

**UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION**

**COAL MINE SAFETY AND HEALTH**

**REPORT OF INVESTIGATION**

**Underground Coal Mine**

**Fatal Fall of Roof Accident  
October 24, 2003**

**Hacker's Creek Mine No. 1  
Roblee Coal Company  
Buckhannon, Upshur County, West Virginia  
I.D. No. 46-08820**

**Accident Investigators**

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Industrial Hygienist**

**Jan B. Lyall  
Coal Mine Safety and Health Inspector – Roof Control**

**Jason W. Rinehart  
Industrial Hygienist**

**William Gray  
Mining Engineer, Technical Support**

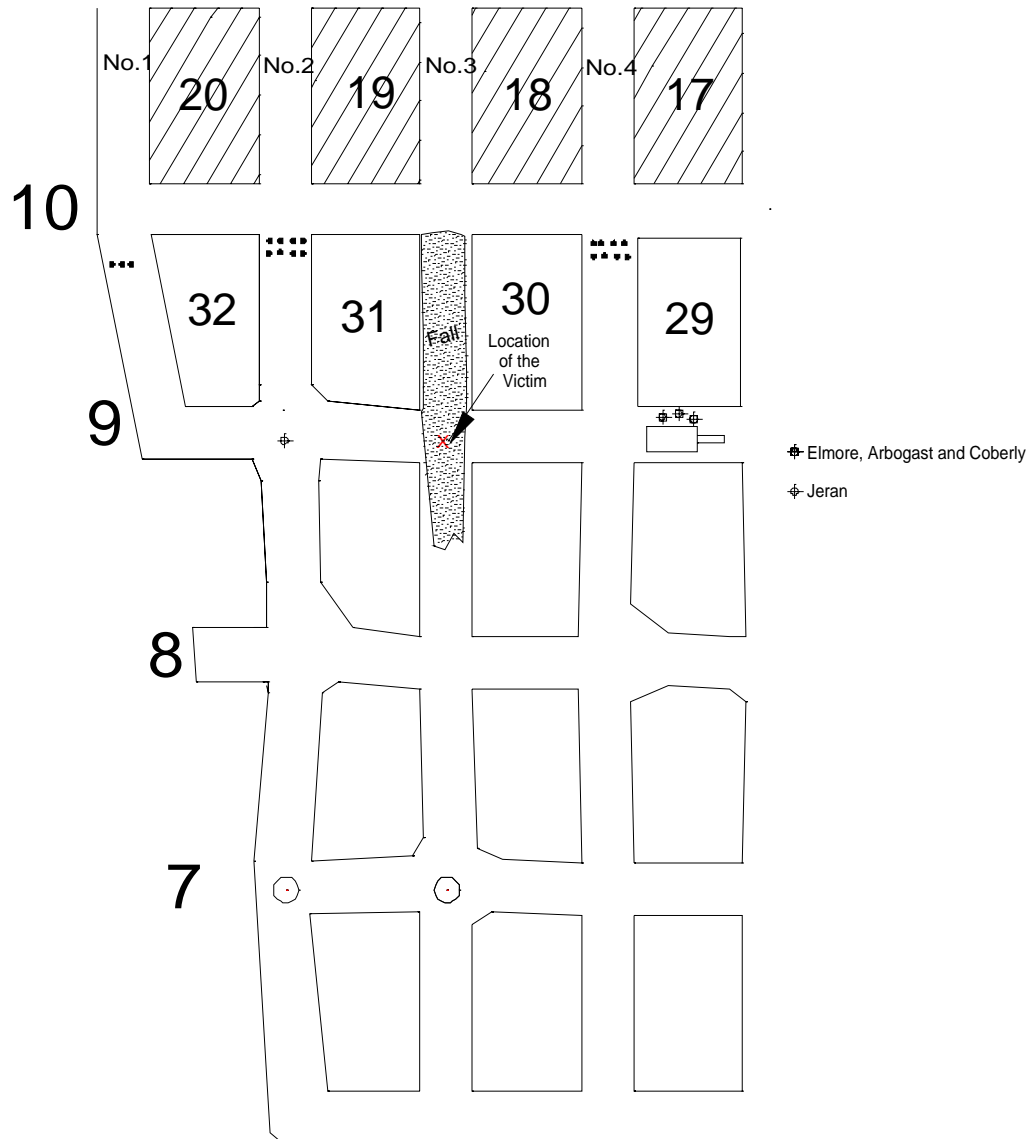
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## **Table of Contents**

|   |    |
|---|----|
| SKETCH OF ACCIDENT SITE .....                       | ii |
| OVERVIEW .....                                      | 1  |
| GENERAL INFORMATION .....                           | 2  |
| DESCRIPTION OF THE ACCIDENT .....                   | 3  |
| RECOVERY EFFORTS .....                              | 4  |
| INVESTIGATION OF THE ACCIDENT .....                 | 4  |
| DISCUSSION .....                                    | 5  |
| ROOT CAUSE ANALYSIS .....                           | 7  |
| CONCLUSION .....                                    | 8  |
| ENFORCEMENT ACTIONS .....                           | 9  |
| APPENDIX A – INVESTIGATION PARTICIPANTS .....       | 11 |
| APPENDIX B – LOCATION OF SURFACE CRACKS .....       | 12 |
| APPENDIX C – PILLAR BLOCK EXTRACTION SEQUENCE ..... | 13 |

## SKETCH OF ACCIDENT SITE



## **OVERVIEW**

On October 24, 2003, at approximately 10:20 a.m., Richard L. Harlan II, a 29-year old classified Utilityman working as a Timberman, was fatally injured in a roof fall accident in the 1-Left pillar section.

Between 10:00 and 10:15 a.m., the continuous mining machine (continuous miner) was backed outby the pillar line after completing No. 20 pillar block and was being moved toward the right side of the section to begin mining block No. 21 (refer to Appendix C). Harlan and Ryan Jeran, Section Electrician, set three breaker posts in the No. 1 entry just outby the No. 20 block, when the roof began to work and fall behind the gob curtains in the No. 2 entry. Harlan and Jeran walked from the No. 1 entry to the No. 2 entry gob curtain between 31 and 32 blocks. They observed that the fall had knocked out the inby row of breaker posts in the No. 2 entry. Harlan and Jeran traveled outby to the intersection of the No. 2 entry in the No. 9 row of crosscuts. Harlan and Jeran heard the roof beginning to work again. Jeran observed Harlan run toward the right side of the section through the No. 3 intersection of the No. 9 row of crosscuts where the roof collapsed on him. Jeran and other members of the crew yelled for Harlan, but there was no response. The crew installed timbers around the fall and notified John Murphy, Outside Man, of the accident. Harlan's body was recovered at 8:15 p.m. Harlan was pronounced dead by Coroner Keith Queen at 8:45 p.m.

The accident occurred because hazardous roof conditions on the working section were not identified and corrected. A near vertical, weathered, stress-relief joint on the left side of the No. 3 entry resulted in a detached block that cantilevered from the opposite side pillar. Abutment pressures from second mining, in conjunction with a fall that originated in the pillared area and that overrode the breaker posts, caused failure of the cantilevered beam.

## **GENERAL INFORMATION**

Roblee Coal Company's Hacker's Creek Mine No. 1 is located near Buckhannon, in Upshur County, West Virginia. The mine is accessed by four drift openings into the 60-inch thick Redstone seam and has been in producing status since August 9, 2000. Coal is produced on the dayshift and occasionally on the midnight maintenance shift. The mine produces approximately 650 tons of raw coal daily, using the room and pillar method. The mine employs 21 persons, including 18 underground and 3 surface employees. The mine normally operates eight hours per day, five days per week.

Coal is extracted with a remote controlled continuous miner equipped with a wet-bed scrubber, utilizing a 40-foot extended cut plan on development. The maximum allowable entry width is 18 feet and centers are 40 to 200 feet. The mine operator has the option to use different pillaring plans dependent on the orientation of the blocks and whether they use the entry or crosscut approach to extract coal from the solid coal pillars. Prior to this accident, the last reported roof fall occurred on June 6, 2001.

Shuttle cars are used to transport coal to the section belt conveyor feeder. Coal is transported to the surface by a series of belt conveyor flights. The mine is ventilated with a single main mine fan, utilizing a blowing system. The mine liberates approximately 2,233 cubic feet of methane every 24 hours.

The principal officials for Roblee Coal Company at the time of the accident were:

|                 |                                   |
|-----------------|-----------------------------------|
| Robert.R. Jeran | President                         |
| Joe Johnson     | Director/Production & Maintenance |
| Dale D. Harlan  | Mine Foreman                      |
| Mary B. Book    | Secretary/Treasurer               |

The last MSHA regular Health and Safety Inspection (AAA) was completed on 8/21/2003. The Non-fatal Days Lost (NFDL) incidence rate during the previous quarter for the industry was 5.92 and 0.00 for this mine.

## DESCRIPTION OF THE ACCIDENT

On October 24, 2003, at approximately 6:50 a.m., the day shift crew, under the supervision of Mark Chewning, Section Foreman, entered the mine via a rubber-tired personnel carrier and traveled to the 1-Left Section. Chewning instructed Thomas Elmore, Continuous Miner Operator, to service the machine (clean the scrubber, check sprays, etc.). He then traveled across the faces to conduct an examination of the section. Chewning returned to the continuous miner. Production initiated on the far left side of the section, from the No. 1 entry in the No. 20 block of coal at approximately 8:30 a.m. Chewning then made a second examination of the section, including the permissible pump located in the face area, and returned to the continuous miner. The pillar block was mined according to the approved roof control plan without incident. Mining of the pillar block was completed sometime between 9:45 a.m. and 10:00 a.m. The final pushout was not mined (the approved roof control plan permits the final pushout to be mined or left unmined at the discretion of the operator). Elmore trammed the continuous miner toward the right side of the section for three blocks and stopped and gathered cable slack. Elmore, Steven Arbogast, Continuous Miner Helper, and William Coberly, Shuttle Car Operator, were at the continuous miner. Chewning and the Roof Bolter Operators, Timothy Tenney and Paul Tenney, were attaching the continuous miner's electrical cable and waterline to the scoop.

Meanwhile, Richard Harlan, Utility Man, and Ryan Jeran, Section Electrician, were installing breaker posts. They had set three posts in the No. 1 entry when they heard the roof working "more than normal" behind the gob curtains. They walked to the intersection of the No. 2 entry and the crosscut immediately outby the pillar line. Harlan remained in the intersection while Jeran traveled inby to the No. 2 entry gob curtain to assess the roof inby the breaker posts. He returned to the intersection with Harlan as the roof within the pillared area began working heavily. Harlan ran through the crosscut, toward Elmore, Arbogast, and Coberly, who were located near the continuous miner. As Harlan reached the No. 3 entry through the No. 9 row of cross cuts, he was struck by a roof fall that extended from the pillared area, outby for approximately 1½ crosscut. Jeran, still located in the No. 2 entry, observed the fall as it struck Harlan at approximately 10:15a.m.

Elmore, Arbogast, and Coberly saw Harlan's caplight disappear as he ran toward them during the roof fall. They began yelling in an attempt to locate Jeran and Harlan. Chewning and the Tenneys ran toward the fall area when they heard Jeran respond to their calls. Jeran told the others what he observed. The crew installed timbers along the left and right side of the fall area. After several attempts and no response from Harlan, Chewning notified John Murphy, Outside Man, of the accident. Murphy phoned Robert Jeran, President of Roblee Coal Company, who was at the company's 108-I Mine, and informed him of the accident. Jeran traveled to the Hackers Creek Mine and discussed the accident with Chewning. Jeran notified MSHA of the accident at approximately 10:45 a.m.

## **RECOVERY EFFORTS**

Ryan Jeran informed the recovery team of the approximate location of the victim. Based on the observed conditions, a joint decision was made to recover the victim from the No. 2 entry side of the fall. The 103(k) Order was modified to allow the operator to utilize equipment and other resources to recover the victim. The victim was recovered at 8:15 p.m. At 9:15 p.m. the 103(k) Order was modified to allow the operator to maintain the mine.

## **INVESTIGATION OF THE ACCIDENT**

Carlos Mosley, MSHA Assistant District 3 Manager for Technical Programs, was notified of the accident at approximately 11:05 a.m. on October 24, 2003, by Marlene Cayton, Bridgeport Field Office Secretary. Mosley notified Ronald L. Wyatt, Staff Assistant, who notified the necessary personnel to respond to the accident. Mosley and Wyatt telephoned the mine operator and issued a verbal 103(k) Order. Wyatt also notified MSHA headquarters in Arlington, Virginia, and requested that Educational Field Services and MSHA's Pittsburgh Safety and Health Technology Center be notified. Kenneth Tenney, Bridgeport Field Office Supervisor, was the first MSHA employee at the accident scene, arriving at 11:45 a.m. Jim Satterfield, Bridgeport Field Office Supervisor, arrived at approximately 12:15 p.m. Jan Lyall, Coal Mine Safety and Health Inspector (Roof Control) arrived at approximately 1:15 p.m. At approximately 1:30 p.m., Ronald Wyatt, Staff Assistant, and Gregory Fetty, Industrial Hygienist, arrived at the accident site to assist with recovery efforts. Fetty served the 103(k) order in writing upon his arrival. Tenney, Satterfield, Lyall, West Virginia Office of Miners' Health, Safety, and Training (WVOMSHT) representatives, and company officials traveled underground to the accident site.

This investigation was conducted in cooperation with WVMOSHT. Other participants included management personnel from Roblee Coal Company and surveyors from Wolfe and Associates. A list of those persons who participated in the investigation is contained in Appendix A of this report.

Investigation team members Fetty and Lyall initiated the accident investigation on the day of the accident. Photographs, measurements, and sketches were made of the area. Tenney obtained preliminary statements from witnesses prior to the arrival of the accident investigation team. Other documents and relevant information was gathered by the investigators.

On October 27, 2003, persons having knowledge of the facts regarding the accident were interviewed by MSHA, WVMOSHT, and company officials. Jason W. Rinehart, Industrial Hygienist, joined the accident investigation team to assist in interviewing the miners. Personnel from MSHA's Pittsburgh Safety and Health Technology Center, Roof Control Division, John R. Cook, Mining Engineer, and William J. Gray, Mining Engineer, joined the accident investigation team and took additional photographs and measurements at the accident site. Brad Crandall and Jeremy Devine, Wolfe and Associates employees, assisted in mapping the area.

After the initial investigation and recovery efforts, the 103(k) Order was modified to allow the operator to move the section feeder, section power center, and allow the roof bolting machine to drill test holes to evaluate the strata while MSHA and State officials were present.

Additional interviews were conducted with persons having knowledge of the facts regarding the accident. MSHA and State officials also traveled to the 1-Left section to evaluate the roof strata. Jerry Vance, Educational Field Service Specialist, reviewed training records and found no violations of 30 CFR 48.

Following site visits and a meeting between MSHA, WVMOSHT, and mine management, a revised roof control plan was submitted and approved, and the 103(k) Order was terminated.

## **DISCUSSION**

### **Geologic Conditions**

The portion of the mine where the accident occurred was located under a relatively narrow ridge that was approximately 920 feet wide from outcrop to outcrop. The Redstone coal seam averaged 60 inches thick and was above drainage at this location. Overburden thickness averaged 137 feet at the accident site. No mining had been conducted above or below the Redstone coal seam in the immediate area. The immediate roof was composed of sandy shale-green-grey shale.

The fall extended outby from the pillared area and measured 96 feet long, 14 feet wide, and 5 feet high. The fallen material was composed of thinly laminated dark gray shale and sandstone which predominately remained intact as one massive block. In the days following the accident, more material fell from the inby portion of the fall cavity toward the pillared area.

The left side of the fall was bounded by a near vertical, weathered stress-relief joint, often referred to as a hillseam or surface crack. As observed from the left side crosscut (from No. 2 entry to No. 3 entry), this joint was approximately 3 to 5 inches wide and had been in-filled with rock and soft, clay-like material. There was also considerable iron-oxide staining visible. The presence of this extensive joint essentially resulted in a detached block, cantilevered from the opposite side pillar. Abutment pressures from second mining overloaded the cantilevered beam and caused the failure in conjunction with a fall that originated within the pillared area. This same joint continued outby the fall area for approximately 120 feet where it angled over a coal pillar.

The right side of the fall broke along the outside bolt row in the entry, and while generally vertical in profile, was more jagged than the smooth vertical surface on the weathered-joint side of the fall. The outby side of the fall was also somewhat jagged, and feathered out.

Numerous other weathered joints were present throughout the section. Several of these were gapped as much as 5 inches (Appendix B shows the location of these features as observed on October 27). The joints typically ran North East.

### **Roof Control Practices**

The fall occurred shortly after the Joy continuous miner had completed mining No. 20 block from the No. 1 entry. Pillars typically were developed on 50-foot by 70-foot centers. The currently approved roof control plan permitted a maximum entry width of 18 feet, except when within 100 feet of an outcrop, where the plan specified a reduction to 16-foot wide entries and crosscuts. Entry width of the No. 1 Entry in the last open crosscut was 16 feet 8 inches, and in the No. 2 Entry, 17 feet 4 inches. Since these entries were both within 100 feet of the highwall, both of these measurements exceeded the plan requirement of 16 feet. These factors did not contribute to the accident as the roof in these two entries was solid and in a reasonably good visible condition.

The accident site was developed in October 2001. The roof was supported with Grade 60, 5/8-inch diameter, 60-inch long, fully grouted, headed rebar roof bolts. The bolts were installed with 8-inch square, donut embossed, Grade 2 bearing plates. Outby the accident site in the No. 3 Entry, and in several of the adjacent entries and crosscuts, where two parallel surface cracks were observed, straps were installed across the cracks as required in the currently approved roof control plan. Throughout the area, roof bolts were typically installed on closer centers than the spacing stipulated as the maximum in the plan (5-foot maximum between bolt rows by 4½ feet between bolts within a row).

Prior to the recovery of the victim, a similar fall occurred in the No. 5 entry. This fall was present at the time the accident investigation team arrived on the section. Although it cannot be specifically determined when this fall occurred, the fall was not reported in pre-shift record book. The fall extended from the pillared area, through the breaker posts, and outby in the entry. It stopped prior to the intersection in the No. 9 crosscut. At some time in the two days following the accident, a roof fall also occurred in No. 2 entry. This fall was also bounded by a weathered stress-relief joint on the left side and mirrored the fall in No. 3 entry, but did not continue into the last open crosscut.

## ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic causes of the accident that were correctable through reasonable management controls. During the analysis, causal factors were identified that, if eliminated, would have either prevented the accident or mitigated its consequences.

Listed below are causal factors identified during the analysis and their corresponding corrective actions implemented to prevent a recurrence of the accident:

*Causal Factor:* The standards, policies, and administrative controls in use at the mine did not ensure that the roof was supported or adequately controlled to protect persons from the hazards associated with falls of roof. There were one dozen surface cracks on the 1-Left pillar section ranging from 1 to 5 inches wide and several feet in length located throughout the section. A roof fall similar to the fall that resulted in the death of the victim was present in the No. 5 entry. The overall roof conditions on the section were such that additional measures to support the roof should have been implemented.

*Corrective Actions:* The approved roof control plan was revised to include the following measures necessary to be implemented during pillar mining when surface cracks are present: (1) The minimum number of breaker posts has been increased from 8 to 12, and (2) A minimum of six cable bolts eight feet in length are required to be installed in the intersection outby the pillar block prior to pillar mining. The increase in the minimum number of breaker posts and the installation of cable bolts in the intersection minimizes the likelihood of a fall in the gob riding out into the intersection.

*Causal Factor:* The pre-shift examination of the roof conditions in the 1-Left Pillar Section was deficient in that it failed to identify hazardous roof conditions so that corrective measures could be initiated. The surface cracks across the section were extensive in nature. A review of the preshift examination record books did not contain any comments or indication of the presence of surface cracks or adverse roof conditions. An adequate examination would have recognized the surface cracks as a hazardous condition for work scheduled in the area, which included retreating the pillar line toward these surface cracks. Identifications of these conditions during the preshift examination should have prompted the installation of additional roof support or abandonment of the area that was mined.

*Corrective Actions:* The certified persons making the examinations should properly identify and record all hazardous conditions and make the appropriate corrections. Mine management should develop and follow procedures to identify and correct any and all hazardous conditions. Management should be aware that simply not entering hazardous conditions into the on-shift records is unacceptable.

## CONCLUSION

The accident occurred because hazardous roof conditions on the working section were not identified and corrected. A near vertical, weathered, stress-relief joint on the left side of the No. 3 entry resulted in a detached block that cantilevered from the opposite side pillar. Abutment pressures from second mining, in conjunction with a fall that originated in the pillared area and that overrode the breaker posts, caused failure of the cantilevered beam.

Approved By:

//Kevin G. Stricklin  
Kevin G. Stricklin  
District Manager

1/07/2004  
Date

## ENFORCEMENT ACTIONS

- A 103 (k) Order, No. 7146722 was issued to Roblee Coal Company to ensure the safety to all persons until an investigation was completed and the area deemed safe.
- A 104(a) Citation, No. 7146724, was issued to Roblee Coal Company for a violation of 30 CFR 75.202(a): An investigation of the fatal fall of roof accident, which occurred on October 24, 2003, determined that the roof was not adequately supported or otherwise controlled to protect persons from the hazards associated with falls of roof on the 1-Left Pillar Section. Surface cracks ranging from one to five inches in width were present at the following locations:
  - (1) The No. 2 entry had a surface crack from the No. 10 row of blocks to the No. 6 row of blocks, a distance of approximately 280 feet.
  - (2) The No. 2 to No. 3 crosscut in the No. 9 row of blocks had a surface crack from rib to rib, a distance of approximately 18 feet.
  - (3) The No. 3 entry had a surface crack beginning even with the No. 9 row of blocks and extending outby for a distance of 140 feet.
  - (4) The No. 4 entry had a surface crack just inby the corner of the No. 4 to No. 3 crosscut in the No. 9 row of blocks and extended outby for a distance of 140 feet, making the crack 158 feet in length.
  - (5) Crosscut No. 5 to No.4 in the Nos. 8 and 9 row of blocks had surface cracks that extended from rib to rib (two in each crosscut).
  - (6) The No. 5 entry had a surface crack that began just outby the No. 10 row of blocks and extended outby for a distance of 175 feet.
  - (7) The No. 5 to No. 6 crosscut in the No. 8 row of 1 blocks had a surface crack that extended from rib to rib, a distance of approximately 18 feet.
  - (8) The No. 6 entry had a surface crack that began between the No. 9 and No. 10 row of blocks and extended outby to the No. 7 row of blocks, a total distance of approximately 175 feet.
  - (9) The No. 8 entry in the No. 8 row of blocks contained two surface cracks running parallel to each other for a distance of 18 feet. The surface crack farthest to the right extended outby for an additional distance of 5 feet,
  - (10) The No. 9 entry between the No. 9 and No. 10 row of blocks contains a surface crack that extends outby for a total distance of 140 feet,
  - (11) The No. 10 entry between the No. 10 and No. 11 blocks contains a surface crack that extents outby to a location in between the No. 7 and No. 8 row of blocks, a total distance of 200 feet.
  - (12) The No. 11 entry between the No. 10 and No. 11 blocks contains a surface crack that extends outby to a location in between the No. 8 and No. 9 blocks, a distance of approximately 150 feet.

Based on information obtained during interviews of this accident, a roof fall in magnitude similar to the fall that resulted in the death of the victim occurred during the week of August 18, 2003. Additionally, an examination of the section during the accident investigation revealed that a fall similar in nature and size occurred in the No. 5 entry which rode out the breaker posts and extended down the entry, but did not reach the intersection. Due to the numerous surface cracks present on the section at the time of the accident, the prior roof fall, and the hazards associated with pillar mining, additional measures should have been implemented to adequately support the mine roof.

- A 104(a) Citation, No. 7146725, was issued to Roblee Coal Company for a violation of 30 CFR 75.360(b)(3): An investigation of the fatal fall of roof accident, which occurred on October 24, 2003, determined that the pre-shift examiner failed to properly examine the 1-Left Pillar Section for hazardous conditions. There were one dozen surface cracks that were identified on the section as part of the accident investigation that ranged between one and five inches wide and between 140 feet and 280 feet in length. Additionally, there were surface cracks in the crosscuts where six surface cracks extended from rib to rib. (See Citation No. 7146724 issued on the same date for an accurate description of the surface crack locations). This mine has experienced two unintentional roof falls. In addition to the numerous surface cracks present in the mine, the extensiveness of these surface cracks should have prompted identification of these hazardous roof conditions so that corrective actions could have been taken. Due to the hazards associated with mining, and specifically with pillar mining, measures should have been implemented to adequately support the mine roof to correct the hazardous condition or the area should have been dangered off and the section pulled back. The preshift record book did not contain any entries identifying the surface cracks or adverse roof conditions.

## APPENDIX A

List of persons furnishing information and/or present during the investigation:

### Roblee Coal Company

|                      |                                   |
|----------------------|-----------------------------------|
| Robert R. Jeran      | President                         |
| Joseph Johnson       | Director/Production & Maintenance |
| * Mark W. Chewning   | Day Shift Section Foreman         |
| * Paul J. Tenney     | Roof Bolter Operator              |
| * Timothy E. Tenney  | Roof Bolter Operator              |
| * Marshall Scott     | Scoop Operator                    |
| * R. Kurt. Humphreys | Shuttle Car Operator              |
| * Steve L. Arbogast  | Miner Helper                      |
| * Thomas C. Elmore   | Miner Operator                    |
| * William E. Coberly | Shuttle Car Operator              |
| * R. Ryan Jeran      | Electrician                       |
| * Kendall Riggleman  | Midnight Shift Foreman            |
| * Dale D. Harlan     | Mine Foreman                      |

### Wolfe & Associates, Inc.

|               |          |
|---------------|----------|
| Brad Crandall | Surveyor |
| Jeremy Devine | Surveyor |

### West Virginia Office of Miners' Health, Safety and Training

|                 |                                       |
|-----------------|---------------------------------------|
| Brian Mills     | District Inspector-at-Large           |
| Mark Wilfong    | Assistant District Inspector-at Large |
| Bill Tankersley | District Mine Inspector               |
| Jim Whetsell    | District Mine Inspector-Roof Control  |
| Terry Farley    | Administrator                         |

### Mine Safety and Health Administration

|                      |  |
|----------------------|--|
| Gregory W. Fetty     | Industrial Hygienist                               |
| Jan B. Lyall         | CMS&H Inspector (Roof Control)                     |
| Jason W. Rinehart    | Industrial Hygienist                               |
| James D. Satterfield | Supervisory CMS&H Inspector                        |
| Kenneth W. Tenney    | Supervisory CMS&H Inspector                        |
| Ronald L. Wyatt      | Staff Assistant                                    |
| John R. Cook         | Mining Engineer – Technical Support – Roof Control |
| William J Gray       | Mining Engineer – Technical Support – Roof Control |
| Jerry Vance          | Mine Safety and Health Specialist (Training)       |

\* Persons interviewed

12

