

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

DISTRICT B

FINAL REPORT OF MAJOR MINE FIRE AND EXPLOSION DISASTER
MARS NO. 2 MINE 46-01313
CLINCHFIELD COAL COMPANY
(DIVISION OF THE PITTSBURGH COMPANY)
WILSONBURG, HARRISON COUNTY, WEST VIRGINIA

October 16, 1965

By

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CONTENTS

	PAGE
Introduction.....	1
General Information.....	2
Mining Methods, Conditions, and Equipment.....	3
Mining Methods.....	3
Explosives.....	3
Ventilation and Gases.....	3
Dust.....	4
Transportation.....	5
Electricity.....	5
Illumination and Smoking.....	7
Mine Rescue.....	7
Story of Fire and Explosion and Recovery Operations.....	8
Participating Organizations.....	8
Activities of Bureau of Mines Personnel.....	8
Mining Conditions Immediately Prior to Mine Fire and Explosion.....	9
Evidence of Activities and Story of Fire and Explosion..	9
Recovery Operations.....	10
Investigation of Cause of Mine Fire and Explosion.....	13
Investigation Committee.....	14
Explosive Gases as a Factor in the Explosion.....	15
Flame.....	15
Forces.....	15
Probable Point of Origin.....	15
Factors Preventing Spread of Explosion.....	15
Summary of Evidence.....	16
Cause of Fire and Explosion.....	17
Recommendations.....	17
Acknowledgment.....	19
Table 1 - Analyses of Dust Samples	
Appendix	
A - Victims of Mine Fire and Explosion	
B - Fan Chart and Enlarged Segment Fan Chart	
C - Sketch of Partly Dismantled 557AW Marietta Miner	
D - Map of Entire Mine Showing Bodies and Mine Fire	
E - Map Showing Extent of Forces and Flame and Other Pertinent Details	

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INTRODUCTION

This report is based on an investigation made in accordance with provisions of the Federal Coal Mine Safety Act (66 Stat. 692; 30 U.S.C. Secs. 451-483).

A mine fire occurred about 10:50 p.m., Saturday, October 16, 1965, along the north mains track haulageway at the junction of west mains in the Mars No. 2 mine. Subsequent thereto an explosion of the distillate by-products from burning coal and other combustibles engendered in the presence of high temperatures and low or diminishing oxygen-air content occurred about 11:45 p.m., shortly after the main ventilating fan, which had been purposely stopped by a foreman for 15 to 20 minutes, was restarted.

At the time of the fire 10 men were in the mine; 2 foremen and 5 workmen were engaged in miscellaneous work in by the scene of the occurrence, and a foreman and 2 workmen were trammings the continuous mining machine (Marietta Miner) involved in the fire. Six men were found dead from asphyxiation and one man was found unconscious; however, he died en route to a hospital. The foreman and two workmen engaged in trammings the continuous miner escaped without incident via the drift portal.

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

The fire was initiated by a short circuit when the top of the traction pump drive on a stripped-down continuous mining machine being trammed on the north mains track haulageway contacted the energized trolley and/or trolley feeder wires.

The ensuing electric arcing and flame ignited the rubber belting used for insulation on top of the traction pump drive, head coal and ribs, hydraulic hoses, and oil. Bureau of Mines investigators believe the explosion originated at the scene of the fire when the intentional stopping of the main ventilating fan permitted an accumulation of distillate by-products from burning coal and other combustibles produced in the presence of high temperatures and low or diminishing oxygen-air content and that the resultant gases were ignited when enriched and moved into the fire zone when the fan was restarted. Forces of the explosion extended through the north mains entries outby the fire to No. 1 right panel, a distance of about 1,800 feet, and were dissipated as they traveled toward the drift openings and through the fan shaft.

GENERAL INFORMATION

The Mars No. 2 mine, 1 mile north of Wilsonburg, Harrison County, West Virginia, along the Sardis Road, is serviced by the Baltimore and Ohio Railroad. The names and addresses of the operating officials are:

President	George L. Judy	Dante, Virginia
Vice President	Adler E. Spotte	Clarksburg, West Virginia
Manager of Mines	Cleon Fowler	Clarksburg, West Virginia
Superintendent	Henry B. Price	Clarksburg, West Virginia
Safety Director	Louis Sabo	Clarksburg, West Virginia
General Mine Foreman	William Post	Clarksburg, West Virginia

A total of 160 men was employed; 140 worked underground, 3 shifts a day, 5 days a week, and produced an average of 3,100 tons of coal daily, all loaded mechanically. Production in 1964 was 978,998 tons of coal. The mine is opened by 3 drifts and a shaft 146 feet in depth into the high-volatile Pittsburgh coalbed, which averages 80 inches in thickness in the present mining area and dips slightly south to north. The floor is soft shale. The immediate roof is about 10 inches of coal left to help support a fragile shale, which varies in thickness. Clay veins, rolls, slips, and horsebacks are encountered. The main roof is laminated limestone and the maximum cover is approximately 300 feet.

The analysis of a raw coal sample taken from the Pittsburgh coalbed in the company's nearby Compass No. 2 mine is as follows:

	<u>Percent</u>
Volatile Matter	41.10
Fixed Carbon	47.57
Ash	11.33

Numerous tests by the Bureau of Mines have shown that coal dust having a volatile ratio of 0.12 and higher is explosive. The volatile ratio of the coal from the aforementioned analysis is 0.46 percent, indicating that the coal dust is explosive.

The last regular Federal inspection of the Mars No. 2 mine was completed August 18, 1965, and a spot-check inspection was made September 2, 1965.

MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods

A block system of mining was followed. Multiple entries in sets of four to nine were 12 to 15 feet wide, and crosscuts were made at intervals of 80 to 105 feet. The north mains entries from the drift portal to the junction of No. 2 right panel, a distance of 4,000 feet, were developed with conventional mechanical equipment and ranged from 12 to 14 feet in width. Inby this junction, a borer-type continuous miner was used to develop the north mains entries which were about 12 feet wide. Prior to the disaster, mining in two sections was accomplished with conventional mechanical equipment; a Lee-Norse ripper and a Marietta borer-type continuous mining machine were used in two other coal-producing sections. Pillars were being partially extracted in two working sections. Roof bolts were being used in all active areas throughout the mine and they were installed in full compliance with recommendations of the Bureau's roof-control representative at the completion of the last Federal inspection. Wooden and steel crossbars and posts were used to supplement the bolts where abnormal roof conditions were encountered and also in pillar workings.

Explosives

Permissible explosives and detonators were properly stored in separate magazines on the surface and they were satisfactorily transported into the mine in a specially constructed explosives car; they were stored in specially constructed and suitably located section boxes underground. The coal in conventional equipment sections was topcut and sheared, then blasted on shift with permissible explosives fired with permissible blasting units by shot firers who made suitable roof and gas tests. Blasting practices were satisfactory during the last Federal inspection.

Ventilation and Gases

The mine is classed gassy by the West Virginia Department of Mines and the United States Bureau of Mines. Ventilation was induced by an axial-flow fan operated exhausting, satisfactorily installed on the surface, and operated continuously; except that the fan was intentionally stopped shortly after the fire started for about 20 minutes as indicated on the 7-day pressure-recording chart (see Appendix B). The fan develops a negative pressure of 8.0 to 8.3 inches water gage during normal operations. The volume of return air measured at the bottom of the shaft during the August 1965 Federal inspection was 239,100 cubic feet a minute; total methane liberation from the mine was calculated to be 516,000 cubic feet in a 24-hour period. Overcasts and permanent stoppings were constructed of incombustible material. Main doors were not used or needed. Check curtains and line brattices were used to conduct air to the face areas. Intake air enters the mine through the three drift openings and, because No. 1 entry is not developed outby 2 right, the air is coursed through Nos. 2, 3, and 4 entries to the junction of No. 2 right, thence through Nos. 3, 4, 5, and 6 entries to the west mains junction

(fire area); Nos. 1 and 2 and Nos. 7 and 8 north main entries are utilized as return airways. A split of intake air is directed into the west mains section to the face area through Nos. 3, 4, 5, and 6 entries and then coursed through Nos. 1 and 2 and Nos. 7, 8, and 9 airways into the main returns. The north mains inby the west mains junction is ventilated by coursing a split of intake air to the faces through the Nos. 1 to 6 entries and then into the main returns through Nos. 7 and 8 entries. The air from all parts of the mine is returned to the upcast fan shaft. Each section was ventilated by a separate split of air, and more than 10,000 cubic feet of air a minute was passing through the last open entry crosscuts in each set of entries, and at least 6,000 cubic feet of air a minute was being delivered to the intake end of the pillar lines; face ventilation was adequate at the close of the last Federal inspection. Preshift examinations were made by certified officials before the first operating shift each day; preshift examinations for succeeding shifts were made by the on-shift officials during their regular tour of duty. On-shift examinations for gas and other hazards were made by face bosses, mine foremen, shot firers, and operators of electrical face equipment. When necessary, an auxiliary fan, powered with a permissible driving unit, was used with the borer-type continuous miner in 1 left off west mains. The fan was being operated under Appeal Docket No. A-458, granted by the Joint Industry Safety Committee October 15, 1963. Gas wells penetrated the coal bed; however, the map of the mine indicated that suitable blocks of coal were left around the wells.

Dust

During the August 1965 Federal inspection, the mine surfaces ranged from dry to definitely wet. The major portions of the mine, including the face areas, haulageways, and parallel and back entries, were wet at that time. Water sprays were used on the two continuous miners, on all roof-bolting machines, and at several of the main belt heads to allay the dust at its source. During the last Federal inspection, dangerous quantities of loose coal and coal dust were observed at three locations along the belt conveyor entries; the loose coal and dust were removed promptly and additional rock dust was applied in these areas.

Uniform dust surveys have been made in this mine since it was opened. After the explosion, examination of the north mains entries outby the west mains junction (fire area) revealed that the No. 4 belt conveyor entry and the No. 5 parallel entry had deposits of coal dust and soot. These deposits of dust decreased as the explosion forces were dissipated in traveling outby the No. 2 right panel. Apparently the application of rock dust in the entries inby the junction of west mains and outby the 2 right panel prevented further spread of the explosion. During the investigation, a total of 177 samples of mine dust were collected inby and outby the fire area and in areas affected by the explosion.

Of the 151 dust samples collected in the north mains entries affected by the explosion, 61 contained less than 65 percent incombustibles, and 52 of the 151 samples collected contained coke ranging from traces to large; 7 of the 26 samples collected along the west mains entries inby the fire and explosion areas had less than 65 percent incombustibles (see table 1).

Dust samples collected after the explosion along the north mains entries outby the west mains junction were not representative of mine dust conditions prior to the explosion, as coal dust thrown into suspension and deposited on rock-dusted surfaces decreased the incombustible content.

Transportation

Coal was hauled in shuttle cars from the face regions to well-installed fire-resistant belt conveyors, which transported the coal to the surface. The supply-track haulageway and the haulage equipment were maintained in reasonably good condition. A measurement made 100 feet outby the junction of 2 right along the haulage track entry (the end of conventional mining development) showed the distance from the floor to the roof to be 68 inches. Other measurements made inby 2 right on the track haulage entry at 100-foot intervals to the west mains junction showed distances from the floor to the roof to be from 61 to 72 inches.

Men were transported in covered man-trip cars and in open-type personnel carriers.

A two-way Femco Pagephone communication system was provided between the surface and underground.

Electricity

Electric power, at 110, 220, 440, 4,160, 7,200, and 23,000 volts alternating current and 300 volts direct current, was used on the surface, and 440, 4,160, and 7,200 volts alternating current and 300 volts direct current was used underground. Electric power, 23,000 volts alternating current, was purchased from a public utility company. This electric power was reduced to 7,200 volts alternating current at the Katylick borehole, located about 2,100 feet inby the drift portals, by a 1,500-Kv.-a, 3-phase transformer delta-wye connected for underground transmission. The 7,200 volts alternating current is conducted underground through the Katylick borehole by a 4/0, 3-conductor, ground check mine power Simplex neoprene jacketed cable protected by an oil breaker located on the surface, and set to trip on a 240-ampere load equipped with ground-fault tripping adjusted to trip the oil breaker on a 2-1/2-ampere ground fault. A monitoring system is used which trips the oil circuit breaker in the event the ground circuit is broken. The grounded wye connected system was also provided with current-limiting resistors.

An oil circuit breaker, installed underground 800 feet from the bottom of the borehole and set to trip on a 200-ampere load, provides overload and ground-fault protection for the underground high-voltage system. An oil circuit breaker installed at the entrance to west mains, set to trip at 120 amperes, provides additional overload and ground-fault protection for the high-voltage system in west mains. The underground oil circuit breakers of the high-voltage system were tripped on ground fault; this was indicated by targets of the ground-fault relays. It is believed stray current from the direct-current short circuit caused the relays to operate. The 300 volts direct current was provided by four conversion units, one 300 kw. General Electric ignitron rectifier with a trip setting of 1,500 amperes located on the surface, and two 300 kw.

rectifiers and one 200 kw. rectifier located underground; all stations were connected for parallel operation. The automatic overload breakers for the underground rectifiers were set to trip at 1,200 to 1,600 amperes. Load measuring relays, voltage reclosing relays, and ampere reclosing relays were provided on the control panel of each rectifier. The 300 volts direct current was distributed throughout the mine by 1,000,000 circular-mil copper feeder and No. 9 section trolley wire in the negative circuit, and 60-pound track rails paralleled by 1,000,000 circular-mil feeder for the positive circuit. The track and parallel feeder were bonded and crossbonded where necessary. The trolley feeder wire was supported by U-hangers and porcelain insulators. The trolley wire was installed on bell-type insulators 8 to 20 feet apart, at least 6 inches outside the rail and had a vertical clearance ranging from 54 to 69 inches from the top of the rail along the haulage from 2 right to west mains. Circuit protection for the direct current trolley and feeder system is provided by automatic time delay reclosing type General Electric A.D. 1 circuit breakers at the rectifier stations. These breakers are set to trip according to power demand or kw. rating of the rectifier. Load measuring relays, voltage relays, and current relays, component parts of the automatic breakers, measure the load of a short circuit or overload and prevent the breaker from reclosing at a predetermined value. The predetermined values are usually set at 200 volts and 400 amperes. When the mining machine contacted the trolley and/or trolley feeder wires, the ensuing arcing did not draw sufficient current to trip the automatic breaker or prevent it from reclosing. The automatic breaker at Katylick substation was functioning properly, as it tripped when the explosion blew out an overcast and a metal portion of the overcast fell on the trolley wire. Later, when the trolley wire was cut near this location, the automatic breaker reclosed and provided power for transportation. It is believed that the power supply from other stations ceased after the initial fault due to the ground-fault tripping of the a.c. oil breakers which supplied power for the inby rectifiers. Parallel or multiple operations such as employed at this mine create a fire hazard from short circuits. When a short circuit occurs, power will be fed into the fault from distant substations and power may not be removed by automatic breakers if there is a deficiency in current-carrying capacities of the conductors for the distance of power transmission or high settings of the substation circuit breakers. The economical solution for improving the safety of this power-distribution system is to reduce the total length of the circuit from any one station by isolating the substations with dead blocks.

Disconnecting switches were provided in the direct current system along north mains three crosscuts outby the bottom of the Katylick borehole through which the circuit entered and at the drift portal outby the borehole. A disconnecting switch was installed in the trolley circuit inby the north mains borehole switch but means to deenergize the power was not provided for the parallel feeder at this location. A trolley and feeder switch was located at the substation near the entrance to 10 right off north mains inby the aforementioned trolley wire switch. Disconnecting switches were installed in the trolley and feeder circuits at the beginning of west mains, at the 1 left substation inby the beginning of west mains, and at the substation inby 1 left substation.

A permissible-type Marietta miner, Model 557 AW, manufactured by the National Mine Service Company and designed to operate on 440 volts alternating current, was involved in the fire. Due to the restricted overhead and side clearance along the route the continuous miner was to be trammed, the machine was partly dismantled on the surface by removing the cutter heads, conveyor discharge boom, and other related component parts. The overall length of the dismantled continuous miner was 185 inches and the height from the bottom of the caterpillars to the top of the traction pump drive was 55-3/4 inches. Rubber belting was placed on top of and draped over the machine on the wire side and tied in place as insulation against contact with the trolley and trolley feeder wires.

A 35-horsepower, 250-volt direct current motor and a hydraulic pump were temporarily mounted on the rear bumper of the continuous miner to provide hydraulic power for the tramping system (see Appendix C). A personnel carrier was chained to the rear of the continuous miner to provide power through a cable attached to the trolley slide of the carrier to the direct current motor. The hydraulic system of the continuous miner had a capacity of 230 gallons of oil, but the maintenance supervisor estimated that only about 160 gallons of oil was in the machine when it left the surface shop. This hydraulic fluid was flammable and was consumed by the fire. The electric face equipment was of the permissible and nonpermissible types and the permissible-type equipment was in permissible condition at the close of the last Federal inspection. The trailing cables on the mobile equipment were fire resistant and protected by both automatic circuit breakers and fused nips.

Illumination and Smoking

Permissible electric cap lamps were used for portable illumination underground, and smoking was prohibited and was not observed during any Federal inspection; searches were made regularly for smokers' articles.

Mine Rescue

A State trained and fully equipped mine rescue team, made up of company personnel, was maintained at the company's Mars No. 2 mine. The company also had mine rescue teams at the Compass Nos. 2 and 3 mines. Several other well-trained and equipped mine rescue teams of other coal companies were available at nearby mines.

Self-rescuers were provided for employees underground and were kept in boxes in the working areas of the various sections. Some of the employees who moved from place to place over considerable areas carried self-rescuers on their belts, but other such employees did not carry self-rescuers; however, management stated that self-rescuers were given to all persons who requested them.

Emergency escapeways from each working section to the surface were in safe condition for travel and reasonably free from obstructions. Sufficient direction signs were not posted to indicate escape routes.

Firefighting facilities included a 4-inch waterline installed along the belt entries to near the face areas. Outlets were provided at approximately 400-foot intervals along the waterlines. Fire hoses, 2-1/2-inch adaptors, nozzles, and other fittings were available at strategic locations underground. Dry-type chemical fire extinguishers, 4-, 10-, and 20-pound sizes, and supplies of rock dust were also kept on equipment and at other necessary places underground. Also, an emergency automatic sprinkling system was installed at each belt-conveyor drive. A play-pipe-type extinguisher and a supply of foam concentrate were provided in each active section and a foam-generating machine with a supply of foam concentrate was also available at the company's nearby Compass No. 2 mine Dola portal for firefighting purposes.

Weekly safety meetings were held for 10-minute periods at the dinner hole in each section. Various phases of accident prevention and safety pertaining to the employees and the mine were discussed. Reportedly, fire drills had been conducted occasionally.

STORY OF FIRE AND EXPLOSION AND RECOVERY OPERATIONS

Participating Organizations

Representatives of Christopher Coal Company, Clinchfield Coal Company (Division of the Pittston Company), Eastern Associated Coal Corp., Joame Coal Company, Mountaineer Coal Company, United Mine Workers of America, West Virginia Department of Mines, and United States Bureau of Mines participated in the firefighting and recovery operations.

Activities of Bureau of Mines Personnel

W. D. Baldwin, Federal Coal Mine Inspector, was notified of the occurrence at 12:15 a.m., Sunday, October 17, 1965, by a telephone call from Henry B. Price, superintendent of Mars No. 2 mine. Baldwin immediately notified Federal Coal Mine Inspector Roy C. Estep of the occurrence who in turn called John J. Dougherty, Acting Subdistrict Manager. Dougherty instructed inspectors W. R. Melville, W. D. Baldwin, and Roy C. Estep to go to the mine immediately and ascertain what had happened, and then call him back promptly with details. Melville arrived at the mine about 1:15 a.m. and Baldwin and Estep shortly thereafter. When Estep obtained definite information that a fire followed by an explosion had occurred and seven men were unaccounted for, he called Dougherty by telephone about 2 a.m. and acquainted him with all the available information. In the meantime, W. F. Eigenbrod, Director, West Virginia Department of Mines, had informed W. R. Park, District Manager, by telephone of the incident and Park immediately contacted James Westfield--Assistant Director, Health and Safety, and Dougherty. Dougherty and Inspector McManus arrived at the mine about 4 a.m., and Park arrived about 7 a.m. James Westfield arrived at the mine during the afternoon of October 17.

The following Bureau personnel arrived at the mine at various times following the disaster, and they assisted with recovery operations and the investigations: Robert W. Brown, Jerry Collier, Paul J. Compton, W. M. Cordray, Mike Delridge, Joseph J. Dobis, Mike Dorazio, Matthew I. Duncan, W. L. Evans,

Peter N. Fanok, Wilfred S. Hobbs, L. L. Layne, Cecil E. Lester, Joseph Marshalek, M. W. McManus, C. D. McMaster, Harry T. Pigott, Carl J. Shaffer, and Harrison C. Summers.

Withdrawal Orders, mine fire and explosion dangers, were issued October 17, 1965, debarring all persons from the Mars No. 2 mine, except those needed for exploratory and recovery work. Before the Orders were issued, management had withdrawn all men from the mine, except those mentioned above.

Mine Conditions Immediately Prior to Mine Fire and Explosion

The mine was idle Saturday afternoon, October 16, 1965, except for 10 men doing miscellaneous work and the traming of the continuous mining machine to the west mains entries. The reports of the examinations by the fire boss and section foremen indicated that conditions were normal, and unusual conditions were not reported for the 4 p.m. to 12 midnight shift on October 16, 1965.

Evidence of Activities and Story of Fire and Explosion

Production of coal from the mine ceased at 12 o'clock midnight Friday, October 15, 1965, and plans were made to tram, on October 16 and 17, a partly dismantled Marietta borer-type continuous mining machine from the surface to west mains faces, a distance of approximately 10,800 feet. The machine was partly dismantled to facilitate traming through restricted areas. Traming of the Marietta miner was started about 2:15 a.m., Saturday, October 16, 1965, and continued during the following shift (8 a.m. to 4 p.m.). The continuous miner was tramed without incident from the drift portal to No. 2 right panel sidetrack, a distance of 4,000 feet, during the two shifts. Clell Leedy, section foreman, and three men assigned to move equipment in 10 right off north mains, and Charles Lantz, section foreman, and two men who were to continue traming the machine to west mains entered the mine at the start of the 4 p.m. shift Saturday, October 16, 1965. Bernard Keener, afternoon-shift foreman, and two men remained on the surface to fill the tank rock-dusting machine with rock dust and upon completion of this task went into the mine. Two men went to 1 left off west mains where they were to spend the remainder of the shift rock-dusting the section; Keener went to 10 right off north mains to check on the progress of the work there. When the rock-dusting machine and crew passed by the junction of 2 right panel, the continuous miner was backed out of the 2 right sidetrack switch and traming of the machine was continued on the track haulageway towards west mains junction. Upon returning from 10 right off north mains, Keener assumed the supervision of the traming operation, and Lantz was to spend the remainder of the shift supervising the rock-dusting operation in 1 left off west mains and make the preshift examinations of that area. As the continuous miner approached the junction of west mains, because of scant vertical clearance, the top of the traction pump drive of the machine came in contact with the energized trolley and/or trolley feeder wires. The resultant short circuit caused intense arcing and flame that ignited the coal roof and ribs, rubber belting used as insulation, and later hydraulic hoses and oil. Keener, who was standing approximately 30 to 40 feet behind the continuous miner when the fire started, instructed the two men to try to extinguish the fire while he proceeded by personnel carrier to the power switches to deenergize the power circuits. He deenergized the alternating-current power circuit at the oil switch located about 300 feet outby the

fire and then continued to the borehole power station where he pulled the cutout switch in the direct-current feeder circuit. In order to utilize the personnel carrier which received its power from the trolley wire, Keener had to reclose the aforementioned cutout switch. On arrival at the lamp house he tried to contact the trapped men by Pagephone but received no response. He then immediately notified Henry B. Price, superintendent, by telephone at his home of the fire and suggested that the main ventilating fan be stopped to prevent smoke from entering the inby sections where the seven men were working. Price concurred with Keener on stopping the fan, and he (Keener) proceeded immediately to shut down the main ventilating fan. Meanwhile, Jerry Povroznik and Albin Zbosnik, the two men at the continuous miner, expended the contents of a small fire extinguisher and applied 15 to 20 bags (50 pounds) of rock dust to the fire. When these efforts were ineffective, Povroznik, while getting a hose about 100 feet outby the fire, also tried unsuccessfully to contact the entrapped men by Pagephone. After the hose was connected to a nearby waterline, water was applied to the burning materials, but with the stoppage of the fan both men were forced to retreat because of the rollback of dense smoke. They met Keener near the 2 right overcast as he was returning to the fire after having stopped the fan; they informed him of the fire situation and all three men then returned to the surface.

During the preliminary firefighting efforts and while men were still entrapped, no attempt was made to restrict the flow of air over the fire nor to short circuit the contaminated air from the fire to the return.

Measurements taken between the top of the rail and trolley wire at 100-foot intervals for a distance of 400 feet outby the origin of the fire ranged from 54 to 58 inches. The Marietta continuous miner measured 55-3/4 inches from the bottom of the caterpillars to the top of the traction pump drive. The two men tramping the continuous miner stated that the machine or belting were not in contact with the power wires in this area. However, they did testify that the unit being trammed was in contact with the trolley wire immediately before the fire occurred. Employees also testified during the official hearing that mining equipment had come in contact with the power circuit at the west mains junction on three different occasions while such equipment was being trammed into or out of the mine prior to this occurrence.

Recovery Operations

About 1 a.m., October 17, 1965, after the fan had been restarted, Louis Sabo, safety director, Steve Povroznik, section foreman, from the company's Compass No. 2 mine, Albin Zbosnik, continuous-miner operator, Jerry Povroznik, bolt-machine operator, and Teeney Southern, mechanic, entered the mine to ascertain the extent of the fire and atmospheric conditions inby the fire. Because the power circuits were deenergized, these men coasted on a personnel carrier with the trolley pole slide against the wire into the mine as far as No. 2 right, where they found the first evidence that an explosion had occurred. A mine car was blown across the main track haulageway preventing further travel on the vehicle; Sabo and Steve Povroznik then donned gas masks and explored to the second inby overcast where smoke was encountered. They also found that both overcasts were destroyed and the metal portion of the second overcast was on the trolley wire. The trolley wire was cut with an axe; this removed the short circuit, and the direct current system became energized. Thereupon the men boarded the vehicle and returned to the surface.

Sabo reported the conditions found on the exploration trip to high company officials and then tried to reach the entrapped men by Pagephone without success. About 1:30 a.m. the same day, a man was stationed on the surface at the new 8-inch borehole, which had been previously drilled into the No. 1 entry west mains; he remained at this station shouting into the borehole and tapping on the borehole casing until all bodies were recovered.

About 2:30 a.m., the first mine rescue team, accompanied by company, State, and Bureau of Mines personnel, entered the mine and traveled to the junction of 2 right. The rescue party checked the outby stoppings between the main intake and return airways and found several man doors in the stoppings blown out. Then the rescue team using apparatus explored inby 2 right and discovered that some stoppings between the main intake and return airways were blown out; the air was short-circuited and several incipient fires were found on the No. 5 entry between survey stations 522 and 578 (see Appendix E). A total of 21 incipient fires were extinguished quickly at these locations.

Representatives of the Clinchfield Coal Company, United Mine Workers of America, West Virginia Department of Mines, and United States Bureau of Mines worked in close unison in directing both the rescue operations and firefighting, and all parties concurred in the decisions made concerning these operations.

While the blown-out man doors in stoppings outby 2 right were being replaced, air locks were used to reestablish ventilation in explored areas of north mains to the fire area; this was done to minimize forcing undiluted combustible gas, by-products of the fire, over the burning material. Because 12 stoppings on the right and 4 stoppings on the left sides of north mains and 5 of the 6 overcasts at 2 right were destroyed, it was necessary to explore all entries in north mains while wearing protective equipment. A fresh-air base was established just inby 2 right; a mine rescue team using self-contained oxygen breathing apparatus explored 250 to 500 feet, erected temporary stoppings across all the entries at the inby end of exploration, installed plastic stoppings between the intake and return airways where the permanent stoppings had been blown out, and then returned to the fresh-air base. One or more fully equipped rescue teams were kept in readiness at the fresh-air base to deal with an emergency should it arise during exploratory operations. The area explored was ventilated progressively until all smoke and by-products from the fire were removed and fresh air was extended to the fire area (junction of west mains). The firefighting activities were then confined to containing the fire by the application of water, while mine rescue teams concentrated on directing fresh air into west mains. A split of intake air was directed into Nos. 1 and 2 entries (originally return airways), and then plastic stoppings were erected across Nos. 3, 4, and 5 entries about 600 feet inby the fire area. This move provided a split of intake air free of smoke to enter the west mains sections and then return through the Nos. 7 and 8 entries.

About 1:45 p.m., an exploration party traveled approximately 1,000 feet inby the regulators in Nos. 2 and 3 entries where they encountered smoke and concentrations of carbon monoxide. After this group returned to the junction of west mains, additional intake air was directed into the Nos. 2 and 3 entries west mains. About 3:30 p.m., when the smoke and concentrations of carbon monoxide were cleared from the west mains entries, an exploration party traveled to the faces of Nos. 1 and 2 entries 1 left west mains. When this

group did not locate any of the entrapped men, they returned to the junction of north and west mains. Thereafter, rescue crews continued the exploration of west mains, and at 9:05 p.m., October 17, 1965, Charles Lantz, section foreman, was found unconscious in No. 4 entry approximately 4,600 feet inby the fire area. Lantz, who had an unused self-rescuer in his possession, was immediately removed to the surface; he died en route to a local hospital. About 1:50 a.m., October 18, 1965, the bodies of Carl Banish and Kenneth Kerr were located in No. 3 entry about 2,000 feet inby the fire. After removal of these two bodies to the surface, the rescue crews concentrated their efforts on penetrating the north mains section where it was hoped the four men unaccounted for would be found barricaded and alive. The necessary ventilation change was soon made and rescue operations started inby the fire area. About 6:30 a.m., the bodies of the remaining four men were located in the No. 3 entry about 1,600 feet inby the fire area (see Appendix D). The body of the last victim was brought to the surface about 7:30 p.m., October 18, 1965. The location of the bodies and other discernible evidence indicated the entrapped men vainly tried to escape their entrapment. Lantz had opened several man doors in west mains between the intake and return airways.

The 7 entrapped men when found had in their possession 13 self-rescuers. Upon examination 2 of these self-rescuers, which were attached by the cords around the necks of the victims found outby 1 left off west mains, had the inner and outer lids detached from the cartridges indicating that they could have been used; however, the nose clips were not in place. Two extra unused self-rescuers were carried by the aforementioned men. A self-rescuer removed from the cannister but not activated for use was found in the carrying receptacle on the belt of Lantz, section foreman, who was found unconscious on the west mains track haulageway; an unused self-rescuer found near the west mains faces may have been discarded by Lantz. The four victims in north mains had seven self-rescuers in their possession; however, no evidence was found to indicate that attempts were made to use them. Immediately after the bodies of the victims were brought to the surface all work was directed to fighting the fire by direct methods. While water was being applied at several points of the fire, work was started to reenforce and tighten the plastic stoppings which were erected during the initial exploratory trips and to replace the temporary stoppings with concrete-block stoppings. While this work was in progress, other temporary stoppings and checks were erected and the ventilation was so arranged as to utilize fresh-air splits on both the east and west sides of the fire. The amount of air permitted to pass over the fire was limited to that necessary to carry off smoke and other by-products of combustion and yet permit men to work in proximity of the fire. During the next twelve 8-hour shifts, work continued in applying water to the fire, timbering and roof bolting, and replacing all the temporary stoppings. On Thursday afternoon, October 21, 1965, management considered the outby end of the fire to be cooled sufficiently to warrant loading out the falls and hot material on the track entry; loading was started about 7:10 p.m. that evening. As work progressed, ventilation was maintained to the point of loading and water was hosed on the hot material constantly; in addition, perforated pipe lances, through which water was forced, were driven into the fallen hot material in advance of the loading machine. Water was applied on the hot material as it was discharged from the boom of the loading machine into shuttle cars and also as it was discharged on the conveyor belt from the shuttle car.

On October 22, 1965, loading of the hot materials on the track entry had advanced to the personnel carrier, which was recovered and removed from the mine. On October 26, 1965, the continuous miner was uncovered; it was pulled by a hoist outby the junction of west mains, dismantled, and removed from the mine. During the next 7 days, work continued loading out the hot material from the north mains track and belt conveyor entries, in crosscuts connected thereto, and from a crosscut to the right of the north mains belt conveyor entry. As the loading progressed in the aforementioned areas, the roof and ribs were supported by crossbars, posts, and numerous roof bolts.

On November 2, 1965, an examination was made of the west mains and 1 left off west mains to determine conditions in these areas preparatory for a planned ventilation change. Conditions were found favorable in west mains, and the following day some stoppings were erected, overcasts at 2 right were repaired, and regulators in Nos. 7 and 8 entries west mains were closed. Intake air was then directed into the No. 4 (track) entry west mains and returned through Nos. 1 and 2 airways to 2 right overcasts into the main returns. At this time, loading operations were resumed in the west mains belt conveyor entry.

On November 13, 1965, 27 days after the fire occurred, loading of the hot material was completed. The fire area was then cooled with water and kept under surveillance for several shifts. About 2,325 shuttle cars of material from the fire area were loaded and transported from the mine by belt conveyors. Roof falls in the fire area ranged to a height of 35 feet, hence supporting roof and ribs in the fire area was hazardous. To expedite the installation of roof bolts in the roof and ribs and perform such work as safely as possible, the fire materials were loaded out in two lifts. The first (top) lift consisted of all material within 8 to 10 feet of the roof and was kept 40 to 50 feet ahead of the second lift. This method of loading out the fire material permitted employees to install bolts in the roof and ribs promptly and with relative safety. This procedure also made possible bolts to be installed on an average of about a foot apart, and permitted the effective application of water to "hot" spots quickly and easily. No one was injured during the entire recovery operations.

A special inspection was made of the Mars No. 2 mine on November 22-23, 1965, and the dangers described in the withdrawal Orders issued October 17, 1965, were found to be partially abated to the extent that on November 23, 1965, the Acting Director of the Bureau of Mines revised the Orders to permit resumption of production in all the mine except in north mains inby a line 125 feet inby the junction of west mains and in 10 right off north mains.

INVESTIGATION OF CAUSE OF MINE FIRE AND EXPLOSION

A formal investigation of the mine fire and explosion was made on November 13, 1965, by company officials, representatives of United Mine Workers of America, West Virginia Department of Mines, and by the United States Bureau of Mines.

Investigation Committee

The investigation committee consisted of:

Clinchfield Coal Company (Division of the Pittston Company)

Adler E. Spotte	Vice President
Cleon Fowler	Manager of Mines
Henry B. Price	Superintendent
Louis Sabo	Safety Director

United Mine Workers of America

Leonard Pnakovich	Vice President, District 31
Steve Nikses	President, Local No. 1334
Ralph Wallen	Chairman, Safety Committee
John Morton	Member, Safety Committee

West Virginia Department of Mines

W. F. Eigenbrod	Director
Leslie C. Ryan	Inspector-at-Large
John M. Ashcraft	Assistant Inspector-at-Large
Ewell Snuffer	District Mine Inspector

United States Bureau of Mines

James Westfield	Assistant Director--Health and Safety
W. R. Park	District Manager
John J. Dougherty	Acting Subdistrict Manager
Joseph J. Dobis	Federal Coal Mine Inspector
Joseph Marshalek	Federal Coal Mine Inspector
C. D. McMaster	Federal Coal Mine Electrical Inspector

A detailed examination of the area affected by the fire and explosion was carefully made by the entire investigating committee. To expedite the work, the committee was divided into two groups, each composed of representatives of the respective agencies. Each group was provided with a mine map properly inscribed so that when the examination was completed each agency had a complete record of the findings.

The West Virginia Department of Mines conducted an official preliminary hearing in the mine rescue room at the Company's Compass No. 2 mine, October 22, 1965, and a final official hearing November 29, 1965, at Clarksburg, West Virginia. The hearings were headed by W. F. Eigenbrod, Director, assisted by other State personnel. Mr Eigenbrod invited representatives of the Clinchfield Coal Company, the United Mine Workers of America, and the Bureau of Mines to participate in the interrogation of any person who may have information regarding events prior to and at the time of the mine fire and explosion.

Explosive Gases as a Factor in the Explosion

The circumstances under which the gases accumulated and the soot residue from the fire and/or explosion when studied and analyzed indicate the gases that entered into the explosion were primarily the distillate by-products of coal engendered in the presence of high temperatures and low or diminishing oxygen-air content. The gases so engendered contained several of the hydro-carbons, carbon monoxide, and possibly a small amount of free hydrogen.

Flame

Evidence of heat or flame, in the form of soot and coke, was observed in all eight of the north mains entries for distances of approximately 2,350 feet outby the junction of west mains and 600 feet inby this junction. Twenty-one smoldering fires were found and extinguished on the floor between No. 4 belt entry and No. 6 entry about 1,350 feet outby the origin of the explosion. A total of 177 dust samples was collected in the north mains entries inby and outby the fire area, and in the west mains entries inby the fire area. The results of analyses 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 flame was fixed; 52 of the 151 dust samples collected in north mains inby and outby the fire and explosion area contained coke ranging in quantities from traces to large.

Forces

Forces of the explosion radiated from the fire area and traversed all but Nos. 1 and 8 entries in north mains for distances of about 1,800 feet outby and 600 feet inby. Twelve of the 13 concrete block stoppings destroyed between Nos. 6 and 7 entries in north mains were blown toward the No. 5 entry and the other one toward No. 7 entry. Four stoppings between Nos. 2 and 3 entries in north mains were displaced toward No. 2 entry. Man doors in stoppings not damaged were either blown off or blown open toward the No. 1 entry. Five overcasts inby 2 right were destroyed and one was damaged. Portions of the No. 3 north mains conveyor belt and structure in No. 4 entry were blown toward No. 3 entry and an empty steel mine car parked in the 2 right track switch was blown onto the north mains haulageway. Forces of the explosion also reached the surface as one of the explosion doors at the fan was blown open. Forces of the explosion dissipated rapidly after reaching the 1 right junction and traveled toward the drift openings (see Appendix E).

Probable Point of Origin

The fire originated on the north mains track haulageway at the junction with the west mains track entry followed by an explosion in the fire area about 55 minutes later.

Factors Preventing Spread of Explosion

The areas affected by the explosion are shown on the mine map (Appendix E). None of the belt conveyors in the mine contained coal at the time of the explosion, and the absence of coal on the belts helped to prevent the forces of the explosion from spreading. Apparently the applications of rock dust throughout the mine and in the explosion area kept coal dust from entering extensively into and prevented the further spread of the explosion.

Summary of Evidence

Conditions observed in the mine during recovery and firefighting operations and the investigation following the disaster, together with information available from previous Federal coal mine inspection reports and that obtained from hearings and company officials, workmen, and mine records, provided evidence as to the cause and origin of the fire and explosion. The evidence from which the conclusions of the Federal investigators are drawn is summarized as follows:

1. A partly dismantled Marietta continuous miner was being trammed on the main track haulageway to the west mains.
2. A foreman and two men were working in 1 left off west mains engaged in rock-dusting operations, and a foreman and three men were moving equipment in 10 right off north mains.
3. Measurements between the top of the rail and trolley wire taken at 100-foot intervals for a distance of 400 feet outby the origin of the fire ranged from 54 to 58 inches, and the height of the Marietta continuous miner from the bottom of the caterpillars to the top of the traction pump drive was 55-3/4 inches. The two men tridding the continuous miner testified that the rubber belting on the machine was pressed against the trolley wire when it was stopped immediately before the fire occurred.
4. Other mine equipment either being trammed into or out of the mine contacted the power circuit at the west mains junction on three previous occasions.
5. About 10:50 p.m., while the continuous miner was being trammed, the top of the traction pump drive on the machine contacted the trolley and/or trolley feeder wires at the west mains junction; the resultant short circuit caused intense arcing and flame that ignited the coal roof and ribs, rubber belting used as insulation, and later hydraulic oil.
6. Disconnecting switches were not installed in the direct current trolley and trolley feeder lines in the north mains haulage entry to permit effective deenergizing of the circuits.
7. The intensity and duration of the arcing resulted from improper or inadequate short-circuit protection in the direct-current power system.
8. An employee was not on duty on the surface where he could receive and dispatch emergency calls emanating in the mine.
9. No attempt was made to restrict the velocity of the air over the fire and reduce the amount of smoke and gases coursed by the air current into the inby mine workings, nor was any attempt made to short circuit the contaminated air from the fire into the return.
10. The main ventilating fan was intentionally stopped; after a stoppage of 15 to 20 minutes it was restarted.

11. Immediately after the fan was restarted, an explosion occurred when an accumulation of distillate by-products of burning coal and other combustibles produced in the presence of high temperatures and low or diminishing oxygen-air content was coursed over the fire and ignited.
12. The location of the bodies when found indicated that the entrapped men had tried to reach safety; arrows and chalk markings made by the victims on stoppings and track rails were found in north mains.
13. Six men died from asphyxiation following the mine fire and explosion; a foreman found unconscious 22 hours later died presumably of carbon monoxide poisoning while en route to a hospital.
14. Only 2 of the 13 self-rescuers found in the possession of the 7 victims showed evidence of attempts to use them.
15. Coke found in the 52 of the 151 dust samples collected in north mains entries indicated that coal dust assisted to a limited degree in the propagation of the explosion.
16. Flammable hydraulic oil added to the duration and intensity of the fire.

Cause of Fire and Explosion

This fire occurred when a continuous miner being trammed in the mine came in contact with the energized trolley and/or trolley feeder wires; the resultant short circuit caused intense arcing and flame that ignited the coal roof and ribs, rubber belting used as insulation, and later hydraulic hoses and oil. The stopping of the main fan permitted the generated explosive gases to accumulate in and around the fire zone, and with the restarting of the fan, some of the oxygen-enriched gases were moved into the fire area where they were ignited.

RECOMMENDATIONS

The following recommendations are made to prevent similar disasters:

1. Men should not be permitted to work in areas that are ventilated with air coursed over large bulky equipment being moved along travel routes having scant clearances and energized power wires.
2. When large bulky equipment is being moved along haulageways having energized power wires and scant clearances, the power wires should be deenergized in the area through which the equipment is being moved.
3. Adequate short-circuit protection, properly installed and used, should be provided for the underground direct-current power system.
4. Disconnecting switches should be provided in both the trolley and trolley feeder wires at not more than 2,000-foot intervals and near the beginning of all branch lines.

5. Officials, haulage crews, electricians, and others engaged in moving equipment along haulageways should be made familiar with the location of cutout switches.
6. As quickly as possible, the quantity of air coursed over an active fire should be regulated to the minimum amount necessary to keep the fire area reasonably free of smoke and gases.
7. When men are known to be entrapped in by an active mine fire, every possible effort should be made to short circuit the contaminated air from the fire into the returns as promptly as circumstances will permit.
8. While men are underground, an employee should be available on the surface to dispatch emergency calls emanating underground.
9. The main ventilating fan should not be intentionally stopped when the safety of men is involved without due consideration and consultation with company, duly authorized representatives of mine workers, State, and Federal officials.
10. When the ventilating fan is stopped following an emergency, it should not be returned to operation until after a carefully considered discussion is held by responsible company, duly authorized representatives of mine workers, State, and Federal officials.
11. Rock dust shall be distributed uniformly on the roof, ribs, and floor and maintained in such quantity that the incombustible content of the combined rock dust, coal 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.
12. All persons who travel about in the mine should carry a self-rescuer on their person or equipment, and all underground employees should be acquainted with the availability of and be instructed in the use, care, and limitations of a self-rescuer.
13. All underground personnel should be instructed on procedures that should be followed in the event of an emergency, such as a fire or explosion underground. These instructions should include information on barricading, especially information on when, where, and how to erect barricades.
14. Underground workmen should be thoroughly trained in firefighting procedures, and fire drills should be held regularly.
15. Fire-resistant fluids should be used in the hydraulic systems of mining equipment.
16. Sufficient direction signs should be posted conspicuously to indicate the escapeways.

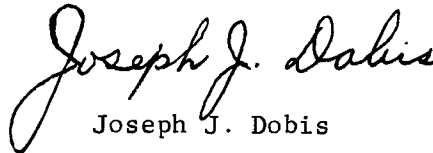
Since the occurrence of the fire and explosion, all accumulations of coal dust in the west mains entries and north mains entries outby the junction have been cleaned up and these areas adequately rerock-dusted; an oil circuit

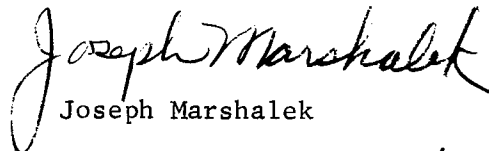
breaker for the high-voltage system was installed within 500 feet of the bottom of the borehole; cutout switches have been provided in the trolley wires and trolley feeder wires at not more than 2,000-foot intervals and near the beginning of all branch lines, and the direct-current power system has been sectionalized by use of dead blocks and sectionalizing I-T-E type KSC breakers. Training of employees in the use, care, and limitations of self-rescuers has been started. Suitable and adequate firefighting equipment is provided when bulky mining machinery is being transferred underground.

ACKNOWLEDGMENT

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

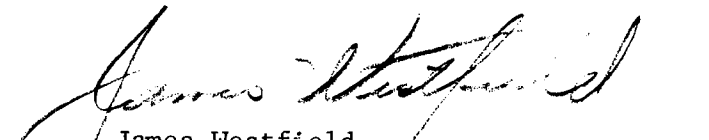
Respectfully submitted,



Joseph J. Dobis


Joseph Marshalek


C. D. McMaster

Approved by:


James Westfield
Assistant Director--Health and Safety


Walter R. Hibbard, Jr.
Director

LAB. NOS. 160567-160682

Sheet No. 1

TABLE 1 ANALYSES OF DUST SAMPLES

DATE COLLECTED October 20 and 25 and November 12, 1965

Pittston Company Mike Derazic

MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek and

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE
			EXPLOSION SAMPLES		
			No. 1 survey following mine fire and explosion sampling area in north main entries outby fire area		
			C = centerline No. 2 entry north mains at station 158 + 30 feet		
			No. 1 entry		
			not developed from 0 + 00 to 0 + 1,600'		
160567	A10	roof and ribs	0 + 1,800'	trace	60.5
160568	A11	same	0 + 2,000'	trace	58.5
160569	A12	same	0 + 2,200'	trace	54.5*
160570	A12X	band	0 + 2,200'	small	77.7
160571	A13	roof and ribs	0 + 2,400'	none	54.0*
160572	A14	same	0 + 2,600'	none	74.0*
160573	A15	same	0 + 2,800'	none	67.5*
160574	A15X	same	0 + 2,800'	none	67.1
160575	B1	same	0 + 0	none	52.0*
160576	B2	same	0 + 200'	none	71.5*
160577	B3	band	0 + 400'	none	84.0*
160578	B3X	"	0 + 400'	none	92.5*
160579	B4	roof and ribs	0 + 600'	none	70.5*
160580	B5	same	0 + 800'	none	50.0*
160581	B6	band	0 + 1,000'	none	66.3
160582	B6X	"	0 + 1,000'	none	70.5*
160583	B7	"	0 + 1,200'	none	66.0*
160584	B8	roof and ribs	0 + 1,400'	none	48.0*
160585	B9	same	0 + 1,600'	none	54.5*
160586	B9X	band	0 + 1,600'	none	70.5*
160587	B10	roof and ribs	0 + 1,800'	trace	43.5*

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED October 20 and 25 and November 12, 1965
 MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek and Mike Dorazio
 Pittston Company

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE
160588	B11	band	0 + 2,000'	trace	73.0*
160589	B12	"	0 + 2,200'	small	72.0
160590	B12X	"	0 + 2,200'	trace	55.2
160591	B13	"	0 + 2,400'	small	64.1
160592	B14	"	0 + 2,600'	small	64.3
160593	B15	"	0 + 2,800'	large	45.8
	B15X		no sample, crosscut gobbled No. 3 entry (track haul- ageway)		
160594	C1	"	0 + 0	none	71.5*
160595	C2	"	0 + 200'	none	90.0*
160596	C3	"	0 + 400'	none	89.5*
160597	C3X	"	0 + 400'	trace	74.0*
160598	C4	"	0 + 600'	none	75.0*
160599	C5	"	0 + 800'	none	83.0*
160600	C6	"	0 + 1,000'	none	92.0*
160601	C6X	"	0 + 1,000'	none	87.5*
160602	C7	"	0 + 1,200'	none	88.0*
160603	C8	"	0 + 1,400'	none	81.5*
160604	C9	"	0 + 1,600'	none	75.0*
160605	C9X	"	0 + 1,600'	small	65.0
160606	C10	"	0 + 1,800'	trace	77.0*
160607	C11	"	0 + 2,000'	small	58.4
160608	C12	"	0 + 2,200'	none	78.0*
160609	C12X	"	0 + 2,200'	small	64.6
160610	C13	"	0 + 2,400'	trace	54.0*
160611	C14	"	0 + 2,600'	none	52.5*
	C15	"	0 + 2,800'		
			no sample, fire area No. 4 entry (belt entry)		
160612	D1	"	0 + 0	none	81.0*
160613	D2	"	0 + 200'	none	51.5*

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED October 20 and 25 and November 12, 1965
 MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalak and Mike Dorazio
 Pittston Company

IAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE
160614	D3	band	0 + 400'	none	74.0*
160615	D3X	roof and ribs	0 + 400'	none	81.0*
160616	D4	band	0 + 600'	none	71.0*
160617	D5	"	0 + 800'	none	60.5
160618	D6	"	0 + 1,000'	none	27.5*
	D6X	"	0 + 1,000'		
160619	D7	"	0 + 1,200'	none	50.0*
160620	D8	"	0 + 1,400'	large	47.8
160621	D9	"	0 + 1,600'	large	46.9
160622	D9X	"	0 + 1,600'	small	57.5
160623	D10	"	0 + 1,800'	trace	45.0*
160624	D11	"	0 + 2,000'	small	40.5
160625	D12	"	0 + 2,200'	large	38.7
160626	D12X	"	0 + 2,200'	large	63.6
160627	D13	"	0 + 2,400'	large	38.4
160628	D14	"	0 + 2,600'	small	29.0
	D15	"	0 + 2,800'		
			no sample, fire area No. 5 entry		
			no sample, wet		
160629	E1	roof and ribs	0 + 0	none	69.5*
160630	E2	same	0 + 200'	none	65.5*
160631	E3	same	0 + 400'	none	89.5*
	E3X	same	0 + 400'		
	E4	same	0 + 600'		
	E5	same	0 + 800'	none	48.5*
160632	E6	same	0 + 1,000'	small	58.1
160633	E6X	band	0 + 1,000'	small	62.4
160634	E7	"	0 + 1,200'	small	74.3
160635	E8	roof and ribs	0 + 1,400'	large	49.6
160636	E9	band	0 + 1,600'	large	55.8
160637	E9X	"	0 + 1,600'	large	63.2
160638	E10	"	0 + 1,800'	none	50.0*

TABLE 1 ANALYSES OF DUST SAMPLES

DATE COLLECTED October 20 and 25 and November 12, 1965
 Pittston Company
 Mike Dorazio

MINE Mars No. 2

COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek and

Mike Dorazio

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE
160640	E11	band	0 + 2,000'	none	75.5*
160641	E12	"	0 + 2,200'	trace	80.0*
160642	E12X	"	0 + 2,200'	trace	73.0*
160643	E13	"	0 + 2,400'	small	59.6
160644	E14	"	0 + 2,600'	small	75.1
160645	E15	"	0 + 2,800'	trace	69.5*
	E15X	"	0 + 2,800'		
160646	F1	"	0 + 0		60.6
160647	F2	"	0 + 200'	trace	72.0*
160648	F3	roof and ribs	0 + 400'	none	74.5*
160649	F3X	same	0 + 400'	none	72.5*
160650	F4	band	0 + 600'	trace	67.0*
	F5	"	0 + 800'		
160651	F6	"	0 + 1,000'	none	69.5*
160652	F6X	roof and ribs	0 + 1,000'	trace	63.0
160653	F7	same	0 + 1,200'	small	67.7
160654	F8	same	0 + 1,400'	none	72.5*
160655	F9	same	0 + 1,600'	none	76.5*
	F9X	band	0 + 1,600'		
160656	F10	"	0 + 1,800'	none	67.0*
160657	F11	"	0 + 2,000'	none	65.5*
160658	F12	"	0 + 2,200'	none	86.0*
160659	F13	"	0 + 2,400'	none	77.0*
160660	F14	"	0 + 2,600'	none	67.0*
	F15	"	0 + 2,800'		
	F15X	"	0 + 2,800'		
160661	G1	roof and ribs	0 + 0	none	71.0*
	G2		0 + 200'		

LAB. NOS. 160567-160682

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED October 20 and 25 and November 12, 1965
 MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek and Mike Dorazio
 Pittston Company

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE
160662	G3 G3X G4 G5	roof and ribs	0 + 400' no sample, wet no sample, not developed	none	34.0*
160663	G6	band	0 + 800'	trace	66.5*
160664	G6X	roof and ribs	0 + 1,000'	none	67.0*
160665	G7		0 + 1,200'	none	85.0*
160666	G8		0 + 1,400'	trace	69.9
160667	G9	same	0 + 1,600'	trace	80.0*
160668	G9X	band	0 + 1,600'	trace	72.0*
160669	G10	"	0 + 1,800'	none	39.0*
160670	G11	"	0 + 2,000'	none	79.0*
160671	G12	"	0 + 2,200'	none	69.2
160672	G12X	"	0 + 2,400'	none	84.0*
160673	G13	"	0 + 2,600'	none	79.0*
160674	G14	"	0 + 2,800'	none	70.0*
160675	G15 G15X	"	0 + 2,800'	none	82.0*
160676	H5 H6 H7 H8	roof and ribs	0 + 0 to 0 + 600' entry (back entry) No. 8 entry not developed no sample, wet same	none	73.7
160677	H9	band	0 + 1,000'	trace	75.0*
160678	H10	"	0 + 1,200'	trace	46.0*
160679	H11	"	0 + 1,400'	none	82.0*
160680	H12	"	0 + 1,600'	none	81.0*
160681	H13	"	0 + 1,800'	none	72.0*
160682	H14 H15	"	0 + 2,000'	none	75.0*
			0 + 2,200'		
			0 + 2,400'		
			0 + 2,600'		
			0 + 2,800'		
			floor wet		
			*By Volumeter		

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED October 26, 1965
 MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek
 Peter N. Fanok and

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	AS-RECEIVED PERCENT INCOMBUSTIBLE
			EXPLOSION SAMPLES	
			survey No. 2	
			following mine fire and explosion	
			sampling area = west main entries	
			0 = centerline No. 2 entry 50 feet outby station 1035	
			No. 1 entry (back entry)	
			0 + 0 no sample, not developed	
159691	2A1	band	0 + 200'	68.5*
159692	2A2	"	0 + 400'	75.0*
	2A3	"	0 + 400'	
	2A3X	"	0 + 400'	
			no sample, gobbled	
			No. 2 entry (back entry)	
159693	2B1	"	0 + 0	74.0*
159694	2B2	"	0 + 200'	83.5*
159695	2B3	"	0 + 400'	80.0*
159696	2B3X	"	0 + 400'	75.0*
			inby crosscut	
			No. 3 entry (back entry)	
159697	2C1	"	0 + 0	81.5*
159698	2C2	"	0 + 200'	77.0*
159699	2C3	"	0 + 400'	46.0*
159700	2C3X	roof and ribs	0 + 400'	61.4
			inby crosscut	
			No. 4 entry (track haulageway)	
159701	2D1	band	0 + 0	52.0*
159702	2D2	"	0 + 200'	61.6
159703	2D3	"	0 + 400'	30.5*
159704	2D3X	"	0 + 400'	75.0*
			inby crosscut	
			No. 5 entry (belt conveyor)	
159705	2E1	roof and ribs	0 + 0	67.7
159706	2E2	same	0 + 200'	66.1
159707	2E3	same	0 + 400'	76.0*
159708	2E3X	band	0 + 400'	50.0*

LAB. NOS. 159691-159716

Sheet No. 2

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED October 26, 1965

MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek Peter N. Fanok and

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	AS-RECEIVED PERCENT INCOMBUSTIBLE
159709	2F1	roof and ribs	No. 6 entry (parallel entry)	72.0*
159710	2F2	same		65.7
159711	2F3	same		77.0*
	2F3X		no sample, wet inby crosscut	
159712	2G1	band	No. 7 entry (back entry)	91.5*
159713	2G2	"		54.0*
159714	2G3	roof and ribs		79.0*
	2G3X		no sample, wet inby crosscut	
159715	2H1	band	No. 8 entry (back entry)	80.5*
159716	2H2	roof and ribs		83.0*
	2H3		no sample, wet	
			floor wet	

*By Volumeter

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED November 12, 1965

MINE Mars No. 2 COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph J. Dobis Joseph Marshall and Joseph Marshall

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE	
160683	3A1	band	EXPLOSION SAMPLES No. 3 survey following mine fire and explosion sampling area = north main entries inby fire area 0 = centerline = No. 1 entry north mains at station 998 + 40 feet No. 1 entry (back entry) inby crosscut No. 2 entry (back entry) inby crosscut No. 3 entry (track haul- ageway) inby crosscut No. 4 entry (belt conveyor entry)	none	87.0*	
160684	3A2	"		0 + 0	none	83.0*
160685	3A3	"		0 + 200'	none	75.5*
160686	3A3X	"		0 + 400'	none	81.0*
160687	3A4	"		0 + 400'	none	78.0*
160688	3B1	"		0 + 600'	trace	74.5*
160689	3B2	"		0 + 0	none	48.0*
160690	3B3	"		0 + 200'	none	72.0*
160691	3B3X	"		0 + 400'	none	70.5*
160692	3B4	"		0 + 400'	none	62.5
160693	3C1	"		0 + 600'	none	37.5*
160694	3C2	"		0 + 0	none	66.0*
160695	3C3	"		0 + 200'	none	49.5*
160696	3C3X	"		0 + 400'	none	74.5*
160697	3C4	"	0 + 400'	none	62.3	
160698	3D1	"	0 + 600'	small	48.2	
160699	3D2	"	0 + 0	small	24.1	
			0 + 200'			

LAB. NOS. 160683-160717

Sheet No. 2

TABLE 1 ANALYSES OF DUST SAMPLES DATE COLLECTED November 12, 1965

Pittston Company

Joseph J. Dobis

MINE Mars No. 2

COMPANY Clinchfield Coal Company, Division of the COLLECTED BY Joseph Marshalek and

LAB. NO.	CAN NO.	SAMPLE OF DUST FROM	LOCATION IN MINE	ALCOHOL COKE TEST	AS-RECEIVED PERCENT INCOMBUSTIBLE
160700	3D3	band	0 + 400'	small	58.5
160701	3D3X	"	0 + 400'	none	65.0
160702	3D4	"	0 + 600'	none	62.8
160703	3E1	"	0 + 0	small	51.3
160704	3E2	"	0 + 200'	none	65.5*
160705	3E3	"	0 + 400'	none	59.4
160706	3E3X	"	0 + 400'	none	70.5*
160707	3E4	"	0 + 600'	none	68.0*
160708	3F1	"	0 + 0	none	63.0
160709	3F2	"	0 + 200'	none	64.4
160710	3F3	"	0 + 400'	none	48.0*
160711	3F3X	"	0 + 400'	none	50.0*
160712	3F4	"	0 + 600'	none	72.0*
160713	3G1	"	0 + 0	none	62.8
160714	3G2	"	0 + 200'	none	60.7
160715	3G3	"	0 + 400'	none	67.0*
160716	3G3X	"	0 + 400'	none	78.5*
160717	3G4	"	0 + 600'	none	59.4
			no samples, entry wet in its entirety		
			No. 5 entry (parallel entry)		
			inby crosscut		
			No. 6 entry (parallel entry)		
			inby crosscut		
			No. 7 entry (back entry)		
			inby crosscut		
			No. 8 entry (back entry)		
			inby crosscut		

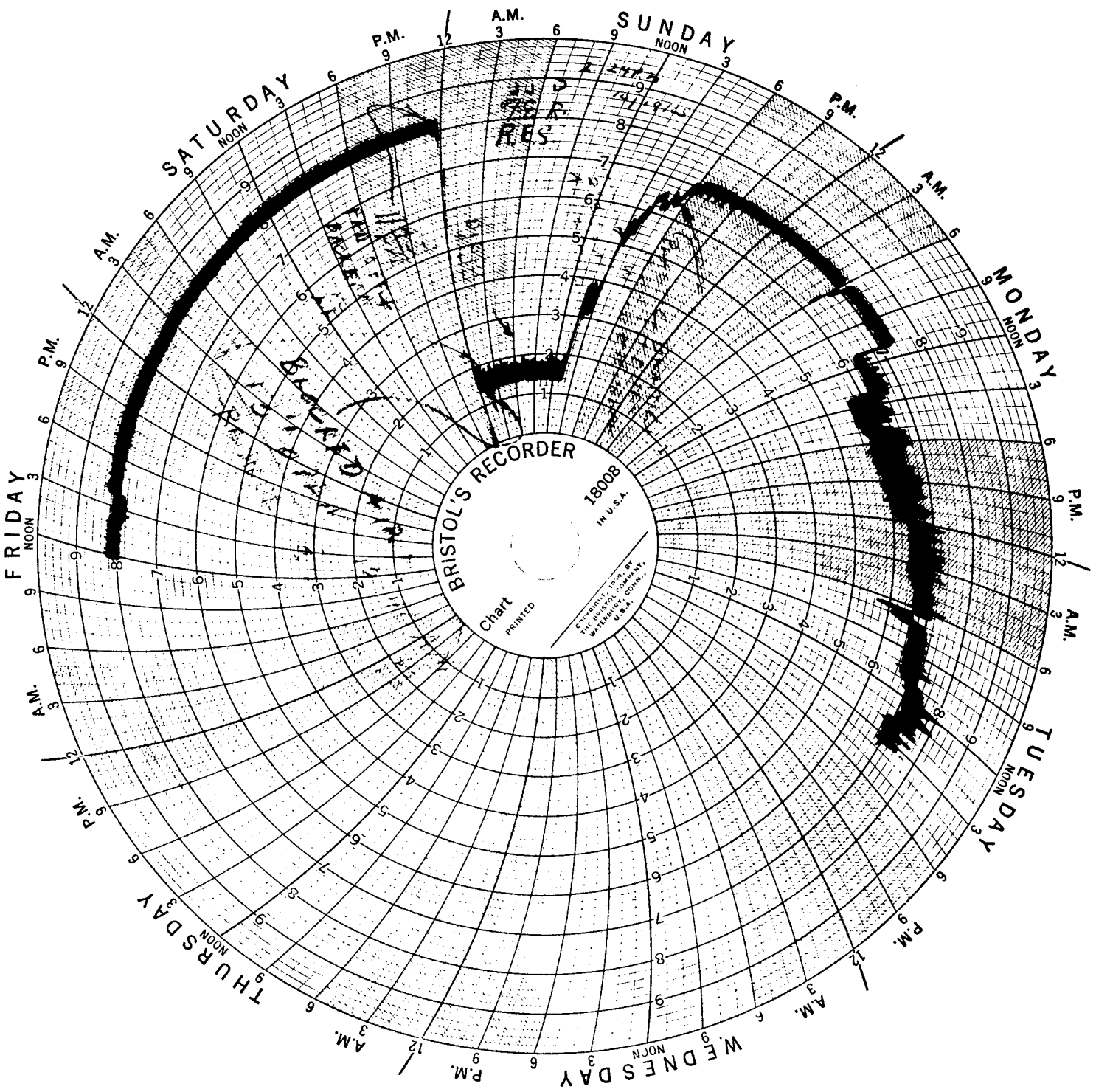
*By Volumeter

APPENDIX A

VICTIMS OF MINE FIRE AND EXPLOSION, MARS NO. 2 MINE

October 16, 1965

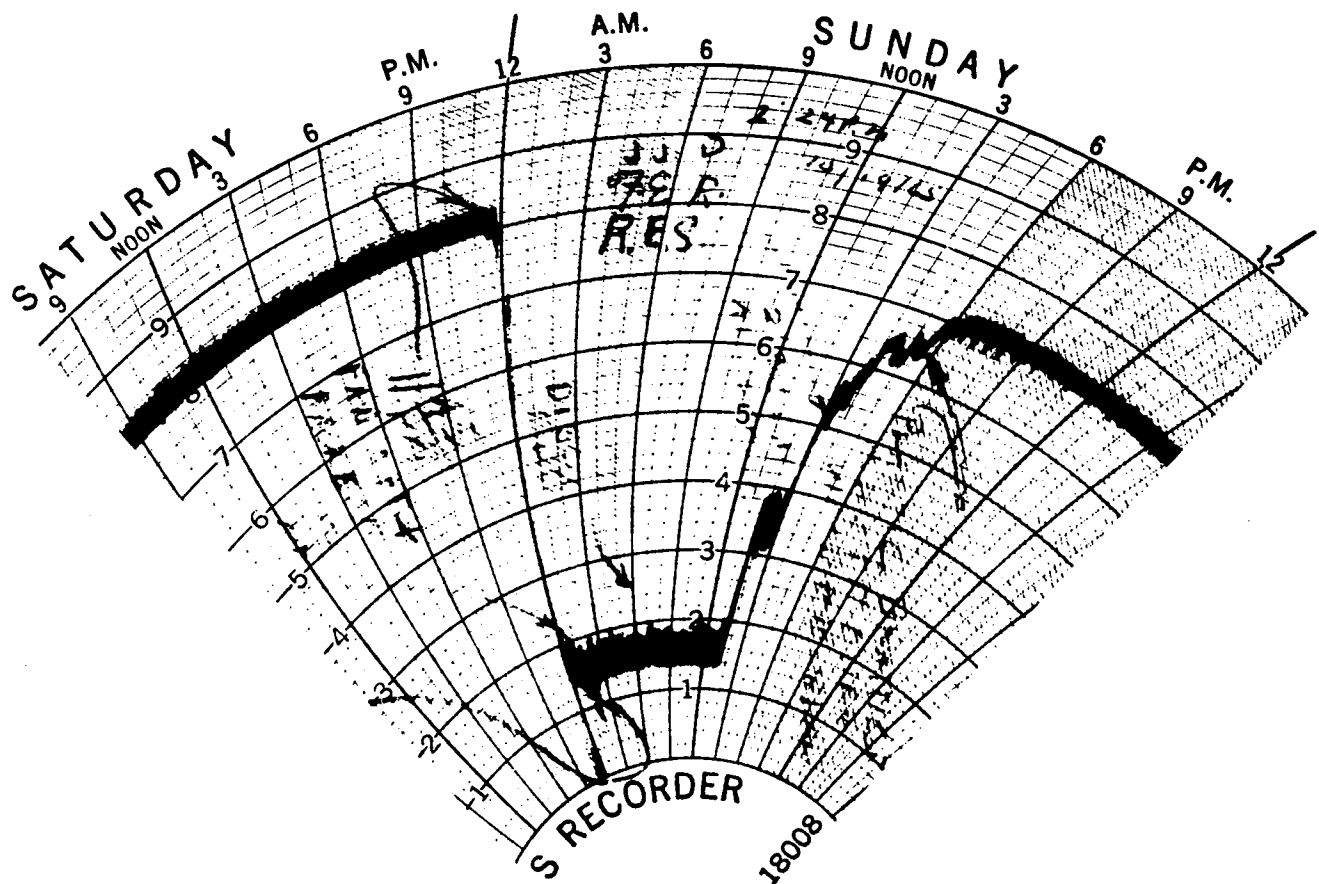
Name	Age	Occupation	Mining Experience	Marital Status	Number of Dependents
Carl Banish	45	Brakeman	26 years	Married	10
Kenneth Lee Kerr	44	Locomotive Operator	28 years	Married	1
Andy Kuroz	53	Loading-Machine Operator	28 years	Married	4
Charles Lantz	26	Section Foreman	5 years 5 months	Married	2
Clell Leedy	53	Section Foreman	2 years 5 months	Married	5
Issac G. Moats	39	Shuttle-Car Operator	16 years	Married	5
Robert A. Savage	56	Mechanic	39 years	Married	1



APPENDIX B

FAN CHART

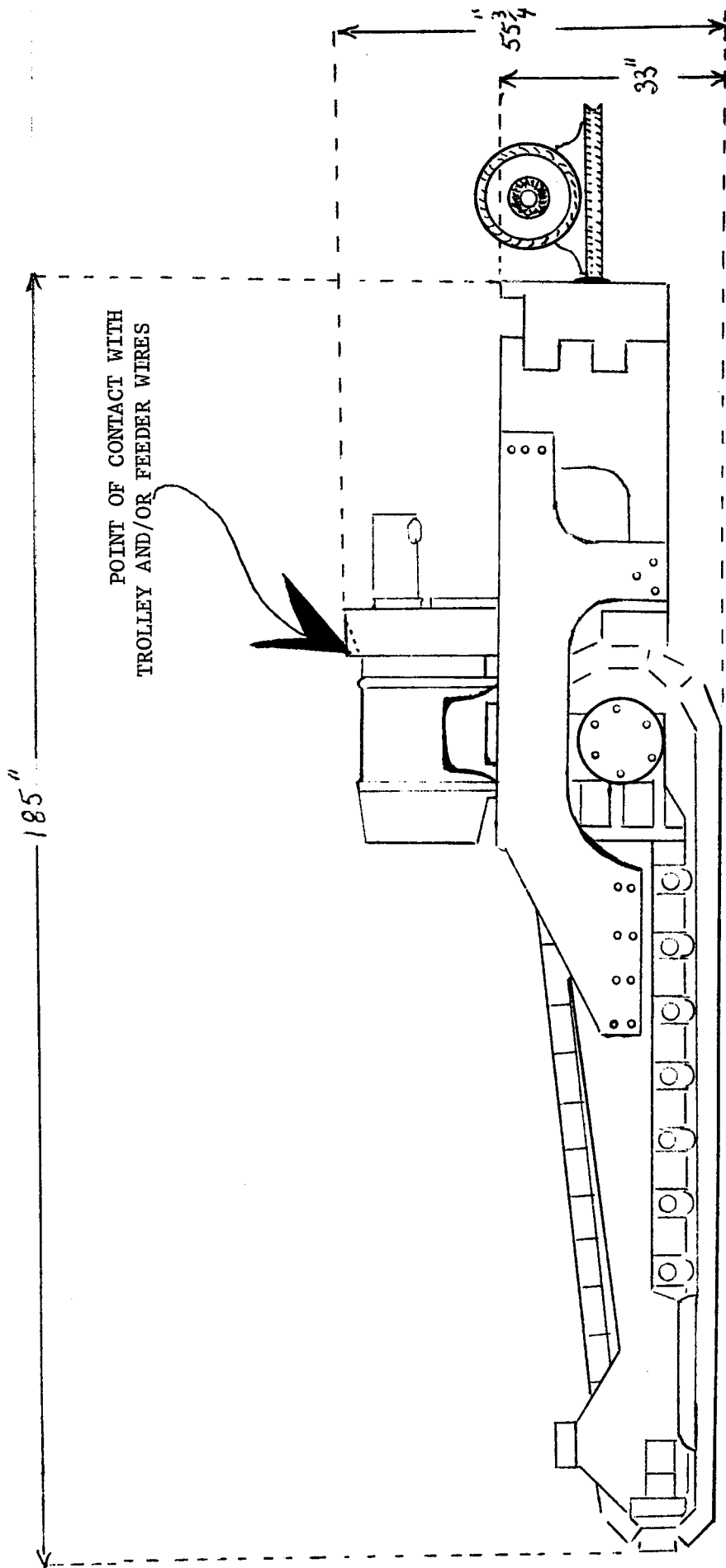
MARS NO. 2 MINE



APPENDIX B

ENLARGED SEGMENT FAN CHART

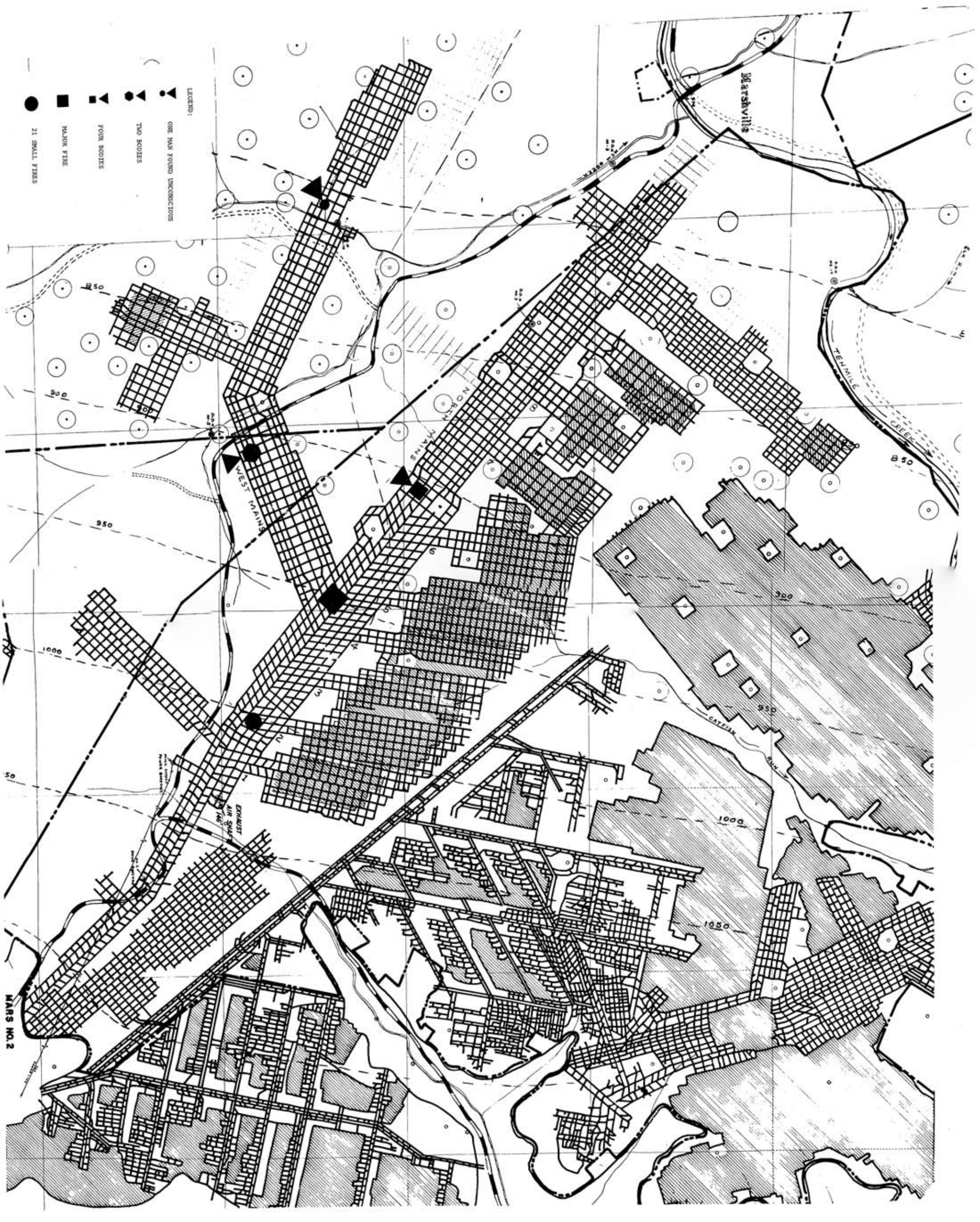
MARS NO. 2 MINE

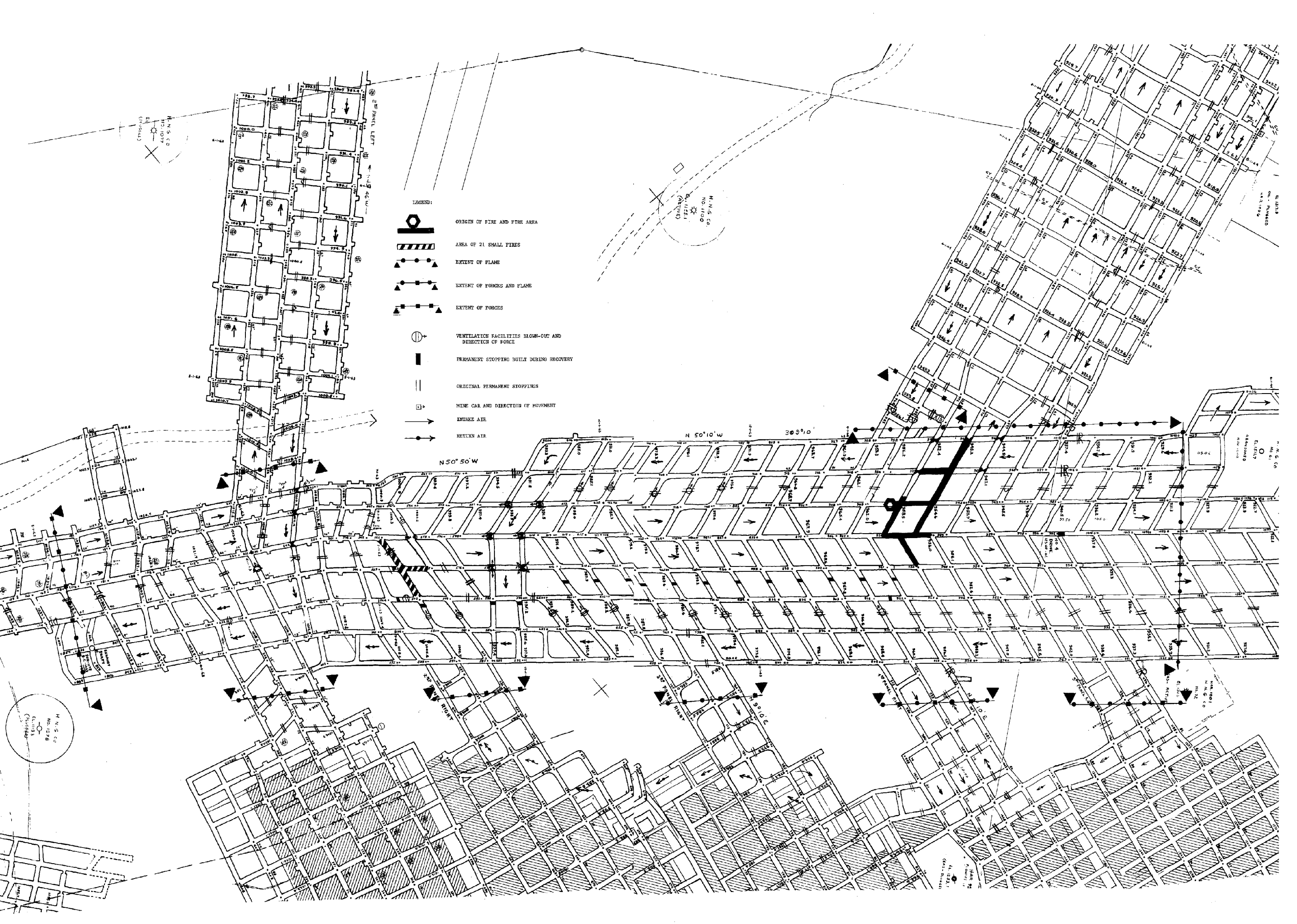


APPENDIX C












PARTLY DISMANTLED 557AW MARIETTA MINER

- LEGEND:
- ▲ ONE MAN FOUND UNCONSCIOUS
 - ▲ TWO BODIES
 - ▲ FOUR BODIES
 - ▲ MAJOR FIRE
 - 21 SMALL FIRES





LEGEND:

-  ORIGIN OF FIRE AND FIRE AREA
-  AREA OF 21 SMALL FIRES
-  EXTENT OF FLAME
-  EXTENT OF FORCES AND FLAME
-  EXTENT OF FORCES
-  VENTILATION FACILITIES BLOW-OUT AND DIRECTION OF FORCE
-  PERMANENT STOPPING BUILT DURING RECOVERY
-  ORIGINAL PERMANENT STOPPINGS
-  MINE CAR AND DIRECTION OF MOVEMENT
-  INTAKE AIR
-  RETURN AIR

M.N.S. CO.
SECTION NO. 1273
ELEVATION
M.N.S. CO.
SECTION NO. 1274

M.N.S. CO.
SECTION NO. 1275
ELEVATION
M.N.S. CO.
SECTION NO. 1276

N 50° 50' W

N 50° 10' W

M.N.S. CO.
SECTION NO. 1273
ELEVATION
M.N.S. CO.
SECTION NO. 1274

M.N.S. CO.
SECTION NO. 1275
ELEVATION
M.N.S. CO.
SECTION NO. 1276

M.N.S. CO.
SECTION NO. 1275
ELEVATION
M.N.S. CO.
SECTION NO. 1276