CAI-2007-09

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Surface Coal Mine

Fatal Surface Blasting Accident
July 16, 2007

CAM Mining, LLC
Three Mile Mine #1
Ashcamp, Pike County, Kentucky
I.D. No. 15-17659

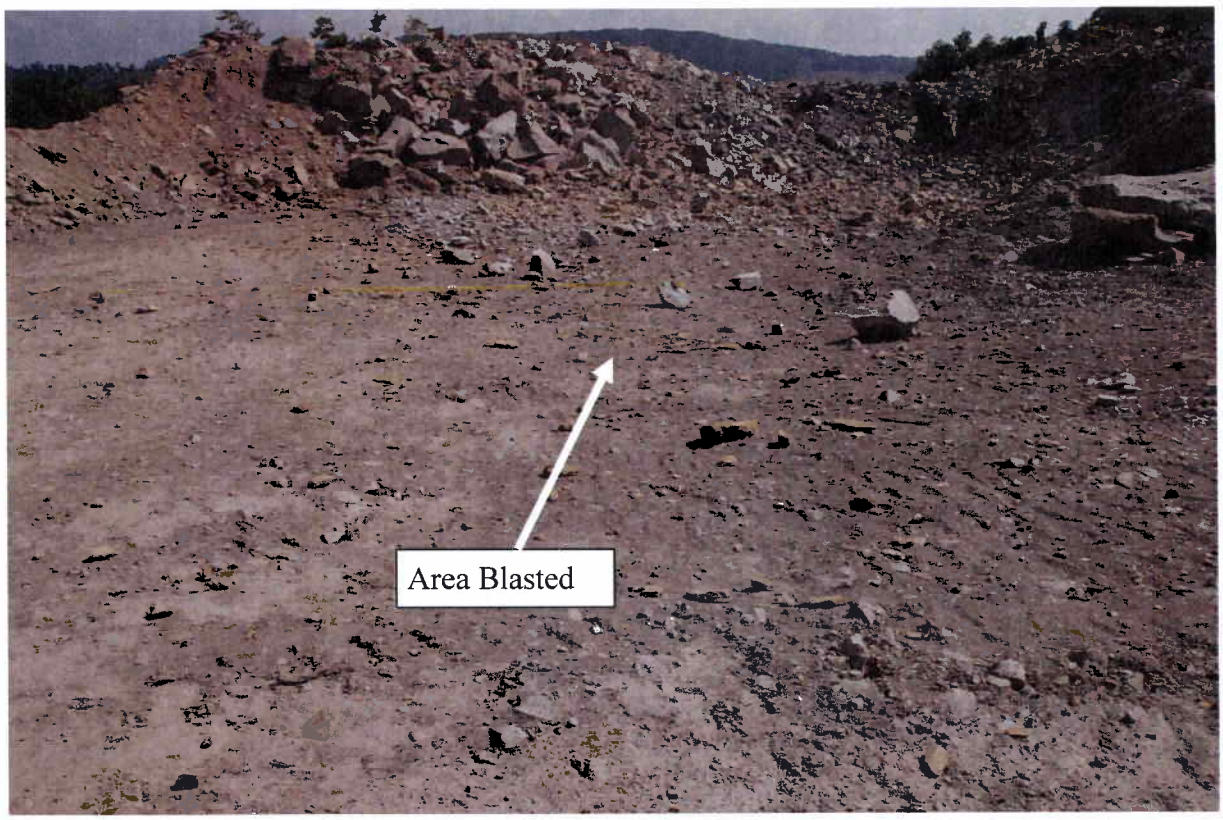
Accident Investigators

Robert J. Newberry
Mining Engineer

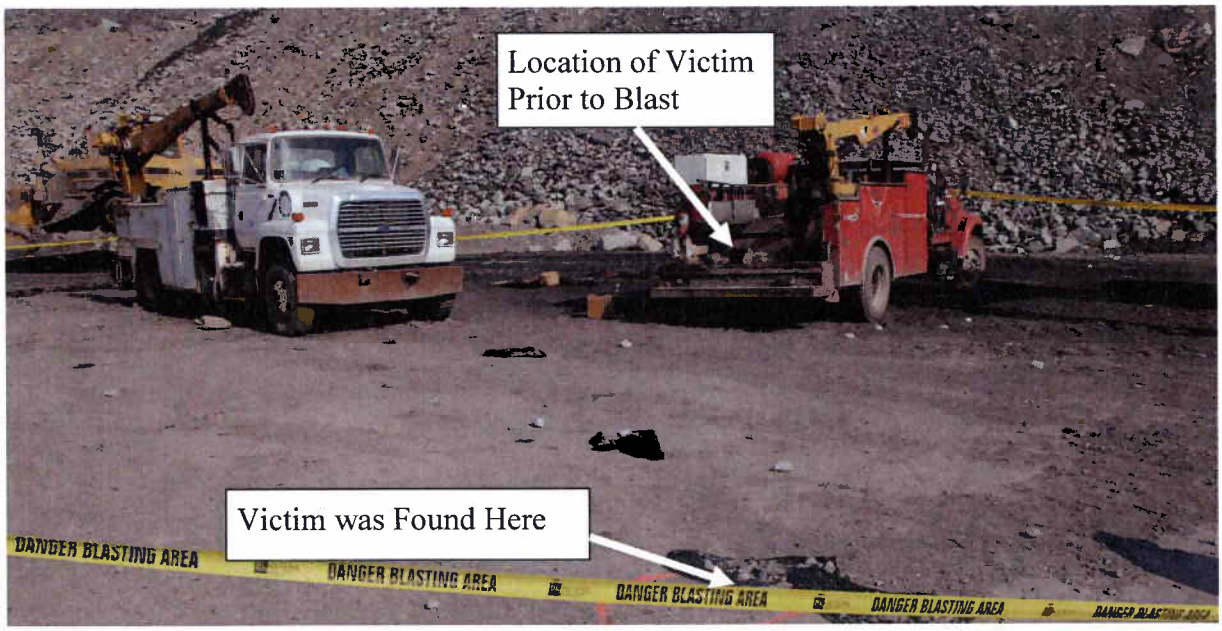
Arlie A. Webb
Staff Assistant

Originating Office
Mine Safety and Health Administration
District 6
100 Fae Ramsey Lane
Pikeville, KY 41501
Norman G. Page, District Manager

Table of Contents



Photograph No. 1 – Blast Area



Photograph No. 2 – Victim Location

OVERVIEW

At approximately 4:35 p.m. on July 16, 2007, Bobby Messer, a 40-year old mechanic received fatal injuries when he was struck by fly rock from a production blast. The victim had 20 years of mining experience, 10 years of which was at this mine. The fly rock that struck the victim traveled approximately 1,500 feet, into an area where miners parked their personal vehicles and mine equipment between shifts. The fly rock passed over a 50 foot embankment prior to reaching the accident site (Appendix II). Although several pieces of fly rock were found at the accident site, the size of the rock that struck the victim could not be determined. The accident occurred because safe procedures for conducting blasting operations were not followed.

GENERAL INFORMATION

The Three Mile Mine #1 is operated by CAM Mining LLC near Ashcamp, in Pike County, Kentucky. This is a multiple seam surface coal mine that is operated on multiple, rotating shifts. The overburden is broken up by conventional drilling and blasting. Removal of overburden is accomplished by either dozers or haul trucks. Rubber tired end loaders then load the exposed coal into highway trucks for removal from the mine site.

The company designated a staging area for equipment parking, servicing and shift change. During idle times, equipment is often serviced in this area. This area was considered to be remote from the blast area at the time of this blast and consequently was outside the area to be guarded as designated by the blaster in charge.

CAM Mining LLC, employs both the drilling crews and the blasters for this mining operation. Sub-contractors are not involved in the drilling and blasting operations at this mine. Portions of the mine operate in minimal cover areas where the rock overburden is not consolidated. The blaster in charge is responsible for designating the blast area and for sounding the blast warning, which consists of a vehicle mounted siren and transmission of the siren sound through the citizens band (CB) radio. The surface equipment at this mine is equipped with CB radios.

DESCRIPTION OF ACCIDENT

On the day of the accident, the day shift had finished their shift and had parked the equipment in the staging area awaiting re-fueling and routine service. The victim and another mechanic had also finished their shift and were preparing to leave for the day. Testimony indicates that, at the time of the accident, 4:35 p.m., the CB radios in the mechanic's trucks were turned off. The two mechanics reportedly heard an unusually loud blast, looked up and saw fly rock coming toward them. As they ran for cover, one of the mechanics was struck with a piece of fly rock and fatally injured.

Other pieces of fly rock, including one approximately 16 inches x 20 inches (as measured from an imprint in ground) hit within a few feet of where the men were standing. The rock appeared to have broken on impact with the ground, with smaller pieces bouncing in a fan like direction. Fly rock also struck the adjacent mechanic's truck resulting in several areas of damage.

INVESTIGATION OF ACCIDENT

James Clevinger, second shift foreman, notified MSHA of the accident at 4:42 p.m. on July 16, 2007. A 103(k) Order was issued to secure the accident scene while the investigation was conducted and to ensure the safety of any person working at the mine. An investigation was conducted in cooperation with officials from the Kentucky Office of Mine Safety and Licensing, U. S. Office of Surface Mining Reclamation and Enforcement, and Kentucky Division of Mining Reclamation and Enforcement. Miners and mine management officials deemed to have knowledge of the facts regarding the accident were interviewed on two separate occasions. The interviews were conducted at the Mine Safety and Health Administration, District 6 office at Pikeville, Kentucky on July 17 and 20, and at the Kentucky Office of Mine Safety and Licensing at Pikeville, Kentucky on August 9 and 13.

DISCUSSION

Location of the Accident

The blast was initiated at the north end of the mine. Fly rock traveled approximately 1,586 feet south east to the staging area. The weather at that time was dry, clear and sunny, 95° Fahrenheit, with a wind velocity of 0 to 3 mph from the north.

Description of the Blast

The blast was designed and directed by John Goble II, designated Blaster in Charge. The shot patterns were laid out, drilled, loaded, and detonated by employees of CAM Mining, LLC.

Shot One (as designated by the company) consisted of 92 holes, each of which was 7-7/8 inches in diameter, laid out in 11-1/2 rows with a spacing of 18 feet by 18 feet. The bench height was 20 feet. No drill log (a written record of the drill hole which indicates cracks, mud seams and other abnormalities) was maintained. Sixty-seven of the holes were loaded with a total of 12,026 pounds of explosive product and the remaining 25 holes (outside holes on the crest) were decked and loaded with a total of 2,692 pounds of explosives. Decked holes have the powder column separated by non-explosive material (stemming). The holes were stemmed with between 10-11 feet of drill cuttings.

Shot Two (as designated by the company) consisted of 28 holes, each of which was 7-7/8 inches in diameter, laid out in 3-1/2 rows with a spacing and burden of 16 feet by 16 feet. The bench height was 15 feet with no drill log. These holes were loaded with a total of 2,513 pounds of explosives. Blast records show that this blast required 1484 mS (approximately 1.5 seconds) to propagate.

Although information provided by the blaster-in-charge indicated each shot was fired separately, only one lead-in line was observed during the site investigation. A lead-in line connects a series of blast holes to a remote detonating device. Two seismographs, which are typically used near surface mines to measure ground and air vibrations, had been placed in the area by the company. Seismograph readings are triggered by ground vibration and air vibration (sound.) A seismograph, located approximately 1,425 feet from the blast area, was triggered by the first shot. Seismic records from the first blast indicate a peak air over pressure (air vibration) of 123 dB at 7.6 Hz at trigger. Blast records show that this blast required 2568 mS to propagate.

Blast Design

Blast holes should be designed to balance the explosives energy with the mass of the material to be broken up. Larger blast holes require thicker amounts of burden than do small diameter blast holes. Uniform geologic materials can evenly distribute the energies while broken areas (fractures) leak energy. As a result, explosives must be more evenly distributed in faulty areas than in uniformly structured areas. Large blast holes require more stemming and burden than do small diameter blast holes. The blasting chart in Appendix III summarizes related information.

Fly rock can originate from insufficient burden and result in a blow-out or over-break when the blast hole is too close to free face, or due to geologic conditions. Fly rock can also result in cratering due to insufficient stemming, unconsolidated cover, too high of a powder factor, too large of a blast pattern, or other factors).

Insufficient burden type fly rock usually has a lower trajectory angle than does the cratering type of fly rock. The fly rock involved in the accident was a high angle blow-out type of fly rock resulting from a condition known as back break which is fracturing of the area adjacent to the blast site. Back break is typically noticed by the driller during drilling as a loss of air pressure, jumping of the drill stem, and otherwise difficult drill penetration. These conditions should be noted in a drill log - which was not being maintained at this mine. Back break and/or loose burdens can result in fly rock since they do not provide the required confinement typical to consolidated burden.

Fly Rock in Brief

MSHA defines the blast area as; "... the area near blasting operations in which concussion or flying material can reasonably be expected to cause injury." Fly rock is rock that travels outside of the area that the blaster defines as the blast area. The fly rock at this mine was a high angle, blow-out type of fly rock due to the terrain between the blast site and the impact area(s) and the impacted fly rocks continuing path after impacting the ground.

Medical Information

Information from an autopsy conducted on July 17, 2007, indicated that the victim was fatally injured by blunt force trauma near the base of the skull. The nature and extent of the injuries indicated the object (fly rock) came from behind, above and to the left of the victim. This is consistent with fly rock from the blast site.

ROOT CAUSE ANALYSIS

An analysis was conducted to determine the most basic causes of the accident. Listed below are the root causes identified during the analysis and the corresponding corrective actions implemented to prevent a recurrence of the accident. In each case, no effective management system, policy or procedure was in place to assure compliance with the underlying regulations and safe mining practices.

Root Cause: Effective policies and procedures were not in place to ensure that an adequate blast area was provided. The mine operator did not protect or remove persons from areas where there was a potential for fly rock. The area near the blasting operations where flying material could reasonably be expected to cause injury was not increased to protect persons even though abnormal conditions were known to exist.

Corrective actions: The mine operator developed and implemented a plan to prevent a similar occurrence of this accident. The plan includes a revision to the ground control plan that stipulates that all persons within 2000 feet of the blast site will be in shelters and that the shelters will be at least 1000 feet from the blast site. The plan also requires training to be provided to the employees on the revised ground control plan and hazards associated with blasting operations.

Root Cause: The mine operator did not maintain safe control of the mining pit. Fly rock from the mining pit traveled more than 1500 feet to a staging area where equipment was being fueled and routine service was being performed. No procedure was in place to demarcate the 'Blast Site' from other production areas during the load-out crews overburden removal procedures. This increased the probability that the highwall would be 'Over Dug,' reducing the burden from its original thickness. The type of fly rock that occurred at this site was the result of insufficient burden at the opening of the blast #1 (the first blast holes that were detonated.)

Corrective actions: The mine operator developed and implemented a plan to prevent a similar occurrence of this accident. The plan includes a revision to the ground control plan that requires that the drillers log the blast holes as they are drilled and provide this log to the blaster who will include this log with the blast report. The revision also requires that adequate burden along the edge and free face of the blast site equal to or greater than 25 times the hole diameter (measured in inches) divided by twelve and that the burden along the edges of the blast site will be measured with a burden pole. The plan also requires training to be provided to the employees on the revised ground control plan and hazards associated with blasting operations.

CONCLUSION

The accident occurred because safe procedures for conducting blasting operations were not followed. The procedures in effect at the time of the accident did not ensure that all persons were either cleared from the blast area or were in shelters, especially when abnormal conditions were known to exist in the blast area. No procedure was in place to demarcate the 'Blast Site' from other production areas during the load-out crews overburden removal procedures, increasing the probability that the highwall would be 'Over Dug,' reducing the burden from its original thickness. The fly rock resulted from the loss of confinement of the first series of blast holes because this series of blast holes lacked sufficient burden to confine the explosive energy.

Approved by:

Norman G. Page
District Manager

12-4-07
Date

ENFORCEMENT ACTIONS

1. 103(k) Order No. 7428795 was issued on July 16, 2007 to CAM Mining, LLC.

Condition or Practice: "A fatal accident occurred at this operation on July 16, 2007, when fly rock from a blast landed in a maintenance area. This order is issued to ensure the safety of persons working at this operation until an examination or investigation is made to determine that the mine is safe. Only those persons selected from company officials, state officials, the miners' representative and other persons deemed by MSHA to have information relevant to the investigation may enter or remain in the affected area. The operator shall have written authorization from an authorized representative for all actions to restore operations."

2. 104(d)(1) Citation No. 7428799 was issued to CAM Mining LLC for a violation of 30 CFR, §77.1303(h)

Condition or Practice: The mine operator did not ensure that all persons were cleared from the blast area or were in shelters. Additional precautions were not taken to increase the secure area from a blast site which contained blast holes which were known to be cracked or "busted up." The area near the blasting operations where flying material could reasonably be expected to cause injury was not increased to account for the abnormal conditions which were known to exist in the blast holes.

Fly rock from a blast detonated on July 16, 2007, left the blast site and traveled approximately 1500 feet, where equipment was being fueled and routine service was being performed, resulting in fatal injuries to an equipment mechanic.

3. 104(a) Citation No. 7428800 was issued to CAM Mining LLC for a violation of 30 CFR, §77.1000.

Condition or Practice: The mine operator's established ground control plan was not adequate to provide safe control of the mining pit. Evidence indicates that drilling and blasting precautions were not taken to provide adequate burden to prevent blow-out of blast holes along the edge of the blast site. Material was excavated from the area adjacent to the blast creating a free face and reducing the burden between the holes and the free face where evidence indicates that one or more blast hole "blew out" creating fly rock.

Fly rock from a blast detonated on July 16, 2007, left the blast site and traveled approximately 1500 feet to a staging area, where equipment was being fueled and routine service was being performed, resulting in fatal injuries to an equipment mechanic.

Appendix I - **List of Persons Participating in the Investigation**

CAM Mining LLC

David G. Zatezalo	Sr. Vice President (Rhino Energy)
Chad Hunt	Vice President
Roger Cantrell	Safety Director
Arnold J. Stewart, Jr.	Blasting and Drill Foreman
Donald Holliday	Manager of Surface Operation
Joseph Randall Miller	V.P. and Associate General Counsel
James Gregory Clevinger	Night Shift Foreman
Jedford Colvin	Day Shift Foreman
Lee Edward Rowe	Drill Operator
John Henry Holbrook	Blasting Helper
Barry Cameron Blair	Blasting Helper
Terry Monroe Adams, Jr.	Service/Greaser
William Ernest Holbrook	Mechanic
Delmon Eugene Adams, Jr.	Mechanic
John Chester Goble, II	Blaster
Johnny W. Sexton	Blasting Coordinator
Mark Heath	Attorney (Spillman, Thomas & Battle)
J. Scott Kreutzer	Attorney (Baird & Baird)
Marko Rajkovich	Attorney (Rajkovich, Williams, Kilpatrick, and True)

Blastech Associates Inc.

Doug Smith	Seismograph Specialist

Kentucky Office of Mine Safety and Licensing

Greg Goins	Deputy Chief Accident Investigator
Tracy Stumbo	Chief Accident Investigator
Worley Taylor	Inspector
Mike Elswick	District Supervisor
Kevin Meade	Blasting Inspector
Martin Brashear	Blasting Inspector
Jeff Taylor	Director of Blasting and Explosives

Kentucky Division of Reclamation Enforcement

Culhayne Nichols	Environmental Scientist
Robert Dupree	Blast Specialist

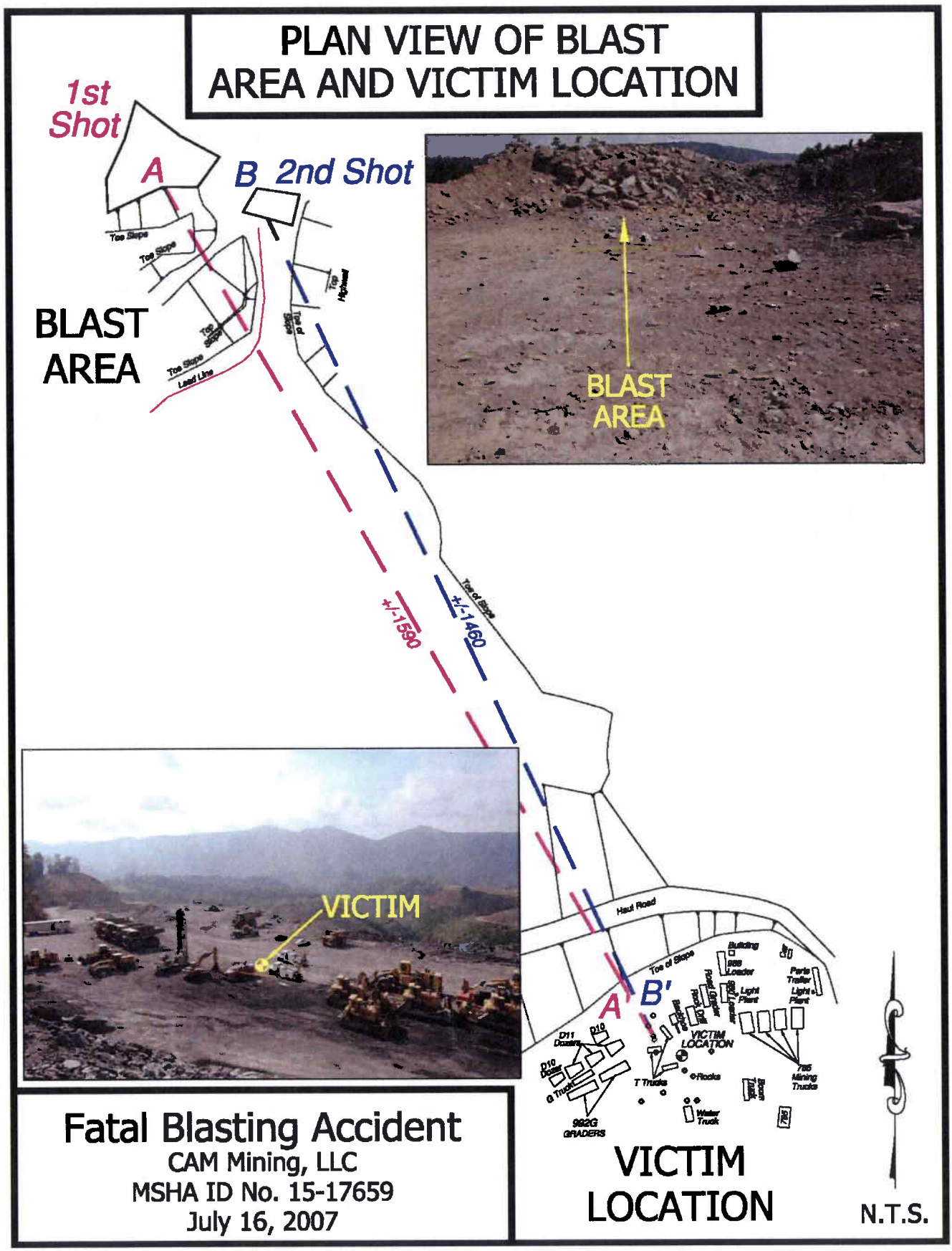
U. S. Office of Surface Mining Reclamation and Enforcement

John Chedester	Reclamation Inspector
Gary Hall	Reclamation Inspector
Dennis Clark	Mining Engineer

Mine Safety and Health Administration

Bennett Hylton	Coal Mine Inspector
James Hager	Supervisory Mine Inspector
Anthony Burke	Conference Litigation Representative
Danny Deel	Conference Litigation Representative
Arlie A. Webb	Staff Assistant
Gregory Hall	Civil Engineer
Thomas Lobb	Physical Scientist (Tech Support)
Robert Newberry	Mining Engineer
Mary Sue Taylor	Attorney

PLAN VIEW OF BLAST AREA AND VICTIM LOCATION



Fatal Blasting Accident

CAM Mining, LLC
MSHA ID No. 15-17659
July 16, 2007

Appendix III – Blasting Chart

Blast Parameters 7 - 16 - 2007	**Blast #1 (7 7/8 " hole) 18 X 18 pattern**	**Blast #2 (7 7/8 " hole) 16 X16 pattern**	**Blast (ideal with high risk blast)**	**Design Parameters**
Hole Depth / Burden	1.1	0.93	**Min 4.0**	**1.5 - 4.0**
Collar Depth	10 feet	10 feet	**12.6 feet min**	**70 % Burden**
Stemming Vs. Hole Diameter	10/ (7 7/8)/12 = 15.2	10/(7 7/8)/12 = 15.2	**15+ feet solid bench collar**	**14.1 - 28.1 times hole diameter**
Burden to Charge Ratio	27.4 (7 7/8 hole)	24.4 (7 7/8 hole)	**30 approx.**	**20 - 40**
Spacing / Burden (Ms delay)	1 (16 x 16)	1 (16 x 16)	**1.5**	**~ 1.2 - 1.8**
Delay between holes in same row (mS)	42	42	**16 - 80 mS**	**~1 - 5 per foot burden**
Delay between rows (mS)	100	100	**32 - 240 mS**	**~ 2 - 3 above**
Powder Factor	Reported 0.74	Reported 0.63	**Use 0.50 for a high risk area**	**0.25 - 2.5 Lower BC no. increases the PF**

Appendix IV – Victim Information

Accident Investigation Data - Victim Information
Event Number: 4 1 7 8 8 9 5

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

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:
Bobby L. Messer	*M*	*40*	*1111*	*01 Fatal*

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: *a. Date: 07/16/2007 b.Time: 16:54*

7. Date and Time Started: *a. Date: 07/16/2007 b.Time: 6:00*

8. Regular Job Title: *004 Mechanic*

9. Work Activity when Injured: *098 Preparing to leave for the day*

10. Was this work activity part of regular job? Yes X No

11. Experience	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	10	0	0	b. Regular Job Title:	20	0	0	c. This Mine:	10	0	0	d. Total Mining:	20	0	0

12. What Directly Inflicted Injury or Illness? *089 Flyrock from blast area*

13. Nature of Injury or Illness: *370 Blunt impact of head, neck and torso*

14. Training Deficiencies: Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

15. Company of Employment:(If different from production operator) *Operator*

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment: Not Applicable: | First-Aid: | CPR: | EMT: X | Medical Professional: | None:

17. Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim: *9999 None (No Union Affiliation)*

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

7. Date and Time Started:

8. Regular Job Title:

9. Work Activity when Injured:

10. Was this work activity part of regular job? Yes | No

11. Experience:	Years	Weeks	Days		Years	Weeks	Days		Years	Week	Days		Years	Weeks	Days
a. This Work Activity:				b. Regular Job Title:				c. This Mine:				d. Total Mining:			

12. What Directly Inflicted Injury or Illness?

13.Nature of Injury or Illness:

14. Training Deficiencies: Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

15. Company of Employment: (If different from production operator)

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment: Not Applicable: | First-Aid: | CPR: | EMT: | Medical Professional: | None:

17.Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim:

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

7. Date and Time Started:

8. Regular Job Title:

9. Work Activity when Injured:

10. Was this work activity part of regular job? Yes | No

11. Experience:	Years	Weeks	Days		Years	Weeks	Days		Years	Week	Days		Years	Weeks	Days
a. This Work Activity:				b. Regular Job Title:				c. This Mine:				d. Total Mining:			

12. What Directly Inflicted Injury or Illness?

13. Nature of Injury or Illness:

14. Training Deficiencies: Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

15.Company of Employment:(If different from production operator)

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment: Not Applicable: | First-Aid: | CPR: | EMT: | Medical Professional: | None:

17. Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim:

MSHA Form 7000-50b, Dec 1994

Printed 10/25/2007 10:21:37 AM