R645-301-522, Coal Recovery; Confirmation from the USDOI / BLM / SLO that the resource recovery and protection plan(s) is adequate for each of the Federal coal leases which is being proposed for addition to the Bear Canyon Mine permit area. [PHH]

R645-301-522, A confirmation letter from the BLM is inlcuded.

R645-301-523; the Permittee must describe the anticipated annual production being recovered for each of the following mining methods;

1) Continuous mining primary development;

2) Continuous mining secondary extraction;

3) Longwall secondary extraction.

R645-301-523, Anticipated annual production for the following methods has been added on page 5-10

1. Continuous mining primary development;
2. Continuous mining secondary extraction;
3. Longwall secondary extraction.

R645-301-525.200, R645-301-358.200, The Permittee must describe what measures are to be taken to prevent damage to this area from the underground secondary coal extraction activities. The Permittee must provide a map that correlates the surface location of this area to be protected with the underground workings, and how the protection area correlates with the extraction area, (i.e., how does the surface location correlate with the longwall face). The Permittee must revise Plate 5-3 to accurately reflect the area of potential subsidence above the perimeter of the projected mine workings, using the selected angle of draw determined above and the average depth of overburden within the mining area. [PHH]

R645-301-525.200, R645-301-358.200,

A description of measures being taken to protect these areas (raptor nests) was added on page 3-68, 5-18, 5C-10. Plate 5-3A correlates the location of these area with the underground workings.

Plate 5-3 and 5-3A were updated to accurately reflect the area of potential subsidence based on a 22 degree angle of draw and the depth of overburden. The angle used was stated on page 5C-3.

R645-301-525.312, The Permittee must clearly define how it will monitor and/or protect this area. The Permittee must correlate this location with a map of the underground workings showing the protection area, and blocks of coal that are to be left to protect it. [PHH]

R645-301-525.312, A description of how these areas (perennial streams) will be protected was added on page 5-18, 5C-9, and 5C-10. Plate 7-4 and Plate 5-3 correlates the location of these areas with the underground workings.

R645-301-525.440, the Permittee must commit to installing **ONE** subsidence monitoring point in each longwall panel as close to the longitudinal and latitudinal center of the panel as possible in order to determine when subsidence has reached its maximum in that area. Comparison of data with adjacent monitoring points will determine if the subsidence trough is at the supercritical stage.

R645-301-525.440, A commitment was added to install at lease one subsidence monitoring point in each longwall panel as close as possible to the longitudinal and latitudinal center of each panel on page 5C-8. A commitment was also made to compare data from adjacent panels that will include the current year of subsidence data and the previous two years at a minimum.

R645-301-525.440, the Permittee must commit to compiling an analysis of the subsidence monitoring data that is submitted with the annual monitoring report for the area, which was extracted during the current monitoring year. An analysis of the monitoring data for previous years over areas adjacent to those extracted during the current monitoring years is also required. However, the analysis of data for areas which have been extracted two years prior to the current monitoring year **IS NOT NECESSARY.** [PHH]

R645-301-525.440, A commitment was added compile and analysis of the subsidence monitoring data and submit it with the annual report on page 5C-8.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155
http://www.blm.gov

IN REPLY PLEASE REFER TO:
3482
U-61048, U-61049, U-020668
(UT-923)

SEP 2 2 2006

Certified Mail--Return Receipt Requested

Mr. Pete Rutledge
Office of Surface Mining
P. O. Box 46667
Denver, Colorado 80201-6667

Re: Resource Recovery and Protection Plan (R2P2) Modification, Federal Coal Leases U-61048, U-61049, and U-46484, Co-Op Mining Company, Bear Canyon Mine, C/015/025

Dear Mr. Rutledge:

On July 29, 2006, the Bureau of Land Management (BLM) received a request from Co-Op Mining Company to modify the Bear Canyon R2P2 to include the Mohrland lease area, comprised of the three listed Federal coal leases. A request to modify the July 29, 2006 R2P2 modification submittal was received on September 5, 2006. These leases are included in the Bear Canyon LMU application, and will be added to the LMU R2P2 as an R2P2 modification. This letter documents the BLM's evaluation of the up-to-date R2P2 modification.

On September 2, 2005, the Office of Surface Mining determined that mining on these leases would require Federal Mining Plan approval. This R2P2 modification is included in the permit application package (PAP) for adding the listed Federal coal leases to the approved Bear Canyon Mine Permit.

The addition of the lands held in these Federal leases to the permit area would add approximately 7,500 acres of federal and private coal lands. The surface lands associated with these coal leases are either owned privately or are governed by the National Forest. This permitting action would allow CW Mining Company's wholly-owned subsidiary, Co-Op Mining, to mine, by exclusively underground methods, approximately 25 million tons of recoverable coal. Coal mining has been conducted previous to the passing of the Surface Coal Mining and Reclamation Act of 1977 on Federal leases U-61048, U-61049, and U-46484.

The BLM found the submitted R2P2 to be acceptable. The proposed coal extraction areas of the R2P2 were determined by the BLM to comply with the lease terms, including special lease stipulation 13, which addresses subsidence damage to escarpments and perennial streams. Any additional restrictions placed on the coal recovery as depicted in this R2P2 would require consultation with the authorized officer of the BLM in order to properly address Mineral Leasing Act (MLA) requirements.

The R2P2 addresses all the required items per 43 CFR 3482.1 (b), and shows that mining is planned for all areas where potential minable coal is currently known to be located. All minable coal in two seams will either be accessed from existing mine workings, or from in-mine rock slopes of the Bear Canyon #3 and #4 Mines (located on adjacent leases). No new surface facilities are currently planned on this permit extension.

The BLM finds the R2P2 to comply with the Mineral Leasing Act of 1920, as amended, the lease terms and conditions, and the regulations in 43 CFR 3480. The BLM has also determined that the current modification will enable Maximum Economic Recovery (MER) of Federal coal. We therefore recommend that the Secretary approve the R2P2 modification as part of the Federal mine plan approval.

If the permit authorized by the Division of Oil Gas and Mining results in changes to the mining plan that would effect the coal recovery outlined in this R2P2, the BLM will need to review these changes to ensure that the mining plan is still in conformance with the Mineral Leasing Act of 1920 as amended, the lease terms and conditions and achieves MER of the Federal coal.

If you have any questions, please contact Jeff McKenzie of my staff at 801-539-4038 or Stephen Falk at the Price Field Office at 435-636-3605.

Sincerely,

James F Kohler

James F. Kohler
Chief, Solid Minerals Branch

Enclosure
Approved Mine Maps

cc: Division of Oil Gas and Mining, State of Utah
1594 West North Temple Street, Suite 1210
Salt Lake City, Utah 84114-5801

Price Field Office, UT-070

C. W. Mining Company
P. O. Box 1202
Huntington, Utah 84528

In addition, Co-Op has agreed that in the event that escarpment failure due to subsidence impacts any raptor nests within the permit area, that Co-Op will notify UDWR and the U.S. Fish and Wildlife Service and take whatever action is recommended in order to mitigate such loss. ~~At this time no raptor nest are at risk due to their absence from all areas of potential impact. Raptor nests will be safeguarded from subsidence by maintaining a min of a 100' barrier to the outcrop.~~ In areas where raptor nest may be impacted C. W. Mining will try to adjust their timing so that these areas will not be undermined during the nesting season. In the event we are unable to do this obstructions such as fencing will be placed over the nest to prevent them from being used. If a nest is lost due to escarpment failure C. W. Mining will get a take permit for the nest and the impact will be mitigated. This mitigated will most likely be replacing the nest with an artificial nest, or expanding on the raptor prey base study included in Appendix 3N.

UDWR authorities will be consulted, in the event a need for pesticides becomes necessary to control rodents or insects during reclamation. No control measures will be used without prior approval by all parties concerned.

In order to mitigate a possible impact to a red tail hawk nest during the WHR construction DWR required C.W. Mining Company performed a Raptor prey base study in 2005. The results of this study are included in Appendix 3N. ~~will require some mitigation for the loss of Big Game Habitat and for the potential loss of raptor nesting during the construction and operation of the facilities. C. W. Mining Company is working with the Division of Wildlife Resources to develop a raptor prey base study and will complete the study in the summer of 2003 for mitigation.~~

R645-301-523 Mining Method

Mining at the Bear Canyon complex is done by a longwall and continuous miners. ~~The miners discharge into shuttle cars, which carry the coal to the feeder breaker. The feeder breaker discharges the coal onto the belt conveyor where it is taken out of the mine.~~ The main entries consist of a five-entry system on 80 ft -200 ft centers to be driven to the property limits. For longwall recovery 2-5 gate entries are driven off the mains on either side of the panel to the head of the panel where they are connected by bleeders. The longwall then mines out the panel. For continuous miner recover sub-mains consisting of five entries on 80 ft - 200 ft centers are then driven off the mains and room-and-pillar panels are developed off the sub-mains. Rooms are developed within the panels on 70 ft - 150 ft centers. This is referred to as "Development". The pillars are then recovered according to the approved plan. This is referred to as "retreat". Timber or mobile roof supports are installed to support the roof and provide for breaker control of the caving roof. Retreat mining of this type will provide a recovery of 70pct - 80 pct within the panels. See Figures 5-1 and 5-2. Sub-mains under the escarpment area in Bear Canyon will be developed and left.

Anticipated average annual production is 2,100,000 Tons from the longwall face and 400,000 Tons from development mining. Before the longwall face comes on line and after it is finished some room and pillar retreat mining will be done. The average annual production from room and pillar retreat mining is 600,000 Tons.

As can be seen on Plates 5-1A and 5-1B, the lower seam workings are planned to be columnized with the upper seams as closely as practicable. Where this is not practiced due to geologic conditions, pillars will be adequately sized to afford stability for the rooms. Geologic conditions and the limited lateral extent of reserves in the Tank Seam precludes columnizing of pillars with the other seams in some areas. However, experience has shown that the overburden (250') between these seams will provide adequate roof stability even if the pillars are not all columnized. The mining plan sequence allows for recovery of the upper seam areas (Tank Seam first, then Blind Canyon Seam) prior to final recovery of the lower seam. This procedure is consistent with accepted engineering practice in multiple seam mining.

Protection of Natural Surface Structures & Streams

~~C. W. Mining's commitment to maintain a min of 200 ft barrier pillars to outcrops where required by lease stipulations, or protection of streams and wildlife to minimize the possibility of escarpment failure and resulting detrimental impacts to down stream water quality or nesting raptor. Submains under the escarpment area in Bear Canyon will be left unless otherwise approved, no retreat mining will take place under the escarpment areas, which are outside of the potential subsidence zones shown on Plate 5-3.~~ The primary natural structures that need protection are escarpments and streams. Escarpment locations are shown on Plate 5-3 and 5-3A, and a discussion of their protection is included in Appendix 5C. The only stream channels which lies over the minable portion of the permit area is Bear Creek, where it flows through Federal Lease U-024316, and Fish Creek where it flows through a portion Federal Lease U-61049 and private property. See Appendix 5-C for an explanation of the protection zone delineation and method of protection. Adequate barrier zones will be left to protect adjacent stream channels, such as Bear Creek. Downstream channels are protected from disturbed area runoff contamination by utilization of sediment ponds. Temporary sediment controls i.e.; silt fences, straw bail dikes, etc. will be installed and vegetation will be reestablished as required in the event of impacts by escarpment failure.

In areas where coal burn exists the burning of the coal as caused natural subsidence causeing failure of some natural structures. A barrier left adjacent to these areas would cause an interuption between the natural and man made subsidence creating greater impacts to the surface. Because of this no barrier will be left in these areas unless it is needed for roof stability or temperature considerations, in which cause the minimum possible size will be used.

Appendix 5-C

Subsidence Control and Monitoring

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SUBSIDENCE CONTROL AND MONITORING PLAN

SUBSIDENCE

Subsidence can normally be expected to occur over areas where second mining has taken place ~~(pillaring)~~. See R645-301-523 for mining operation. Based on the geologic interruptions within a mine, subsidence becomes very difficult to predict, due to the variable nature of the mining panels. However, Figure 5C-1 will give an estimate of the maximum subsidence from room and pillar mining that may be expected in mine studied in the Western U.S. Maximum subsidence for an average room and pillar panel in the Bear Canyon Mine has been estimated from Figure 5C-1, using the criteria shown in Table 5C-1. For longwall panels, due to their ability to uniformly remove the coal, subsidence predictions are more accurate and there is less surface impacts. An analysis of subsidence effects from longwall mining specific to the Bear Canyon Mine reserves in the Tank seam and Hiawatha seam is included as attachment 3. Attachment 3 mentions additional reserves, these reserves are located in the Blind Canyon. The cumulative affects of subsidence, based on attachment 3 for the Tank and Hiawatha seams, and attachment 1 for the Blind Canyon seam, is shown on Plate 5-3. Subsidence has been estimated based on the number of seams mined in the area and assuming the worst case scenario for mine layout and barrier pillar sizing.

For all subsidence calculations, and in determining the affected area an agle of draw of 22.5° was used. Past experience in this area shows no indication that subsidence would be this drastic, historically mines in the area have experienced an angle of draw of

approximately 15°. Additionally no actual subsidence has been noted from areas pillared as much as 40 years ago, and the subsidence monitoring network initiated in 1987, has shown only minor (0.47 ft max 1992) variations in elevation. Based on this, little, if any, detectable subsidence is expected to become apparent when mining under these depths. Some minor fracturing and an escarpment rock fall have been noted in the adjacent Trail Canyon Mine area, and although these are assumed to be mine-related, they occurred in areas of relatively low cover and unknown outcrop protection. Only minor fracturing has been noted in relation to the Bear Canyon Mine (see Plate 5-3). Based on this and on the environmental friendly design and mining methods being used few surface fractures and escarpment failures are anticipated. The main affect will be a uniform lowering in elevation.

Figure 5C-1 Subsidence Chart

Table 5C-1 Estimated Maximum Subsidence

Coal Seam	Fee and Fed Lease U-024318	Federal Lease U-024316 and U-46484	Federal Lease U-020668 and U-38727	Fee and Federal Lease U-61049	Federal Lease U-61048
BLIND CANYON SEAM Panel Width Average Depth Width/Depth Ratio Seam Thickness Maximum Calculated Subsidence	 600 ft. 800 ft. 0.75 9 ft. 5.4 ft.	 Mining Questionable	 650 ft. 1200 ft 0.54 9 ft. 3.2 ft.	 Not Minable	 Not Minable
HIAWATHA SEAM Panel Width Average Depth Width/Depth Ratio Seam Thickness Maximum Calculated Subsidence	 600 ft. 860 ft. 0.75 5 ft. 3.2 ft.	 Mining Questionable	 Not Minable	 650 ft. 1600 ft. 0.40 14 ft. 5 ft.	 650 ft. 1600 ft. 0.40 14 ft. 5 ft.
TANK SEAM Panel Width Average Depth Width/Depth Ratio Seam Thickness Maximum Calculated Subsidence	 650 ft. 560 ft. 1.16 8 ft. 5.5 ft.	 650 ft. 1,400 ft. 0.46 7 ft. 4.5~~1.9~~ ft.	 680 ~~650~~ ft. 3,300 ~~950~~ ft. 0.21 ~~0.68~~ 7.5 ft ~~4.5~~4.1 ft.	 760 ft. 4,600 ft. 0.17 7.5ft. 4.5 ft.	 Not Minable
Total Calculated Subsidence	**14.1 ft.**	**4.5~~1.9~~ ft.**	**7.7 ~~7.3~~ ft.**	**10 ft.**	**5 ft**

MONITORING

Since subsidence may occur over any underground extraction, a monitoring network was installed in the summer of 1987, and has been monitored since that time. Monitoring stations are steel rebar with aluminum caps, set in concrete so weather, frost heave or wildstock/wildlife will not disturb them. Location of monitoring stations are shown on Plate 5-3.

Ten permanent subsidence monitoring points (SMS-1 thru SMS-5, Con 6, and SMS-7 thru SMS-10) are located on the mine site area. Before expansion into the Federal Lease area U-023416 the subsidence monitoring plan consisted of 3 monitoring points (SMS-1, SMS-2, and SMS-3) in the Bear Canyon Permit Area, a fourth point SMS-4 in the Trail Canyon Permit Area, and a Control Point CON-5, located outside the mining area. SMS-1, SMS-3, and SMS-4 are common to both the Trail Canyon and Bear Canyon Permits. CON-6 and SMS-7 thru SMS-10 were proposed in 1990 and established 22 September 1991. CON-5 became an additional subsidence monitoring point (redesignated SMS-5). The location of all existing and proposed points are shown on Plate 5-3.

15 additional monitoring points were installed on Federal Lease U-024316. These are shown on Plate 5-3 as points 11 through 24. 26 ~~additional~~ points ~~will be~~ were added to Wild Horse Ridge (Nos. 25 through 50) to monitor subsidence on Federal Lease U-020668 and U-38727. 7 points were added in and around Lease U-61049 (Numbers 51-57). Above the first long-wall panel 11 points were established at a spacing of 50 ft

going across the width of the panel (points 25A-K) in order to determine if subsidence is following the predicted pattern. Potential points were also selected above the 2nd and 3rd longwall panels and will continue to be selected above each of the panels one year prior to mining at a spacing of 250 ft as recommended in Attachment 3. The actual spacing and location of these points may change based on the results from points 24A-K, and on the yearly analysis that will be performed. If subsidence occurs as anticipated the spacing of 250 ft will continue. If it does not additional points will be added to determine the behavior, and our subsidence model will be updated. At a minimum 1 point will be placed in each panel as near as possible to the latitudinal and longitudinal centers.

Stations shall be monitored, and evaluated yearly for changes in elevation. This evaluation will include the current year and the previous two years at a minimum. In addition, a field investigation shall be made yearly of the mining area (including escarpment areas), and any obvious subsidence or mine related surface effects will be noted and located on a map. A copy of the results of the subsidence analysis, survey and map will be available for inspection at the office, and a summary of the ~~survey~~ results will be sent to the Division with the Annual Report.

MITIGATION/PROTECTION OF POTENTIAL IMPACTS

~~.11.20025Potential impacts and mitigation efforts are discussed in R645-301-5~~

Mr. Larry Dalton, Resource Analyst Utah Division of Wildlife Resources and the State's foremost authority on potential impacts of subsidence on wildlife, inspected the site in June 1984. The results of that investigation, as well as others, in part are as follows:

Considering the absence of spring, water sources, the negative potential impacts of subsidence within the Bear Canyon Permit Area could easily be offset by potential positive aspects.

On the negative side: Loss of riparian area and/or water sources and state appropriated water rights is of greatest concern, followed by loss of vegetation from methane gas leaking to the surface from an underground works. Considering the lack of riparian area or water sources above the coal seam, this concern is not warranted for most areas. There are two area of concern above Fish Creek in section 19 as shown on Plate 7-4. These areas will be monitored for loss of water as it is being undermined. ~~Secondly~~, In regards to methane gas Co-Op has never encountered methane gas underground so there is little concern relative to potential vegetation loss. , ~~and last,~~ The last concern is the loss of nests due to escarpment failure.

On the positive side: The tension fractures resulting from subsidence along the steep side hills are frequently utilized by big game as movement corridors. The fractures and rubble provide escape cover for a variety of wildlife species as well as additional habitat for burrowing and denning animals. While there is concern over the potential loss of nests as a result of escarpment failure, there is also a potential for additional nesting sites to be created through this gravitational shearing of escarpment surfaces.

PROTECTION

In order to protect water resources and state appropriated water rights from impacts C. W. Mining has designed their mine layout so that areas where these resources

exist with less then 900 feet of overburden between the resource and the coal, the resource will be outside of the affected area. Based on the mining handbook and past history, 900 feet of overburden is sufficient to prevent adverse affects to the resource. Additionally in the areas where perennial streams exist above the affected area (as shown on Plate 7-4) C. W. Mining will increase the monitoring of these areas to a weekly bases one month prior to mining in the area. This weekly monitoring will continue until one month after mining has left the area. Monitoring will then be reduced to once a month for an additional 6 months at which time it will resume its normal schedule. This increased monitoring will include the sites FC-2, FC-3, FC-4, FC-5, and SCC-2 for the right fork of Fish Creek, and FC-1, FC-6, SBC-18, SBC-20, and SBC-21 for the left fork of Fish Creek.

In escarpment failure areas containing raptor nests C. W. Mining will try to time their mining so that it does not occur during the nesting season. If we are unable to do this a physical obstruction such as fencing will be placed over the nesting site to prevent it's use. This would ensure that if a nest was lost no raptors would be lost with it. As of 2005 there were currently 6 raptor nest located inside the affected area. These area discussed in greater detail in Appendix 3L. Anticipated escarpment failure is discussed in greater detail under the applicable lease.

MITIGATION~~NOTIFICATION~~

Notification

During operation, all owners of property within the area that could be impacted by subsidence shall be notified by mail six months prior to mining beneath their property and be informed of:

a. Specific areas mining will take place

b. Dates of underground operations that could cause subsidence in the area.

c. Measures to be taken to prevent and or control adverse surface effects.

Co-Op further commits to the following course of action should subsidence cause any material damage or a reduction in value of structure or land.

a. Restore, rehabilitate, or remove and replace, to the extent technologically and economically feasible, each materially damaged structure, feature or value promptly after the material damage from subsidence is suffered, to the condition it would be in if no subsidence had occurred and restore, to the extent technologically and economically feasible, those surface lands that were reduced in reasonable foreseeable use as a result of such subsidence to a condition capable of supporting before subsidence; or

b. Purchase the damaged structure or feature (except structures or features owned by the person who conducted the underground coal mining activities) for its pre-subsidence fair market value. The person conducting the underground coal mining operation

shall promptly, after the material damage or reduction in value or reasonable foreseeable use from subsidence occur, to the extent technologically and economically feasible, restore the purchased structure or the structure owned by the person conduction the underground mining operations, restore those surface lands that were materially damaged or reduced in value or reasonable foreseeable use by such subsidence, to a condition capable and appropriate of supporting the structure, and any other foreseeable uses such surface lands were capable of supporting before mining. Nothing in the paragraph shall be deemed to grant or authorize an exercise of the power of condemnation of the right of eminent domain by any person engaged in underground coal mining activities; or

c. Compensate the owner of any surface structure in the full amount of the diminution in value resulting from subsidence, by purchase prior to mining of a noncancellable premium prepaid insurance policy or other means approved by the Division as assuring before mining begins that payments will occur; identify every person owning an interest in the surface for all damages suffered as a result of the subsidence; and , to the extent technologically and economically feasible, fully restore the land to a condition capable of maintaining reasonably foreseeable uses which it could support before subsidence.

d. The area will be monitored on an annual basis, and field investigation will also be performed at that time. If escarpment failure is observed in areas where no escarpment failure is anticipated, ~~mining will be immediately stopped in the~~An immediate evaluation of the eaffected area, ~~until a proper evaluation can~~will be

performed to determine the cause of the failure, and any necessary remedies or protection required. The DOGM and the U.S. Forest Service, Price District Ranger would be notified of such an occurrence. An escarpment stability study is included as attachment 2.

U-024316

Mining is projected within the vicinity of Bear Creek in Federal Lease U-024316. An additional concern over escarpment failure has been raised by the U.S. Forest Service; therefore, the following discussion will address the potential for such failure.

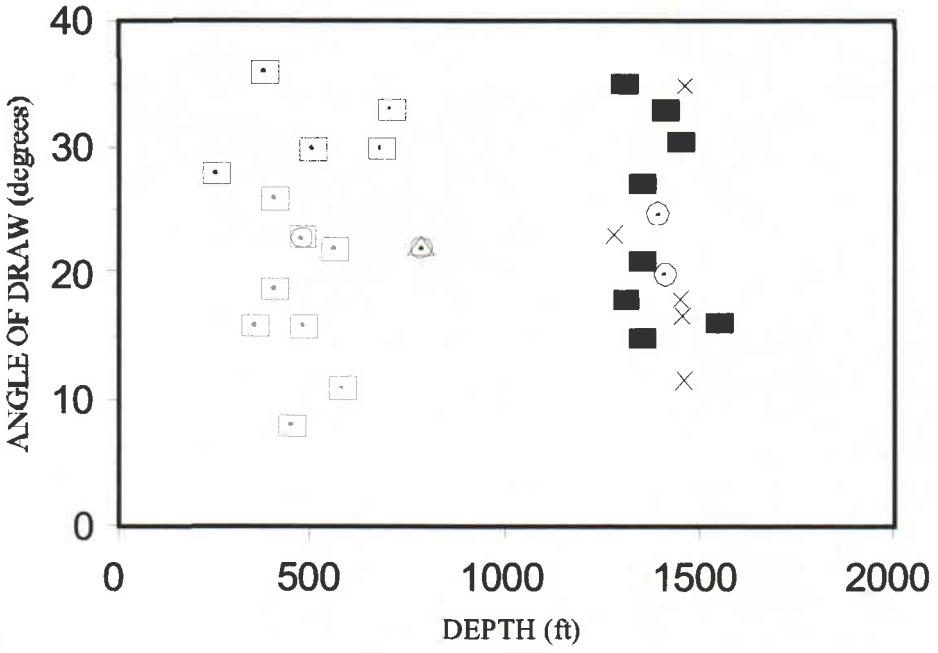
The steep area of Bear Canyon in the S.W. corner of Section 13 is approx 1200 feet above the coal seam (See Plate 6-10). To prevent subsidence to Bear Creek and the adjacent ledges, no retreat mining was conducted East of the in-mine fault paralleling the section line between sections 13 and 14, T.16S., R.7.E. See Plate 3-4C.

This Protection Zone was determined by examining the angles of draw. Figure 5C-2 shows angle of draws plotted against depths for various mines within the general area of the Bear Canyon Mine. Based on this information, an average angle of draw of 22.5° was used.

Plate 5-3 shows the areas which will potentially be affected by subsidence. None of the area within Federal Lease U-024316 is included in this potential area..

Within the lease, pillars were developed on 80' centers minimum. This pillar size was evaluated using the "Analysis of Retreat Mining Pillar Stability (ARMPS)" software, developed by the National Institute for Occupational Health and Safety. A pillar stability factor of 1.54 was determined, which shows the pillar size to be adequate to prevent subsidence of the ledges and Bear Creek. NIOSH research has found that in 94% of all

case studies stability factors greater than 1.5 have provided long-term stability (Mark, 1997), showing that pillars with safety factors above 1.5 are adequate to hold the weight of the overburden, thus preventing subsidence. Monitoring of the ledges for subsidence subsequent to the development on this lease has confirmed that no subsidence has occurred, and no escarpment failures have been observed.



YORK CANYON
PRICE RIVER
PMC
DEER CREEK
AVERAGE

Outcrop protection has been increased to a minimum of 200 feet in the plan (see R645-301-525-300). This is consistent with other mines in the Wasatch Plateau, and with the exception of some longwall operations, has been shown to be effective at preventing escarpment failure near outcrops.

Figure 5C-2

Subsidence Factor Versus Mining Depth

U-38727, U-61048, U-61049, and U-020668

As with Federal Lease U-024316, lease stipulation 13~~12~~ requires mining to be conducted in a manner to prevent hazardous conditions such as potential escarpment failure.

The uppermost escarpment in the Wild Horse Ridge area is the Castlegate sandstone, located approximately 800 ft. above the Tank Seam, and 950 ft. Above the Blind Canyon Seam.

To prevent subsidence to these escarpments in areas where it has been determined escarpment failure would be a hazardous condition, a barrier zone will be left in which no retreat mining will take place. The width of this barrier was determined using an angle of draw of 22.5° (See Figure 5C-2 and attachment 2).

~~or the Tank Seam a minimum barrier of 300' will be maintained in which no retreat mining will take place. For the Blind Canyon Seam, a minimum barrier of 370 feet will be maintained.F~~ Plate 5-3 shows the cumulative anticipated ~~zone which will be affected by~~ subsidence contours, and the Castlegate Sandstone, located ~~outside of this area.~~within the permit area. ~~This zone is also~~Individual seam subsidence contours are shown on Plates 5-1A, 5-1B, and 5-1C to show the relationship between the development and retreat panels. W~~. Therefore, this pillar size will be adequate to prevent subsidence and escarpment failure. Mining on Federal Lease U-024316 has also confirmed that this size is adequate in the Bear Canyon Mine area. for room and pillar retreat mininghere~~

~~panels are shown encroaching on the barrier zone, pillars will be developed and left in place to prevent subsidence. The pillars will be developed on 80' centers minimum. Using the ARMPS software (NIOSH), a minimum pillar stability factor of 1.58 was determined~~

There area two areas within these leases and a third area just outside of the leases where it has been determined that escarpment failure does not present a hazardous condition. The locations of the areas are in the left fork of Fish Creek where it runs through lease U-020668, and U-38782, as well as an area at the top of the left fork of Fish Creek just outside of two portions of lease U-61049, and in the left fork of Bear Creek where it runs through lease U-61049. These areas as well as additional areas of been studied and modeled for rock falls. This study is included as Attachment 2. A summary and discussion of these result are included below. The cross-sections modeled for rock falls are shown on Plate 5-3.

Summary of Rock Fall Anaylsis

Section	Distance to Stream Bed	Maximum Rockfall Distance
A-A'	2,050 ft.	800 ft.
B-B'	1,674 ft.	1,200 ft.
C-C'	2,600 ft.	950 ft.
D-D'	1,980 ft.	650 ft.
E-E'	450 ft.	450 ft. (rock hits bottom of canyon)

Section A-A'

This are is located above the old Bear Canyon #1 and #2 mines. It was used to calibrate the model

Section B-B'

This section is located on the point of Wild Horse Ridge. It was initially selected because it represented the steepest slope within the affected area. However as mining proceeded towards this area it was discovered that there was active burning so mining stopped and never reached this area. This area will however be impacted by natural subsidence resulting from the natural burning of the coal.

Section C-C'

This section is located on Wild Horse Ridge against the left fork of Fish Creek near the south-east end of U-38727. It was selected because secondary mining will take place under this area and also go out past the escarpments. The escarpments in this area range form 0-80 feet. The cross-section was placed where escarpments were the largest and the slope was the steepest. Escarpment failure will occur in this section, however based on models, the failure will not reach the stream channel so no water impacts will occur. There will however be loss of vegetation in the path of the rock fall. This will have minimal aesthetic impacts since there is little vegetation along the slope and also because escarpment failure happens naturally along Fish Creek so any areas would still match the appearance of surrounding areas.

Section D-D'

This section is located on Wild Horse Ridge against the left fork of Fish Creek near the north-east end of U-38727. This section represents the transition area where subsidence contours are beginning to move from under the escarpments to adjacent to the

escarpments, and then away from the escarpments. The escarpments in this area range from 80-160 feet. Any escarpment failure in this area will not reach the stream channel so impacts are the same as section C-C'.

Section E-E'

This area is at the upper portion of the right fork of Fish Creek between the two segments of Lease U-61049. Fish Creek is a box canyon and the escarpments in the area that will be impacted are the stream bed. The escarpments range from 160-240 feet. Since the escarpments are the stream bed any escarpment failure would have an impact on water resources. However the impacts would be quickly dissipated since flow are minimal in this area (10-30 gpm). Little vegetation impact is expected because of the short slope distance and the fact that water has eroded most of the soil in the area leaving exposed rock ledges.

References

Mark, C., and F.E. Chase
Analysis of Retreat Mining Pillar Stability (ARMPS). Paper in Proceedings on New Technology for Ground Control In Retreat Mining, 1997, NIOSH pub. 97-133, pp. 17-34.