

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
November 10, 2014

Red Bone Mining Company
Crawdad No. 1 Mine
Maidsville, Monongalia County, WV
I.D. No. 46-05589

Accident Investigators

Jan B. Lyall
Mine Safety and Health Specialist-Roof Control

Joedy N. Gutta, PE
Mine Safety and Health Specialist-Impoundments

Originating Office
Mine Safety and Health Administration
District 3
604 Cheat Road
Morgantown West Virginia
Carlos T. Mosley, District Manager

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OVERVIEW



On Monday, November, 10, 2014, at approximately 9:25 p.m., Raymond Scott Savage (victim) a 49-year-old section foreman, was fatally injured when a rock measuring five feet long by three feet wide and approximately one foot thick fell between the mine rib and the canopy of a roof bolting machine and struck him. Savage was operating a roof bolting machine in the No. 2 entry of the 2-North Section when the accident occurred.

The accident was caused by a roof anomaly (slickensided rock) that was not identified prior to positioning the roof bolting machine and starting the roof bolting process. While placing the next row of roof bolts to be installed along the rib, the loose rock fell without warning and struck the victim. Adequate protection was not provided between the Automated Temporary Roof Support (ATRS), the rib, and the last row of supports.

GENERAL INFORMATION

The Crawdad No.1 Mine is an underground mine operating in the Sewickley coal seam, located near Maidsville, in Monongalia County, West Virginia. The mine was started on August 1, 1977 and operated by various contractors prior to Red Bone Mining Company taking control on July 3, 1986.

The mine accesses the coal seam by 4 drift entries. Bituminous coal is mined at an average height of 60 inches by the room and pillar method of mining, utilizing one working section that transports the coal to the surface by conveyor belt. The mine typically operates three production shifts five days a week, with maintenance being conducted on midnight shift. The mine employs 41 people; 38 underground and 3 on the surface. The employees are not represented by a labor organization. The mine produces an average of 1,500 tons of material per day. The mine is ventilated by one fan and liberates 400,411 cubic feet of methane every 24 hours. When the accident occurred, the mine was on a 15-day spot inspection cycle for methane liberation.

The principal officers at the mine were:

Kristopher C. Lilly.....President
Kerry Lilly.....Mine Superintendent

A regular MSHA Health and Safety inspection (E01) was in progress at the time of the accident. The last regular inspection was completed on September 29, 2014. The Non-Fatal Days Lost (NFDL) incidence rate for the mine in 2014 was 2.00, compared to the National rate of 3.29 for mines of this type.

DESCRIPTION OF ACCIDENT

On Monday November 10, 2014, Savage; George Ray, Roof Bolting Machine Operator; Bill Everly, Roof Bolting Machine Operator; and John Shaffer, Section Mechanic, started the afternoon shift at 2:00 p.m. Savage and Everly traveled into the mine together, while Savage conducted an examination of the roadways. Ray and Shaffer entered the mine together as Ray conducted a preshift examination of the intake seals. After arriving on the working section, Shaffer serviced the continuous mining machine and Ray and Everly started roof bolting areas the previous shift left unsupported.

The remainder of the crew arrived on the section and began normal mining activities at approximately 4:00 p.m. During the shift, the mining cycle was determined as follows; mining in No. 2 to No. 1 crosscut, then to the No. 4 entry, then to the No. 2 entry. The

applicable page from the roof control plan can be found in Appendix A. At the time of the accident, mining was taking place in the No. 3 entry. Ray and Everly were operating the No. 1 roof bolting machine (primary roof bolting machine). The No. 1 roof bolting machine had mechanical problems, rendering the machine inoperable twice during the shift. The first problem was a ground fault in the trailing cable while roof bolting in the No. 5 entry. The second problem was a broken tram chain while bolting in the No. 4 entry. Shaffer repaired the machine on both occasions. Mining continued while Shaffer made the repairs, increasing the number of unsupported cuts. Savage and Jeff Belanger, Section Utility Man, used the No. 2 roof bolting machine (spare) to catch up on roof bolting while repairs were being made to the No. 1 roof bolting machine. They bolted the No. 2 to No. 1 crosscut, No.4 entry, and No. 5 entry. Savage trammed the No. 2 roof bolting machine between the No. 2 and No. 3 crosscut and parked it while he conducted an examination of the section.

After the examination, Savage and Belanger trammed the No. 2 roof bolting machine to the No. 2 entry to install roof bolts. Savage was operating the control side and Belanger was operating the opposite side of the machine. They installed the first row of roof bolts using four, 6-foot torque tension bolts and a 12-foot cable bolt from each drill head. Using the inch-tram controls, Savage advanced the machine to install the next row of bolts. He set the ATRS system in place and began placing roof bolts to be installed along the rib. Belanger had raised his drill steel against the roof when he heard a rock fall.

Belanger looked across the machine and could not see Savage or his light. Belanger went around the rear of the machine and found Savage face down on the floor with rocks on top of him. He removed a small rock located on top of the Savage's head, but was unable to move a large rock across Savage's back. Belanger went to the No. 3 entry for help where Brian Mayle, Continuous Mining Machine Operator, and Kenny Barnett, Shuttle Car Operator, were working. Belanger, Barnett, and Mayle went back to the No. 2 entry and attempted to remove the rock, but were unsuccessful. Mayle then traveled to the No. 4 entry where Everly and Ray were roof bolting with the No. 1 roof bolting machine. He informed them of the accident and Everly and Ray went to the accident scene. Mayle continued to the power center and notified Shaffer, emergency medical technician (EMT), of the accident. Shaffer went to the accident scene. Mayle then called Charles Rhome, Dispatcher, and instructed him to call 911. Everly was the first EMT to arrive and administered care to Savage, while the others were attempting to lift the rock by hand.

Monongalia Emergency Centralized Communications Agency (MECCA 9-1-1) was contacted at 9:27 p.m. and notified of the accident. Shaffer instructed Andy Bankhead, Section Utility Man, to prepare the emergency ride to transport the victim to the surface. Mayle notified Outby Section Utility Man, Scott Whitehair, of the accident.

Whitehair was shoveling along the belt outby the tailpiece and he traveled to the accident scene.

Belanger, Barnett, and Ray wrapped a nylon sling around the rock covering Savage in an effort to lift the rock off of him. They lowered the roof bolting machine ATRS from the roof and placed the nylon sling around the ATRS arm. The ATRS was used to lift the rock off of the victim. Whitehair and Ray immediately went to get the section first aid kit. Everly and Shaffer assessed Savage, believing they detected a pulse, and repositioned him for placement on a backboard. Bankhead drove the emergency ride to the last open crosscut. Savage was secured to the backboard, administered oxygen and loaded on the emergency ride to travel outside. Bankhead, Mayle, Belanger, and Shaffer accompanied Savage on the emergency ride as they transported him to the surface. When they left the section, Savage's pulse could no longer be detected. Belanger was giving Savage breaths and Shaffer started chest compressions, continuing cardiopulmonary resuscitation (CPR) while Savage was transported to the surface. Once outside, the victim was transferred to the Monongalia County EMS unit who administered care to the victim. The ambulance left the mine at 10:31 p.m. Savage was transported to Ruby Memorial Hospital where he was pronounced dead at 10:53 p.m. by Dr. Venard Adams, Deputy Chief Medical Examiner.

INVESTIGATION OF THE ACCIDENT

The MSHA Call Center was notified of the accident on November 10, 2014 at 9:45 p.m. by Kerry Lilly, Superintendent. The Call Center then notified Jeffery Maxwell, District 3 Supervisory Special Investigator, who issued a 103(j) Order verbally by phone to Lilly at 10:30 p.m. The affected area was the working section. Maxwell spoke with Michael Stark, Acting Accident Coordinator, who then dispatched Jan B. Lyall, Coal Mine Safety and Health Specialist (Roof Control) and Joedy N. Gutta, Coal Mine Safety and Health Specialist (Impoundments) to investigate the accident. The 103(j) Order was modified by Lyall to a 103(k) Order at 11:45 p.m. to ensure the safety of all persons during the accident investigation and to preserve all evidence at the accident site.

The accident investigation was conducted in conjunction with the West Virginia Office of Miners, Health, Safety and Training (WVOMHS&T), and Red Bone Mining. The accident investigation team was briefed of the circumstances surrounding the accident prior to traveling underground. The team then travelled underground to the accident site where observations, measurements and photographs of the scene were made. During the day shift on November 11, 2014, Kelley Surveying PLLC prepared a sketch and mapped the accident site (See Appendix B). On November 12, 2014, the accident investigation team made a follow up visit to the site. The No. 2 roof bolting machine was inspected and additional measurements and photographs were obtained. No deficiencies were found with the roof bolting machine.

Formal interviews were conducted on Monday, November 17, 2014, at the MEPCO, LLC corporate office located near Star City, West Virginia. A representative of the victim's family was present during the interviews. A list of persons who participated in the investigation is contained in Appendix C. Appendix D contains a list of persons interviewed.

DISCUSSION

Accident Location

The accident occurred at block 239 in the No. 2 entry of the 2-North section. This was an extended cut measuring approximately 33 feet that had been previously mined this shift.

Roof Bolting Machine

The equipment involved in the accident was a Roof Ranger II twin head roof bolting machine, model RRB - B-A, serial number 2008-026, company No. 2 manufactured by J.H. Fletcher and Co. The machine is provided with drill station canopies equipped with slider extensions. The ATRS system is an "L" style - "T bar" with one ATRS pad on each end of the unit measuring 16 inches long by 12 inches wide. The width of the ATRS system is manually adjustable with four pin selections on each side, each 6 inches apart. The pins were located in the second slot from the inside. At this setting in an 18-foot wide entry, the left pad was measured to be 58 inches from the rib. This is within the allowable maximum distance of 60 inches.

Twin Boom Roof Bolting Machine Controls

There are two sets of controls on the roof bolting machine that control different functions. The "inch tram" controls are located near the center of the machine and control movement of the roof-bolting machine. The controls for the ATRS are also located at this location. The roof drilling controls are the second set of controls. An attached canopy is located over the roof drilling controls and provides protection for the roof bolting machine operator. The canopy and roof drilling controls move/swing as one unit. The distance between the last installed bolt and the canopy increases or decreases depending on the location of the roof drilling controls. This machine is not provided with controls at the "inch tram" control station to move/swing the roof drilling controls. These controls are located with the roof drilling controls.

Normal Roof Bolt Installation Procedure

When the roof bolting machine is advanced to install the new row of bolts, the ATRS system is set against the roof, providing temporary support. The current approved roof control plan allows the ATRS system to be 6 feet from the last row of permeant support and 5 feet from the closest rib. When the roof bolting machine was positioned to reconstruct the accident, the distance between the ATRS pad and the last row of bolts measured 60.5 inches and the distance between the ATRS pad and the left rib measured 58 inches. The placement of the temporary support provided by the ATRS system was in compliance with the current approved roof control plan. The roof drilling controls are located on the outside of the machine close to the ATRS. This location places the roof bolting machine operator between the coal rib and drill station to operate the controls. The normal roof bolting sequence is to first install the outside bolt in the row. The inside bolt is installed last (Refer again to Appendix A for roof bolt installation sequence). This installation sequence leaves the roof drilling controls and canopy adjacent to the machine when the row is completed. The roof drilling controls are normally left in the inside bolting position to advance the roof-bolting machine for installing the next row of roof bolts. The canopy over the drilling station was not in optimal position to deflect the rock that fell in the area between the coal rib, the last row of installed support and the ATRS pad. Savage was located in this area between the roof drilling controls and the "inch tram" controls, when the accident occurred.

Geology

The rock fell from a contact location where two different types of rock intersected. The rock separated from beneath a compaction slickenside, which represented a plane of low cohesion while disrupting the lateral continuity of the strata. The compaction zone represents a narrow sand channel that meanders northeast/southwest across the section, but lobes of the sand channel were only exposed in the mining horizon in the No. 2 entry/Crosscut No. 239 intersection. The small pods of sandstone are very hard and dense; producing sparks when struck with a hammer, and define a keel shape that protrudes from the roof. Shale of the immediate roof was compacted around the obdurate sandstone, forming meandering slickensides that follow the trend of the keel-shaped sandstone. The compaction slickensides represent low-angle folds, dipping from 8-11 degrees away from a central axis that follows the trend of the sandstone. The fatal rock represents a slickenside-bounded block of shale that destabilized.

Examination of the Section

Possible adverse roof conditions were identifiable across the section. These areas were bolted by experienced roof bolters and examined (preshifted) by a certified foreman. The adverse roof was present in the outby cross cut between the No. 2 to No. 1 entries and extended into the No. 2 entry where the accident occurred. However, the adverse

roof in the cross cut was not as pronounced being broad and shallow, allowing the condition to go undetected.

Roof Control Plan

The last fully revised and consolidated roof control plan was approved on September 5, 2014. The plan permitted a maximum mining width of 18 feet and required the roof to be supported with fully-grouted roof bolts at least 48 inches long in normal mining conditions. Roof bolts are spaced no more than 4 feet apart, side to side, and a maximum distance of 4 ½ feet apart between rows. When mining over or within 100 feet of a "Pittsburgh break" zone, two cables bolts are required to be installed between every row of support. If torque tension bolts are used as primary support, two cable bolts are required to be installed between every other row of bolts. A "Pittsburgh break" zone refers to areas of old workings, partial mining, or barrier pillars left in the Pittsburgh coal seam which lies 80 feet beneath the Sewickley seam. The 2-left section had just crossed a "Pittsburgh break" zone in the No. 6, 7, and 8 entries at cross cut 239. The roof supports being used at the time of the accident in all entries were 6-foot torque tension roof bolts in conjunction with two - twelve foot cable bolts installed between every other the row of support

The extended cut section of the roof control plan also required the depths of the cut to be reduced to a length sufficient to effectively control the mine roof when adverse roof conditions are encountered. Adverse conditions are classified as clay veins, slips, mud seams, excessive water coming from the roof washouts or other irregularities. Where these conditions are encountered, longer bolts with boards, or larger plates, and if needed crossbars are to be installed.

At the time of the accident all measurements and distances required by the roof control plan were complied with.

The mine operator was following the provisions of the roof control plan pertaining to the "Pittsburgh break" zone across the entire section. Entries 6, 7, and 8, were still within the zone.

Experience and Training

The victim had over 29 years mining experience, 24 years at this mine with 19 ½ years as a roof bolting machine operator. He received task training as a roof bolting machine operator on October 5, 2012, along with experienced miner training. The victim's annual refresher training was received on October 31, 2014, and was current at the time of the accident.

ROOT CAUSE ANALYSIS

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

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

1. Root Cause: The mine operator did not assure there was adequate protection provided between the ATRS, the rib, and the last row of supports. The ATRS had not been extended outward enough for the pads of the unit to come in contact with a rock that fell from the left rib line. The ATRS system on this machine is manually adjusted with four settings. At the time of the accident, it was set in the second setting from the inside leaving a distance of 58 inches from the outside edge of the pad to the rib. If the setting had been in one of the outside slots, the pad would likely have been in contact with the fallen rock and possibly prevented the accident.

Corrective action: The approved roof control plan was revised to require that one of the two most outside slots be used during roof bolt installation. The miners were trained in the provisions of the revised roof control plan.

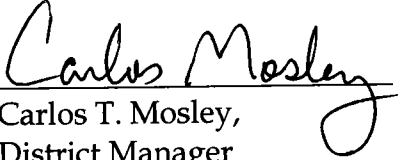
2. Root Cause: The mine operator did not assure there was adequate protection provided between the ATRS, the rib, and the last row of supports. After the second roof bolt (middle) is installed in each cycle, the roof drilling controls and canopy remained adjacent to the machine while the machine was advanced to install the next row of roof bolts. This position, adjacent to the roof bolting machine, left an unsupported area between the ATRS and the last row of support. The canopy over the drilling station was not in optimal position to deflect the rock that fell in the area bounded by the coal rib, the last row of installed support, and the ATRS pad.

Corrective action:

The approved roof control plan was revised to require the drill station controls and the canopy to be moved to the outside position after the middle support is installed and before lowering the ATRS. The miners were trained in the provisions of the revised roof control plan.

CONCLUSION

The accident occurred because a roof anomaly (slicksided rock) was present, but was not identified prior to positioning the roof bolting machine and starting the roof bolting process. The ATRS system was engaged with the roof at the time of the accident, but the pads of the ATRS were not in contact with the destabilized rock. The position of the roof drilling controls and canopy were adjacent to the machine, causing the victim to travel under the rock which fell without warning. The mine operator did not assure that adequate protection was provided between the ATRS, the rib, and the last row of supports.


Carlos T. Mosley,
District Manager

Date: 3-5-2015

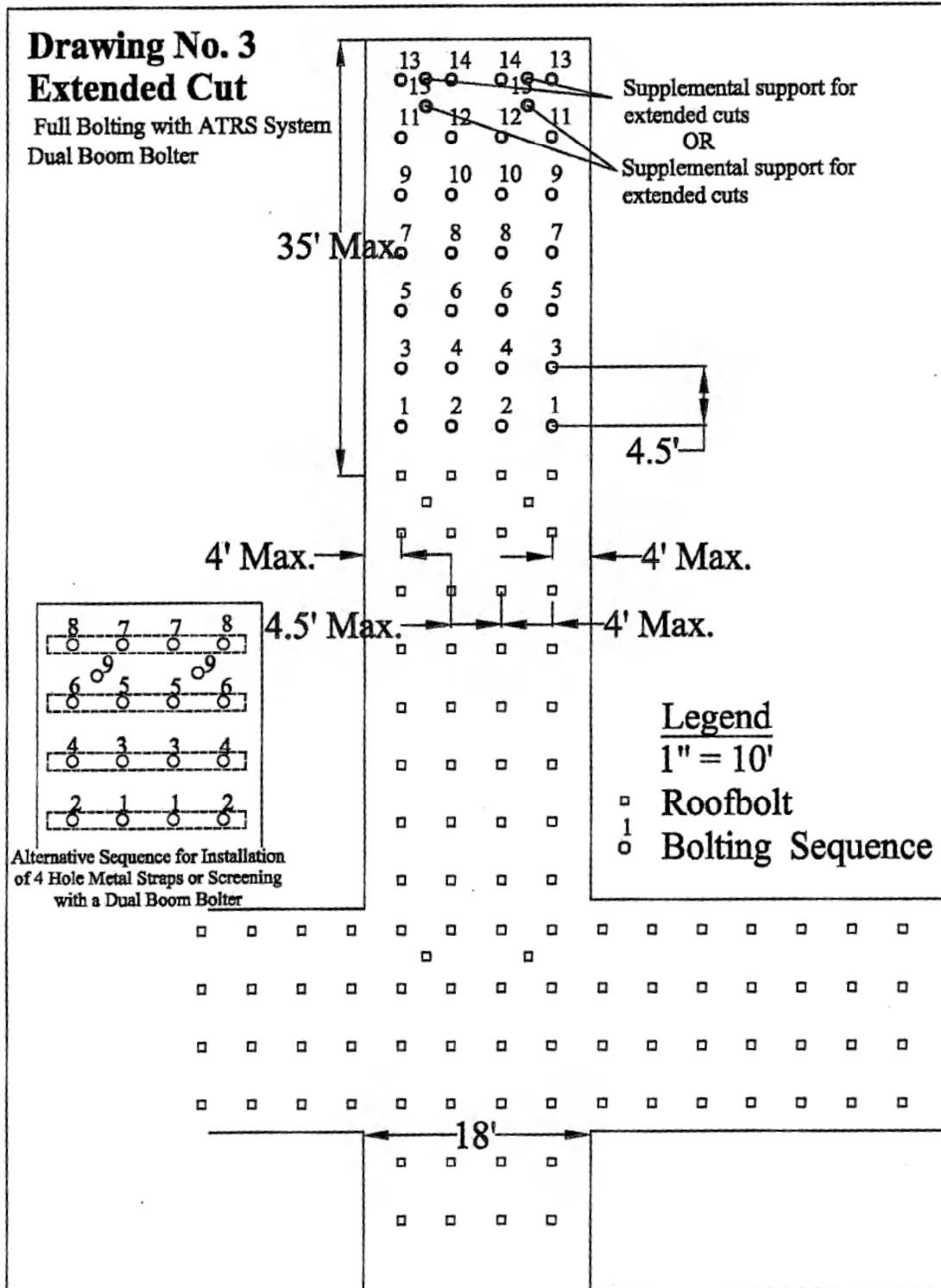
ENFORCEMENT ACTIONS

1. A 103(J) Order, Number 8060499, was issued to Red Bone Mining Company at approximately 10:30 p.m. to ensure the safety of all persons at the operation and to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident until an investigation was completed and the area deemed safe.

Appendix A

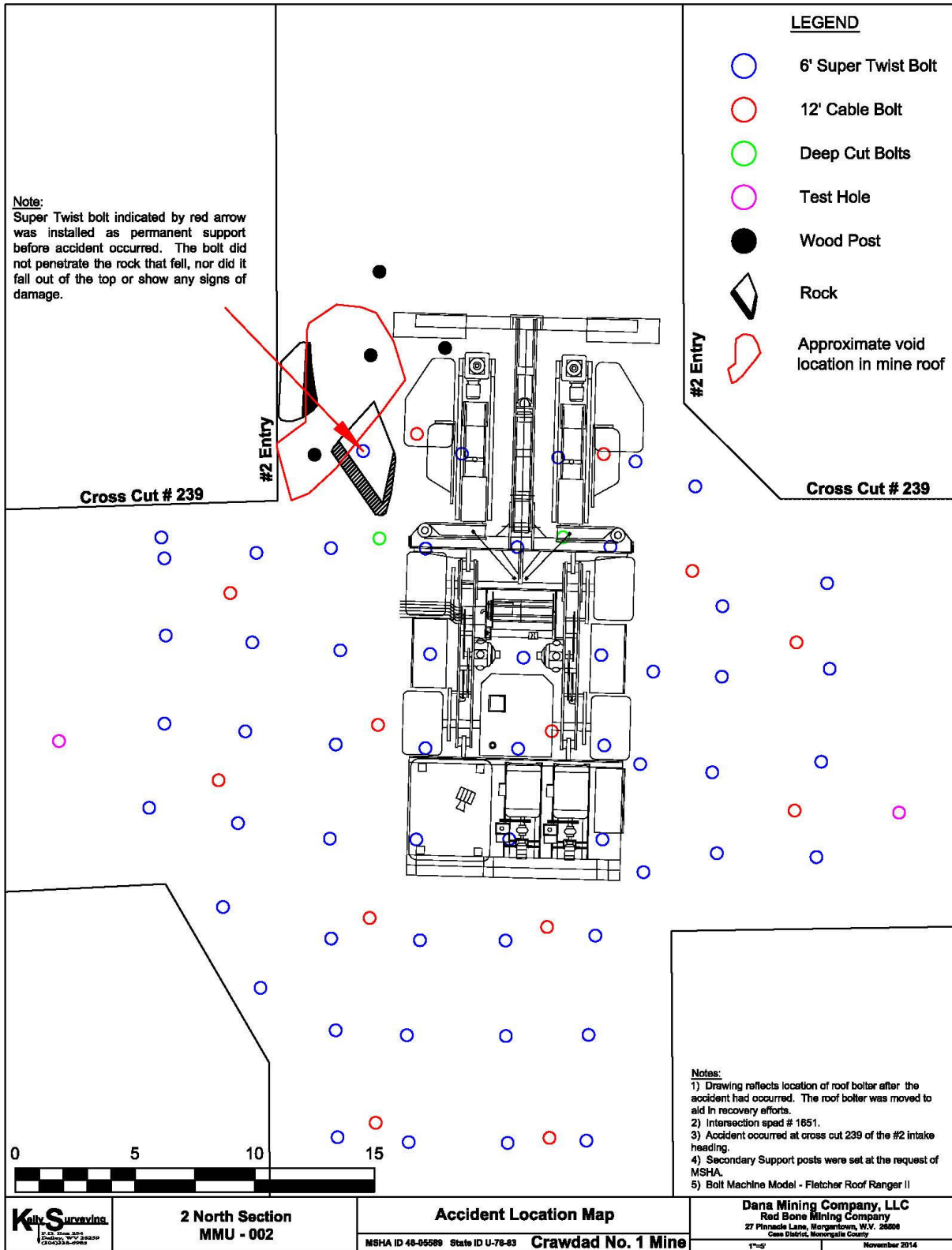
Crawdad No. 1 Mine – Roof Control Plan

August 6, 2014



Another section of the roof control plan for the "Pittsburgh break" zone requires 2 cable bolts to be installed every other row.

Appendix B



Appendix C

Persons Participation in the investigation

MINE SAFETY AND HEALTH ADMINISTRATION

Jan B. Lyall Roof Control-Specialist-District 3
Joedy N. Gutta.....Impoundments Specialist- District 3
Sandin E. Phillipson...Roof Support Division- Technical Support

WEST VIRGINIA OFFICE OF MINERS HEALTH, SAFETY AND TRAINING

Eugene White.....Director
Jeff BennettDistrict Inspector-Roof Control
Brent Colvin.....District Inspector
Ed Peddicord.....Inspector at Large

KELLY SURVEYING PLLC

Chris Smith.....Surveyor
Steve Haskle.....Surveyor

MEPCO LLC

Kevin Hatfield.....Engineer/Mapping

RED BONE MINING COMPANY OFFICIALS

Kristopher C. Lilly.....President
Kerry Lilly.....Superintendent
Christopher D Pence.....Hardy Pence LLC
Charles Lilly.....Previous owner, Red Bone Mining

Appendix D

Persons Interviewed

George W. Ray III.....Section foreman/roof bolting machine operator
Jeffery L Belanger, Sr.....Shuttle Car Operator/ Right side bolting machine operator/
No.2 machine on day of accident
Brian K. Mayle.....Miner Operator
Kenneth G. Barnett.....Shuttle Car Operator
William M. Everly.....No. 1 roof Bolter Operator
Andrew Bankhead.....Utility
John ShafferMechanic/Electrician/EMT
Scott Whitehair.....Belt Man
Charles RhomeOutside / Responsible Person

Appendix E

Victim Information

Accident Investigation Data - Victim Information

U.S. Department of Labor
Mine Safety and Health Administration



Event Number:

Victim Information: 1

1. Name of Injured/Ill Employee: <i>Raymond Savage</i>			2. Sex: <i>M</i>	3. Victim's Age: <i>49</i>	4. Degree of Injury: <i>01 Fatal</i>										
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 11/10/2014 b. Time: 23:32</i>					6. Date and Time Started: <i>a. Date: 11/10/2014 b. Time: 21:30</i>										
7. Regular Job Title: <i>049 Supervisory/management/foreman/boss</i>				8. Work Activity when Injured: <i>080 Roof bolter, tramming</i>			9. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>								
10. Experience a. This	Years	Weeks	Days	b. Regular	Years	Weeks	Days	c. This	Years	Weeks	Days	d. Total	Years	Weeks	Days
Work Activity:	<i>19</i>	<i>26</i>	<i>2</i>	Job Title:	<i>15</i>	<i>0</i>	<i>0</i>	Mine:	<i>24</i>	<i>0</i>	<i>0</i>	Mining:	<i>27</i>	<i>15</i>	<i>0</i>
11. What Directly Inflicted Injury or Illness? <i>121 Back mine roof, hanging wall</i>					12. Nature of Injury or Illness: <i>170 Crushing</i>										
13. Training Deficiencies: Hazard: <input type="checkbox"/> New/Newly-Employed Experienced Miner: <input type="checkbox"/> Annual: <input type="checkbox"/> Task: <input type="checkbox"/>															
14. Company of Employment: (if different from production operator) <i>Operator</i>								Independent Contractor ID: (if applicable)							
15. On-site Emergency Medical Treatment: Not Applicable: <input type="checkbox"/> First-Aid: <input checked="" type="checkbox"/> CPR: <input checked="" type="checkbox"/> EMT: <input checked="" type="checkbox"/> Medical Professional: <input checked="" type="checkbox"/> None: <input type="checkbox"/>															
16. Part 50 Document Control Number: (form 7000-1) <i>220143230005</i>										17. Union Affiliation of Victim: <i>9999 None (No Union Affiliation)</i>					