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UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Underground Coal Mine

Fatal Rib Burst Accident  
May 12, 2014

Brody Mining, LLC  
Brody Mine No.1  
Wharton, Boone County, WV  
I.D. No. 46-09086

Accident Investigators

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## OVERVIEW

On Monday, May 12, 2014, at approximately 8:15 p.m., Eric Legg, a 48-year-old continuous mining machine operator and Gary Hensley, a 46-year-old roof bolting machine operator, were fatally injured when a large pillar burst occurred while retreat mining was conducted in the No. 6 entry, on the No. 1 Section in the 4 East Mains. Legg was operating the continuous mining machine and Hensley was operating the two mobile roof support (MRS) units and standing just behind Legg when the pillar burst occurred.

The pillar burst caused a large amount of coal from the mine ribs to be suddenly and violently ejected into the mine entry, filling the mine entry to within 30 inches of the mine roof. The original mine entry opening was estimated to be approximately 78 inches in height. The accident occurred because the mine operator failed to recognize areas with potential rib burst conditions, and to develop and implement a method of mining suitable to mine safely and control those conditions.



## GENERAL INFORMATION

The Brody Mine No. 1 is an underground coal mine operating in the Eagle Coal Seam, located near Wharton, in Boone County, West Virginia. The mine is operated by Brody Mining, LLC, a subsidiary of Patriot Coal Corporation. At the time of the accident, three active mining sections were in production. The No. 1 section, located in the 4 East Mains, was conducting retreat mining of the panel's pillars.

Bituminous coal is mined at this operation using the room and pillar method. The mine works two nine-hour production shifts and one maintenance shift per day, typically producing five to six days per week. The mine employs 193 people, 171 underground and 22 on the surface. The employees at this operation are not represented by a labor organization. The mine produces an average of 7,500 tons of raw material per day.

The principal officers for the mine at the time of the accident were:

Gregory Dotson .....	President
Joe Athey.....	Operations Manager
Scott Thompson .....	General Mine Foreman
Jamie Lester .....	Evening Shift Mine Foreman
Willard Bourne .....	Evening Shift Asst. Mine Foreman
Bobby Moore .....	Evening Shift Section Foreman
Justin Ray .....	Safety Manager

Prior to the accident, the Mine Safety and Health Administration (MSHA) completed the last regular safety and health inspection (E01) on March 27, 2014. The Non-Fatal Days Lost (NFDL) injury incidence rate for this mine during the period of January through March, 2014, was 5.11, compared to the National rate of 3.50. This mine was issued a Pattern of Violations (POV) notice by MSHA on October 24, 2013.

The mine's roof control plan was last updated and approved by MSHA on December 9, 2013. Subsequently, the plan for retreat mining of the 4 East Mains was revised and approved on February 5, 2014. The plan for retreat mining of the 4 East Mains was reviewed by MSHA's Technical Support Division and recommended for approval in a memorandum dated February 3, 2014. The mine's ventilation plan was amended for retreat mining of the 4 East Mains and was approved by MSHA on February 28, 2014.

## DESCRIPTION OF ACCIDENT

On Monday, May 12, 2014, at the start of the evening shift, a safety meeting was conducted with miners on the No. 1 Section. During the safety meeting, an accident that occurred on the section on the previous Friday, May 9, 2014, was discussed with the section crew and described as a "rib roll." Because of this accident, additional safety precautions were suggested and passed on to the crew by Bobby Moore, Section Foreman. The additional safety measures suggested by mine management consisted of setting rib timbers on the right side of the entry and for the continuous mining machine operator to position himself away from the machine as far as possible. The accident investigation interviews revealed that several members of the crew stated they had voiced concerns during the safety meeting. The miners believed that the suggested rib timbers were inadequate for the adverse rib conditions encountered previously. Rib timbers are typically used as a means of roof support for wide areas and are not an accepted prudent engineering practice to provide protection from rib rolls.

The evening shift section crew arrived on the No. 1 Section at approximately 3:55 p.m. and started retreat mining operations in the No. 5 entry. The previous crew had completed setting rib timbers along the right side of the entries, in the Nos. 6, 7, and 8 entries. The pre-shift examination report for the section indicated that no hazards were observed in these entries. After completing retreat mining in the No. 5 entry, the Mobile Roof Support (MRS) units were moved by Hensley and the continuous mining machine was moved by Legg to No. 6 entry to begin retreat mining. The first left lift and the first right lift were mined successfully. At approximately 8:15 p.m., while mining the second left lift from the pillar between the Nos. 5 and 6 entries, a large violent and sudden pillar burst (bump) occurred, causing fatal injuries to Legg and Hensley.

The primary cause of the pillar burst was a highly stressed coal pillar located between Nos. 6 and 7 entries. Legg and Hensley would likely have had their backs toward this pillar while they were engaged in mining the second left lift. The original entry height in the No. 6 entry was estimated to be approximately 78 inches and approximately 20 feet in width. After the burst, this entry was filled with loose coal to within 30 inches of the mine roof and the estimated entry height had been reduced to 66 inches due to convergence of the mine roof and mine floor.

During the accident investigation interviews, miners and personnel at the mine referred to the pillar burst as a "bump." According to the interviews, the pillar burst also caused a large amount of dust to be suspended in the mine air, making visibility very difficult for several minutes after the event. As a result of the burst, the pillar located between Nos. 6 and 7 entries contained a large gap between the coal and the mine roof of an undetermined width and depth. The immediate



mine roof in this area consisted of sandstone that contained only minor cracks and the roof strata in the area remained intact after the pillar burst. No roof fall was associated with this event.

Prior to the accident, Mike Shull, Section Electrician, was standing approximately 55 feet outby the continuous mining machine near the MRS units in the last open cross cut of the No. 6 entry. He observed Legg and Hensley working at the continuous mining machine and was supposed to help them move the continuous mining machine cable, when a shuttle car being driven by Bazzil Goodman approached the area. As the shuttle car approached, Shull stepped back into the crosscut to get out of the way. At that time, the pillar burst occurred. Shull stated that the force of the burst was so strong that Shull's chest was hurt and he was nearly knocked down. The only thing that prevented Shull from being knocked down was that he grabbed the MRS cables hanging near where he was standing. Shull was the closest miner to the accident scene and was the first person to respond. Shull stated that the entire entry was immediately filled with dust and he could not see for several minutes. When the dust initially cleared, Shull still could not see the continuous mining machine because the entry was filled with coal. Shull started yelling for Legg and Hensley, but received no response. Shull used his hand-held radio to call for help and assistance, stating that they had "two guys covered up and that they needed help."

Goodman and Todd Agosti, Shuttle Car Operators, arrived at the accident scene. Shull told Goodman to go and find Bobby Moore, Section Foreman, for assistance and guidance. Shull and Agosti tried again to look up the No. 6 entry. As the dust cleared, they could see the lights on the top of the MRS units. Shull noticed that the continuous mining machine's cable had been forced over top of the machine's conveyor boom.

At the time of the accident, Moore and Jackie Bailey, Roof Bolting Machine Operator, were standing near the backup curtains in the No. 3 entry. When the pillar burst occurred, they reported hearing the burst, feeling the vibration from it, and noticed dust filling the air. Immediately after the pillar burst, Moore and Bailey started running toward the location of the continuous mining machine in the No. 6 entry. Moore and Bailey encountered Goodman. Goodman and Moore discussed the accident briefly, while Bailey proceeded on to the accident scene. Goodman and Moore followed shortly thereafter.

Bailey stated that when he arrived at the accident scene, the area experienced a "second bump," which again caused dust to be suspended into the air surrounding the accident scene. The second "bump," as described in interviews, caused the uninjured miners near the accident location to move outby in the No. 6 entry.

Moore arrived near the accident scene in the No. 6 entry and proceeded to the section mine phone and called outside for Joey Athey, Operations Manager, for assistance. Shortly after this second event, Shull, Bailey, Agosti, Goodman, and Moore, returned to the accident scene and discovered that they had verbal communications with Hensley. Moore went back to the mine phone and called outside to inform Athey that they had communications with one of the miners involved in the accident.

Moore returned to the accident scene and had the two outby MRS units moved to the edge of the crosscut nearest the No. 6 entry in order to provide additional roof support to the affected area of the accident. Moore took the section battery scoop and started removing the ejected coal from the No. 6 entry to provide additional clearance for access to the trapped miners.

Jeremy Buskirk, Outby Laborer and an experienced first responder with a local volunteer fire department, was working near the No. 2 Section. Buskirk learned of the accident and went to the No. 1 section where he spoke to Shull at the section mine phone. Buskirk proceeded to the accident scene where he observed the area behind the continuous mining machine was filled with coal. Moore was still removing the loose, ejected coal and debris with the battery scoop. Buskirk could hear someone calling for help near the continuous mining machine. Buskirk stopped Moore from using the battery scoop to remove any additional loose coal. Buskirk feared they could cause additional injuries to the victims because they did not know their exact location. When Moore stopped the battery scoop, they could hear Hensley shouting for help again.

Moore, Agosti, Buskirk, Bailey, and Goodman crawled over the ejected coal to the back of the continuous mining machine. They crawled single file, with Moore leading, due to the restricted room to maneuver in the entry. They found Legg and Hensley laying near the machine, with Hensley under the conveyor boom and Legg at the cable standoff near the back of the machine. Moore proceeded to Legg, who was further inby, and pulled him away from the cable standoff. Legg was found to be unresponsive and no pulse was detected.

Moore then turned to help Hensley, who was shouting for them to get him out. Moore, Agosti, Buskirk, Bailey, and Goodman started to uncover and dig out the material around Hensley, using their hands and trying to pull him free. Moore realized there was still electrical power on the continuous mining machine and Hensley was pinned from just below his chest by the machine's conveyor boom. Moore retrieved the continuous mining machine's remote control unit, which was with Legg, and connected it to Goodman's battery light in order to get power for the unit. Moore used the remote control unit to move the continuous mining



machine's conveyor boom off of Hensley by raising the conveyor boom vertically. According to the interviews, shortly after the conveyor boom was removed, Hensley became unresponsive and attempts to revive him were unsuccessful. The area near the accident location began to "bump" again, forcing Moore, Agosti, Buskirk, Bailey, and Goodman to leave the immediate area. A decision was made to bring additional timbers and cribbing to the accident site to aid in recovery of the victims. The removal of the loose coal from the entry with the battery scoop was resumed, because the location of both victims had been determined. Timbers were installed in the last open crosscut, the loose coal was removed in the No. 6 entry up to the continuous mining machine, and the entry was supported with wooden cribs installed near the center line of the entry.

The following mine officials had also arrived on the No. 1 Section: Mark White, Chief Electrician; Jamie Lester, Evening Shift Mine Foreman; Willard Bourne, Evening Shift Assistant Mine Foreman; Joe Athey, Operations Manager; Scott Thompson, General Mine Foreman; and Mike Day, Assistant Mine Foreman. These officials arrived between the hours of 8:53 p.m. and 10:30 p.m. Mine management decided to have all hourly personnel leave the section. The section personnel, except for Moore, departed for the surface at approximately 10:02 p.m. The remaining mine officials resumed efforts to recover the victims.

At 11:03 p.m., MSHA Inspectors Joshua McNeely and James Jackson arrived from the Madison Field Office. In addition, Wayne Pauley and Steve Akers, Inspectors from the West Virginia Office of Miners' Health Safety and Training (WVOMHST), arrived on the section. The MSHA and WVOMHST inspectors assisted with recovery of the victims.

Hensley's body was recovered at approximately 12:05 a.m., and Legg's body was recovered at approximately 12:21 a.m. on Tuesday, May 13, 2014. The victims were placed on a mantrip for transport to the surface and arrived on the surface at approximately 12:45 a.m. Both victims were transported by the Boone County Emergency Medical Assistance (EMA) ambulance to the Wharton Barrett Fire Department to await the arrival of the medical examiner. The victims were declared dead by State Medical Examiner, James Kaplan, M.D. The victims were later transported to the West Virginia Medical Examiner's office where autopsies were performed.



## INVESTIGATION OF ACCIDENT

At 8:40 p.m. on May 12, 2014, Justin Ray, Mine Safety Manager, notified the MSHA Emergency Call Center of the accident. The MSHA Call Center then notified Thomas Clark, District 4 Staff Assistant, who issued a 103(j) order verbally by phone to Joey Athey, Operations Manager, at 9:00 p.m. The affected area of the order was the entire mine. The mine operator reported to the Call Center that two miners were trapped due to a roof fall on the No. 1 Section, and indicated that the two miners were stuck underneath the conveyor boom of the continuous mining machine. Ray also stated that there was communication with the miners and that "they were fine."

Clark notified the Madison Field Office Supervisor, Terry Price, who immediately dispatched MSHA Inspectors Joshua McNeely (also an MSHA Accident Investigator) and James Jackson to the mine. Upon their arrival at the mine at 10:00 p.m., both inspectors proceeded underground to investigate the accident, which was believed to be an entrapment at that time. The 103(j) Order was modified to a 103(k) Order at 10:10 p.m. by McNeely to ensure the safety of all persons during the accident investigation and to preserve all evidence at the accident scene.

Other MSHA personnel arrived at the mine shortly after McNeely and Jackson, including Price; District Manager Scott Mandeville; Assistant District Manager (Technical) David Morris; and Assistant District Manager (Enforcement) Lincoln Selfe.

District 4 Roof Control Specialist and Accident Investigator, Daris Barker, was notified of the reported entrapment at approximately 10:00 p.m., and was placed on standby. At approximately 11:30 p.m., Barker was notified that the accident had resulted in two fatalities and he was dispatched to the mine to lead the accident investigation.

Barker arrived at the mine at 1:00 a.m., Tuesday, May 13, 2014. The victims had been recovered and no one was underground. Preliminary written statements were obtained from miners who were working on the No. 1 Section at the time of the accident, and from other miners who were dispatched to the section to provide assistance. Records were requested from the mine's tracking system and copies of the examination records for the No. 1 Section were obtained. Additionally, the two victims' personal items were examined and photographed, and copies of personnel and training records were obtained from the mine operator.

A joint meeting with MSHA personnel, WVOMHST personnel, and company representatives, was conducted to discuss the accident investigation. It was evident that the accident did not involve a collapse of the mine roof as originally reported, but instead was a large pillar burst. Those involved in recovery of the victims also reported that conditions indicated another burst might occur. The investigation team decided to wait until approximately 11:00 a.m. before returning to the accident scene and allow the recovery participants to rest.

District 4 personnel requested the assistance of MSHA's Technical Support Roof Control Division to participate in the accident investigation. On May 13, 2014, Barker and McNeely returned to the mine to continue the accident investigation. They traveled underground to the No. 1 Section with company representatives, WVOMHST personnel, and other MSHA personnel. The accident scene was examined, photographed, measured, and sketched by the accident investigators, who returned to the surface at 2:00 p.m. At approximately 4:40 p.m., the accident investigation team made a second trip underground to the accident scene with Christopher Mark and Sandin Phillipson from MSHA's Technical Support Group.

Formal interviews were conducted on Monday, May 19, 2014, and Wednesday May 28, 2014, at MSHA's Madison Field Office, with persons considered to have knowledge of the accident.

A list of the persons who participated in the investigation is contained in Appendix A. The victims' information is contained in Appendix B.



## DISCUSSION

### Victims' Experience and Training

Legg received his West Virginia Underground Miner's Certification on October 16, 1987, and he had over 26 years of mining experience. He began working at the Brody Mine No. 1 on August 17, 2011, as a roof bolting machine operator. The mine operator provided documentation showing that Legg became a continuous mining machine operator on March 13, 2013.

On August 17, 2011, Legg received experienced miner training. Records indicate that he also received task training for the roof bolting machine on August 27, 2014, and task training for the continuous mining machine on February 28, 2014. Legg last received annual refresher training on March 22, 2014.

Hensley began working at the Brody Mine No. 1 on September 29, 2010, as a general contract laborer. Hensley received his West Virginia Underground Miner's Certification on March 30, 2011, and he had approximately 3 years and 32 weeks of mining experience. The mine operator provided documentation that showed Hensley was hired by Brody Mining, LLC, and became an employee of the mine operator at the Brody Mine No. 1 on May 31, 2011.

On September 29, 2010, Hensley received new miner training. He also received task training for the roof bolting machine. His job title at the time of the accident was Roof Bolter Operator. The mine operator provided documentation showing that Hensley became a roof bolter operator on April 22, 2013. Hensley last received annual refresher training on March 22, 2014.

### Time of the Accident

Legg was operating the continuous mining machine in the No. 6 entry of the No. 1 section and was performing pillar recovery at the time of the accident. He had just completed two previous pillar lifts, one on the left side in No. 78 block (see Appendix C) and one on the right side of the entry in the No. 79 block, prior to the burst. According to interviews, when the "bump" occurred, Legg was mining the second lift on the left side of the entry in the No. 78 block. Legg had completed cleaning up loose coal from the mine floor, using the continuous mining machine, and had stopped momentarily to clean off the machine's lights by spraying them with water. As Legg moved the continuous mining machine back into the lift, the accident occurred. The back of the machine was found to be located just to the left of the center of the entry after the accident. Directly prior to

the "bump," Hensley was standing beside Legg, near the back of the continuous mining machine, assisting him with clean-up by keeping the machine's electrical cable out of the way of the shuttle cars. Based on a review of the tracking system data and testimony from witnesses, the fatal accident occurred at approximately 8:15 p.m., on Monday, May 12, 2014.

### Accident Location

The accident occurred when an overstressed coal pillar failed suddenly and violently expelled coal from the pillar into the mine opening. Locally referred to in southern West Virginia as a "bump," this type of event is also known as an outburst, bounce, or burst. Bounces and bumps are broader terms that can include any dull, hollow, or thumping sound produced by the movement or fracturing of overlying strata as a result of the mining operations. Such vibrations in the strata can be felt by miners and detected by seismographic instruments, but they typically do not pose a threat to miners. However, coal or rock bursts are specifically characterized by the sudden and violent failure of overstressed rock or coal, resulting in the instantaneous ejection of material into mine openings. When such events occur in active workings, they pose a serious hazard to miners. Violent coal bursts are very rare events. Prior to this fatal rib pillar burst accident, there was no previous history of bumps or coal pillar bursts that had been reported to MSHA for the mine or known to have occurred at any other active operation mining in the Eagle Seam.

The accident primarily affected the No. 79 coal pillar between the Nos. 6 and 7 entries, located between crosscut Nos. 14 and 15 of the No. 1 Section, on the 4 East Mains. The pillar burst caused a large section of the right pillar's rib to explode instantaneously and be displaced approximately six to eight feet into the No. 6 entry and filled the No. 6 entry to within approximately 30 inches of the mine roof. The exact amount and extent of the rib material that was expelled into the entry could not be determined because much of it was removed during recovery of the victims. The burst was accompanied by a loud noise, which witnesses likened to a large explosion, and severe ground shaking. The atmosphere around the accident scene was also filled with fine coal dust, hampering visibility.

The adjacent No. 80 coal pillar, located in the same row on the pillar line between the Nos. 7 and 8 entries, was also involved and was heavily damaged by the burst event. Minor burst damage was also noted on the coal pillars located just outby the pillar that was being mined, between the Nos. 6 and 8 entries, in crosscut No. 14.

The original estimated height of the No. 6 entry at the accident scene was 78 inches and the entry height after the accident was measured to be only 66 inches.



Therefore, the roof in the area of the accident converged an estimated 12 inches, but remained intact due to its inherent strength with only small visible cracking.

After the accident, the last open crosscut was timbered on both sides of the No. 6 entry and two MRS units positioned in the crosscut between the Nos. 5 and 6 entries had been moved to the edge of the No. 6 entry in order to provide better support of the intersection. The No. 6 entry in by the last open crosscut intersection had been center-cribbed to provide roof support during recovery of the victims. Refer to Appendix C for a drawing of the accident scene.

### Mining Layout and Roof / Rib Support of No. 1 Section

The 4 East Mains was developed on an azimuth (an angular measurement in a spherical coordinate system) of approximately North 80 degrees East (N80E), with eight entries mined on 87-foot centers with crosscuts developed off the main entries on 105-foot centers. To the south, the 4 East Mains is separated from a previously pillared panel, 1 Right off 4 South Mains, by a 250-foot wide solid coal barrier pillar. To the north, a 180-foot barrier separates the 4 East Mains from another previously pillared panel, 5 Left off 1 South Mains Parallel.

The mine's approved roof control plan for retreat mining of the 4 East Mains required that the leftmost pillar, between Nos. 1 and 2 entries, be left in place from crosscut No. 18 to No. 13. In this area the extracted panel width was reduced to 530 feet and the depth of cover over the accident scene was 1,050 feet.

The primary roof supports for the mine roof are 5-foot fully grouted rebar bolts, grade 60 steel,  $\frac{3}{4}$  inch in diameter, installed 4 bolts per row with a maximum spacing of 5 feet and a maximum distance of 4 feet between the rows. Additionally, the mine's approved roof control plan requires supplemental support to be installed in each intersection prior to retreat mining. The supplemental roof support to be set during retreat mining consists of a minimum of six, 8 foot long cable bolts or equivalent, installed in the intersection as shown in Drawing 10 on page 38 of the approved roof control plan. The roof in the 4 East Mains section where the accident occurred had been supported in accordance with the approved roof control plan.

The mine ribs on the No. 1 Section were bolted with 48-inch fully grouted rebar bolts, grade 60 steel,  $\frac{5}{8}$  inch in diameter, installed on 4 foot centers. Rib bolting is required by the roof control plan in all areas of the mine where the depth of overburden is 1000 feet or greater.

## Geology and Multiple Seam Conditions

The Eagle Coal Seam occurs within the Kanawha Formation of the Appalachian Basin. At the burst location, the Eagle Seam is approximately 6 feet thick, including a 9 inch thick layer of gray shale near the middle of the seam horizon. The total mining height, including floor rock taken with the seam, is about 78 inches.

At the burst site, the immediate roof was observed to be composed of coarse, gray sandstone that was very hard. The nearest core (drill) hole, V-1037, located 830 feet south of the burst site, provides a general stratigraphic sequence above and below the Eagle Seam near the 4 East Mains. The roof strata (mine roof) in this core hole consists of approximately 17 feet of gray, medium grained, thick bedded sandstone, lying directly on top of the Eagle Seam coal. Two other core holes, both located about 1200 feet to the west of the burst site, show 24 feet and 10 feet of similar sandstone, also lying almost immediately above the coal seam. Historically, strong, thick, massive sandstone roof like this has often been associated with coal bursts.

The record log for core hole V-1037 also shows that the strata underlying the Eagle Seam (mine floor) consists of one foot of shale underlain by 5½ feet of sandstone, a thin shale parting, and then more than 11 feet of sandstone. The logs of the other two holes show at least 5 feet of interbedded shale, coal, and thin sandstone between the coal and the first 5 foot thick sandstone unit.

Observations of the gob area behind the pillar line, where retreat mining had been completed, suggest that a transition in the type of roof strata occurred in the 4 East Mains near the accident site. The roof strata transitioned from shale to sandstone, progressively from left to right across the section. This was obvious by observation of the roof material that had already fallen near the remnant pillar stumps in the Nos. 2 and 3 entries, while the cave line moved progressively farther back into the gob toward the right side of the section. The immediate roof strata in the No. 1 entry, within two crosscuts of the active pillar line, was composed entirely of shale.

Extensive previous mining was conducted in three coal seams overlying the Brody Mine No. 1. In the Powellton Seam, located approximately 80 to 90 feet above the burst site, there were three panels that were retreat mined in a direction nearly perpendicular to the 4 East Mains. The burst site is located directly beneath a 220 foot wide coal barrier that separates two of these panels in the Powellton Seam. Retreat mining was also conducted in the No. 2 Gas seam, located 165 feet above the Eagle Seam. A gob-solid boundary in the No. 2 Gas Seam, oriented approximately North 45 degrees East (N45E), is located almost



directly above the burst site. The abandoned mine workings in the Powellton and No. 2 Gas seams overlap each other such that the burst site is surrounded on three sides by overlying gob areas (see Figure 1). This configuration probably concentrated unusually high loads on the coal pillars that burst.

**Figure 1**

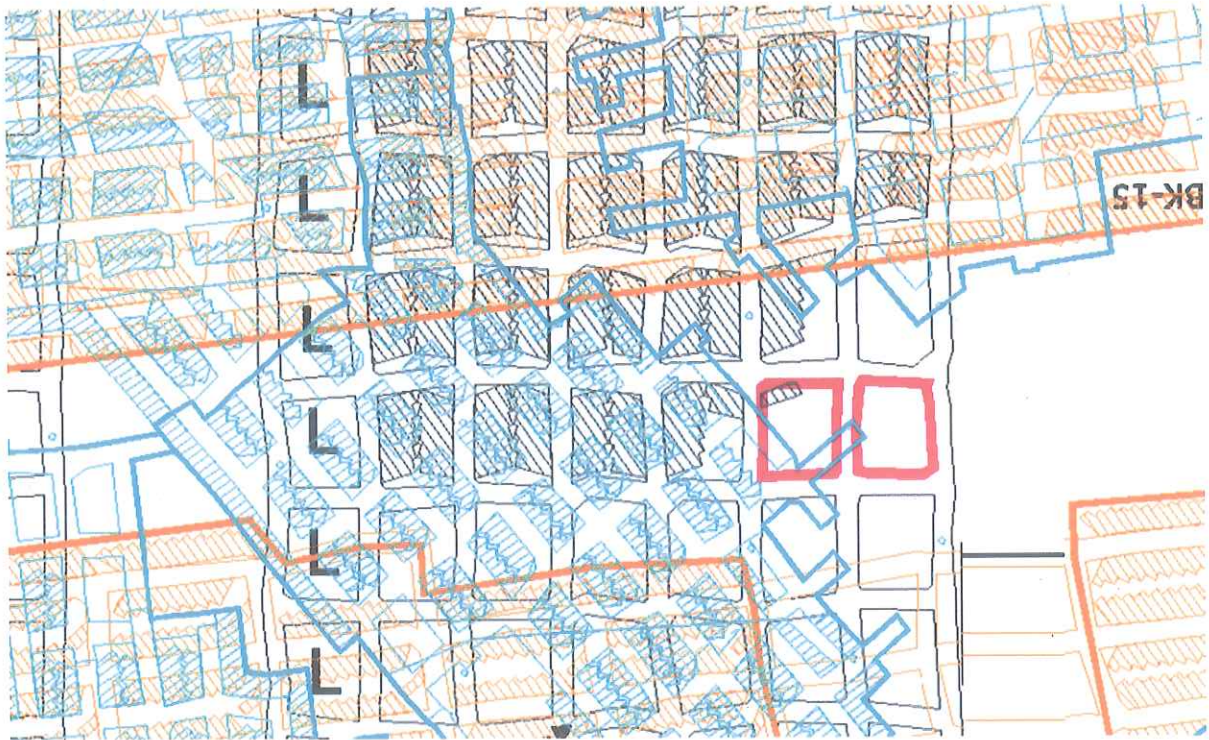


Figure 1. Location of 4 South Mains panel in the Eagle Seam (black) and the two pillars that burst on 5/12/14 (red), relative to the overlying workings in the Powellton Seam (brown) and the No. 2 Gas Seam (blue).

The burst site is further overlain by workings in the Williamson Seam, located 355 feet above. It seems unlikely that the Williamson Seam workings had much influence on conditions at the burst site. This is unlikely due to the large interburden thickness between the seams and the fact that no retreat mining had been conducted in the Williamson Seam mine. Mining has also been conducted in other seams above the Williamson, but the interburden to those seams would be in excess of 500 feet and any interactions would be extremely unlikely.

Figure 2 shows a generalized geological columnar section of the strata above the Brody Mine No.1.

**Figure 2**

<u>Seam Thickness</u>	<u>SEAM/STRATA</u>	<u>Presence of over mining</u>
4' to 8'	Kittanning Seam	<b>Yes</b>
	40 to 135 ft.	
4' to 8'	Stockton Seam	<b>Yes</b>
	70 to 130 ft.	
4' to 7'	Coalburg Seam	<b>Yes</b>
	+ 130 ft.	
8' to 10'	Dorothy Seam	<b>Yes</b>
	+ 90 ft.	
3' to 4'	Chilton Rider	<b>Yes</b>
	+90 ft.	
4' to 6'	Chilton Seam	<b>No</b>
	+ 15 ft.	
4' to 5'	Lower Chilton	<b>Yes</b>
	+ 147 ft.	
4' to 6'	Williamson Seam	<b>Yes</b>
	+ 189 ft.	
4' to 6'	No.2 Gas Seam	<b>Yes</b>
	+ 80 ft.	
3' to 6'	Powellton Seam	<b>Yes</b>
	+ 100 ft.	
4' to 6'	Eagle Seam	Brody Mine No.1



## Pillar Design Evaluation

The engineering evaluation of the pillar design for the 4 East Mains area had to consider the increased pillar loads resulting from the mine workings in the overlying seams. The most widely used method for evaluating multiple seam interactions is the Analysis of Multiple Seam Stability (AMSS) program developed by the National Institute for Occupational Safety and Health (NIOSH). However, AMSS can only evaluate situations involving a maximum of two seams. The LaModel program, developed by NIOSH and West Virginia University (WVU), is capable of evaluating situations with three or more seams.

A detailed LaModel analysis was submitted to MSHA by the mine operator in support of the retreat mining plan for the 4 East Mains panels. At the request of MSHA District 4, MSHA's Technical Support Roof Control Division reviewed the LaModel analysis and all of the supporting data files and maps. Included with the analysis was a spreadsheet summary of the calculated pillar stability factors. MSHA Technical Support determined that the operator's study followed the LaModel version 3 protocols for retreat mining evaluation that were developed by WVU and used by MSHA. Technical Support personnel concluded that the pillar design of the 4 East Mains was acceptable for pillar recovery following the proposed mining plan.

During the two years prior to the pillar burst, MSHA's Technical Support Roof Control Division has also assisted District 4 with the evaluation of proposed pillar recovery plans for four other panels at the Brody Mine No. 1.

### Previous Accident on May 9, 2014 (Not Reported to MSHA)

On the evening production shift of Friday, May 9, 2014, at approximately 11:00 p.m., the No. 1 Section experienced an accident while retreat mining in the No. 6 entry. This accident occurred in the previous row of pillars, one block in by the location of the May 12, 2014, fatal accident, in the No. 73 Block (see Appendix D). The May 9<sup>th</sup> accident also involved a Continuous Mining Machine Operator, Rob Salmons, who was working at the mine as a contract employee. During the fatal accident investigation interview conducted on May 19, 2014, Salmons described the May 9<sup>th</sup> accident. Salmons stated that he was operating the continuous mining machine and was taking the fourth lift, which was the second lift on the right side of the No. 6 entry, when a "rib roll or bump," as described by Salmons, occurred. The coal and rock that was released from the right rib was sufficient enough in force to knock Salmons to the ground and cover him up with debris from his mid-thigh down, entrapping him for less than five (5) minutes. Salmons was unable to remove the material himself and required help in order to be freed. In this instance, the material that dislodged from the rib did not block or impede

the movement of the continuous mining machine or the MRS units. This accident occurred at approximately 11:00 p.m., within 30 minutes of the scheduled end of the work shift.

Salmons was transported to the surface where he was checked by a paramedic from a nearby ambulance service. He refused to be taken to a medical facility by the ambulance and did not seek further medical attention. Salmons reported to work for his next regularly scheduled work shift and he performed his normal duties. Salmons stated that he received only bruises and some stiffness to his right leg. The May 9, 2014, accident was not reported to MSHA or the WVOMHST. This accident should have been reported to MSHA and the State.

The mine operator conducted an investigation of the accident that occurred on May 9, 2014, and the report was completed by Willard Bourne, Assistant Mine Foreman. The accident investigation report stated that a coal "bump" occurred and dislodged the right rib where Salmons was standing, striking him in the right leg and riding him to the mine floor. In the accident report, the size of the dislodged rib was described as being approximately 14 feet long and 18 to 20 inches in thickness. The accident report also describes additional damage to the coal rib, which resulted in an 18-inch wide gap that opened up from the floor to the roof and which extended back into the block for a distance of 8 feet. The conditions described in the company's accident investigation report are consistent with a pillar burst where an intact section of the pillar rib is moved outward into the mine entry.

A subsequent interview was conducted with Agosti, the shuttle car operator whose shuttle car was being loaded at the time of the accident involving Salmons. He stated the rib material that struck Salmons was violently and forcible ejected from the pillar rib. He further stated the entry was filled with dust immediately after the accident to the degree that he could not see. Agosti stated this accident was so startling to him that he immediately started backing his shuttle car out of the entry until someone yelled at him to stop. He then got off his shuttle car and ran toward Salmons, finding him on the ground where he had been knocked up against the shuttle car. He described the condition of the right pillar rib after the accident, stating that an approximately 8 feet long section of rib had been ejected into the entry. The ejected material also included the 4-foot bolts that had been installed in the rib previously during development. Additionally, the shuttle car operator said that the top of the pillar had become separated from the mine roof, some 6 to 8 inches and that this separation extended back over the pillar for a visible distance of about 14 feet. This account of the accident by an eye witness is also descriptive of a pillar burst. His description of the amount of rib that was dislodged is consistent with the accident report completed by the company.



The accident on May 9, 2014, in the No. 73 pillar occurred in the same entry (No. 6) of the No. 1 section and disrupted regular mining activities for an extended period of time. A normal mining practice would have been to complete retreat mining of the coal pillars in the row where the accident occurred, prior to moving to the next row of pillars located outby. Instead, the subsequent production shift began their mining cycle on the outby row of pillars in the No. 2 entry, leaving one and one half pillar blocks intact and not mined as they normally would have been.

Based on interviews of the miners, the "bumping" noise they described, and the accident report prepared by the company, it was determined that the accident that occurred on May 9, 2014, was actually a rib burst. Although this event should have been reported to MSHA as an accident, because it disrupted mining for more than one hour, it was not reported and MSHA cited the mine operator. Consequently, mine management took corrective actions as if the accident was a rib roll, instead of a rib burst and failed to take actions to prevent a another burst.

### **Roof Control Plan Review**

The last six month review of the roof control plan for the Brody Mine No. 1 was conducted by the District 4 Roof Control Department and completed on February 13, 2014. The review concluded that there had been zero roof falls at the mine, and that there had been ten roof and rib violations issued in the previous six month period. The review also determined that the approved roof control plan was adequate for the current mining conditions encountered at this operation at the time of the review.

The No. 1 Section was last inspected by the roof control personnel on April 28, 2014. At that time, retreat mining on the No. 1 Section was being conducted between crosscuts 20 and 19, which was five crosscuts or pillar rows inby the location of the May 12 accident. A review of the pillaring methods and the section's mining conditions were observed during that time. No hazardous mining conditions were reported and the review concluded that the roof control plan "appeared to be in good shape at the current time."

### **Examination Records**

A review of the mine operator's examination records of the No. 1 Section from April 28, 2014 through May 12, 2014, was conducted as part of the accident investigation. The first report of bad rib conditions was recorded on May 9, 2014. The bad rib conditions were reported to be located in the No. 7 entry of the section on the pre-shift examination report for the evening shift, which was prior to the rib burst that occurred in the No. 6 entry on May 9, 2014. The examination records indicate that the No. 7 entry was dangered-off and jacks were set in the

No. 6 entry as a corrective measure to prevent exposure to miners from the adverse rib conditions.

The subsequent on-shift examination report on the midnight shift continued to show the bad ribs in the No. 7 entry as dangered-off, and the No. 6 entry as being mined. The pre-shift examination report conducted for the day shift of May 10, 2014, reported bad ribs in the Nos. 6, 7, and 8 entries and the connecting crosscuts, and also reported the corrective action taken was to danger-off the entire area.

The on-shift examination records for May 10, reported that the ribs were rolling off of the pillars between the Nos. 6, 7, and 8 entries and that the pillars were left unmined. However, the production report for the day shift of May 10, 2014 reported that 58 feet of coal was mined in the No. 7 entry prior to leaving these blocks and moving across the section to the No. 2 entry where mining was started in the next row of pillars. The mine operator's production report is in conflict with the testimonies given during the accident investigation.

The testimonies given to the accident investigation team reported that no coal was mined from the No. 7 entry on May 10, 2014. This would have meant that the coal pillars (Nos. 73 and 74) between the Nos. 6, 7, and 8 entries were left intact after the previous rib burst accident that occurred on Friday May 9, 2014 (See Appendix D).



## ROOT CAUSE ANALYSIS

A root cause analysis was conducted to identify the cause(s) of the accident that were correctable through reasonable management controls. Listed below is the root cause identified during the analysis and the corresponding corrective actions implemented to prevent a recurrence of the accident.

*Root Cause:* The mine operator failed to recognize and anticipate the potential for pillar burst conditions and did not develop and implement a method of mining to mine safely and control those areas with potential pillar burst conditions. A method of mining was needed in order to mitigate the hazards associated with pillar bursts at the mine.

*Corrective Actions:* The mine operator has abandoned the 4 East Mains section and discontinued retreat mining activities at the mine. The mine operator has also discontinued all mining in the eastern side of the mine where the fatal accident occurred. On June 23, 2014, MSHA notified the mine operator in writing that a risk assessment must be completed and submitted for review. The letter informed the mine operator that all future mining, development or retreat mining, would require the submittal of a risk assessment specific to the mine's particular mining method and mine operation. The mine operator conducted a Coal Burst Risk Assessment for the western side of the mine including the LaModel computer analysis, which was submitted to MSHA on August 1, 2014. The information was reviewed by the MSHA's Roof Control Division of Technical Support. MSHA's review of the Coal Burst Risk Assessment concluded that the potential for a burst using the current mining techniques and the associated geology in the western side of the mine is low. The mine operator was notified of the findings of the MSHA review by letter dated August 25, 2014. The mine operator was also informed that if significant changes in the mining methods or geology were encountered, or if mining plans included any future pillar recovery, a risk assessment would be required prior to mining of those areas.

## CONCLUSION

The accident occurred because the mine operator failed to recognize areas with potential rib burst conditions, and to develop and implement a method of mining suitable to mine safely and control those conditions. Mine management took insufficient actions to investigate the previous rib burst accident that occurred on the No. 1 Section on May 9, 2014, and failed to address hazardous conditions that caused the rib burst. Management's failure to recognize and address the hazards associated with rib burst conditions, resulted in continued exposure to the hazard and led to the deaths of two miners on May 12, 2014.

Approved By:

David S. Mandeville

David S. Mandeville  
District Manager  
Coal Mine Safety and Health, District 4

10/1/14

Date



## ENFORCEMENT ACTIONS

1. Order No. 9001129, was issued over the phone verbally at approximately 9:00 p.m., on May 12, 2014, under the provisions of section 103(j) of the Mine Act:

A reported accident of the entrapment of two miners occurred at this operation on March 12, 2014. This Order was issued to prevent the destruction of any evidence which would assist in the investigation of the cause or causes of the accident and covered the entire mine.

The 103(j) Order, No. 9001129, was modified (01) on May 12, 2014, to a 103(k) Order and was reduced to writing at 10:10 p.m. At that time the accident was known to involve a double fatality at this mine on the No. 1 Section on the 4 East Mains.

The 103(k) Order, No. 9001129, was modified (02) on May 12, 2014, at 10:50 p.m., to allow the operator to make required examinations and to maintain the mine.

The 103(k) Order, No. 9001129, was modified (03) on May 13, 2014 at 08:16 p.m., to allow the operator to monitor the roof and rib conditions on the No. 1 section. The operator was also permitted to remove the following equipment from the No. 1 Section: the company No. 505 Scoop, the No. 884 Tractor, and the No. 388 Mantrip.

The 103(k) Order, No. 9001129, was modified (04) on May 15, 2014, at 10:20 a.m., to allow the operator to resume normal mining operations on the Nos. 3 and 4 Sections. This order still prevents any second mining within the entire mine.

The 103(k) Order, No. 9001129, was modified (05) on May 19, 2014, at 3:30 p.m., to allow the operator to implement an equipment recovery plan for two mobile roof supports (MRS's) submitted and dated May 16, 2014, by the operator.

The 103(k) Order, No. 9001129, was modified (06) on May 28, 2014, at 4:09 p.m., to allow the operator to remove all equipment from the No. 1 Section except for the Continuous Miner and the two MRS's located inby the accident scene. This is to be done in accordance to the submitted plan dated May 28, 2014, by the operator.

2. Citation No. 7272494, was issued under the provisions of Section 104(e)(2) of the Mine Act, for a violation of 30 CFR § 75.202(a):

The operator failed to support or otherwise control the mine ribs in order to protect miners from being exposed to the hazardous conditions associated with a coal burst. The operator failed to recognize a precursor burst, which occurred on the No. 1 Section on May 9, 2014, and also failed to take adequate corrective actions to protect the miners from hazardous rib conditions. The operator failed to develop and implement a plan, or method, of mining designed to eliminate the hazardous conditions associated with a coal burst, and at approximately 8:15 pm on Monday May 12, 2014, a second violent burst occurred on the No. 1 Section fatally injuring two miners. A continuous mining machine operator, and a roof bolting machine operator, were fatally injured while conducting retreat mining in the No. 6 entry of the 4 East Mains on the No. 1 Section (009-0 MMU).

A written notice of Pattern of Violations, No. 7219154, was issued by MSHA on 10/24/2013.

Standard 75.202(a) was cited 15 times in two years at mine 4609086 (15 to the operator, 0 to a contractor).

3. Citation No. 7272454, was issued under the provisions of Section 104(e)(2) of the Mine Act, for a violation of 30 CFR § 50.10(d):

The operator failed to immediately report an accident that occurred at approximately 11:00 p.m., on Friday, May 9, 2014, while retreat mining was being conducted in the No. 6 entry of the No. 1 Section (009-0 MMU). The accident occurred in the block between crosscut 15 and 16, while mining the second lift on the right side pillar. This accident involved a coal rib outburst that covered the continuous mining machine operator with coal/rock debris from below his thigh, temporarily entrapping him and requiring assistance to free him from the rubble. Due to this accident, miners and equipment were required to be withdrawn from the active mining area in the Nos. 6, 7 and 8 entries. The accident also caused normal mining activities to be disrupted and altered for more than one hour. Mining was discontinued in the row of pillars where the accident occurred and was only resumed after a substantial period of time when the equipment was repositioned to the No.2 entry to start retreat mining in the next row of pillars outby the accident site. By not reporting this accident, the mine operator deprived MSHA the opportunity to investigate the accident and also failed to determine the root cause of the accident.



A written notice of Pattern of Violations, No. 7219154, was issued by MSHA on 10/24/2013.

4. Citation No. 7272462, was issued under the provisions of Section 104(a) of the Mine Act, for a violation of 30 CFR § 50.12.

The operator failed to preserve the accident site at an accident that occurred at approximately 11:00 p.m., on Friday, May 9, 2014, while retreat mining was being conducted in the No. 6 entry of the No. 1 Section (009-0 MMU). The operator allowed the destruction of evidence that would have contributed to the investigation of the accident. The failure to preserve this accident site prevented MSHA from performing an accident investigation into the cause or causes of the accident. The investigation would have prohibited mining activity in the affected area until MSHA permitted the operator to resume normal mining activities.

**APPENDIX A**  
**Persons participating in the investigation**

**Brody Mining LLC.**

Greg Dotson ..... President  
Phillip G. Worley ..... Senior Ground Control Engineer  
Joey Athey ..... Operations Manager  
Scott Thompson ..... General Mine Foreman  
Mike Day ..... Assistant Mine Foreman  
Jamie Lester ..... Evening Shift Mine Foreman  
Willard Bourne ..... Evening Shift Assistant Mine Foreman  
Justin Ray ..... Safety Manager  
Jonathan Asbury ..... Day Shift Continuous Miner Operator  
Steve Webb ..... Day Shift Continuous Miner Operator  
Josh Anderson ..... Day Shift Section Foreman  
Chris Walls ..... Outby Day Shift Foreman  
Rob Salmons ..... Evening Shift Continuous Miner Operator  
Bazzil B. Goodman Jr. .... Evening Shift Shuttle Car Operator  
Danny R. Bailey Jr. .... Evening Shift Shuttle Car Operator  
Todd Agosti ..... Evening Shift Shuttle Car Operator  
Jackie W. Bailey ..... Evening Shift Roof Bolter Operator  
Harold "Mike" Shull ..... Evening Shift Section Electrician  
Bobby J. Moore ..... Evening Shift Section Foreman  
Johnny Cochran ..... Evening Shift Electrician  
Mark Morrison ..... Evening Shift Dispatcher  
Jeremy Buskirk ..... Evening Shift Outby Laborer  
Mark White ..... Evening Shift Chief Electrician

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

Eugene White ..... Director  
John Kinder ..... Assistant to Director  
Danny Jarrell ..... Inspector at Large  
Wayne A. Pauley ..... Assistant Inspector at Large  
Monte Hieb ..... Chief State Engineer  
Barry Koerber ..... Attorney with WVOMHS&T  
Steve Akers ..... District Inspector  
Jeff Spratt ..... District Inspector  
Bill Gillenwater ..... District Inspector



**APPENDIX A**  
**Persons participating in the investigation (continued)**

**Mine Safety and Health Administration**

David Morris, PE .....Assistant District Manager/Technical Programs  
Thomas Clark ..... Staff Assistant  
Terry Price ..... Madison Field Office Supervisor  
Daris Lee Barker, Jr, PE..... Mining Engineer/ Accident Investigator  
Joshua McNeely..... CMI/ Accident Investigator  
James Jackson ..... Coal Mine Inspector  
Robert Hatfield ..... Electrical Supervisor  
Christopher Mark..... Technical Support Principal Roof Control Specialist  
Sandin Phillipson.... Technical Support Geologist Roof Control Division

## APPENDIX B Victim Information

Accident Investigation Data - Victim Information

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



Event Number: **6 3 0 2 4 2 6**

**Victim Information: 1**

1. Name of Injured/Ill Employee: <i>Eric D. Legg</i>		2. Sex: <i>M</i>	3. Victim's Age: <i>48</i>	4. Degree of Injury: <i>01 Fatal</i>												
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 05/12/2014 b. Time: 20:30</i>				6. Date and Time Started: <i>a. Date: 05/12/2014 b. Time: 15:00</i>												
7. Regular Job Title: <i>038 Continuous Miner Operator</i>			8. Work Activity when Injured: <i>049 Operate Continuous Miner</i>			9. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>										
10. Experience a. This Work Activity:		Years	Weeks	Days	b. Regular Job Title:		Years	Weeks	Days	c. This Mine:		Years	Weeks	Days	d. Total Mining:	
		<i>1</i>	<i>8</i>	<i>4</i>			<i>1</i>	<i>8</i>	<i>4</i>			<i>2</i>	<i>34</i>	<i>1</i>	<i>26 2 4</i>	
11. What Directly Inflicted Injury or Illness? <i>122 Coal Rib Outburst</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 checked="" type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>																
16. Part 50 Document Control Number: (form 7000-1)				17. Union Affiliation of Victim: <i>9999 None (No Union Affiliation)</i>												

**Victim Information: 2**

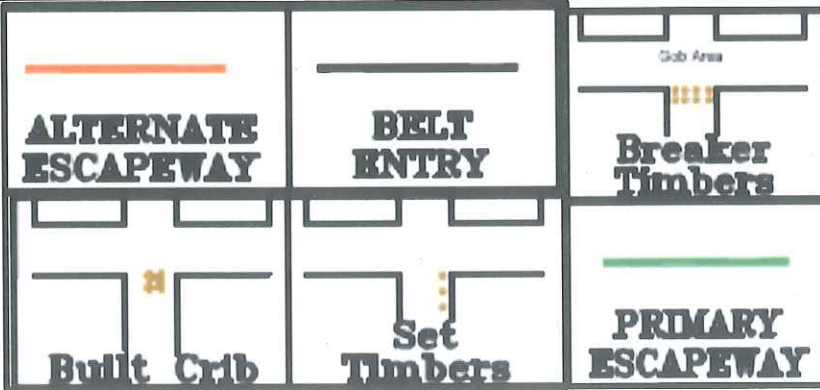
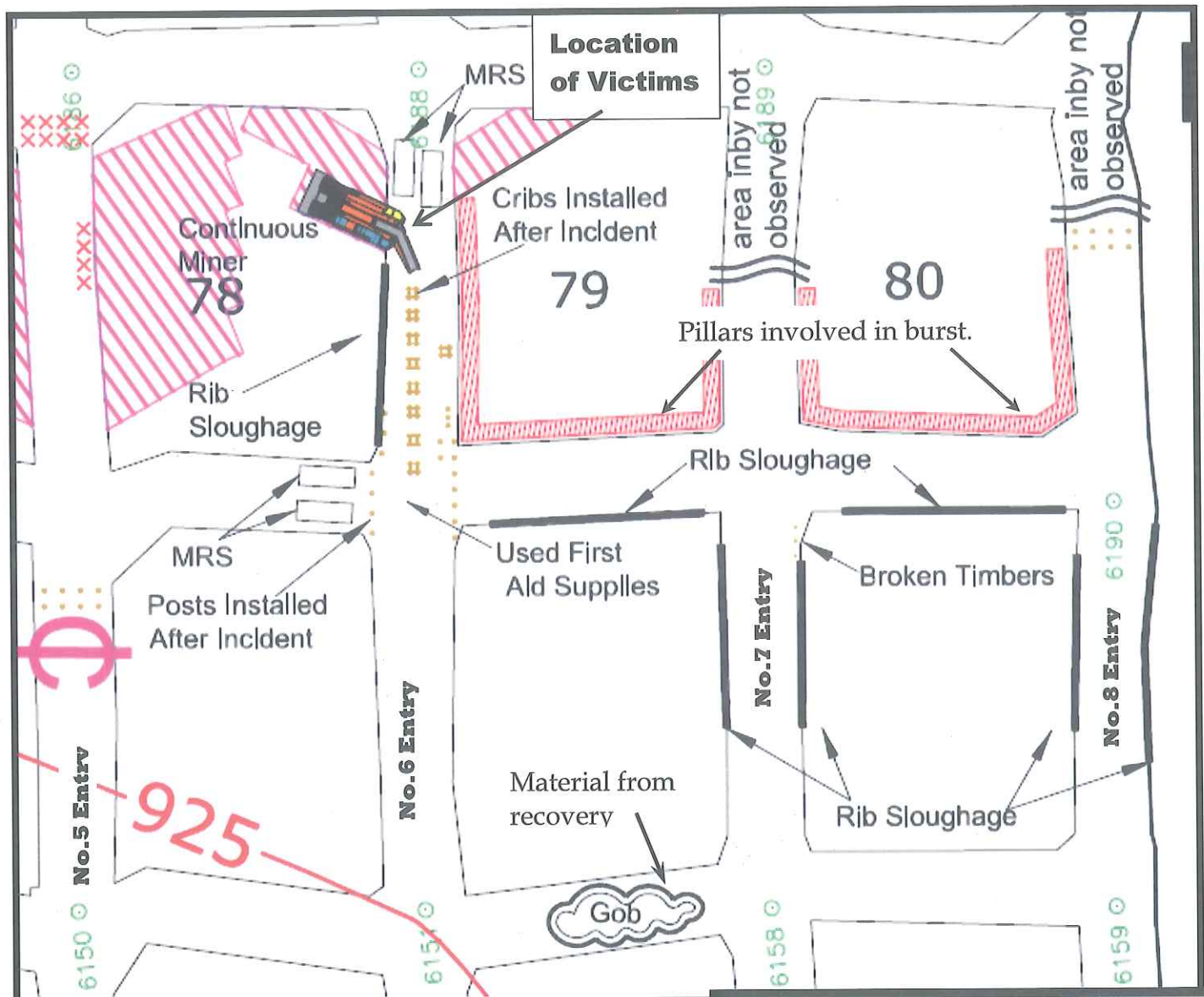
1. Name of Injured/Ill Employee: <i>Gary P. Hensley</i>		2. Sex: <i>M</i>	3. Victim's Age: <i>46</i>	4. Degree of Injury: <i>01 Fatal</i>												
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 05/12/2014 b. Time: 20:45</i>				6. Date and Time Started: <i>a. Date: 05/12/2014 b. Time: 15:00</i>												
7. Regular Job Title: <i>012 Roof Bolter Operator</i>			8. Work Activity when Injured: <i>073 Operating MRS machines.</i>			9. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>										
10. Experience a. This Work Activity:		Years	Weeks	Days	b. Regular Job Title:		Years	Weeks	Days	c. This Mine:		Years	Weeks	Days	d. Total Mining:	
		<i>0</i>	<i>39</i>	<i>1</i>			<i>1</i>	<i>2</i>	<i>6</i>			<i>3</i>	<i>31</i>	<i>6</i>	<i>3 31 6</i>	
11. What Directly Inflicted Injury or Illness? <i>122 Coal Rib Outburst</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 checked="" type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>																
16. Part 50 Document Control Number: (form 7000-1)				17. Union Affiliation of Victim: <i>9999 None (No Union Affiliation)</i>												

**Victim Information:**

1. Name of Injured/Ill Employee:		2. Sex:	3. Victim's Age:	4. Degree of Injury:												
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:				6. Date and Time Started:												
7. Regular Job Title:			8. Work Activity when Injured:			9. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input type="checkbox"/>										
10. Experience a. This Work Activity:		Years	Weeks	Days	b. Regular Job Title:		Years	Weeks	Days	c. This Mine:		Years	Weeks	Days	d. Total Mining:	
11. What Directly Inflicted Injury or Illness?				12. Nature of Injury or Illness:												
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)				Independent Contractor ID: (if applicable)												
15. On-site Emergency Medical Treatment: Not Applicable: <input type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>																
16. Part 50 Document Control Number: (form 7000-1)				17. Union Affiliation of Victim:												



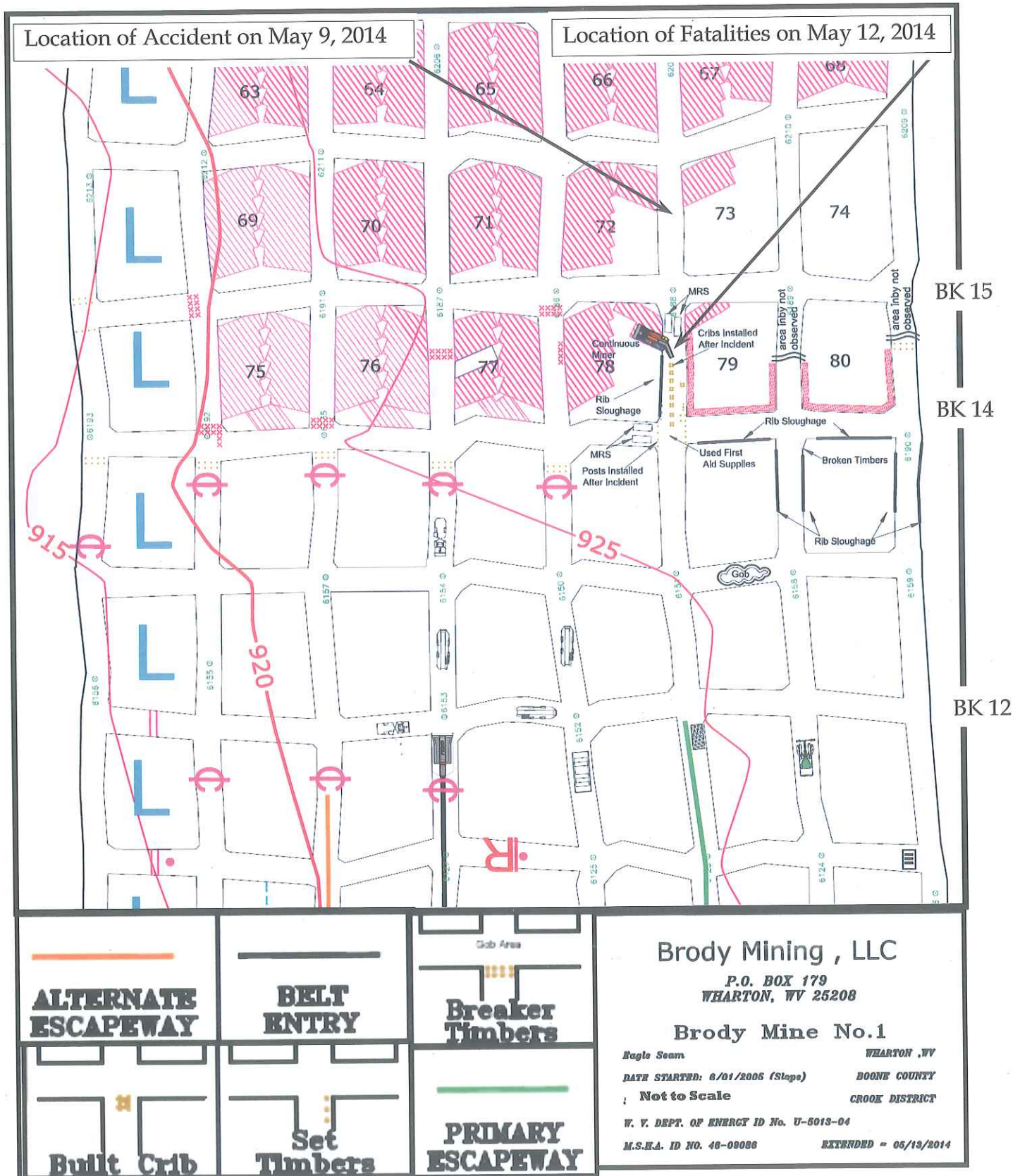
APPENDIX C  
 Sketch of the Fatal Accident Scene



**Brody Mining , LLC**  
 P.O. BOX 179  
 WHARTON, WV 25208

**Brody Mine No.1**  
 Eagle Seam WHARTON ,WV  
 DATE STARTED: 6/01/2005 (Stops) BOONE COUNTY  
 Not to Scale CROOK DISTRICT  
 W. V. DEPT. OF ENERGY ID No. U-5013-04  
 M.S.E.A. ID No. 46-09086 EXTENDED - 06/13/2014

**APPENDIX D**  
**Sketch Showing Location of May 9<sup>th</sup> and 12<sup>th</sup> Accidents**



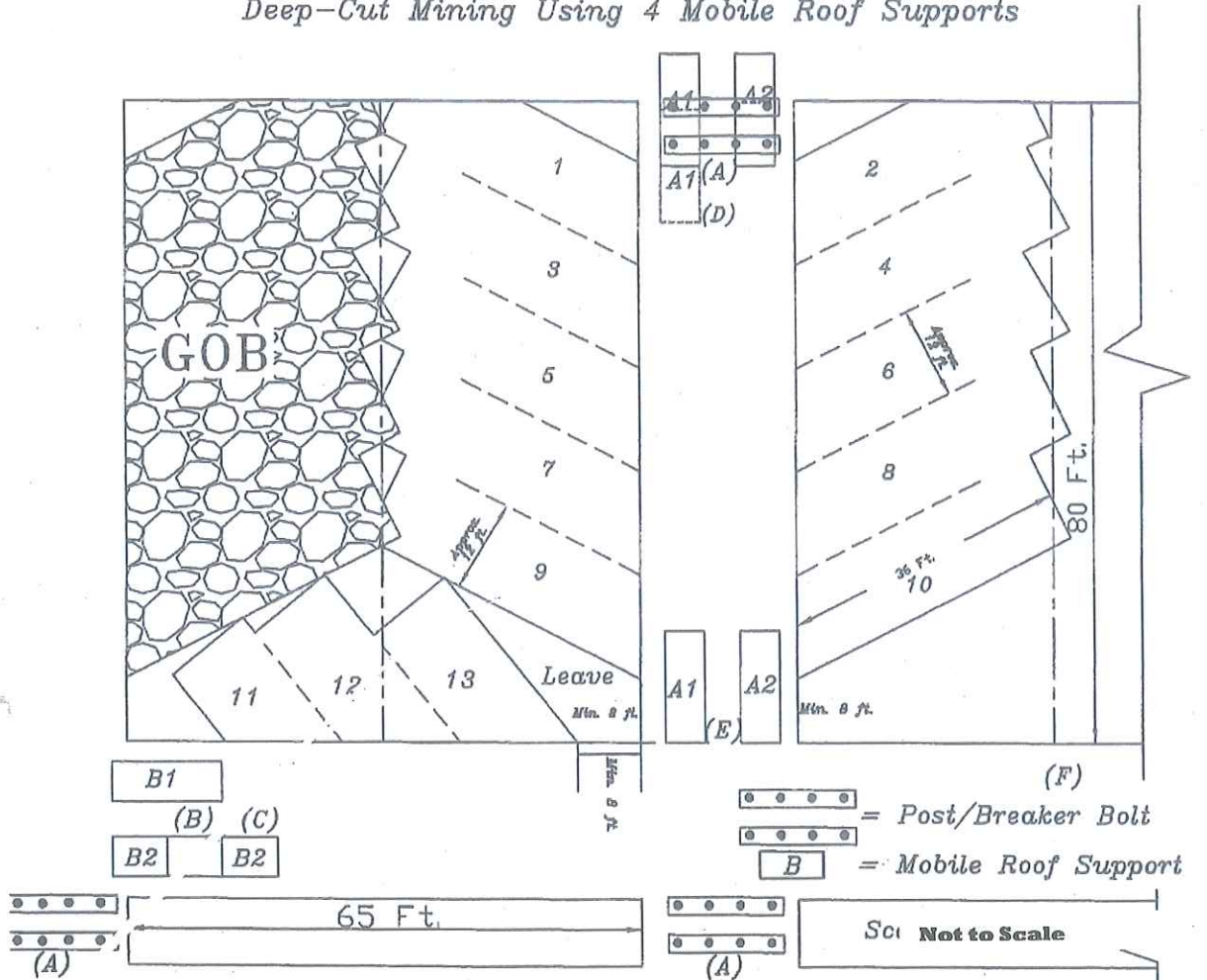


APPENDIX E  
Page 24 of Approved Roof Control Plan  
Pillaring Sequence Being Used at Time of Accident

DRAWING NO. 4A

Pillar Recovery

Deep-Cut Mining Using 4 Mobile Roof Supports



1. 8 Breaker posts at (A) are to be installed immediately after mining is completed inby. Breaker bolts at location (A) shall be installed prior to mining the inby block. Mobile Roof Supports (MRS) units A1 and A2 are to be installed prior to mining lifts 1 and 2.
2. MRS units B1 and B2 shall be installed at locations (B) immediately upon completion of mining inby and prior to mining lifts 1 and 2.
3. The MRS A1 shall be moved to location (D) after mining lift No. 1 prior to mining lift No. 2 and the MRS units will be moved in a similar manner for each subsequent lift.
4. The MRS units A1 and A2 shall be moved to location (E) immediately upon completion of mining inby.
5. The MRS unit B2 shall be moved to location (C) prior to mining lift No. 11 and the MRS units will be moved in a similar manner for each subsequent lift.
6. The continuous miner shall operate in remote mode only.
7. This plan can be used on other size pillars. Pillar length may warrant additional pillar cuts (min. block 40'x40').
8. All posts are to be installed on 4 foot maximum spacing.
9. No person shall proceed inby the continuous miner operator while the machine is in operation.
10. Prior to mining lift No. 9, the haulroad at location (F) will be discontinued.
11. Depth of cut can be 36' measured from rib line, provided that the cut does not exceed half of the pillar width.
12. If height exceeds 8' the stump size will equal 1:1 ratio to height.