



# Reports

Pocahontas Fuel #34

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES

DISTRICT C

FINAL REPORT OF MAJOR MINE EXPLOSION DISASTER  
NO. 34 MINE  
POCAHONTAS FUEL COMPANY, INCORPORATED  
McDOWELL COUNTY, WEST VIRGINIA  
(NEAR BISHOP, TAZEWELL COUNTY, VIRGINIA)

February 4, 1957

By

W. R. Park  
District Supervisor

E. M. Lewis  
Health and Safety Engineer

and

W. M. Cordray  
Health and Safety Engineer

Originating Office - Bureau of Mines  
Mount Hope, West Virginia  
W. R. Park, District Supervisor  
Health and Safety District C

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#### INTRODUCTION

An explosion occurred in the No. 34 mine of the Pocahontas Fuel Company, Incorporated, near Bishop, Tazewell County, Virginia, about 1:55 a.m., Monday, February 4, 1957. Thirty-seven men were killed by the explosion; 24 of them died from burns and/or forces and 13 were killed by afterdamp. None of the other employees in the mine at the time of the explosion was injured, imprisoned, or made an attempt to erect a barricade; these men, 141, escaped unassisted.

The names of the victims, their ages, marital status, occupations, and the number of their dependents are listed in Appendix A of this report.

Bureau of Mines investigators believe that the explosion originated at or near the faces of working places being driven in or off the Day Headings when an explosive mixture of methane-air was ignited by an electric arc or spark from the face electric equipment or a power conductor. Forces of the explosion extended throughout the Day Headings, Shaft Headings, and Little Horse Pen entries, into the Bleeder entries, and to the surface through the man shaft.

#### GENERAL INFORMATION

The No. 34 mine of the Pocahontas Fuel Company, Incorporated, is in McDowell County, West Virginia, about a mile south of Bishop, Virginia,

and it is served by the Norfolk and Western Railway Company. The operating officials of the Pocahontas Fuel Company, Incorporated, on February 4, 1957, were:

A. R. Matthews	President	Pocahontas, Virginia
A. V. Sproles	Vice President	Pocahontas, Virginia
P. P. Ferretti	General Superintendent	Pocahontas, Virginia
W. J. Skewes	Chief Engineer	Pocahontas, Virginia
J. W. Pero	Director of Safety and Mine Inspection	Pocahontas, Virginia
M. E. Hall	Division Superintendent	Pocahontas, Virginia
Charles T. Stephenson	Superintendent	Bishop, Virginia
Howard Clark	Assistant Superintendent	Bishop, Virginia
Louis Roncaglione	Mine Inspector	Bishop, Virginia
John F. Meade	Mine Foreman	Bishop, Virginia

A total of 825 men was employed; 675 of them worked underground, 3 shifts a day, 5 days a week and produced an average of 9,500 tons of coal daily. One hundred and fifty men were employed on the surface. Production for the year of 1956 was 2,083,751 tons of coal. The last Federal inspection of this mine prior to the disaster was made October 29-31 and November 5-9, 1956.

Access into the mine is by seven drifts and two concrete-lined air shafts into the Pocahontas Nos. 3, 4, and 5 coal beds; the shafts are 315 and 320 feet in depth, respectively. At the time of the explosion, mining was being done only in the No. 3 coal bed, which averaged 72 inches in thickness in the areas being mined and dipped to the north about 4 percent. The intervals between the Nos. 3, 4, and 5 coal beds are 120 and from 2 to 15 feet, respectively. The Nos. 3, 4, and 5 coal beds have been interconnected at several locations by open passageways.

The immediate roof was unconsolidated shale, from 8 to 20 inches in thickness. The main roof was laminated shale and sandstone beddings, from 20 to 40 feet in thickness. Kettle bottoms, slips, and slickenside formations were prevalent in the immediate roof. Cover over the coal bed ranges from a few feet to 1,000 feet in thickness. The floor is either sandstone or shale. The analysis of a coal sample from the Pocahontas No. 3 coal bed in this mine, as provided by the company, is as follows:

	<u>Percent</u>
Moisture	2.5
Volatile Matter	21.0
Fixed Carbon	70.5
Ash	6.0
	<u>100.0</u>

Numerous tests by the Bureau of Mines have shown that coal dust having a volatile ratio of 0.12 is explosive and that the explosibility increases with an increase in the volatile ratio. The volatile ratio of the coal in this mine as determined from the above-mentioned analysis is 0.23, indicating that the dust from this coal is explosive.

The mine records indicate that three gas explosions occurred in the Nos. 4 and 5 coal beds of this mine in 1937 and 1951; three persons were killed in the first explosion, and one in each of the others. Other major mine explosions that have occurred in nearby mines include:

<u>Mine</u>	<u>Date</u>	<u>Location</u>	<u>Lives Lost</u>
Algoma No. 7	September 15, 1902	Algoma, W. Va.	17
Grapevine	February 26, 1905	Wilcoe, W. Va.	7
Tidewater	July 5, 1905	Vivian, W. Va.	5
Tidewater	November 4, 1905	Vivian, W. Va.	7
Standard	August 1, 1911	Welch, W. Va.	6
Bottom Creek	November 18, 1911	Vivian, W. Va.	18
King	March 28, 1916	Kimball, W. Va.	10
Yukon No. 1	December 15, 1917	Yukon, W. Va.	18
Carswell	July 18, 1919	Kimball, W. Va.	7
Yukon No. 2	March 28, 1924	Yukon, W. Va.	24
Shannon Branch No. 3	May 13, 1927	Capels, W. Va.	8
Keystone No. 2	April 2, 1928	Keystone, W. Va.	8
No. 1	May 22, 1928	Yukon, W. Va.	17
No. 1	January 10, 1940	Bartley, W. Va.	91
Carswell	January 22, 1941	Carswell, W. Va.	6
Havaco No. 9	January 15, 1946	Havaco, W. Va.	15

#### MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods. An entry-and-block system of mining was followed. Multiple entries in sets of 3 to 12, turned at various intervals, were driven 16 feet wide on 75- or 90-foot centers, and crosscuts were about 80 feet apart. Pillars were recovered by an open-end method. Pillar lifts were 18 to 20 feet in width. A high percentage of the coal was recovered in this mine.

Bolts were used for roof support in all areas of the mine, except in pillar lifts where the draw rock was more than 5 feet in thickness or where the draw rock fell when the coal was cut or blasted. Where roof conditions in pillar lifts would not permit bolting, posts were set on 4-foot centers and two rows of posts were set on the open side of all lifts. Breaker posts were set in the pillar sections, and the roof support plan required that additional supports be provided where needed. Coal was top cut and sheared with rubber-tired Universal mining machines and loaded into rubber-tired shuttle cars with tractor-mounted loading machines.

Explosives and Blasting. Permissible explosives were used for blasting, and the blasting supplies were transported underground in specially constructed explosives cars and stored temporarily in suitable section boxes. The coal was top cut to an average depth of 9-1/2 feet and sheared vertically near the middle of the cuts, then blasted on shift by trained shot firers. Two shot holes were drilled, one above the other, near the rib on each side of the cut in solid places. In such places, all shot holes were charged, the two shot holes on each side of the shear cut were wired together, and each set of shots fired separately. In pillar work, the two shot holes on the pillar side of a cut were loaded, wired together, and fired simultaneously, and then the two shot holes on the open side of the cut were fired. Six to eight cartridges of explosive were used in each shot hole. Incombustible material was used for stemming, and permissible multiple-shot blasting units were used for firing the shots. During the last Federal inspection, suitable examinations for methane were made before and after blasting.

Ventilation and Gases. Ventilation was induced by four electrically driven axial-flow fans, operated exhausting and circulating through the mine approximately 941,300 cubic feet of air a minute. The fans were operated continuously. Each fan was installed in a fireproof structure on the surface, offset from its mine opening, and provided with explosion doors, a recording pressure gage, and a device to give alarm should the fan slow or stop. Overcasts and permanent stoppings were constructed of incombustible material. Temporary stoppings were constructed of lumber and/or brattice cloth. Check curtains and line brattice were used to conduct air in the face regions; part of the line brattice at a few places in sections unaffected by the explosion sagged from the roof or was torn, and the area between the line brattice and rib at several places was somewhat restricted. Perceptible movement of air was discernible at the ends of all line brattice. Only five ventilation doors were in use in the mine on the day of the explosion. Three of these doors were installed to form a single air lock in the Day Headings; two of them were on the haulageway and the third was across a spur track in the adjacent parallel entry. A single door in the Bleeder entries was used in conjunction with wooden stoppings to direct intake air through the No. 6 entry and to the other entry faces. Another single door was used in a pillar section. The space between the air-lock doors on the haulageway in the Day Headings was approximately 80 feet and, reportedly, a trip to this section usually consisted of 10 mine cars and the locomotive. Each mine car has an overall length of 14 feet; consequently, 10 cars and a locomotive could not clear in the space between the doors, and both doors on the haulageway had to be open at the same time while a trip was passing through the air lock. Inasmuch as permanent or temporary stoppings were installed on both sides of entries from the air-lock doors to the faces of Day Headings, a complete short-circuiting of intake air to the return airways would not occur when these air-lock doors were opened. However, the excessive number of brattice-cloth stoppings in the Day Headings would likely permit sufficient leakage, when the air-lock doors were open, to interfere seriously with face ventilation in the Shaft Headings and Day Headings.

Ventilation in the area affected by the explosion was induced by the Horse Pen fan; three additional working sections were also ventilated by means of this fan. Each working section, except the Day Headings and Shaft Headings, was ventilated with a separate split of intake air. The quantities of air reaching the last open entry crosscuts and the intake ends of pillar lines during the November 1956 Federal inspection ranged from 15,000 to 40,000 cubic feet a minute. In several working sections, intake air was coursed through the center entries of each set, split right and left near the faces, and returned by way of the outside entries. In other working sections, a single row of stoppings was used to separate the intake airways from the single return. On February 1, the Day Headings and Shaft Headings were ventilated with a single split of air, coursed first through the Shaft Headings and Little Horse Pen entries and thence to the Day Headings. This air current was controlled by the air-lock doors in the Day Headings (see Appendix B).

The following air measurements and methane determinations were made during the November 1956 inspection:

<u>Location</u>	<u>Volume of air, c.f.m.</u>	<u>Methane, percent</u>	<u>Cubic Feet of Methane in 24 hours</u>
Immediate return, pillar split 3 panel 3 left section	19,000	0.08	21,888
Immediate return, 4 left tunnel section	15,000	0.25	54,000
Immediate return, pillar split 2 panel 3 left section	24,000	0.13	44,928
Immediate return, 6 panel 5 left section	15,000	0.27	58,320
Immediate return, Bleeder entries	40,000	0.48	276,480
Immediate return Jenkinjones section	34,000	0.55	269,280
Immediate return Daniel mains, left side	33,000	0.45	213,840
Immediate return, Daniel mains, right side	23,000	0.46	152,352

<u>Location</u>	<u>Volume of air, c.f.m.</u>	<u>Methane, percent</u>	<u>Cubic Feet of Methane in 24 hours</u>
Immediate return, Shaft entries	38,000	0.24	131,328
Main return, Horse Pen Shaft, No. 1 airway - Daniel Mains	102,000	0.54	793,152
Main return, Horse Pen Shaft, No. 3 airway - Bleeder entries	172,000	0.39	965,952
Main return, Horse Pen Shaft, No. 2 airway - Jenkinjones	109,000	0.41	643,536
Main return, Big Creek Fan	331,000	0.14	667,296

According to measurements made by the general assistant mine foreman about noon, Saturday, February 2, the quantity of air passing through the regulator controlling the air split for the Day Headings and Shaft Headings was 91,000 cubic feet a minute. The quantity of air passing through this regulator on January 24, was 83,811 cubic feet a minute, indicating that "holing through" of the Little Horse Pen entries to the Bleeder entries had little effect on ventilation other than to increase slightly the volume of air in the split ventilating the Day Headings and Shaft Headings.

The mine is classed gassy by the West Virginia Department of Mines and by the Bureau of Mines. Fire bosses made preshift examinations for gas and other hazards for the 12:00 to 8:00 a.m., shifts; other preshift examinations for succeeding shifts were made on shift by the section foremen during their regular tour of duty. Fire bosses and assistant foremen stated that the finding of gas during preshift examinations, which occurred quite frequently, was not included in the fire-boss record book if the gas was removed while the examiner was present. Although the aforementioned policy was followed by the fire boss who examined the Day Headings, his record of preshift examinations shows that he found gas in and "dangered off" the following places in the Day Headings during the period January 4 to February 3, 1957:

<u>Date</u>	<u>Working Places Dangered Off</u>	<u>Date</u>	<u>Working Places Dangered Off</u>
1-4	Nos. 2 and 4	1-16	No. 3 and crosscut
1-6	Nos. 1, 3, and 4	1-17	No. 1
1-7	Nos. 1 and 4	1-18	Nos. 1, 2, 4, and 5
1-8	No. 4	1-21	Nos. 2 and 4
1-10	No. 1	1-22	Nos. 2, 4, and 5
1-11	Nos. 2 and 3	1-25	No. 2
1-14	Nos. 1 and 2	1-27	No. 5
1-15	No. 3	2-1	No. 11

On-shift examinations for gas and other hazards were made by fire bosses, section foremen, assistant foremen, and the general mine foreman, but records of such on-shift examinations were not made. Also, records were not made to show how hazards reported by the preshift examiners were corrected.

Operators of electrical face equipment were instructed to make suitable tests for gas before electrical equipment was taken to the working faces and frequently while the equipment was being operated at the faces. However, during the November 1956 Federal inspection, more than 3 percent of methane was detected with a permissible flame safety lamp at a point not less than 12 inches from the roof, face, and ribs in a roof cavity 18 inches deep, 7 feet wide, and 8 feet in length at the face of No. 1 entry of the Shaft Headings and the mining machine was being operated at this face. The line brattice was repaired and the methane was removed promptly.

The section foreman and four workmen in the Day Headings had flame safety lamps at the time of the explosion; the lamp used by the roof bolters was destroyed by forces. The other four lamps were sent to the Bureau of Mines laboratories in Pittsburgh, Pennsylvania, for testing and examination. These tests showed that the four lamps were in permissible condition, and they did not ignite methane in any of the tests performed.

Coal and Rock Dust. The following information was obtained from the November 1956 Federal inspection report: The mine surfaces ranged from wet to dry. Dangerous accumulations of loose coal and coal dust were not present, and excessive coal dust was not raised into the air during normal mining operations. Water was used in the working places to allay the dust produced during mining operations and along the shuttle-car roadways. The working places were well rock-dusted to within 40 feet of the faces, including all open crosscuts, and the dry haulageways and parallel and back entries were rock-dusted adequately. The incombustible content of the 11 dust samples collected during the inspection ranged from 87.0 to 97.0 percent.

According to the superintendent, the loading-machine operators' helpers were required to shovel any loose coal and dust from along the ribs to the middle of the places so that the material could be loaded by machines. If loading operations were delayed or interrupted, all the men available on the section were required to clean up loose coal and dust. Five 50-pound bags of rock dust, or more if needed, was distributed by hand in the area for each cut of coal removed. Generalized rock-dusting was done by machines on week-ends and in some cases by portable rock-dusting machines between shifts. Company officials stated that the section foreman and three men from the 4:00 p.m. to 12:00 midnight shift in the Day Headings worked their regular shift February 1, and then worked the next shift cleaning and rock-dusting the working places in the Day Headings. Company records showed that 8,320 tons of rock dust was applied, and 2,083,751 tons of coal was produced in 1956; this amounts to about 8 pounds of rock dust used per ton of coal produced.

After the explosion, examination of the Day and Shaft Headings revealed that the sections were covered with a thin layer of dust and/or soot. Evidence that the areas had been rock-dusted was apparent throughout the sections, and excessive accumulations of coal dust were observed only near the loading points and in the areas between the loading points and the working faces.

Examination of the face areas of three working sections not affected by the explosion (Bleeder entries, Daniel mains, and Pine Ridge entries) during the underground investigation revealed that dangerous accumulations of coal dust were present at one or more locations near the working faces in each section, and small to excessive amounts of fine coal dust were present on the roof and ribs, particularly on ledges and offsets in the ribs, in these areas between the loading points and the faces. The floor material in the face regions of each section ranged from damp to wet. All openings in by the loading points had been rock-dusted by hand, but visual observation indicated that these locations generally were not rock-dusted adequately. Dust samples were collected in the face areas of the three sections and at regular intervals along the entire length of the back entries, parallel entries, and haulageways. Only 1 of the 12 dust samples collected within 350 feet of the faces of the Bleeder entries contained more than 65 percent incombustible material; the other 11 samples contained incombustible material ranging from 26.7 to 61.7 percent. The incombustible content of the 16 dust samples collected within 300 feet of the faces of Pine Ridge entries ranged from 24.3 to 95.7 percent, and only 5 of the 16 samples containing more than 65 percent incombustible. One of the samples collected near the faces of Daniel main entries contained 97.4 percent incombustibles; the other 5 samples contained incombustibles ranging from 28.4 to 43.3 percent (see Appendix B).

If rock-dusting in the face regions of the Day Headings at the time of the explosion was similar to rock-dusting in the face regions of the Bleeder entries, Pine Ridge entries, and Daniel mains, it must be assumed that sufficient incombustible material was not present and therefore, some of the coal dust that entered into propagation of the explosion came from the face regions of the Day Headings.

Transportation. Permissible-type cable-reel shuttle cars were used for face haulage; they discharged the coal directly into 5-ton capacity steel mine cars, which were hauled by trolley locomotives to the surface. The rolling equipment was maintained in reasonably good repair. The tracks were well maintained and the clearance space along the haulageways was free of obstructions. Shelter holes were provided at 80-foot intervals, and shelter holes or more than 6 feet of clearance was provided at switch throws. Men were transported in special section man-trip cars, and suitable man-trip waiting stations were provided. In some instances when only a few men were transported, they were hauled in a mine jeep.

Electricity. Electric power, 110, 220, 440, and 2,300 volts alternating current was used on the surface; and 275 volts direct current was used underground. Alternating current was transmitted by armored cables through drill holes from the surface substation to underground air-compressor stations. Trolley, feeder, and power wires were installed on insulators and sectionalized with cut-out switches. The electric face equipment was frame-grounded, was of the permissible type, and was in a permissible condition at the close of the November 1956 Federal inspection. The trailing cables on the mobile equipment were fire resistant and were provided with short-circuit protection. Temporary splices in trailing cables were made with splicing rings and were well insulated. At the time of the November 1956 Federal inspection, operators of electrically driven equipment made suitable tests for gas before taking the equipment into the face regions and at frequent intervals thereafter.

The company safety inspector examined the electric face equipment in the Day Headings on Friday, February 1, and found the equipment in permissible condition, except that an opening in excess of 0.004 inch was present in a compartment on No. 27 shuttle car. The condition was corrected immediately. However, none of the face electric equipment in the Day Headings was in permissible condition when examined by Federal electrical inspectors after the explosion. Four pieces of this equipment had major permissibility deficiencies, any one of which could have ignited an explosive mixture of methane. The gland at the pump motor on the loading machine needed packing, and the trailing cable for this machine contained 7 temporary splices, one of them 8 feet from the machine. Substandard conditions noted in the shuttle car that was under the boom of the loading machine included a bare splice in the Miller-plug connection, two openings of more than 0.005 inch in the forward-motion foot-button enclosure, another such opening between the contactor box and its cover, cable-entrance glands on the headlight resistor and pump motor needed packing, three hose conduits were broken, the trailing cable was pulled apart at a splice, and the right front wheel of the mining machine was on the cable. The rear headlight lens on the Jeffrey mining machine was loose, an open circuit was in the power conductor in this headlight, the headlight and two control fuse-holders were bridged, one of the bridge wires across the headlight fuse-holders was burned in two, a bare splice was in the lead from the contactor compartment to the reel collector ring, and the hose conduit on this lead was broken. The lead from the controller enclosure to the resistor box on the mining machine was spliced and the hose conduit was broken. The gland for the 7-conductor cable at the entrance to the cutting-chain drive motor needed packing, and 4 bare splices were in that part of the trailing cable on the reel. There was an opening in excess of 0.005 inch in the contactor enclosure of the roof-bolting machine, the hose conduit at the packing gland for the rear headlight was too short, there was no packing in this gland, and the trailing cable was pulled apart at two bad splices.

As mentioned previously, trailing cables in Day Headings contained numerous bare or poorly made or poorly insulated splices. It will never be known

whether the trailing cables on the roof-bolting machine and the shuttle car were pulled apart prior to or after the explosion, but it is certain that arcing or sparking at the splices could have ignited explosive methane. It will further never be known if any of the other foregoing permissibility deficiencies on the face electric equipment, such as loose leads through insufficiently packed glands, existed prior to or were caused by the heat and forces of the explosion. However, it is our opinion that the above types of deficiencies in the equipment in the Day Headings were not caused by the explosion.

The outby 1 of 2 "nipping" stations for the face electric equipment was about 180 feet from the nearest working face, and the inby "nipping" station near the end of the trolley wire in No. 11 entry was about 130 feet from a working face. Reportedly, a check curtain was installed in No. 11 entry to direct the return air from the working places to the No. 12 entry without flowing directly by the "nipping" station. Certainly, if air coursed through the working places in the Day Headings had not been checked effectively and directed into No. 12 entry inby the "nipping" station explosive methane in such air could be easily ignited at the "nipping" station.

Illumination and Smoking. All employees used permissible electric cap lamps for portable illumination underground. Fixed electric lights were installed at frequent intervals along the haulageways. Smoking was not permitted or observed underground at the time of the November 1956 Federal inspection, and searches for smokers' articles were conducted daily.

Mine Rescue. A mine rescue team was not maintained at the mine; however, two fully equipped and trained teams were maintained at the company's McComas mines. Fully equipped and regularly trained mine rescue teams were also available at the Gary mines of the United States Steel Corporation and at the Berwind mines of the New River and Pocahontas Consolidated Coal Company. Several other mine rescue teams and a fully equipped State mine rescue truck were within a 50-mile radius of the mine. Self-rescuers were not provided for the underground employees. Sufficient escapeways were available from the working sections to the surface, and direction signs were posted conspicuously to indicate escapeways. In addition to the automatic elevator, an emergency stairway was provided in the man shaft. The check-in and check-out system in effect provided positive identification upon the person of each individual underground.

Hand-type fire extinguishers were provided on the loading machines, mining machines, and shuttle cars; an adequate supply of rock dust was placed at air-compressor stations, pumps, doors, and other strategic locations. Water was provided at the faces of all working sections.

#### STORY OF EXPLOSION AND RECOVERY OPERATIONS

Participating Organizations. Officials of the several organizations who took part in direction of the recovery work include: A. V. Sproles,

vice president, and P. P. Ferretti, general superintendent, of the operating company; Charles Ferguson, safety director, and James Leeber, safety engineer, United Mine Workers of America; Julius C. Olzer, chief, West Virginia Department of Mines; and Marling J. Ankeny, director, and James Westfield, assistant director, Bureau of Mines.

Four mine rescue teams of the following companies assisted: United States Steel Corporation, American Coal Company of Allegany County, and New River and Pocahontas Consolidated Coal Company.

Activities of Bureau of Mines Personnel. An official of the company notified Health and Safety Engineer E. M. Lewis of the explosion about 4:00 a.m., February 4. Lewis notified other Bureau of Mines personnel of the occurrence, and then he and Inspectors Zeleskey and Vickers traveled to the mine, arriving about 6:30 a.m. Additional Bureau representatives arrived at the mine later in the day at the following times: James Micheal - 9:00 a.m.; George Noe - 10:00 a.m.; W. R. Park and D. W. Barger - 12:00 noon; W. M. Cordray - 1:00 p.m.; M. J. Ankeny, James Westfield, and Arthur Charlesworth - 5:00 p.m. W. B. Michael and F. J. Gallagher arrived at the mine about 7:00 a.m., February 5, and Denis McGinity and Elwood Menta later the same day.

On arriving at the mine, Lewis, Zeleskey, and Vickers were briefed regarding the explosion damages and underground activities. After the briefing, these men entered the mine and assisted with the recovery of the bodies and the restoring of ventilation in the affected areas. As the following Inspectors arrived at the mine, James Micheal, George Noe, W. R. Park, and W. M. Cordray, each in turn, after briefing, entered the mine and assisted with the recovery operations.

On February 4, four small fires were found and extinguished by parties restoring ventilation in the affected areas; on February 7, three smoldering fires were found and extinguished by parties collecting dust samples in the Shaft Headings. The bodies of the 37 victims were recovered at various times during the day of February 4; the last 3 bodies were recovered from under a roof fall in the Shaft Headings about 4:00 p.m., and all deceased were removed to the surface by 5:30 p.m.

Westfield, Park, Lewis, and Zeleskey assisted with the underground investigation and official hearing to determine the cause of the explosion.

Inspectors Noe, Vickers, Barger, Cordray, Menta, James Micheal, and McGinity participated in the underground investigation and F. J. Gallagher and W. B. Michael examined the electrical equipment and circuits in the explosion areas. Gallagher and W. B. Michael examined the electrical face equipment in the unaffected sections of the mine, and Inspectors Zeleskey, McGinity, and Menta remained on duty on separate shifts each day in the explosion area; the three Inspectors remained at the mine until permanent ventilation was reestablished in the explosion area, February 20.

Mining Conditions Immediately Prior to the Explosion. The weather on February 3 and 4 was cloudy with overcast skies and intermittent rain. Records of barometric pressures and temperatures in the vicinity were not available.

The mine was idle on Sunday, February 3, except that men (supervisors) entered the mine to check general mine ventilation and other conditions.

The records indicate that each underground working section was fire bossed prior to the beginning of the first shift, 12:00 - 8:00 a.m., February 4, and all conditions were recorded in the preshift records as normal. The fire bosses and foremen who made fire runs on Sunday, February 3, stated that the ventilation currents were flowing within normal courses and quantities; however, air measurements were not made by these men at any location.

Story of Explosion. At the beginning of the shift 178 men entered the mine, and they were transported in special section man cars to their respective sections, except that the men working in the Day and Shaft Headings walked from the bottom of the man shaft to their sections, a distance of approximately 2,200 feet. Underground employees reached their respective sections without mishap, and all had been in the face regions from 1-1/2 to 1-3/4 hours when the explosion occurred. Conditions found after the explosion indicated that coal was being produced in each section in the usual manner, except that the section crew in the Shaft Headings was performing their assigned duties in connection with moving equipment and starting a new working section.

Luther Dillon, fire boss, who made the preshift examination of the affected area Sunday night, visited the Day Headings shortly after 11:00 p.m., or about 1 hour before the working shift entered the section; he found the ventilation traveling in its normal course and quantity. George Johnson and Marshall Heflin, section foremen from other sections, were in the Day Headings late Sunday night, February 3, to check water conditions, particularly in Nos. 7 and 8 working places, and to ascertain whether accumulated water would interfere with normal coal-loading operations during the oncoming shift. These foremen examined the faces of all places in the Day Headings; they stated that the ventilation and rock-dusting were good, but they did detect a small amount of methane with a flame safety lamp in the left corner of a crosscut; they removed the methane by reinstalling the line brattice. When Johnson and Heflin were leaving the Day Headings en route to the bottom of the man shaft, they met Dillon, the fire boss, on his way to the section about 11:00 p.m. at the junction of the Day Headings and Shaft Headings.

Harry Hall, general foreman - third shift, was at the intersection of Daniel mains and new 35 mains, 3,000 feet north of the man shaft about

2:00 a.m., when he was engulfed in a strong rush of air and dust. Hall traveled through the dusty atmosphere for about 200 feet to a telephone and then notified the mine superintendent and assistant superintendent that something, most likely, an explosion, had occurred underground; Hall and others contacted by telephone all underground working sections except Day Headings, Shaft Headings, and Bleeder entries. All men contacted were advised that an explosion had occurred and that they were to proceed to the surface. These men, a total of 141, were in areas of the mine unaffected by the explosion and, consequently, were uninjured and returned to the surface unassisted. Hall and several others traveled to the man shaft, where they found the automatic elevator was inoperative and stoppings used to control ventilation to the Shaft Headings blown out. They traveled the stairway in the man shaft to the surface, where plans were made to examine those parts of the mine where contact by telephone could not be made after the explosion.

A section foreman and 12 men were producing coal in the Day Headings when the explosion occurred. The positions of the bodies of 11 of these men showed that they moved little, if any, after the explosion, as their bodies were in the face regions near their usual places of work. The body of the mechanic was adjacent to a pump near the entrance to the section, and the body of the Joy operator's helper was in a crosscut near the air-lock doors at the entrance to the section. The locations of the 11 bodies in the face regions make it very doubtful that the 2 men found near the entrance to the section could have moved to these locations after the explosion. Therefore, it is assumed that the 2 men were performing assigned duties in the area when the explosion happened.

A section foreman and 10 men were moving equipment and preparing to start a new working section in the Shaft Headings during the 12:00 to 3:00 a.m. shift, February 4. The position of the bodies of these 11 men showed that they were killed immediately by flame and forces of the explosion.

A section foreman and 12 men were performing normal coal-producing duties in the Bleeder entries when the explosion occurred. These entry face regions were not affected by the explosion, but telephone and power lines were blown down and stoppings were blown out, short-circuiting the intake air currents just outby the intersection of Little Horse Pen entries with the Bleeder entries, a distance of more than 3,500 feet outby the Bleeder entry faces. Locations of equipment, flame safety lamps, and clothing in the face regions of the Bleeder entries indicated that the 13 men began walking towards the man shaft immediately after the power failure and concussion; they apparently walked directly into the fumes of the explosion and died close to the Little Horse Pen intersection, as the 13 bodies were found relatively close together about 3,000 feet outby the Bleeder entry faces. It is entirely possible that these men might have lived without erecting barricades if they had remained in the face regions of the Bleeder

entries until rescued, as recovery crews located their bodies early Monday morning, February 4. If the victims had erected barricades near the faces of the Bleeder entries and remained behind the barricades until rescued, there is little doubt that they would have been saved.

About 10 days before the explosion, No. 1 entry of Little Horse Pen entries was "holed through" to the Bleeder entries. Thereafter, Nos. 2, 3, 4, and 5 entries of Little Horse Pen entries were "holed through" progressively to the Bleeder entries. The No. 5 entry was connected to the Bleeder entries during the 8:00 a.m. to 4:00 p.m. shift, Saturday, February 2. During the next working shift, 4:00 p.m. to 12:00 midnight, Saturday, the section crew moved most of the face electric equipment to a new working section at the junction of the Shaft Headings and Little Horse Pen entries.

During the 4:00 to 12:00 p.m. shift, February 2, and the 12:00 to 8:00 a.m. shift, Monday, February 4, four stoppings were removed from crosscuts between the intake and return airways at and near the intersection of the Shaft Headings and Little Horse Pen entries. Reportedly, intake air traveled immediately through the crosscuts into Nos. 4 and 5 entries of Little Horse Pen entries and part of this air moved toward the Bleeder entries, although the greater part of the intake air returned through the Shaft and Day Headings.

As mentioned previously, intake air had been coursed through the Shaft Headings, then through Nos. 1, 2, and 3 entries of Little Horse Pen entries to the working faces, returned through Nos. 4 and 5 entries of Little Horse Pen entries and Nos. 5 and 6 entries of the Shaft Headings to the Day Headings, through the working places in Day Headings, and back to the Shaft Headings to the main returns. The split of air ventilating the Bleeder entries was a free split; whereas, the split of air ventilating the Day Headings, Shaft Headings, and Little Horse Pen entries was controlled by a regulator. Each official questioned stated that "holing through" of the Little Horse Pen entries to the Bleeder entries made little, if any, difference in the quantity of air circulated in the two splits, and nothing was done to close the Little Horse Pen connections to the Bleeder entries. Air measurements made at the regulator controlling the air split for the Shaft and Day Headings before and after the "holing through" of the Little Horse Pen entries supported this contention.

The explosion destroyed approximately 70 concrete-block stoppings, one overcast, and many wooden and canvas stoppings. Trolley wire and telephone lines were blown down at several locations and a number of roof falls occurred. Damage to equipment was negligible. The elevator in the man shaft was lifted several feet and damaged slightly by the forces, but it was placed in operation about 8:00 a.m., February 4. Several windows were shattered in the building at the top of the man shaft and in a building near the shaft.

The explosion resulted in loss of production from the entire mine from February 4 until February 11, when 9 working sections resumed operations. Permanent ventilation was restored in the 3 affected sections, Day Headings, Shaft Headings, and Bleeder entries, February 20. The Day and Shaft Headings were cleaned up and rock-dusted, the electric face equipment was placed in permissible condition, and the sections resumed normal coal-producing operations March 6.

Recovery Operations. Immediately after being notified of the explosion, Charles Stephenson, mine superintendent, advised higher company officials of the occurrence and then proceeded to the Horse Pen openings (man shaft). Upon arriving at the man shaft, Stephenson had the ventilating fans examined; the examination revealed that the fans were apparently not damaged and were operating satisfactorily. An examination of the automatic elevator in the man shaft revealed that it was damaged slightly and inoperative. The general mine foreman, John Meade, was instructed to take a crew of men and examine the stairway in the man shaft. These men found the stairway undamaged and they traveled down it to the bottom of the man shaft. Their examination showed that the ventilating facilities at the shaft bottom were undisturbed. When Stephenson received the information regarding the stairway and ventilation at the shaft bottom, he instructed the crew to explore the area leading to the Shaft Headings. Exploration in this area quickly revealed stoppings blown out, the first such stoppings were out about 150 feet from the shaft bottom. This crew of men erected temporary brattice-cloth stoppings in the crosscuts to restore ventilation and permit travel and exploration into the Shaft Headings. This procedure was followed and permitted rapid advance into the area where the first body was located about 4:00 a.m.

A second crew of men was instructed to proceed into the Bleeder entries and to reestablish ventilation by means of temporary brattice-cloth stoppings if they found stoppings blown out. The first two recovery crews were supplemented by higher company officials and representatives of the West Virginia Department of Mines, United Mine Workers of America, and Bureau of Mines, each of whom proceeded underground shortly after his arrival at the mine. Examinations and tests in the return from the Bleeder entries at the overcast about 7:30 a.m., indicated 0.10 percent carbon monoxide. Similar tests made at the same location about 20 minutes later indicated that the carbon monoxide in this return had diminished to 0.04 percent.

Federal Inspectors Lewis and Zeleskey, accompanied by Inspectors Lee, Lawrence, and Gillispie of the West Virginia Department of Mines, P. P. Ferretti, general superintendent, M. E. Hall, division superintendent, and two mine rescue teams, advanced into the Bleeder entries shortly after the aforementioned tests were made, when they were informed that 13 bodies had been located at the intersection of the Bleeder and Little Horse Pen entries. This group traveled about a mile into the Bleeder entries, where

methane in excess of 3 percent was encountered on the haulageway. The concrete-block stoppings were intact, and a fresh-air base was set up at this location (survey station No. 5758). The mine rescue team, wearing oxygen breathing apparatus, explored each intake entry and crosscut for a distance of about 450 feet in by the fresh-air base. This team then removed sufficient blocks from a stopping to make an area of approximately 12 square feet, which cleared the areas of and diluted methane that had accumulated in the entries when the ventilation was short-circuited outby. This procedure was followed as the party advanced toward the faces of the Bleeder entries, new fresh-air bases were established and openings were made in the stoppings to connect intake and return airways. Reestablishing ventilation and clearing the Bleeder entries of methane, as mentioned previously, lessened the possibility of forcing an explosive mixture of methane-air into the unexplored entry faces. Ventilation to the faces of the Bleeder entries was reestablished and the entry faces were examined by 5:30 p.m., February 4. During the exploration of the entry faces three lighted flame safety lamps were found, one in the crosscut between Nos. 2 and 3 entries, another on the mining machine near the face of No. 3 entry, and the third on the loading machine near the face of No. 4 entry. These flame safety lamps had burned for approximately 18 hours, and visible tracks of rodents in the rock-dusted faces of these entries indicated that the atmosphere in the area after the explosion was life sustaining.

Company and union representatives and State and Federal inspectors explored the Day Headings and Shaft Headings as ventilation was reestablished. Restoring ventilation in these entries was relatively simple, as blown-out stoppings were replaced rapidly with temporary stoppings constructed of brattice cloth. Advance to the faces of the Day Headings was rapid and 12 bodies were located quickly, one near the intersection of the Day and Shaft Headings and 11 near the working faces. Four bodies were located near the faces of the Shaft Headings, three bodies were found in No. 3 entry of Little Horse Pen entries near survey station No. 6045, and another victim was found in No. 2 entry of Little Horse Pen entries near survey station No. 6041. Three bodies were located under a roof fall at the new loading point in the Shaft Headings about 3:00 p.m., and the last body in the Day Headings was found about 3:00 p.m. in a crosscut near the junction of the Day and Shaft Headings. The bodies of the 37 men were carried to the bottom of the man shaft and then removed to the surface by way of the main drift portals. All bodies were on the surface by 5:30 p.m., February 4. During the initial exploration of the Shaft Headings and Little Horse Pen entries four small fires were found and extinguished; again on Thursday, February 7, three small smouldering fires were found and extinguished in these areas by crews collecting dust samples.

A crew of men began replacing permanent stoppings in the Shaft Headings on February 5, and additional men began cleaning up the affected sections and rock-dusting the areas February 11. Permanent stoppings in

the Bleeder entries were replaced, and no changes were made in the method of ventilating this section. Prior to the explosion, 10 brattice-cloth stoppings and 6 check curtains were used to control and direct the ventilating current in the Day Headings. In reestablishing ventilation in the Day and Shaft Headings, separate splits of intake air were provided for each section. Intake air was coursed through the center entries of the Day Headings, split right and left near the faces, and returned through the outside entries. On February 20, 16,800 cubic feet of air a minute was measured in the right split and 20,900 cubic feet of air a minute was measured in the left split. The four working places in the Shaft Headings were ventilated with 24,100 cubic feet of air a minute.

#### INVESTIGATION OF CAUSE OF EXPLOSION

Investigation Committee. The underground investigation of the cause of the explosion was conducted on February 5, 6, and 8. Members of the official investigation committee were:

##### West Virginia Department of Mines

Julius C. Olzer	Chief
D. J. Lee	Acting Inspector-at-Large
Emory J. Lawrence	District Inspector
H. H. Wall	District Inspector
W. C. Sturgill	District Inspector
R. F. Goodman	Rock-dust Inspector

##### United Mine Workers of America

Charles Ferguson	Safety Director
James Leeber, Jr.	Safety Engineer, District 29

##### Pocahontas Fuel Company, Incorporated

P. P. Ferretti	General Superintendent
M. E. Hall	Division Superintendent
J. W. Pero	Director of Safety and Mine Inspection
Howard Clark	Assistant Superintendent
Louis Roncaglione	Inspector

##### United States Bureau of Mines

James Westfield	Assistant Director--Health and Safety
W. R. Park	District Supervisor
E. M. Lewis	Federal Coal-Mine Inspector
John Zeleskey	Federal Coal-Mine Inspector

Many other representatives of the aforementioned organizations participated in the different phases of the underground investigation of the disaster. Bureau of Mines representatives included Messrs. Noe, Barger, Cordray, Vickers, Menta, McGinity, Ulshafer, J. D. Micheal, Gallagher and W. B. Michael.

Julius C. Olzer, Chief of the West Virginia Department of Mines, conducted an official inquiry and investigation of the explosion by interrogating a number of officials and employees of the company in the mine offices at Bishop, Virginia, February 7. The purpose of the inquiry was to hear and record all testimony relevant to conditions and practices in the mine prior to and on February 4, and to determine therefrom, if possible, the cause of the explosion. Some of the information thus obtained is included in this report.

Methane as a Factor in the Explosion. The mine is classed gassy by the West Virginia Department of Mines and by the Bureau of Mines, and methane has been detected in the mine on numerous occasions. Three gas explosions resulting in a total of five fatalities had occurred previously in this mine. During the three Federal inspections completed in April, August, and November of 1956, the mine was liberating methane at a calculated rate of 4,348,655, 2,846,016, and 3,069,936 cubic feet, respectively, in 24 hours. During the November 1956 inspection, the immediate return air from the Bleeder entries contained 0.48 percent methane in 40,000 cubic feet of air a minute, and the immediate return air from the Shaft entries (Shaft and Day Headings) contained 0.24 percent methane in 38,000 cubic feet of air a minute. Analyses of air samples collected during the last 2 months by company officials at 2-week intervals in the same immediate returns indicated that relatively similar amounts of methane were present in about the same volumes of air.

Mine officials stated that line curtain was kept within 8 to 10 feet of the faces during loading and cutting operations and within about 6 feet of the faces during blasting operations in the 3 sections affected by the explosion. These officials stated further that gas could be detected with a flame safety lamp at the face almost without exception after blasting and generally during loading and cutting operations if the lamp were held close to the face. It is necessary to keep measurable volumes of air sweeping the working faces to keep the faces clear of methane, and any interruption of face ventilation during normal mining operations in these sections results generally in gas accumulating at the face. Because of the gas being liberated at the working faces during normal mining operations and the high methane contents in the immediate section returns during the April 1956 inspection, the Federal inspector suggested that each of the five sections being developed in virgin coal (5 left off new 35 mains, Jenkinjones mains, Daniel mains, Bleeder entries, and Shaft entries) be ventilated by two splits of air. It was suggested that intake air in these

sections be coursed through the center entries, then split right and left near the faces, and returned through the outside entries.

It is believed that the air current was short-circuited from the Shaft Headings, particularly Nos. 5 and 6 returns inby the Day Headings, and from the working places in and off the Day Headings while normal mining operations were being performed therein during the 12:00 to 8:00 a.m. shift, February 4. Lack of adequate ventilation would permit methane to accumulate at these locations. Inasmuch as all evidence indicates that the explosion originated in the face regions of the Day Headings, the most logical conclusion is that gas accumulated in the working places and was not detected or the power conductors were not deenergized after it was detected. It is also believed that gas liberated in the Nos. 5 and 6 entries of the Shaft Headings during the ventilation interruption aided in propagating the explosion. The extensive accumulation of methane in the Bleeder entries following the short-circuiting of ventilation in these entries after the explosion proves clearly that large amounts of methane are liberated from the coal ribs. Eight hours after the explosion, more than 3 percent of methane was present in all six of the Bleeder entries about 2,500 feet outby the faces.

Fragile, globular coke droplets adhering to the roof and ribs, indicative of slow burning gas, were found in No. 12 entry from the face outby to the crosscut, in the crosscut being driven from No. 11 entry to No. 12 entry, in No. 11 entry from 10 feet outby the face to the crosscut, in No. 10 entry from 20 feet outby the face to the crosscut, along the inby rib of the crosscut between Nos. 10 and 9 entries, in No. 9 entry from 28 feet outby the face to the crosscut, along the inby rib of the crosscut between Nos. 9 and 8 entries, and in No. 8 entry from 18 feet outby the face to the crosscut. Soot streamers were found on the roof and ribs throughout the greater part of the Day Headings outby the face regions (see Appendix C). The aforementioned evidences of burning gas were not found anywhere else in the explosion area.

Flame. Evidence of heat or flame, in the form of ashes, coke, soot, or partly burned paper, canvas, and wood, was observed throughout the Day Headings south of the Shaft Headings, throughout the Shaft Headings west of the Day Headings, and throughout the Little Horse Pen entries. The bodies recovered in these areas were burned severely. The distance from the faces of the Day Headings through the Little Horse Pen entries to the Bleeder entries is about 4,100 feet.

Four small coal fires were extinguished during the initial recovery operations in the Shaft Headings, and three smouldering fires were extinguished in these entries on February 7.

Positive evidence of explosives having been discharged by forces or flame was not found, although 4 cases of explosive were in a mine car

in No. 3 entry of Little Horse Pen entries about 1,200 feet inby the Shaft entries, and 10 explosive cartridges and pieces of 2 cartridges were in a rubberized bag and 12 cartridges of unconfined explosive were on the floor at the face of No. 12 entry of the Day Headings. These explosives were close to shot holes in this face. Four boxes of unexploded detonators were in the same mine car with the explosives in Little Horse Pen entries. A quantity of exploded detonators was found at the junction of No. 4 entry of Day Headings and No. 6 entry of the Shaft Headings, a number of unexploded detonators were under the edge of a roof fall at an intersection near the entrance to the Day Headings, and several boxes of unexploded detonators were scattered in a crosscut in the Shaft Headings. Reportedly, nine cases of permissible explosive were stored in a crosscut adjacent to the haulageway in Day Headings near survey station No. 6102 prior to the explosion. No trace of such explosive was found after the explosion, although parts of the crosscut rib were shattered and dislodged.

A total of 281 mine dust samples was collected after the explosion; 95 of these samples were collected in the affected area. The results of analysis for incombustible content and tests for coke in the mine dust samples are shown in table 1. The presence of coke in the mine dust samples is one of the criteria by which extent of the flame area was fixed, even though it is possible that such coke in the Bleeder entries and in the Little Horse Pen entries adjacent to the Bleeder entries may have been blown therein. Fifty-four of the ninety-five samples collected in the affected area contained coke ranging in quantities from traces to large particles. Fourteen of the eighteen regular samples collected in the Day Headings contained coke, and a sample collected from the top of a loaded mine car at the loading point in Day Headings contained a small amount of coke. Thirty-four of the thirty-five dust samples collected in the Shaft Headings west of the Day Headings and in the Little Horse Pen entries contained traces to large amounts of coke. Five of twenty dust samples collected in the Bleeder entries at and near the Little Horse Pen junction contained traces of coke. None of the dust samples collected in the Shaft Headings at the junction with the Day Headings and outby towards the man shaft contained coke. Coke that ranged from a fraction of an inch to more than 2 inches in thickness was plastered on roof bolts, lips of cuts in the roof, on roof-bolted cap pieces, and on other material at numerous locations in the Day Headings, Shaft Headings, and the Little Horse Pen entries.

Sixty-two percent (174) of the 281 samples contained less than 65 percent incombustible, the minimum amount required by the Federal Coal Mine Safety Act. The dust samples collected in the affected area are not truly representative of mine dust conditions prior to the explosion, as burning of coal dust in suspension increases the incombustible content of the mine dust, and the unburned coal dust thrown into suspension and deposited on rock-dusted surfaces decreases the incombustible content. Of the 95 samples taken in the explosion area, only 6 contained more than 65 percent

incombustibles. One of the six was collected in the Shaft Headings and the other 5 in the 1,500 linear feet of affected area in the Bleeder entries. Thirty-four dust samples were collected within 350 feet of the faces of the 3 unaffected sections; 26 of these samples did not contain as much as 65 percent incombustibles. The remaining 152 samples were collected at about 500-foot intervals in the Daniel main entries and the unaffected parts of the Bleeder entries; these entries were adjacent to the explosion area. Ninety-six of these 152 samples contained more than 65 percent incombustibles; 9 of the 56 substandard samples contained incombustibles ranging from 60.6 to 64.5 percent, 15 others contained incombustibles ranging from 54.1 to 60 percent, 22 samples contained incombustibles ranging from 40 to 54.0 percent, and the other 10 contained less than 40 percent incombustibles. Generally, places where the substandard samples were collected in the Daniel mains and the Bleeder entries were between locations where rock dusting was adequate.

Tests at the Bureau of Mines experimental mine indicate that the dust of coal having a ratio of volatile matter to total combustible matter of 0.23 (the volatile ratio of the coal in this mine) is rendered nonexplosive when it is mixed with rock dust to the extent that the incombustible content of the mixed dusts ranges from 50 to 58 percent when methane is not present; also, that for Pocahontas No. 3 coal dust an additional 7 percent incombustible is required for each 1 percent methane present in the ventilating current.

The average incombustible content of the 104 dust samples collected in the Daniel mains was 71 percent; of the 44 samples taken in unaffected parts of the Bleeder entries, 64.3 percent; of the 20 samples taken in affected parts of the Bleeder entries, 55.6 percent; and of all 64 samples taken in the Bleeder entries, 61.6 percent.

Inasmuch as the return airways from the Daniel main entries and the Bleeder entries contained about 0.5 percent methane, as shown by analyses of air samples collected before the explosion, the mine dust in these areas was nonexplosive and would not enter into or propagate an explosion. Assuming that rock-dust conditions in the Day and Shaft Headings were at least comparable with those in the aforementioned unaffected entries, the mine dust in these Headings would have been rendered explosive by the methane accumulated therein during the ventilation failure.

Forces. Evidences of forces indicating the direction of travel were conflicting within the individual sets of entries, but little difficulty was experienced in discerning the direction of forces at and near the junction of the entries. Extensive coking and considerable evidence of slow-burning gas were on the roof, ribs, and floor in the face regions of the Day Headings, and emanation of forces was from these face regions outward, east and north. An empty car was forced under a partly loaded car at the loading point; pieces

of canvas, temporary stoppings, and other material were blown east and north toward the Shaft entries. A stopping across the Day Headings near the junction with the Shaft Headings was blown north, toward the Shaft Headings. Other evidence indicated that the forces moved outward from the face regions of the Day Headings into the Shaft Headings, where they spread north, east, and west, moving east through the Shaft Headings to the man shaft and surface, and west through the Shaft Headings, thence through Little Horse Pen entries into the Bleeder entries. Two mine cars loaded with rock dust and one empty mine car were derailed near the junction of the Day Headings with the Shaft Headings; their position indicated that they had been forced east toward the man shaft, and the air-lock doors at this junction were blown north. All concrete-block stoppings in the Shaft Headings west of the Day Headings were destroyed, several of these stoppings were blown north, but the greater number were blown in the opposite direction, south. A concrete-block stopping across No. 4 Shaft Heading between the first and second crosscuts outby the Little Horse Pen entries was blown west toward the Little Horse Pen entries.

A concrete-block stopping in No. 2 entry of Little Horse Pen entries between Nos. 2 and 3 entries of the Bleeder entries and 12 similar stoppings outby between the same entries were blown north, toward No. 2 entry. Concrete-block stoppings in crosscuts between Nos. 3 and 4 entries of Little Horse Pen entries were generally blown northeast.

As the explosion moved east from the Day Headings through the Shaft Headings toward the man shaft, 14<sup>a</sup> concrete-block stoppings were blown out by the forces. The elevator in the man shaft was lifted several feet and damaged slightly and windows in the building at the top of the shaft and in a nearby building were broken. Evidence of forces moving east and north to the sidetrack near the junction of Daniel mains and new 35 mains were noted by the general night foreman who was engulfed in a strong rush of wind and dust at this sidetrack. Forces of the explosion dissipated rapidly after reaching the man shaft and a light deposit of dust on the ribs and roadways was the principal indication of force beyond the man shaft. Forces traveling through the Little Horse Pen entries dissipated rapidly when they reached the Bleeder entries; about 1,500 linear feet of these entries were affected by the forces. Evidence of extreme violence was not observed at any location in the explosion area.

Evidence of Activities. At the time of the explosion, about 1:55 a.m., Monday, February 4, 1957, 178 men were in the mine performing regular duties in connection with normal coal production. Thirty-seven men were in the areas affected by the explosion, 13 in the Day Headings, 11 in the Shaft Headings, and 13 in the Bleeder entries.

The location of equipment, flame safety lamps, clothing, et cetera in the face regions of the Bleeder entries after the explosion

showed clearly that the 12 men and section foreman were performing their usual tasks in connection with producing coal. The face regions of the Bleeder entries were not affected by the explosion, and these 13 men probably began walking towards the man shaft, a distance of about 7,900 feet, immediately after the explosion occurred, as the immediate power failure, concussion, short-circuiting of the ventilating current, and probable presence of dust in the atmosphere likely indicated to these men that an explosion had occurred. The bodies of the 13 men were found near the junction of the Little Horse Pen entries with the Bleeder entries.

A section foreman and 10 men were moving equipment and preparing to start a new working section in the Shaft Headings when the explosion occurred. The positions of the bodies of these men indicated that they were performing their assigned tasks when killed by forces and flame of the explosion. Most of the equipment for the new section had been moved to the new location previously; however, when the explosion occurred, 4 men were transporting supplies and explosives with a locomotive and open mine car from the abandoned section to the new working section. This equipment and the 4 bodies were found on the haulageway of the Little Horse Pen entries near survey station No. 6045. Three men were installing a car-spotting hoist for the new loading point; their bodies were found under a roof fall that occurred after the explosion. Two bodies were found along the side of the loading machine; these apparently were the bodies of the loader operator and shuttle-car operator. The first cut had been made in the first working place in the new section, and two bodies were found about 100 feet outby the new cut; one of the bodies at this location was the foreman's.

The men on this new section removed one or more stoppings from crosscuts to set up the new section, but removal of these stoppings would not have affected ventilation in the Day Headings.

A section foreman and 12 men were producing coal in the Day Headings when the explosion occurred. The positions of the bodies of 11 of these men indicated that they had moved little, if any, after the explosion. This section consisted of 6 working places, Nos. 7, 8, 9, 10, 11, and 12 entries; Nos. 7 and 8 entries had not been worked for several days prior to the explosion because of water.

The section foreman on the 4:00 to 12:00 p.m., shift stated that only one place, No. 11 crosscut had been cut, when the last shift prior to the explosion was completed and that the roof-bolting machine was in No. 12 entry at the end of the shift. During the investigation, it was observed that bolting in No. 12 entry had been completed, the face had been cut, four shot holes had been drilled, and the shot firer had charged two shot holes and apparently was ready to charge the remaining shot holes; the foreman's body was found near the face of No. 12 entry. The roof-bolt

machine was being moved, or the crew was ready to move the machine from No. 9 entry; this crew had completed their bolting operations in a cross-cut being driven toward No. 8 entry. The mining machine was blocking the shuttle-car roadway at the mouth of No. 10 entry; it could not be determined whether the machine was stopped or was being tammed. One of the shuttle cars apparently was leaving the loading point to return to the loading machine. The loading machine was at the face of the crosscut being driven from Nos. 11 to 12 entries, and the second shuttle car was under the loading boom, nearly loaded. The cut of coal had been practically loaded; less than 1/2 a shuttle car of loose coal remained at the face. Eight loaded mine cars were at the loading ramp; officials stated this was about the usual number of cars of coal from a cut and that likely the only loading during the shift had been done in No. 11 crosscut. A flame safety lamp was found hanging on the loading machine, another lamp was hanging on the mining machine, the shot firer and foreman each had flame safety lamps in their possession; these four lamps were in good condition; however, a fifth lamp on the section, in possession of the roof-bolting crew, was damaged beyond repair by forces.

The regular motorman for the Day Headings stated that he had not made a trip to the section during the shift on February 4, 1957.

The body of the regular mechanic on Day Headings was found adjacent to a pump located at the junction of the Shaft Headings and Day Headings. Officials stated that normally the mechanic on a section took care of any needed pumping or pump repairs; therefore, this man was probably performing assigned duties at the pump in view of water conditions in Nos. 7 and 8 entries.

The body of the loading machine operator's helper was found within the crosscut immediately adjacent to the inby air-lock doors and about 300 feet from the aforementioned pump. Since none of the other victims in this section moved more than a few feet after the explosion, it is almost certain that he was at or very near this location when the explosion occurred. While it is believed that he had been assigned by the section foreman to check the air-lock doors just before the explosion, consideration must be given the possibilities that he had been requested to deenergize the power circuits in the face regions by opening the cut-out switch outby the doors or he had been helping the mechanic with the pump and was returning to the faces at the time. Regardless of what he had been doing, he would have been the most logical crew member to be assigned either task, as his services during the hour preceding the explosion, when a full cut of coal was being loaded at one face and none of the other faces had been prepared for loading, would not have been as necessary to continued production as those of any other crew member.

Evidence of a large quantity of gas having burned in the face regions of the Day Headings proves unquestionably that gas accumulated in

these working places. This gas accumulation could have occurred only as a result of short-circuiting the air current from these places. The method of ventilating the area and examination after the explosion indicate that the most logical explanation for such short-circuiting is that the air-lock doors at the entrance to the section were open for some time previous to the explosion. There are three possible explanations for the doors being open, they were "buttoned" open by the crew members as they entered the section or they were left open either by the mechanic as he traveled, after getting his tools, from the face regions to the pump or by the loading machine operator's helper as he was on his way to deenergize the power circuits or to help the mechanic. Each of the three doors in this area was necessary to complete the air-lock. If the door on the spur track, which was not traveled normally by persons entering or leaving the section, had been left open inadvertently or unknown to the section employees, opening the outby door would have rendered the air lock ineffective and short-circuited the air from the working places even though the inby door on the haulageway was closed.

Probable Point of Origin. The consensus of the Bureau of Mines investigators is that the explosion originated at or near the faces of Nos. 9, 10, and 11 entries being driven off, or at or near the face of No. 1 entry of, the Day Headings.

Factors Preventing Spread of Explosion. The areas affected by the explosion are shown on the mine map (Appendix B). Forces of the explosion extended throughout the Day Headings, into and throughout the Shaft Headings, east and north to the surface through the man shaft, west into and throughout the Little Horse Pen entries, and into and east and west in the Bleeder entries. Forces subsided rapidly as they spread east and west in the Bleeder entries, and forces moving east through the Shaft entries diminished quickly when they reached the man shaft. Evidence of flame was not observed in the Shaft Headings east of the Day Headings or in the Bleeder entries, except near the junction of these entries and the Little Horse Pen entries.

The diluting and quenching effect of the rock dust applied was the principal factor in preventing further spread of this explosion. Other factors acting in combination that helped limit the explosion were: The cooling effect of the extensive rib, roof, and floor surfaces of the numerous entries in the path of the explosion; and ample open areas, including the man shaft, for expansion of forces, resulting in a reduction of flame speed and temperature.

Summary of Evidence. Conditions observed in the mine during recovery operations and the investigation following the disaster, together with information available from previous Federal coal mine inspection reports and that obtained from company officials, workmen, and mine records, provided

evidence as to the cause and the origin of the explosion. The evidence from which the conclusions of the Federal investigators are drawn is summarized as follows:

1. Records of the fire-boss examinations of all working sections list no unusual condition observed during the examinations made several hours before the explosion.

2. Two foremen checking water conditions in the Day Headings immediately before the fire-boss examination of the section detected gas at the face of No. 11 crosscut; the gas was removed by reinstalling the line brattice.

3. The Pocahontas No. 3 coal bed in the area is extremely "gassy", and normal mining operations cause large liberations of methane at working faces. Any interruption of face ventilation during normal coal producing operations will cause gas to accumulate at the working faces.

4. The fire boss who examined the Day Headings found gas in and "dangered off" one or more working places in the Day Headings on 16 different days during the month prior to the explosion.

5. The crew in the Day Headings was engaged in the normal production of coal when the explosion occurred.

6. All forces emanated from the face regions of the Day Headings.

7. The Day Headings and the Shaft Headings were ventilated with a single split of air, which was coursed first through Nos. 1, 2, 3, and 4 entries of the Shaft Headings, returned through Nos. 5 and 6 entries of the Shaft Headings, through the face regions of the Day Headings, and then returned to the Nos. 5 and 6 entries of the Shaft Headings and to the main return. Part of the intake air traveling in the Shaft entries moved through the Little Horse Pen entries and entered the intake airways of the Bleeder entries.

8. Air-lock doors at the entrance to the Day Headings controlled the air split ventilating the Day and Shaft Headings and the Little Horse Pen entries.

9. Evidence of a large quantity of gas having burned in the face regions of the Day Headings proves unquestionably that gas had accumulated in these working places. This gas accumulation could have occurred only as a result of short-circuiting the air current from these places. The method of ventilating the area and examination after the explosion indicate that the most logical explanation for such short-circuiting is that the air-lock doors at the entrance to the section were open for some time previous to the explosion.

10. Opening the air-lock doors also short-circuited the air from the Shaft Headings west of the doors. The normal methane content of return air currents and the methane content of the general air in the Bleeder entries after the explosion and ventilation interruption indicate that measureable amounts of methane were liberated from the coal ribs in the Shaft Headings during a ventilation interruption.

11. Ten brattice-cloth stoppings and six check curtains were used to control and direct the ventilating current in the Day Headings.

12. Bodies of 11 of the 13 men comprising the Day Headings crew were found within 50 feet of their normal places of duty. The mechanic's body was within 50 feet of a pump, operation and maintenance of which were part of his usual work. The body of the loading machine operator's helper was found in the crosscut next to the inby air-lock door and 750 feet from the loading machine. It is concluded, therefore, that the loading machine operator's helper was at or near the doors when the explosion occurred. Whether he had been assigned to check the doors, to open the cut-out switch, or to help the mechanic is purely conjectural; only the fact that he was near the doors is significant to the cause of the explosion.

13. All the face electric equipment in the Day Headings section was in nonpermissible condition when examined after the explosion. Air returning from six of the working places would have flowed directly by the inby "nipping" station if the check curtain inby this station had not been maintained properly.

14. Each one of four of these electrically operated machines, including the trailing cables, was capable of igniting gas, and the only other sources of ignition at or near the point of explosion origin were the "nipping" stations.

15. The exact location where the methane was ignited and the specific piece of equipment or power conductor involved could not be determined, as evidence of burning gas was found in all working places in the Day Headings and gas could have been ignited at the "nipping" station in No. 11 entry or by any one of four pieces of the electrical equipment.

16. Dangerous accumulations of coal dust were present at one or more locations near the working faces of the underground sections not affected by the explosion, and small to excessive amounts of fine coal dust were present on the roof and ribs, particularly on ledges and offsets in the ribs, in these areas between the loading points and the faces. It is assumed that dust conditions in the face regions of the affected sections prior to the explosion were similar, as excessive coal-dust accumulations were observed at several locations in these face regions during the investigation.

17. Sufficient rock dust was not applied in the face regions inby the loading points of the unaffected sections examined during the investigation.

Rock-dusting in the face regions of the affected sections prior to the explosion must have been similar, as coal dust entered into the explosion in the Day Headings and helped propagation.

18. Open areas outby the loading points of the three sections examined were generally well rock-dusted.

Cause of the Explosion. The Federal investigators are of the opinion that the disaster was caused by the ignition of an accumulation of gas in working places being driven in or off the Day Headings. Gas had accumulated in these places as a result of short-circuiting of the ventilating current, which was due to air-lock doors at the entrance to the working section having been left open. The gas was ignited by an electric arc or spark from 1 of 4 pieces of face electric equipment, from the trailing cables to this equipment, or at the inby "nipping" station for part of the equipment. Coal dust in the immediate face areas entered into the explosion and aided in its propagation. When flame and forces of the explosion reached the Shaft Headings, the explosion was further propagated by mine dust (mixed coal and rock dust) that was rendered explosive by the presence of gas that had been liberated in the Nos. 5 and 6 entries of these headings during the ventilation failure.

#### RECOMMENDATIONS

The following recommendations are made to prevent similar disasters:

1. Each mechanical loading section in this mine should be ventilated with a separate split of intake air.
2. Each section being developed in virgin coal with more than four parallel entries should be ventilated with a current of intake air coursed through the center entries, split right and left near the face regions, and returned through the outside entries.
3. Preferably, doors should not be used to control the main ventilating current of an air split. If doors must be used for such purpose, they should be installed in pairs to form air locks large enough to contain an entire trip, so arranged that one door will be closed before the other door is opened, so constructed that a trip passing in either direction will engage bumpers designed to hold the doors open, and so hung that they will close when not held open. Doors should be open only when men or equipment is passing through the doorways, and means to fasten the doors open should not be provided.
4. Stoppings in crosscuts between intake and return airways should be built of solid, substantial material. Preferably, the stoppings

should be constructed of incombustible material, and not more than two temporary stoppings should be permitted between permanent stoppings and the last open crosscuts.

5. The "nipping" stations for face electric equipment should be kept in intake air.

6. Consideration should be given to implementing the company's maintenance program for face electric equipment to the extent that such equipment will be kept in permissible condition.

7. Splices in trailing cables should be well insulated, and a program should be established to require that trailing cables containing a fixed number of temporary splices will be removed from the equipment and service until such splices have been vulcanized.

8. Check curtains and line brattice should be installed and maintained to minimize the possibility of methane accumulating in face areas.

9. Examinations for gas in face workings should be made at intervals sufficiently frequent to detect the presence of methane before it reaches dangerous proportions.

10. Foremen should record clearly, in the daily report book provided for that purpose, the location and nature of any danger observed by them or reported to them during the work shift. The report should show what action, if any, was taken to remedy the danger and should also include any action taken to correct hazards reported by fire bosses. Frequent reporting of gas in an area should be investigated by higher officials and remedial action should be taken immediately.

11. Coal dust and loose coal should not be permitted to accumulate in dangerous quantities in any active underground workings.

12. Rock dust should be distributed uniformly on the roof, ribs, and floor and maintained in such quantity that the incombustible content of the combined coal dust, rock dust, and other dust will not be less than 65 percent, plus 1 percent for each 0.1 percent of methane present in the ventilating current.

13. A program and methods whereby adequate rock-dusting can be done in the face regions should be adopted and put into effect immediately.

14. Dust samples should be collected and analyzed periodically to determine the effectiveness of rock-dust applications.

15. A self-rescuer should be provided for each person underground, who should be thoroughly instructed as to its safe maintenance, use, and limitations.

16. All underground personnel should be instructed on procedures that should be followed in the event of a disaster underground. These instructions should include adequate information on barricading, especially information on when, where, and how to erect barricades.

#### ACKNOWLEDGMENT

The writers acknowledge gratefully the courtesies extended and the help given by officials and other members of the United Mine Workers of America, officials and employees of the operating company, and representatives of the West Virginia Department of Mines and the United States Bureau of Mines.

Respectfully submitted,

/s/ W. R. Park

W. R. Park  
District Supervisor

/s/ E. M. Lewis

E. M. Lewis  
Health and Safety Engineer

/s/ W. M. Cordray

W. M. Cordray  
Health and Safety Engineer

Approved by:

/s/ James Westfield

James Westfield  
Assistant Director--Health and Safety

/s/ M. J. Ankeny

M. J. Ankeny  
Director

Sheet 1

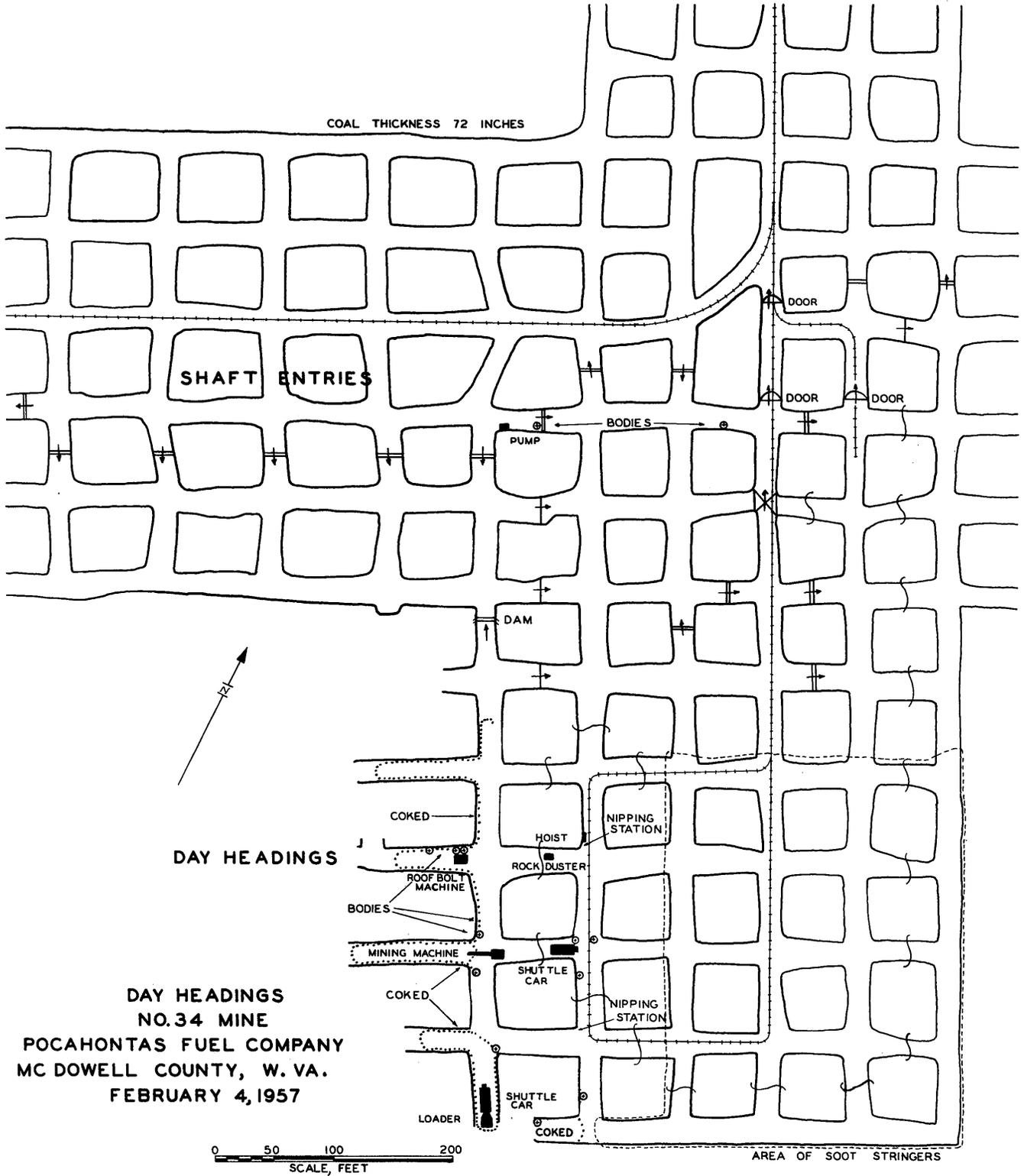
Table 1

## ANALYSES OF MINE DUST SAMPLES

COLLECTED AFTER EXPLOSION

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-1	Band	No. 3 Bleeder entry (parallel), 500 feet outby No. 2 entry, Little Horse Pen.	43.5	Trace
N-2	Band	No. 4 Bleeder entry (track), 370 feet outby No. 2 entry, Little Horse Pen.	40.2	None
N-3	Band	No. 5 Bleeder entry (parallel), 140 feet outby No. 1 entry, Little Horse Pen.	22.9	Trace
N-4	Band	No. 3 Bleeder entry (parallel), 25 feet outby No. 2 entry, Little Horse Pen.	40.4	None
N-5	Band	No. 4 Bleeder entry (track), 60 feet outby No. 3 entry, Little Horse Pen.	52.4	None
N-6	Band	No. 5 Bleeder entry (parallel) at intersection of No. 3 entry, Little Horse Pen.	29.3	Trace
N-7	Band	No. 1 Bleeder entry (parallel) at intersection of No. 3 entry, Little Horse Pen.	60.5	None
N-8	Band	No. 2 Bleeder entry (parallel) at intersection of No. 4 entry, Little Horse Pen.	62.1	None
N-9	Band	No. 3 Bleeder entry (track), 50 feet inby No. 4 entry, Little Horse Pen.	54.4	Trace
N-10	Band	No. 4 Bleeder entry (parallel), 200 feet inby No. 4 entry, Little Horse Pen.	37.8	None
N-11	Roof & Ribs	No. 5 Bleeder entry (parallel), 300 feet inby No. 4 entry, Little Horse Pen. (floor wet)	33.3	None

APPENDIX B



DAY HEADINGS  
NO. 34 MINE  
POCAHONTAS FUEL COMPANY  
MC DOWELL COUNTY, W. VA.  
FEBRUARY 4, 1957

Sheet 2

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-12	Band	2,600 feet outby face, No. 2 Bleeder entry. (parallel)	61.5	None
N-13	Band	2,600 feet outby face, No. 3 Bleeder entry. (track)	64.9	None
N-14	Band	2,600 feet outby face, No. 4 Bleeder entry. (parallel)	56.0	None
N-15	Band	2,150 feet outby face, No. 2 Bleeder entry. (parallel)	44.4	None
N-16	Band	2,150 feet outby face, No. 3 Bleeder entry. (track)	67.2	None
N-17	Band	2,150 feet outby face, No. 4 Bleeder entry. (parallel)	61.8	None
N-18	Band	2,150 feet outby face, No. 5 Bleeder entry. (parallel)	47.3	None
N-19	Band	1,700 feet outby face, No. 2 Bleeder entry. (parallel)	64.0	None
N-20	Band	1,700 feet outby face, No. 3 Bleeder entry. (track)	47.0	None
N-21	Band	1,700 feet outby face, No. 4 Bleeder entry. (parallel)	44.0	None
N-22	Band	1,600 feet outby face, No. 5 Bleeder entry. (parallel)	68.7	None
N-23	Band	1,250 feet outby face, No. 2 Bleeder entry. (parallel)	56.8	None
N-24	Band	1,250 feet outby face, No. 3 Bleeder entry. (track)	82.2	None
N-25	Band	1,250 feet outby face, No. 4 Bleeder entry. (parallel)	49.6	None
N-26	Band	1,250 feet outby face, No. 5 Bleeder entry. (parallel)	66.7	None
N-27	Band	880 feet outby face, No. 5 Bleeder entry. (parallel)	60.6	None
N-28	Band	350 feet outby face, No. 5 Bleeder entry. (parallel)	61.7	None
N-29	Band	80 feet outby face, No. 5 Bleeder entry. (parallel)	26.7	None

Sheet 3

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-30	Band	880 feet outby face, No. 4 Bleeder entry. (track)	54.1	None
N-31	Band	880 feet outby face, No. 3 Bleeder entry. (track)	45.5	None
N-32	Band	880 feet outby face, No. 2 Bleeder entry. (track)	56.1	None
N-33	Band	350 feet outby face, No. 2 Bleeder entry. (track)	30.8	None
N-34	Band	350 feet outby face, No. 3 Bleeder entry.	42.7	None
N-35	Band	350 feet outby face, No. 4 Bleeder entry.	43.2	None
N-36	Band	80 feet outby face, No. 4 Bleeder entry.	44.9	None
N-37	Band	70 feet outby face, No. 3 Bleeder entry.	38.7	None
N-38	Band	60 feet outby face, No. 2 Bleeder entry.	28.2	None
N-39	Band	50 feet outby face, No. 1 Bleeder entry.	42.3	None
N-40	Band	50 feet outby face, No. 0 Bleeder entry.	74.0	None
N-41	Band	350 feet outby face, No. 1 Bleeder entry. (return airway)	56.9	None
N-42	Band	350 feet outby face, No. 0 Bleeder entry. (return airway)	51.0	None
N-43	Band	780 feet outby face, No. 1 Bleeder entry. (return airway)	54.6	None
N-44	Band	880 feet outby face, No. 0 Bleeder entry. (return airway)	55.3	None
N-45	Band	1,250 feet outby face, No. 0 Bleeder entry. (return airway)	59.2	None
N-46	Band	1,250 feet outby face, No. 1 Bleeder entry. (return airway)	54.9	None

Sheet 4

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-47	Band	1,700 feet outby face, No. 1 Bleeder entry. (return airway)	74.5	None
N-48	Band	1,700 feet outby face, No. 0 Bleeder entry. (return airway)	62.7	None
N-49	Band	2,150 feet outby face, No. 0 Bleeder entry. (return airway)	80.6	None
N-50	Band	2,150 feet outby face, No. 1 Bleeder entry. (return airway)	78.2	None
N-51	Band	2,600 feet outby face, No. 1 Bleeder entry. (return airway)	59.7	None
N-52	Band	2,600 feet outby face, No. 0 Bleeder entry. (return airway)	70.7	None
N-53	Band	110 feet outby face, No. 5 Horse Pen entry.	70.8	None
N-54	Band	120 feet outby face, No. 4 Horse Pen entry.	76.4	None
N-55	Band	100 feet outby face, No. 3 Horse Pen entry.	77.6	None
N-56	Band	95 feet outby face, No. 2 Horse Pen entry.	81.3	None
N-57	Band	70 feet outby face, No. 1 Horse Pen entry.	76.0	None
N-58	Band	No. 1 Bleeder entry (return airway), 140 feet outby No. 1 entry, Little Horse Pen.	81.1	None
N-59	Band	No. 2 Bleeder entry (return airway), 150 feet outby No. 2 entry, Little Horse Pen.	87.1	None
N-60	Band	No. 2 Bleeder entry (return airway), 600 feet outby No. 2 entry, Little Horse Pen.	74.6	Trace

Sheet 5			As Rec'd.	Alcohol Coke Test
Can No.	Samples of Dust From	Location in Mine	Percent Incomb.	Coked Particles Present (Amount)
N-61	Band	No. 1 Bleeder entry (return airway), 600 feet outby No. 1 entry, Little Horse Pen.	80.6	None
N-62	Band	No. 5 Bleeder entry (parallel), 3,970 feet inby Daniel mains haulageway.	56.2	None
N-63	Band	No. 4 Bleeder entry (track), 3,970 feet inby Daniel mains haulageway.	78.2	None
N-64	Band	No. 3 Bleeder entry (parallel), 3,970 feet inby Daniel mains haulageway.	51.2	None
N-65	Band	No. 2 Bleeder entry (return airway), 3,970 feet inby Daniel mains haulageway.	77.4	None
N-66	Band	No. 1 Bleeder entry (return airway), 3,970 feet inby Daniel mains haulageway.	65.9	None
N-67	Band	No. 1 Bleeder entry (return airway), 3,320 feet inby Daniel mains haulageway.	96.9	None
N-68	Band	No. 2 Bleeder entry (return airway), 3,320 feet inby Daniel mains haulageway.	83.2	None
N-69	Ribs & Floor	No. 2 Bleeder entry (return airway), 2,600 feet inby Daniel mains haulageway.	66.9	None
N-70	Ribs & Floor	No. 1 Bleeder entry (return airway), 2,600 feet inby Daniel mains haulageway.	72.1	None
N-71	Band	No. 2 Bleeder entry (return airway), 1,550 feet inby Daniel mains haulageway.	75.5	None
N-72	Band	No. 1 Bleeder entry (return airway), 1,550 feet inby Daniel mains haulageway.	73.9	None

Sheet 6

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-73	Band	No. 5 Bleeder entry (parallel), 3,320 feet inby Daniel mains haulageway.	49.4	None
N-74	Band	No. 4 Bleeder entry (track), 3,320 feet inby Daniel mains haulageway.	76.6	None
N-75	Band	No. 3 Bleeder entry (parallel), 3,220 feet inby Daniel mains haulageway.	68.0	None
N-76	Band	No. 5 Bleeder entry (parallel), 2,600 feet inby Daniel mains haulageway.	66.3	None
N-77	Band	No. 4 Bleeder entry (track), 2,600 feet inby Daniel mains haulageway.	76.7	None
N-78	Band	No. 3 Bleeder entry (parallel), 2,600 feet inby Daniel mains haulageway.	67.6	None
N-79	Band	No. 4 Bleeder entry (track), 1,550 feet inby Daniel mains haulageway.	77.1	None
N-80	Band	No. 3 Bleeder entry (parallel), 1,550 feet inby Daniel mains haulageway.	34.4	None
N-81	Band	No. 5 Bleeder entry (parallel), 1,800 feet inby Daniel mains haulageway.	78.8	None
N-82	Band	No. 1 entry (return airway), Daniel mains, 50 feet inby Station No. 4382.	75.7	None
N-83	Band	No. 2 entry (return airway), Daniel mains, 120 feet inby Station No. 4359.	94.4	None
N-84	Band	No. 3 entry (parallel), Daniel mains, 50 feet inby Station No. 4370.	75.7	None

Sheet 7

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-85	Band	No. 4 entry (parallel), Daniel mains, 50 feet inby Station No. 4369.	37.4	None
N-86	Band	No. 5 entry (parallel), Daniel mains, 125 feet inby Station No. 4328.	90.0	None
N-87	Band	No. 6 entry (track), Daniel mains, 60 feet inby Station No. 4355.	48.1	None
N-88	Band	No. 7 entry (return airway), Daniel mains, 70 feet inby Station No. 4349.	93.9	None
N-89	Band	No. 7 entry (return airway), Daniel mains, 140 feet inby Station No. 4496.	96.6	None
N-90	Band	No. 6 entry (track), Daniel mains, 50 feet inby Station No. 4544.	96.2	None
N-91	Band	No. 5 entry (parallel), Daniel mains, 50 feet inby Station No. 4498.	60.5	None
N-92	Band	No. 4 entry (parallel), Daniel mains, 50 feet inby Station No. 4499.	66.9	None
N-93	Band	No. 3 entry (parallel), Daniel mains, 50 feet inby Station No. 4502.	75.6	None
N-94	Band	No. 2 entry (return airway), Daniel mains, 50 feet inby Station No. 4500.	81.4	None
N-95	Band	No. 1 entry (return airway), Daniel mains, 50 feet inby Station No. 4501.	91.2	None
N-96	Band	No. 1 entry (return airway), Daniel mains, 120 feet inby Station No. 4636.	91.5	None

Sheet 8

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-97	Band	No. 2 entry (return airway), Daniel mains, 50 feet inby Station No. 4635.	89.1	None
N-98	Band	No. 2 entry (return airway), Daniel mains, 140 feet inby Station No. 4744.	69.4	None
N-99	Band	No. 1 entry (return airway), Daniel mains, 50 feet inby Station No. 4773.	85.7	None
N-100	Band	No. 1 entry (return airway), Daniel mains, 230 feet inby Station No. 4832.	88.7	None
N-101	Band	No. 2 entry (return airway), Daniel mains, 130 feet inby Station No. 4831.	80.0	None
N-102	Band	No. 1 entry (return airway), Daniel mains, 140 feet inby Station No. 4994.	87.2	None
N-103	Band	No. 2 entry (return airway), Daniel mains, 140 feet inby Station No. 4993.	98.4	None
N-104	Band	No. 2 entry (return airway), Daniel mains, 50 feet inby Station No. 5096.	92.4	None
N-105	Band	No. 1 entry (return airway), Daniel mains, 50 feet inby Station No. 5097.	88.1	None
N-106	Band	No. 3 entry (parallel), Daniel mains, 40 feet inby Station No. 4637.	47.0	None
N-107	Band	No. 4 entry (parallel), Daniel mains, 50 feet inby Station No. 4683.	67.6	None
N-108	Band	No. 5 entry (parallel), Daniel mains, 50 feet inby Station No. 4634.	71.1	None

Sheet 9

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-109	Band	No. 6 entry (track), Daniel mains, 50 feet inby Station No. 4632.	71.3	None
N-110	Band	No. 7 entry (track), Daniel mains, 50 feet inby Station No. 4661.	28.7	None
N-111	Band	No. 3 entry (parallel), Daniel mains, 150 feet inby Station No. 4830.	41.2	None
N-112	Band	No. 4 entry (parallel), Daniel mains, 130 feet inby Station No. 4845.	37.2	None
N-113	Band	No. 5 entry (parallel), Daniel mains, 75 feet inby Station No. 4888.	61.6	None
N-114	Band	No. 6 entry (track), Daniel mains, 50 feet inby Station No. 4902.	74.2	None
N-115	Band	No. 7 entry (return airway), Daniel mains, 50 feet inby Station No. 4903.	22.2	None
N-116	Band	No. 6 entry (track), Daniel mains, 140 feet inby Station No. 4989.	89.6	None
N-117	Band	No. 5 entry (parallel), Daniel mains, 140 feet inby Station No. 4990.	47.7	None
N-118	Band	No. 4 entry (parallel), Daniel mains, 140 feet inby Station No. 4991.	64.5	None
N-119	Band	No. 3 entry (parallel), Daniel mains, 140 feet inby Station No. 4992.	83.5	None
N-120	Band	No. 3 entry (parallel), Daniel mains, 50 feet inby Station No. 5089.	76.0	None

Sheet 10

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-121	Band	No. 4 entry (parallel), Daniel mains, 75 feet inby Station No. 5099.	89.6	None
N-122	Band	No. 5 entry (parallel), Daniel mains, 50 feet inby Station No. 5095.	83.7	None
N-123	Band	No. 6 entry (track), Daniel mains, 50 feet inby Station No. 5122.	90.8	None
N-124	Band	No. 3 entry (parallel), Daniel mains, 140 feet inby Station No. 4743.	82.2	None
N-125	Band	No. 4 entry (parallel), Daniel mains, 140 feet inby Station No. 4746.	48.8	None
N-126	Band	No. 5 entry (parallel), Daniel mains, 50 feet inby Station No. 4763.	57.6	None
N-127	Band	No. 6 entry (track), Daniel mains, 50 feet inby Station No. 4764.	91.3	None
N-128	Band	No. 7 entry (return airway), Daniel mains, 50 feet inby Station No. 4772.	28.1	None
N-129	Band	60 feet outby face No. 10 entry, Daniel mains.	67.4	None
N-130	Band	No. 9 entry (face region), Daniel mains, 25 feet outby Station No. 6078.	42.3	None
N-131	Band	No. 8 entry (face region), Daniel mains, 25 feet outby Station No. 6049.	42.0	None
N-132	Band	No. 3 entry (parallel), Daniel mains, 50 feet inby Station No. 4113.	35.3	None

Sheet 11

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
N-133	Band	No. 4 entry (parallel), Daniel mains, 50 feet inby Station No. 4114.	79.8	None
N-134	Band	No. 5 entry (parallel), Daniel mains, 50 feet inby Station No. 4115.	58.3	None
N-135	Band	No. 6 entry (track), Daniel mains, 50 feet inby Station No. 4116.	81.1	None
N-136	Band	No. 7 entry (parallel), Daniel mains, 50 feet inby Station No. 4110.	39.7	None
N-137	Band	No. 8 entry (intake airway), Daniel mains, 50 feet inby Station No. 4109.	71.4	None
N-138	Band	No. 9 entry (intake airway), Daniel mains, 50 feet inby Station No. 4108.	79.5	None
N-139	Band	No. 10 entry (intake airway), Daniel mains, 50 feet inby Station No. 4137.	91.5	None
N-140	Band	No. 1 entry (return airway), Daniel mains, 50 feet inby Station No. 4111.	81.4	None
N-141	Band	No. 2 entry (return airway), Daniel mains, 50 feet inby Station No. 4112.	64.6	None
V-1	Band	5 feet inby crosscut, No. 1 entry, off Shaft entries	38.6	None
V-2	Band	5 feet inby crosscut, No. 2 entry, off Shaft entries.	39.5	None
V-3	Ribs & Bottom	5 feet inby crosscut, No. 3 entry, off Shaft entries.	44.5	None
V-4	Roof & Rib	5 feet inby crosscut, No. 4 entry, off Shaft entries.	31.8	None

Sheet 12

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-5	Roof & Ribs	5 feet inby crosscut, No. 5 entry, off Shaft entries.	47.0	None
V-6	Band	Between Nos. 1 and 2 entries, off Shaft entries.	34.9	None
V-7	Band	10 feet inby crosscut, No. 2 entry, off Shaft entries.	57.8	None
V-8	Bottom & Ribs	5 feet inby crosscut, No. 3 entry, Shaft entries.	47.2	None
V-9	Bottom & Ribs	10 feet inby crosscut, No. 4 entry, Shaft entries.	45.3	None
V-10	Bottom & Ribs	10 feet inby crosscut, No. 5 entry, Shaft entries.	45.1	None
V-11	Band	Station No. 5395, No. 2 entry, off Shaft entries.	35.8	None
V-12	Band	Station No. 5394, No. 3 entry, off Shaft entries.	37.9	None
V-13	Band	Station No. 5392, No. 4 entry, off Shaft entries.	47.7	None
V-14	Band	Station No. 5363, No. 5 entry, off Shaft entries.	39.5	None
V-15	Band	Station No. 5393, No. 6 entry, off Shaft entries.	46.9	None
V-16	Band	10 feet inby crosscut, No. 1 entry, Day entries.	23.0	Trace
V-17	Band	10 feet inby crosscut, No. 2 entry, Day entries.	18.4	None
V-18	Floor & Ribs	10 feet inby crosscut, No. 3 entry, Day entries.	27.9	Trace
V-19	Floor & Ribs	15 feet inby crosscut, No. 4 entry, Day entries.	27.9	Trace
V-20	Top & Ribs	20 feet inby crosscut, No. 5 entry, Day entries.	24.5	Trace
V-21	Band	10 feet inby Station No. 6118, No. 1 entry, Day entries.	28.3	Small
V-22	Band	80 feet inby Station No. 6118, No. 1 entry, Day entries.	24.5	Large

Sheet 13

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-23	Band	85 feet inby Station No. 6102, No. 1 entry, Day entries.	21.7	Trace
V-24	Band	10 feet inby Station No. 6156, No. 2 entry, Day entries.	23.6	Trace
V-25	Band	85 feet inby Station No. 6116, No. 3 entry, Day entries.	18.9	None
V-26	Band	15 feet inby Station No. 6155, No. 3 entry, Day entries.	17.3	None
V-27	Band	10 feet inby Station No. 6154, No. 4 entry, Day entries.	25.6	None
V-28	Band	10 feet inby Station No. 6157, No. 4 entry, Day entries.	24.7	Trace
V-29	Band	85 feet inby Station No. 6152, No. 5 entry, Day entries.	45.2	Trace
V-30	Band	170 feet inby Station No. 6152, No. 5 entry, Day entries.	17.9	Small
V-31	Band	10 feet inby Station No. 6203, No. 6 entry, Day entries.	22.5	Small
V-32	Band	10 feet inby Station No. 6200, No. 6 entry, Day entries.	30.9	Large
V-33	Band	At corner No. 4 entry off No. 6 Day entry.	22.1	Large
V-34	Band	Station No. 5367, No. 2 Day entry.	29.8	None
V-35	Band	Station No. 5260, No. 2 Day entry.	35.8	None
V-36	Band	Station No. 5225, No. 2 Day entry.	45.9	None
V-37	Band	150 feet inby Station No. 5132, No. 2 Day entry.	46.1	None
V-38	Band	75 feet inby Station No. 5132, No. 2 Day entry.	32.3	None
V-39	Band	Station No. 5132, No. 2 Day entry.	37.0	None
V-40	Band	10 feet outby Station No. 5365, Shaft entries.	31.3	Trace

Sheet 14

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-41	Band	10 feet outby Station No. 5302, Shaft entries.	25.6	Trace
V-42	Band	75 feet inby Station No. 5223, Shaft entries.	79.1	Trace
V-43	Band	75 feet inby Station No. 5222, Shaft entries.	32.1	Trace
V-44	Band	75 feet inby Station No. 5221, Shaft entries.	27.5	Trace
V-45	Band	75 feet inby Station No. 5220, Shaft entries.	46.8	Trace
V-46	Band	15 feet inby Station No. 5625, Shaft entries.	48.3	Small
V-47	Band	15 feet inby Station No. 5642, Shaft entries.	25.5	Small
V-48	Band	90 feet inby Station No. 5617, Shaft entries.	20.5	Trace
V-49	Band	90 feet inby Station No. 5616, Shaft entries.	51.9	Trace
V-50	Band	90 feet inby Station No. 5614, Shaft entries.	26.9	Small
V-51	Band	90 feet inby Station No. 5615, Shaft entries.	29.9	Small
V-52	Band	Station No. 5771, No. 1 entry, Horse Pen entries.	44.8	Large
V-53	Band	Outby Station No. 5775, No. 2 entry, Horse Pen entries.	25.9	Small
V-54	Band	Outby Station No. 5794, No. 3 entry, Horse Pen entries.	37.3	Small
V-55	Band	Outby Station No. 5793, No. 4 entry, Horse Pen entries.	33.4	Trace
V-56	Band	Outby Station No. 5791, No. 5 entry, Horse Pen entries.	28.2	Small
V-57	Band	Outby Station No. 5896, Horse Pen entries.	50.2	Small
V-58	Band	Outby Station No. 5891, Horse Pen entries.	34.9	Trace

Sheet 15

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-59	Band	Outby Station No. 5895, Horse Pen entries.	38.8	Trace
V-60	Band	Outby Station No. 5894, Horse Pen entries.	32.3	Small
V-61	Band	Outby Station No. 5893, Horse Pen entries.	35.7	Trace
V-62	Band	Outby Station No. 6044, Horse Pen entries.	64.7	Trace
V-63	Band	Outby Station No. 6043, Horse Pen entries.	47.9	Trace
V-64	Band	90 feet inby Station No. 5999, Horse Pen entries.	63.3	Small
V-65	Band	90 feet inby Station No. 5998, Horse Pen entries.	27.1	Small
V-66	Band	90 feet inby Station No. 5997, Horse Pen entries.	50.2	Small
V-67	Band	Outby Station No. 6119, Horse Pen entries.	33.7	Trace
V-68	Band	Outby Station No. 6120, Horse Pen entries.	20.5	Small
V-69	Band	Outby Station No. 6123, Horse Pen entries.	39.3	Small
V-70	Band	Outby Station No. 6192, Horse Pen entries.	31.5	Trace
V-71	Band	Outby Station No. 6193, Horse Pen entries.	40.4	None
V-72	Band	Outby Station No. 6194, Horse Pen entries.	24.1	Trace
V-73	Band	180 feet inby Station No. 6148, Horse Pen entries.	22.0	Small
V-74	Band	270 feet inby Station No. 6192, Horse Pen entries.	27.4	Trace
V-75		Taken from top of loaded car at loading point in Day entries.	41.5	Small

Sheet 16

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-76	Band	20 feet inby Station No. 6177, No. 1 entry Daniel mains.	43.3	None
V-77	Band	10 feet inby Station No. 6176, No. 2 entry Daniel mains.	28.4	None
V-78	Band	10 feet inby Station No. 6026, No. 2 entry Daniel mains.	76.9	None
V-79	Band	10 feet outby Station No. 625, No. 1 entry Daniel mains.	89.3	None
V-80	Band	10 feet inby Station No. 5906, No. 1 entry Daniel mains.	29.7	None
V-81	Band	90 feet outby Station No. 5905, No. 2 entry Daniel mains.	38.1	None
V-82	Band	20 feet inby Station No. 5784, No. 1 entry Daniel mains.	71.7	None
V-83	Band	10 feet inby Station No. 5783, No. 2 entry Daniel mains.	70.6	None
V-84	Band	90 feet outby Station No. 5712, No. 1 entry Daniel mains.	44.8	None
V-85	Band	90 feet outby Station No. 5711, No. 2 entry Daniel mains.	55.4	None
V-86	Band	10 feet inby Station No. 5594, No. 1 entry Daniel mains.	45.4	None
V-87	Band	10 feet inby Station No. 5595, No. 2 entry Daniel mains.	58.1	None
V-88	Band	10 feet inby Station No. 5491, No. 1 entry Daniel mains.	62.6	None
V-89	Band	10 feet inby Station No. 5490, No. 2 entry Daniel mains.	82.7	None
V-90	Band	90 feet outby Station No. 5434, No. 2 entry Daniel mains.	97.0	None
V-91	Band	90 feet outby Station No. 5433, No. 1 entry Daniel mains.	82.1	None
V-92	Band	10 feet inby Station No. 5199, No. 1 entry Daniel mains.	93.2	None
V-93	Band	10 feet inby Station No. 5200, No. 2 entry Daniel mains.	77.3	None

Sheet 17

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-94	Band	10 feet inby Station No. 6173, No. 6 entry Daniel mains.	97.4	None
V-95	Band	10 feet inby Station No. 6028, No. 6 entry Daniel mains.	84.4	None
V-96	Band	90 feet outby Station No. 5909, No. 6 entry Daniel mains.	88.0	None
V-97	Band	10 feet inby Station No. 5820, No. 6 entry Daniel mains.	89.7	None
V-98	Band	10 feet inby Station No. 5313, No. 6 entry Daniel mains.	82.6	None
V-99	Band	10 feet inby Station No. 5437, No. 6 entry Daniel mains.	91.8	None
V-100	Band	10 feet inby Station No. 5487, No. 6 entry Daniel mains.	87.6	None
V-101	Band	90 feet inby Station No. 5568, No. 6 entry Daniel mains.	77.7	None
V-102	Band	10 feet inby Station No. 5708, No. 6 entry Daniel mains.	93.4	None
V-103	Band	10 feet inby Station No. 6175, No. 3 entry Daniel mains.	32.5	None
V-104	Band	10 feet inby Station No. 6174, No. 4 entry Daniel mains.	37.5	None
V-105	Band	10 feet inby Station No. 6172, No. 5 entry Daniel mains.	31.1	None
V-106	Band	10 feet inby Station No. 6024, No. 5 entry Daniel mains.	78.5	None
V-107	Band	10 feet inby Station No. 6029, No. 4 entry Daniel mains.	67.7	None
V-108	Band	10 feet inby Station No. 6025, No. 3 entry Daniel mains.	91.4	None
V-111	Band	100 feet outby Station No. 5907, No. 5 entry Daniel mains.	36.2	None
V-112	Band	10 feet inby Station No. 5779, No. 5 entry Daniel mains.	52.1	None
V-113	Band	10 feet inby Station No. 5781, No. 4 entry Daniel mains.	77.3	None

Sheet 18

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-114	Band	10 feet inby Station No. 5782, No. 3 entry Daniel mains.	53.3	None
V-115	Band	10 feet inby Station No. 5710, No. 3 entry Daniel mains.	68.0	None
V-116	Band	10 feet inby Station No. 5709, No. 4 entry Daniel mains.	96.3	None
V-117	Band	10 feet inby Station No. 5707, No. 5 entry Daniel mains.	57.1	None
V-118	Band	90 feet outby Station No. 5599, No. 5 entry Daniel mains.	39.9	None
V-119	Band	90 feet outby Station No. 5600, No. 4 entry Daniel mains.	75.3	None
V-120	Band	90 feet outby Station No. 5601, No. 3 entry Daniel mains.	40.7	None
V-121	Band	10 feet inby Station No. 5489, No. 5 entry Daniel mains.	51.8	None
V-122	Band	10 feet inby Station No. 5488, No. 4 entry Daniel mains.	84.3	None
V-123	Band	10 feet inby Station No. 5486, No. 3 entry.	70.7	None
V-124	Band	10 feet inby Station No. 5438, No. 3 entry Daniel mains.	47.6	None
V-125	Band	10 feet inby Station No. 5436, No. 4 entry Daniel mains.	80.4	None
V-126	Band	10 feet inby Station No. 5535, No. 3 entry Daniel mains.	65.3	None
V-127	Band	10 feet inby Station No. 5206, No. 3 entry Daniel mains.	53.3	None
V-128	Band	10 feet inby Station No. 5242, No. 4 entry Daniel mains.	80.7	None
V-129	Band	10 feet inby Station No. 5338, No. 5 entry Daniel mains.	54.5	None
V-130	Band	10 feet outby Station No. 6048, No. 12 entry Pine Ridge.	49.8	None
V-131	Band	10 feet outby Station No. 5989, No. 11 entry Pine Ridge.	54.5	None

Sheet 19

Can No.	Samples of Dust From	Location in Mine	As Rec'd. Percent Incomb.	Alcohol Coke Test Coked Particles Present (Amount)
V-132	Band	10 feet outby Station No. 5940, No. 10 entry Pine Ridge.	64.7	None
V-133	Band	10 feet outby Station No. 4703, No. 9 entry Pine Ridge.	56.0	None
V-134	Band	90 feet outby Station No. 621, No. 8 entry Pine Ridge.	42.7	None
V-135	Band	90 feet outby Station No. 6020, No. 7 entry Pine Ridge.	69.4	None
V-136	Band	10 feet outby Station No. 5937, No. 6 entry Pine Ridge.	68.7	None
V-137	Band	10 feet outby Station No. 6050, No. 6 entry Pine Ridge.	24.3	None
V-138	Band	90 feet inby Station No. 6020, No. 7 entry Pine Ridge.	52.4	None
V-139	Band	90 feet inby Station No. 6021, No. 8 entry Pine Ridge.	95.7	None
V-140	Band	90 feet inby Station No. 6022, No. 9 entry Pine Ridge.	51.1	None
V-141	Band	90 feet inby Station No. 5990, No. 10 entry Pine Ridge.	32.7	None
V-142	Band	90 feet inby Station No. 6023, No. 11 entry Pine Ridge.	35.0	None

APPENDIX A

VICTIMS OF EXPLOSION, NO. 34 MINE

POCAHONTAS FUEL COMPANY, INCORPORATED

February 4, 1957

<u>Name</u>	<u>Age</u>	<u>Occupation</u>	<u>Marital Status</u>	<u>Number of Dependents</u>
Ralph Altizer	38	Foreman	Married	5
Harvey Bailey	38	Shuttle-Car Operator	Married	5
Walter Pat Carter	43	Stoper Operator	Married	2
Wallace J. Chafin	28	Loading-Machine Operator	Married	5
Kern Delayne Coleman	27	Shuttle-Car Operator	Married	4
Frank B. Collins	47	Shot Fireman	Married	3
Stacey Lionel Couch	31	Electrician	Married	3
Lowell W. Crockett	42	Boomman	Married	4
Kenneth B. Dillon	29	Stoper Operator	Married	4
Robert Lee Dudley	53	Stoper Operator	Married	5
Paul Farrington	31	Cutting-Machine Operator	Married	3
Sam Garzant	60	Bratticeman	Married	3
Clarence Gravely	42	Stoper Operator	Married	10
Kelly Hicks	45	Cutting-Machine Operator	Married	2
Dallas Carl Johnson	50	Shot Fireman	Married	8
Gordon J. Keene	29	Shuttle-Car Operator	Married	5
Jack Dewey Kern	30	Cutting-Machine Operator	Married	4

<u>Name</u>	<u>Age</u>	<u>Occupation</u>	<u>Marital Status</u>	<u>Number of Dependents</u>
Rovie R. Levitt	54	Boonman	Married	2
Clarence E. McGraw	41	Loading-Machine Operator	Married	6
Sylvie Fremont Myers	39	Foreman	Married	2
Elbert Nunley	44	Boonman	Married	3
Raymond Owensby	36	Foreman	Married	4
James L. Parnell	31	Loading-Machine Operator	Married	5
Blaine Rowe, Jr.	33	Loading-Machine Operator	Married	4
Manuel H. Sencion	51	Loading-Machine Operator	Married	4
Fred B. Sensabaugh, Jr.	33	Loading-Machine Operator	Married	3
Edward Rufus Shell	32	Shuttle-Car Operator	Single	1
Luther P. Short	45	Bratticeman	Married	7
Jesse R. Smith, Jr.	25	Shuttle-Car Operator	Married	3
James E. Thompson	45	Bratticeman	Single	None
Jesse Carl Vance	29	Stoper Operator	Single	None
Hansel W. Viers	34	Shuttle-Car Operator	Married	4
Joseph Wargo, Jr.	34	Shuttle-Car Operator	Married	4
Edd Lee Watkins	43	Cutting-Machine Operator	Married	6
Walter M. Whitt	32	Loading-Machine Operator	Married	6
Clyde Wright	36	Electrician	Married	8
Mack Blaine Wright	43	Electrician	Married	5