

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
HEALTH AND SAFETY ACTIVITY



HEALTH AND SAFETY REPORT

FINAL REPORT OF MAJOR MINE FIRE DISASTER
SUNSHINE MINE
SUNSHINE MINING COMPANY
KELLOGG, SHOSHONE COUNTY, IDAHO

May 2, 1972

By

Stanley M. Jarrett
Acting Assistant Deputy Director--Health and Safety

E. Levi Brake, Mining Engineer

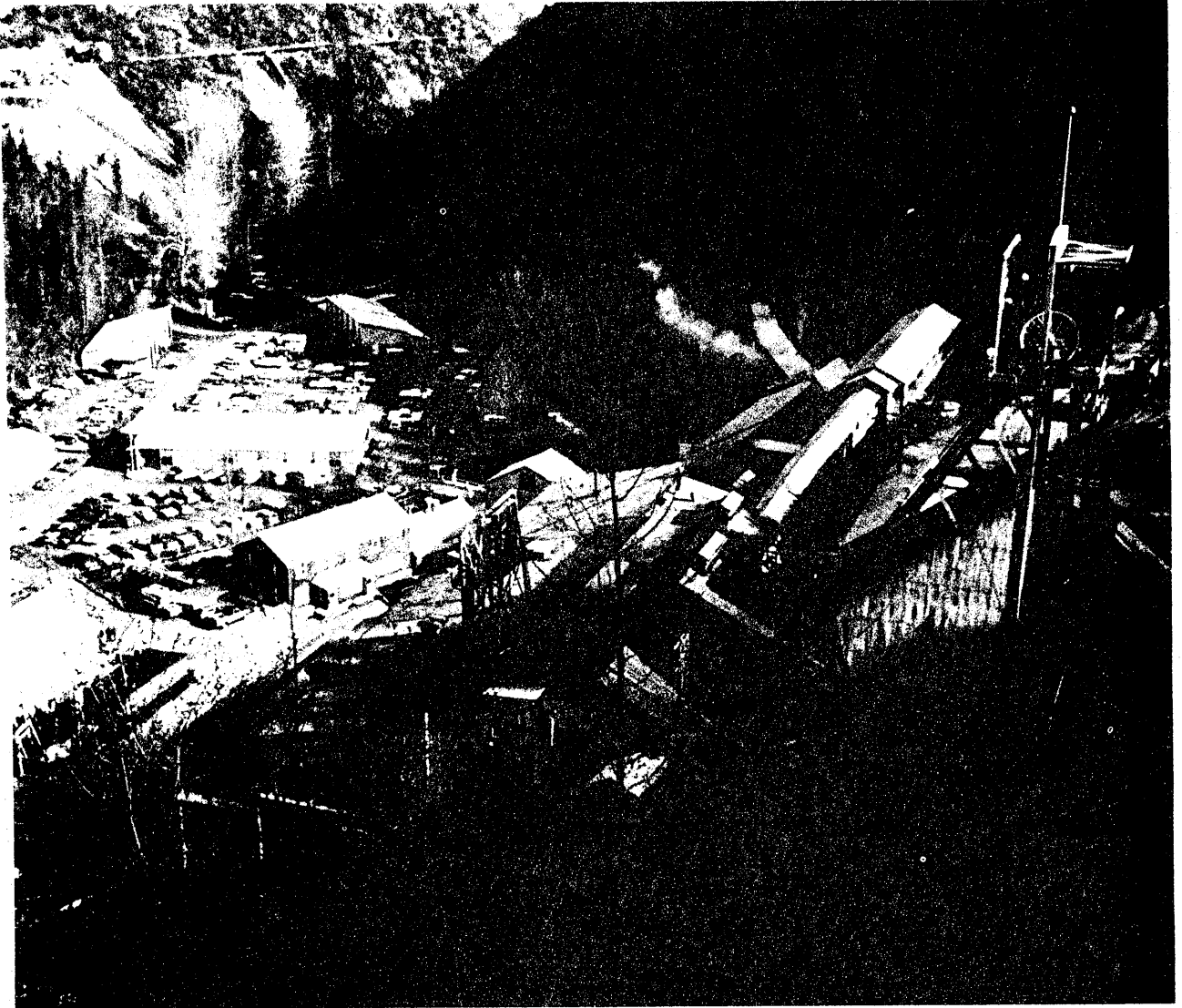
Robert E. Riley, Mining Engineer

Roland V. Wilson, Supervisory Mining Engineer

METAL AND NONMETAL MINE HEALTH AND SAFETY
WESTERN DISTRICT

A. D. Look
DISTRICT MANAGER

Originating Office
620 Central Ave., Bldg. 2F, Room 207
Alameda, California 94501



SUNSHINE MINE

CONTENTS

	<u>Page</u>
INTRODUCTION	1
ABSTRACT	2
GENERAL INFORMATION	4
MINING METHODS, CONDITIONS, AND EQUIPMENT	6
Mining Methods	6
Ventilation	6
Shafts and Hoisting	9
Escapeways	10
Electricity	10
Communications	11
Illumination and Smoking	11
Safety Program	12
Mine Rescue	12
Firefighting Facilities and Organization	13

	<u>Page</u>
STORY OF FIRE AND RESCUE AND RECOVERY OPERATIONS	15
Evidence of Activities and Story of Fire	15
Rescue and Recovery Operations	23
Activities of Bureau of Mines Personnel	36
INVESTIGATION OF CAUSE OF THE DISASTER	40
Investigation Committee	40
Findings and Analyses	43
Possible Causes of the Fire	61
Probable Cause of the Fire	66
Causes of the Disaster	66
Recommendations	67
Mine Reopening	79
ACKNOWLEDGMENT	
APPENDIXES	
A - List of Victims	90
B - Table - Work locations, evacuation routes, use of Self Rescuers and locations of death of mine employees.	94
C - Coroner's Statement	111
D - Organization Charts for Rescue Operations	112
E - Participating Bureau of Mines Personnel and Their Arrival Dates	114
F - Cooperating Organizations	124

	<u>Page</u>
G - Non-Federal Participants in Rescue and Recovery Operations	126
H - Attorneys and Representatives of Organizations Taking Depositions	130
I - Fire Protection Plan, Escape Plan, Procedure to Follow in Case of Fire, and Ventilation Map as posted in mine	132
J - Mine map - vertical section	138
K - Mine maps - level plans	139
L - Gas Analyses of Exhaust Air	154
M - Analyses - Fire Area materials	155
N - Self-rescuer Tests Results	168

FINAL REPORT OF MAJOR MINE FIRE DISASTER
SUNSHINE MINE
SUNSHINE MINING COMPANY
KELLOGG, SHOSHONE COUNTY, IDAHO

May 2, 1972

BY

Stanley M. Jarrett
Acting Assistant Deputy Director--Health and Safety

E. Levi Brake
Mining Engineer

Robert E. Riley
Mining Engineer

Roland V. Wilson
Supervisory Mining Engineer

INTRODUCTION

This report is based on an investigation made pursuant to clause (1) of Section 4 of the Federal Metal and Nonmetallic Mine Safety Act (80 Stat. 772).

Reference numbers used in the report identify mine safety standards promulgated in the Federal Register, Vol. 34, No. 145, Thursday, July 31, 1969; Federal Register, Vol. 35, No. 38, Wednesday, February 25, 1970; Federal Register, Vol. 35, No. 237, Tuesday, December 8, 1970; and Federal Register, Vol. 37, No. 139, Wednesday, July 19, 1972.

This report relates all available facts pertaining to conditions prior to discovery of the fire, events immediately thereafter, subsequent rescue and recovery efforts, investigation of the cause of the disaster and analysis of all the foregoing.

This report also includes reasonable conclusions consistent with known conditions and practices at the Sunshine Mine. Conclusions are so identified.

Recommendations are made to prevent recurrence of a similar disaster.

While this report deals with conditions and events at the Sunshine Mine, the information presented may be applied, with little basic adaptation, to many other underground mines.

ABSTRACT

Smoke was detected in the main haulageway near the electric shop on the 3700 level of the Sunshine Mine, Kellogg, Idaho, about 11:40 a.m., May 2, 1972. The volume of smoke, accompanied by carbon monoxide, increased rapidly and was also detected in the 3100 level main haulageway. Both the 3100 level and 3700 level haulage drifts served as main fresh air intakes to the stope area below 3700 level near No. 10 shaft, where most of the 173 men in the mine that shift were assigned. Mine supervisors, after attempting to locate the fire, ordered evacuation of workmen from the mine about 12:03 p.m. Before the evacuation was halted by the death of the No. 10 shaft hoistman, 80 men escaped from the mine. An intensive rescue operation, organized by industry and Bureau of Mines personnel resulted in the rescue of 2 men. The remaining 91 men died of carbon monoxide poisoning. None of the survivors reported seeing fire or flames.

The Bureau of Mines believes the probable cause of the fire was spontaneous combustion of refuse near scrap timber used to backfill worked out stopes. The fire occurred in an abandoned stoping area near the intersection between the 3400 level exhaust airway and the 09 vein. Extensive ground falls and caving occurred in the immediate area when timber supports were consumed, making investigation of the entire fire area impossible.

It is not possible to single out any one fact as the chief cause for the large loss of life. However, the Bureau of Mines believes that the following major factors contributed to the severity of the disaster:

1. The emergency escapeway system from the mine was not adequate for rapid evacuation.
2. Top mine officials were not at the mine on the day of the fire and no person had been designated as being in charge of the entire operation. Individual supervisors were reluctant to order immediate evacuation or to make a major decision such as stopping the 3400 level fans.
3. Company personnel delayed ordering evacuation of the mine for about 20 minutes while they searched for the fire.
4. The series ventilation system used in the mine caused all persons in by the fire, which contaminated the main intake airways, to be exposed to smoke and carbon monoxide.
5. Most of the underground employees had not been trained in the use of the provided self rescuers and had difficulty in using them. Some self rescuers provided by the company had not been maintained in useable condition.

6. Mine survival training, including evacuation procedures, barricading, and hazards of gases, such as carbon monoxide, had not been given mine employees.
7. The emergency fire plan developed by the company was not effective. The company had not conducted evacuation drills.
8. Abandoned areas of the mine had not been sealed to exclude contaminated air from entering the ventilation airstreams.
9. The controls built into the ventilation system did not allow the isolation of No. 10 Shaft and its hoist rooms and service raises or the compartmentalization of the mine. Smoke and gas from this fire was thus able to move unrestricted into almost all workings and travelways.

These and many other factors involved in the disaster are discussed in detail in the Findings and Analysis section of this report.

GENERAL INFORMATION

The Sunshine silver mine, which also produces copper and antimony, is in Big Creek Canyon about 8 miles east of Kellogg, Shoshone County, Idaho. It was first opened in the late 19th century and is operated by Sunshine Mining Company.

Irwin P. Underweiser was president; Marvin C. Chase, vice president and general manager; Al Walkup, mine superintendent; Leon Barr, mill superintendent; James Farris, personnel and safety director; and Robert Launhardt, safety engineer.

Employment totaled 522 persons, 429 of whom worked underground. The mine was operated three shifts daily, 5 days weekly. Main access to the mine was through a 200-foot long adit to the Jewell Shaft, at the western edge of the mine, down that shaft to the 3100 and 3700 levels, eastward through 5,000-foot long drifts to the No. 10 Shaft, which was collared at the 3100 level, and down that shaft to the active working levels. No. 10

winze and several other vertical openings in the mine were sunk as winzes, but were locally referred to as shafts. (Local terminology is used in this report).

The No. 10 shaft was bottomed just below the 6000 level. Ore was produced from the 4000, 4200, 4400, 4600, 4800, 5000, and 5200 levels. Level development work was in progress on the 5400 level; shaft station development work was in progress on the 5600 and 5800 levels. Surface elevation at the collar of the Jewell shaft was about 2,700 feet above sea level. Level designations represent distances in feet below the Jewell shaft collar. For references, maps are included in the appendix. In December 1945 an underground fire caused extensive property damage, but no loss of life. That fire was started by a short circuit in the 2900 level storage-battery-charging station and was extinguished by sealing and flooding the lower levels.

Large mined out square-set stopes reportedly were above the 3700 level and west of No. 10 shaft. The general condition of the mine was dry. The last regular Federal inspection of the mine was made November 9-12, 1971, and subsequent spot inspections were made January 12 and March 22, 1972. Copies of these reports are available for inspection at the Bureau of Mines Offices, Washington, D. C., and at the following Metal and Nonmetal Mine Health and Safety Offices:

Western District Office
620 Central Avenue
Alameda, California

Seattle Subdistrict Office
Federal Office Building
Seattle, Washington

Spokane Field Office
Seattle Subdistrict
Post Office Building
Spokane, Washington

MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods

Steeply dipping fissure veins were mined by the horizontal cut and sand-fill method by either breasting down or back stoping. The principal ore mineral was tetrahedrite. The stopes were developed a maximum of 100 feet along the strike of the vein. Level intervals were 200 feet. A raise climber was used to drive 6- by 6-foot raises between levels. Ore was concentrated in the mill adjoining the mine.

Ground was controlled in drifts by steel mats and 3/4-inch-diameter rock-bolts 4 and 6 feet in length. The mats and bolts were used alone or in conjunction with drift timber. Similar rock-bolts with or without headboards were used in the stopes. Stulls and three-piece timber sets with squeeze caps were used in combination with rock-bolts and headboards to support incompetent ground in stopes. While waste rock had been used to backfill stopes above 3700 level, sand-fill with cement capping was used to stabilize the mined-out sections of stopes below 3700 level.

Ventilation

Air flow for the Sunshine mine was dependent upon pressures developed by fans located underground. A diagram of the overall ventilation system for the mine is included on the mine map in Appendix J. All of the intake air for the ventilation of the mine was coursed down the Jewell Shaft to the 3100 and 3700 levels. The air was split between those two levels and traveled laterally to the No. 10 Shaft. About 2,000 cfm of air on the 3700 level was coursed through the No. 12 borehole to the 4800 level and then laterally to No. 10 Shaft. Also on the 3700 level, some air was diverted through the Sun Con crosscut.

Intake air from the 3100, 3700 and 4800 levels joined at the No. 10 shaft and coursed down to the 5200 level. Air flow was split on the 5200 level into east and west laterals and was then moved upward through the working stopes to the 4400 level. Up to 16,000 cfm of air was added to the system by the use of compressed air powered equipment. From the 4400 level, ventilation raises located approximately 400 feet to the east of No. 10 shaft provided the airways for upward flow to the 3400 level. Less than 5,000 cfm of the return air flow was passed to the 3100 level, then eastward through the interconnected Silver Summit mine to the surface. The balance of the return air moved westward along the 3400 level exhaust airway to the No. 3 ventilation raise, through which it passed to the 1900 level. An air split was made on the 1900 level where 12,000 cfm of air moved through the Big Hole ventilation shaft to the surface, and the remainder coursed up the inclined shaft and out the Sunshine tunnel. Measurements made April 24, 1972, indicated 95,300 cfm of air travelled across the 3400 level exhaust airway. About 2,000 cfm of air leaked from the 3700 level pipe shop area upward through No. 8 Shaft to the 3550 level and then to the intake side of the 3400 level exhaust fans.

Main fans were located on the 5200, 3400, and 1900 levels and in the Sunshine adit, in a series system. The fan controls were located near the fans.

Methane or other flammable strata gases were not emitted into the mine. A flame safety lamp was available for testing for oxygen deficiency. Two carbon monoxide detectors were available at the mine safety office.

Refrigeration air-conditioning units were installed in the mine to cool the high ambient air temperatures on the lower levels.

Additional information concerning air quantities, fan installations, the effect of natural ventilation, and resistance to air flow is given in the Bureau of Mines report "Ventilation Survey, Sunshine mine, Sunshine Mining Company, Kellogg, Shoshone County, Idaho, September 14 to October 4, 1971, by R. K. Foster and J. W. Andrews," and in the report of "Supplemental Ventilation Survey, April 24, 1972," by the above individuals.

Copies of the reports are available for inspection at the Bureau of Mines in Washington, D. C., and at the following Metal and Nonmetal Mine Health and Safety Offices:

Western District Office
620 Central Avenue
Alameda, California

Seattle Subdistrict Office
Federal Office Building
Seattle, Washington

Spokane Field Office
Seattle Subdistrict
Post Office Building
Spokane, Washington

Shafts and Hoisting

The Jewell and No. 10 shafts were each provided with electric-powered double-drum hoists, and electric-powered single-drum "chippy" hoists.

The Jewell Shaft was originally sunk to a depth of 3860 feet as a four-compartment shaft. Later, two of the four compartments were extended to 45 feet below the 4000 level. The double-drum hoist at the Jewell shaft was used to hoist ore from the 3700 level and for hoisting ore and waste from the 3100 level. The "chippy" hoist at the Jewell shaft was used for moving men and materials to all levels as far down as the 4000 level and for hoisting ore from the 4000 level to the 3100 level.

The No. 10 shaft was a three-compartment shaft from the 3100 level down to 90 feet below 4400 level. From there it was three-and-a-half compartments down to 48 feet below the 4600 level. From that point, it continued to the 6000 level as a four-compartment shaft. The No. 10 double-drum hoist on the 3100 level was used primarily for hoisting ore and waste from mine production and development work. Ore was dumped into a pocket on 3700 and was transferred by train to the Jewell shaft for hoisting to the surface. Waste rock was hoisted to the 3100 level and was similarly transferred for hoisting to the surface at the Jewell shaft. A single-deck 9-man capacity man cage was suspended below the skip in each of the two compartments served by the double-drum hoist. The No. 10 "chippy" hoist was on the 3700 level and was equipped with a four-deck man cage with a total capacity of 48 men. It was used for servicing all levels below 3700.

Escapeways

Escapeways from the mine consisted of raise ladderways from stopes to main levels, drifts and crosscuts to the shafts, No. 10 shaft, Jewell shaft, service raises paralleling No. 10 shaft from 4600 level to 3700 level, and the drift to Silver Summit shaft. Escapeways from the various working areas of the mine are illustrated in Appendix J.

Electricity

Electricity from two surface substations was conducted down the Jewell shaft at 13,800 volts and 2,300 volts, alternating current, by armored borehole cables.

At the Strand substation on 3700 level, the 13,800 volts electricity was transformed to 2,300 volts alternating current. Four individual cables conducted electricity from the Strand substation to 3100 level No. 10 shaft hoist, 3400 level main ventilation fans, 3700 level F-19 switch station, and 3700 level No. 10 shaft service hoist. From F-19 switch station, electricity was conducted to substations on 3700, 4200, 4400, 4600, 4800, 5000, 5200, 5400, and 5800 levels. At the individual level substations the 2,300-volt power was transformed to 440, 220, and 110 volts, alternating current, to power auxiliary fans, slusher hoists, other mining equipment, and for mine illumination.

Grounding grids were buried in the earth at the utility company substations, company surface substations, and adjacent to the Jewell shaft collar. The ground network was extended into the mine upon the armor sheath of the borehole-type cables installed in the mine shafts and upon messenger cables used to suspend cables throughout the mine. Grounding of portable mine equipment was provided through a ground conductor in the equipment cable which was connected to the messenger wire system.

Overload protection, short-circuit protection, and individual disconnect switches were provided at the individual mine equipment, switch stations and substations. Diagrams of the mine substations and switch stations were on file at the mine electric shop.

Communications

A single telephone circuit was provided for normal communications between underground shaft stations, hoistroom, shops and the mine surface. An emergency system was provided with telephones in the safety engineer's office on the surface and the underground first-aid room on 3700 level.

Illumination and Smoking

Individual cap lamps were provided for the mine personnel. Shaft stations were illuminated by 110-volt incandescent lamps, as were shops and maintenance areas.

Smoking was prohibited underground near shafts and explosives-magazine areas, in the 3400 level ventilation return drift and in such areas as oil-storage and battery-charging stations. These areas were posted with signs prohibiting smoking.

Safety Program

The company personnel director, who reported to the general manager, was responsible for the safety program. A full-time safety engineer was employed. The safety engineer's duties included coordinating safety efforts, conducting safety inspections, and inspection and maintenance of safety equipment. Biweekly labor-management safety committee meetings were held. In addition to regular daily inspections conducted by the company safety engineer, a monthly inspection was conducted by the safety engineer with a union safety committeeman, in an area of the mine selected by the union. First-aid classes were conducted once a year. Use of self rescue devices was included in the first-aid training. A total of 46 persons received training in the class conducted during March 1971. Employees attended the classes on a voluntary basis and were compensated for class time. Even though the company provided training, those attending training sessions represented a small percentage of the work force.

Mine Rescue

Fourteen men were trained in mine rescue in May 1971. Nine other men had received training the year before. The company had a program of retraining at maximum intervals of 1 year, but had held retraining classes twice a year during the past few years. Ten sets of 2-hour McCaa self-contained oxygen breathing apparatus were available on the surface. The apparatus were tested every Thursday by a representative of the Central Mine Rescue Station in Wallace, and records were kept of the tests. The self rescuers were stored in locked wooden boxes at various No. 10 shaft stations, the No. 10 shaft hoistroom on 3100 level and in the first-aid

room on 3700 level. Locks had been installed on the boxes to prevent pilferage.

Firefighting Facilities and Organization

Water was available at all working places underground at 60 psi, through 1- and 2-inch lines. Water deluge systems had been installed in both the Jewell shaft and in the No. 10 shaft. The water supply included a 50,000-gallon tank reserved for firefighting. A 60,000-gallon mine and mill supply tank and a 30,000-gallon tank used for the sandfill system could also be valved into the fire-fighting system. Water could also be pumped directly into the system from a creek on the property by two pumps capable of furnishing 1,200 gpm at 180 psi. The pumps were checked weekly and records were kept. Water from the mine supply was delivered underground through a 4-inch-diameter pipeline to a small surge sump on the 1900 level. A 4-inch-diameter pipeline carried water from the 1900 level sump to a 25,000-gallon-capacity sump on 3100 level near No. 10 shaft. Water flow to these sumps was controlled by solenoid valves. All underground water lines had 1-inch valves and connections at 150-foot intervals.

A foam generator capable of being moved on rails or on rubber tires was kept on the surface. About 600 feet of polyethylene roll-out tubing and 1,200 gallons of high expansion foam were kept on hand.

Each shaft station was equipped with a 20-pound multipurpose, dry chemical fire extinguisher, and hoistrooms, pump rooms, battery-charging

stations, underground shops, and most transformer stations were equipped with 10- or 20-pound dry-chemical extinguishers, while 5-pound dry-chemical extinguishers were installed on portable welding equipment. Also, battery-charging stations were equipped with 5-pound CO₂ extinguishers. Company officials stated that extinguishers were checked at regular intervals. Records of underground inspections were not kept.

Automatic fire doors equipped with carbon-monoxide sensors had been installed as an additional precaution on the 3100- and 3700-foot levels, about 300 feet from the Jewell shaft. The doors were designed to close automatically within 45 seconds of sensing carbon monoxide, preceded by a light and whistle for warning workers to clear the door. These doors were designed to protect the workers in the event of a fire occurred in the main (Jewell) shaft.

A stench-warning system to warn underground workers was located in the main compressor building on the surface. The warning system consisted of two containers, each with a 500-gram vial of ethanethiol (C₂H₅SH) 15 percent in trichlorofluoro-methane. The vials could be ruptured and the contents injected into the main compressed air supply to the mine.

Instructions for its use were posted at the installation.

The "Fire Protection and Escape Plan" and "Procedure to Follow in Case of Mine Fire," included as Appendix I, were issued to each supervisor and were posted along with a ventilation map at shaft stations on 3100 and 3700 levels for the information of underground workers.

STORY OF THE FIRE AND RESCUE AND RECOVERY OPERATIONS

The following description of the events related to the major disaster at the Sunshine silver mine is based on records maintained by the mine operator, interviews with mine officials and workers, depositions taken by Department of the Interior attorneys from survivors of the catastrophe and others, Federal mine inspection reports, and observations made by Bureau of Mines personnel.

Times stated are based on evaluation of the above sources of information. Although conflicts exist, the Bureau of Mines believes the times used are accurate.

Evidence of Activities and Story of Fire

On May 2, 1972, a total of 173 men making up a normal day shift (7 a.m. to 3 p.m.) crew entered the mine and proceeded to perform their regular duties until the time they learned of the fire. The work locations of these men are shown in Appendix B. The principal operating officials of the Sunshine Mining Company were in Coeur d'Alene, Idaho, about 45 miles away, attending their annual stockholders' meeting. During their absence, surface and underground foremen were responsible for the activities of their own crews, with no designated individual in charge of the entire operation.

Most of the salaried and day's pay personnel who normally ate their lunch from 11 a.m. to 11:30 a.m. did so at their regular work locations.

During the morning, miners Custer Keough and William Walty were engaged in enlarging the 3400 ventilation drift to decrease ventilation resistance in the main exhaust airway. Their work consisted of drilling and blasting along the back and ribs, mucking, and rock bolting. An underground mechanic, Homer Benson, also reported to the 3400 level with an oxygen-acetylene cutting torch which was needed to remove old rockbolts along the drift. The cutting torch was transported to the worksite about 340 feet west of the 09 vein bulkhead, with a small battery-powered locomotive. Benson completed the cutting of the old rockbolts and arrived back at the 3700 level station with his equipment at 10:35 a.m. Keough and Walty probably ate lunch on the 3400 level No. 10 shaft station, as was their practice.

Floyd Strand, chief electrician; Kenneth Ross, geologist; Larry Hawkins, sampler; and John Reardon, pumpman, completed their morning activities at the No. 10 shaft area and at 11:30 a.m., departed the No. 10 shaft station on the 3700 level enroute to the Jewell Shaft on a man coach. Their route took them past the Strand substation, 910 raise, No. 5 shaft, and No. 4 shaft. They arrived at the Jewell station shortly after 11:40 a.m. and did not report any unusual conditions enroute.

Shortly after lunch, about 11:40 a.m., Norman Ulrich and Arnold Anderson, electricians, stepped out of the electric shop, smelled smoke, and shouted a warning. Harvey Dionne and Bob Bush, foremen, came out of the Blue Room (underground foremen's office) and the four men started in the direction of the smoke. The smoke was discovered to be coming down the

910 raise, about 50 feet west of the Strand substation. Harvey Dionne climbed up onto drift timber below the raise but was unable to detect fire. Jim Bush, foreman, then arrived on a small battery-powered locomotive. Harvey Dionne, Jim Bush, and Ulrich proceeded toward the Jewell Shaft meeting Ronald Stansbury, haulage locomotive operator, enroute. Stansbury and Ulrich closed the fire door near the Jewell Shaft, in accordance with instructions from the mine foremen. Jim Bush and Harvey Dionne returned toward the 910 raise.

At about 11:45 a.m., Delbert (Dusty) Rhoads, lead mechanic, and Jim Salyer, foreman, simultaneously telephone Pete Bennett, mechanic, in the 08 machine shop. They asked Bennett to determine if a fire was burning in the shop area. Bennett and his partner, Kenneth Tucker, knowing there was no fire in the shop, went from the shop toward the 808 and 820 drifts. Bennett discovered the 820 crosscut was so full of smoke he could not enter. He met Bob Bush at the 808 drift, where they found smoke so thick they could travel but a few feet. They retreated toward the 08 machine shop, encountering much heavier smoke in the 820 crosscut. Return to the 08 shop was impossible.

Bob Bush then instructed Bennett and Tucker to go the Jewell Shaft. As Harvey Dionne and Jim Bush returned toward No. 10 shaft, they attempted to go into the 08 machine shop area. They reached the 820 drift and went about 100 feet into the smoke before being forced back. Harvey Dionne then went back to make sure the fire door was closed and to prepare for evacuation at the Jewell Shaft. Jim Bush found Bob Bush, Wayne Blalack and Pat Hobson in a state of near exhaustion near 910 raise.

He attempted to assist the three men by carrying Bob Bush and Hobson under their shoulders and pushing Blalack in front of him. About halfway to the Jewell Shaft, Jim Bush was near exhaustion and had to leave all three men and go for assistance. Harvey Dionne, after returning to the Jewell Shaft, made the decision to remove restrictions over the No. 12 borehole to allow more fresh air to reach the lower levels.

About 12:03 p.m., Fred (Gene) Johnson, shaft foreman, while at the 3700 level No. 10 shaft, telephoned the mine maintenance foreman, Tom Harrah, at his office in the surface machine shop and requested that the stench-warning system be activated and that oxygen breathing apparatus be sent into the mine. At this time, he also instructed the No. 10 shaft double drum hoistman to prepare the cage for moving the men to the 3100 level to get them out of the mine. Harrah contacted Robert Launhardt, company Safety Engineer, at the mine safety office and relayed the requests. The stench warning system was activated at 12:05 p.m. by Launhardt and Harrah, and the oxygen breathing apparatus was transported down Jewell Shaft to the 3100 level station.

Most workmen became aware of fire when smoke entered their workplaces. In some instances, men were dispatched to relay verbal warnings to men in remote locations. Within a short time of detecting the smoke, most of the workmen made their way to the No. 10 shaft station in hopes of escaping. Because of the dense smoke between the 910 raise and No. 10 shaft, Don Wood, the hoistman operating the No. 10 shaft "chippy" hoist on the 3700 level, was forced to abandon the hoistroom.

According to the hoist log taken from the No. 10 double drum hoist on the 3100 level, the first load of men was hoisted at 12:10 p.m. About 12 men rode the cage from the 3700 level to the 3100 level, including men who had ridden up from the 4500 level. The cage arrived at the 3100 level at 12:13 p.m. and returned to the 3700 level where additional men boarded. They left the 3700 level at 12:16 p.m. and arrived at 3100 level at 12:17 p.m. Greg Dionne, a former cager volunteering his assistance, reboarded the cage and went down to the 4600 level with short stops on the 3700 level and 4400 level to pick up additional men, including Delbert (Dusty) Rhoads, who, among others, had ridden the "chippy" cage down after lunch.

A full cage load of men was sent up to the 3100 level from the 4600 level at 12:24 p.m. Greg Dionne remained on the 4600 level station. Byron Schulz, cager, reboarded the cage and went back down to 4600 level, arriving at 12:27 p.m., where another load of men boarded. Dionne remained at the station and Schulz rode up to the 3100 level, arriving at 12:30 p.m. Schulz reboarded at 3100 level and went to the 5000 level with a stop at 4600 to pick up Dionne and additional men. The cage then traveled back to the 3100 level arriving at 12:35 p.m. Delbert (Dusty) Rhoads and Arnold Anderson, mechanical and electrical lead men, possibly returned on this trip to the 3400 level. Another trip was made back to the 5000 level and returned at 12:44 p.m. Schulz

and Dionne both returned to the 3100 level on this trip. The cage went back to the 5000 level, and remained 12 minutes. The cage then went to the 5400 level and made a trip back to the 3100 station. All of the above trips were made on the south cage of the double-drum hoist.

The north cage was unclutched at 12:06 p.m. and remained parked near the 4400 station until it was clutched back in at 12:16 p.m. A load of 9 men boarded it at the 4400 level and traveled to the 3700 level. The cage was again unclutched at 12:17 p.m. near the 3700 level station and remained until 12:21 p.m. It was then clutched in and went to a point near the 3100 level station and remained until 12:26 p.m., when it was again clutched in and went to the 4200 level, arriving at 12:27 p.m. The north cage then remained unclutched until 12:50 p.m., when it was clutched in and made a trip to the 5800 level and returned slowly to the 3100 level, with short stops at 5600, 5400, and 5000 stations. All men on 5800 and 5600 were aboard this skip and traveled to the 3100 level. It was not possible to determine why the north skip was intermittently inactive.

Rhoads and Anderson were standing by on the telephone on 3400 level, requesting permission to stop the main exhaust fans on that level. It was apparently realized that the operation of these fans was a critical factor in forcing smoke and carbon monoxide through the mine. Of those persons present at the mine, no individual assumed authority to issue instructions to stop the fans. Consequently, the fans were never stopped.

The men hoisted from the lower levels of the mine were directed by Gene Johnson to travel to the Jewell Shaft via the 3100 level, to be hoisted to the surface. Gene Johnson had remained at the 3100 station to direct the crews to Jewell Shaft instead of the Silver Summit escapeway, which was contaminated with toxic gases.

All hoisting at No. 10 shaft ceased at 1:02 p.m., when the double-drum hoistman was overcome. While the men on the lower levels attempted unsuccessfully to communicate with the hoistman, a few on the 5200 level tried to build a barricade in a tail drift just off the station. They died from carbon monoxide exposure before completing the job.

Some of the men reported they had difficulty in using the self-rescuers, obtained from storage boxes on shaft stations, and discarded them, while others used them successfully. Many men who succeeded in reaching 3100 level were overcome by carbon monoxide and smoke and died.

The first group to attempt to locate and rescue additional survivors entered the 3100 level from the Jewell Shaft about 1 p.m. The crew, made up of Robert Launhardt, Larry Hawkins, James Zingler, and Don Beehner, equipped with oxygen breathing apparatus, attempted to cross the 3100 level from the Jewell Shaft. On the way toward No. 10 shaft, they met Roger Findley, who was on his way out toward the Jewell Shaft. Findley was having difficulty breathing and was given oxygen. Zingler then took Findley out to good air.

The rescue crew continued toward No. 10 shaft and met Byron Schulz, who appeared to be in serious trouble and pleaded for oxygen. Beehner responded and gave Schulz his face mask, but collapsed as he attempted to put his mask back on. Launhardt tried to assist Schulz, and Hawkins placed his mask over Beehner's face, while holding his breath as long as he could before taking another breath of air from his mask. When Hawkins tried to place his mask again to Beehner's face, Beehner lost consciousness. Hawkins' apparatus then malfunctioned, and he attempted to make his way out. He fell twice and managed to climb onto the last car of a train, which Launhardt was bringing out, with Schulz aboard. All three reached the Jewell Shaft station and were hoisted.

While these events were occurring on the 3100 level, moves were undertaken by some of the miners to rescue fellow workers on the 3700 level. Jim Bush, a mine foreman, had called to the attention of some other miners that three men, Robert Bush, Wayne Blalack, and Patrick Hobson, were in trouble in the No. 5 Shaft. He had tried earlier to save them but was unable to do so. According to depositions from survivors of the disaster, three men at the Jewell Station, Ronald Stansbury, Roberto Diaz, and another man, traveling in a locomotive, made a rescue attempt. After stopping their locomotive near Blalack, Stansbury went farther and located Bob Bush lying on the ground, but Stansbury was rapidly being overcome and was forced to retreat. While returning, he saw Roberto Diaz on the ground. He reached fresh air at No. 5 Shaft where he encountered Harvey Dionne, Paul Johnson, and Jasper Beare reentering the drift.

Stansbury informed them that in addition to the three men that his group had tried to rescue, Diaz was down, making a total of four.

Johnson and his companions then continued toward No. 10 shaft. They boarded the locomotive and car which had been used and abandoned by the previous rescuers. Realizing they could not help any of the fallen men, they started to walk toward the Jewell Shaft after their locomotive derailed. During the trip, Johnson was overcome.

Subsequently, Jim Bush and Ulrich, protected only by self-rescuers, made one more rescue attempt, but had to abandon their efforts. The last survivors who evacuated on May 2 reached the surface at about 1:30 p.m. A total of 80 men safely reached the surface that day.

Rescue and Recovery Operations

Nearly 100 trained rescue personnel from seven other mines in the U.S. and Canada began arriving at the Sunshine Mine about 2 p.m. on May 2. The crews are listed in Appendix G. One of the first crews recovered five bodies along the 3700 level drift and returned to the surface about 4:30 p.m.

The location of the fire was not known by the initial rescue crews nor by any individuals who reached safety during the mine evacuation. The approximate area of the fire was assumed to be between the 3100 and 3700 levels, and between the No. 10 shaft and the Jewell Shaft.

Robert Launhardt, upon returning to the surface, asked Silver Summit officials to stop the Silver Summit fan in hopes that fresh air would then enter the Sunshine 3100 level, allowing any possible survivors to use that escapeway. This was done at about 4 p.m.

Another attempt was made at rescue operations on the 3100 level. This attempt was unsuccessful because of having to travel too great a distance without an established fresh air base. The crew returned to the surface about 1 a.m. on May 3.

Later the same day, the first attempts were made to reach the No. 10 shaft area from the Silver Summit mine. A rescue crew reached a point about 1,000 feet from the Silver Summit raise but was forced to retreat by smoke and heat. The Sunshine fan, which normally forced air out through the Silver Summit, was reversed about 6 a.m. to clear the Sunshine 3100 level and force fresh air toward No. 10 hoistroom.

After the initial attempts to rescue men were made, the assessment of the ventilation situation was that the 3400 fan operations, and that of other fans, would be changed only with care to avoid disturbing the balance of air flows in the lower mine levels so as not to endanger survivors who might be depending on that balance.

Since the smoke-filled 3100 and 3700 levels were the access routes and intake airways to the No. 10 shaft from the Jewell, it became obvious that these levels had to be restored for access to the No. 10 shaft in the hope of reaching the lower mine levels where most men were believed to be trapped. Therefore, a three-phase rescue plan was developed by company and Bureau of Mines personnel. The approaches were: (1) To establish fresh air and access across the 3100 level to the No. 10 hoistroom from the Jewell Shaft; (2) To establish fresh air and access across the 3700 level to the No. 10 shaft and "chippy" hoistroom from the Jewell Shaft; and (3) To establish fresh air and access across the Silver Summit 3000 level and subsequently the Sunshine 3100 level to the No. 10 hoistroom. All of the above approaches would result in fresh air being forced down the No. 10 shaft to the deeper levels. To accomplish all of the above objectives, it was decided to place seals at every opening along each of the access routes to keep out smoke and gas.

On the morning of May 3, apparatus-equipped crews from the Jewell Shaft attempted to erect a bulkhead in the No. 4 Shaft area on the 3100 level but were unsuccessful. Upon returning to the surface at 11 a.m., they sealed off the water drift on the Jewell Adit level to prevent leakage of contaminated air from the Sunshine Tunnel into the Jewell Shaft. The crew then returned to the 3100 level, approaching near enough to No. 10 shaft to hear the ventilation fans operating. Six bodies were recovered during this trip.

At about the same time, crews working from the direction of the Silver Summit mine carried bulkheading material to the Sunshine 3100 level, and advanced to the No. 10 Shaft air door. The drift was clear to within 50 feet of the door until the door was opened, at which time heavy smoke was encountered. The area behind the crew was also contaminated by leakage from openings in a mined-out area north of the No. 10 Shaft called the "Hook" area. Work continued on bulkheads in the "Hook" area in an attempt to seal the old openings and force fresh air into the 3100 No. 10 Shaft station. To provide the necessary seals in the shortest possible time, the Bureau of Mines had its contractor, Westinghouse Electric Corporation, attempt to locate large inflatable bags that could possibly fulfill the need. These inflatable bags, sealed quickly with rigid urethane foam, proved to be effective as temporary stoppings to control the mine ventilation. Monitoring of the Jewell Shaft airstream continued during the afternoon and evening of May 3, in order to ensure fresh air moving down No. 12 borehole to the 4800 level.

On May 4, at about 3 p.m., while examining conditions on the No. 10 Shaft station, the Silver Summit crew reported the presence of more bodies in the station area.

A 10- by 40-foot bulkhead was erected from the Silver Summit side to seal an abandoned drift. A new 150-hp. fan, designated the Silver Dollar fan, was prepared for operation in an attempt to increase fresh air flow to No. 10 Shaft from the Silver Summit mine.

At about 6 p.m., the Silver Dollar fan was started. This increased the volume of air moving toward No. 10 Shaft to more than 50,000 c.f.m. Leakage occurred, however, through the "Hook" area bulkheads when the door to No. 10 station was opened.

Also on May 4, a bulkhead and a 30-hp. fan were installed in 3700 No. 12 Shaft area to ensure fresh air to 4800 level via No. 12 borehole.

By 1 a.m. on May 5, back pressure had developed on the Jewell Shaft air doors on levels between the surface and 3100, causing leakage into the shaft. The Sunshine Tunnel exhaust fan was restarted about 2 a.m., and by 3:30 a.m. all Jewell Shaft air doors had been pressurized from the shaft side. The 150-hp. Silver Dollar fan was also shut down and the 30-hp. fan restarted on the Silver Summit side. At 3:40 a.m., the 3700 level Jewell Shaft air door was reopened, resulting in a strong flow of fresh air toward No. 10 Shaft. Crews then began advancing across the 3700 level, erecting bulkheads. Efforts were resumed to seal leaking bulkheads on the Silver Summit side to provide circulation of fresh air into the 3100 level No. 10 Shaft station. Work was begun on installation of a 250-hp. adjustable-range fan on the surface at the exhaust borehole ("Big Hole"), to increase exhaust air flow and clear the 3100 and 3700 levels.

On May 7, because delays were encountered in attempts to gain access to No. 10 Shaft, a fourth rescue approach was developed by the Bureau of Mines. The purpose was to gain access to 4800 level by means of a capsule lowered from 3700 level through No. 12 borehole.

The Bureau assembled additional rescue personnel from all over the country, along with oxygen-breathing apparatus and gas detection equipment.

The 250-hp. fan on the exhaust borehole was started and brought into balance with the Sunshine Tunnel fan about 5 a.m. By 6:30 a.m., the 3100 No. 10 Shaft station area was cleared of carbon monoxide. The Silver Summit crew reported 15 bodies in this area.

Progress toward No. 10 Shaft required many stoppings and seals making advance very slow. Based on the smoke problems and on information about the existing ventilation, it was decided to stop the 3400 fans. They were probably feeding air to the fire area.

At 3:06 p.m., in order to eliminate recirculation and facilities access to No. 10 Shaft, fans on the 3400 level were shut down from the 3700 level switch station. Four more bodies were found at the 3700 cable shop. By 4 p.m., ventilation to the 3100 level No. 10 Shaft station had improved considerably, and the air door was opened. At 5:13 p.m., the compressed air pressure dropped to 25 psi, indicating a major rupture in the system. The 3700 level door to No. 10 Shaft was closed, and efforts were directed toward opening the 3100 level between the Jewell and No. 10 Shafts. Crews from the Silver Summit and Sunshine met on the 3100 level at 8:45 p.m.

On May 8, at 3:50 p.m., an extensive cave-in was discovered in the 910 raise area on the 3700 level. A 12-inch compressed air line and a main powerline to the Strand substation had been broken by the cave-in, explaining the loss of compressed air pressure. The cave-in also caused a loss of power to No. 10 hoist, which was critical to all phases of the three-phase approach to reach the lower levels. Installing a new electric cable on 3100 level from the Jewell Shaft, therefore, was immediately assigned to electrical crews so that the hoist could be made operable as soon as possible.

The three-phase attack on the fire was now reduced to two with the loss of access through the 3700 level. In re-examining all possible alternatives, it was decided to again examine the No. 12 borehole as a possible way to get to the 4800 level where men were known to have been working. This approach was to be undertaken in a way which would not diminish the progress of work to reach and descend through the No. 10 Shaft, which had to remain the principal effort.

In preparing to send men to the lower levels via the No. 12 borehole, as part of its plan to carry out rescue and recovery operations through a fourth front, the Bureau had obtained two man-capsules from the AEC Nevada test site. Frank Solaegui, an engineer employed by Reynolds Electrical and Engineering Corp., an AEC prime contractor, provided invaluable help with the rigging and use of the capsules in the Sunshine mine.

The compressed air pressure in the mine was inadequate to operate the air-powered hoist installed at No. 12 borehole. In order to lower men down the borehole in one of the capsules, a portable air compressor was obtained. This was connected to a separate pipeline to supply power for the capsule hoist. After the borehole was surveyed by means of a closed-circuit television camera and found to be passable, it was decided to make various additional tests to determine if any difficulties would be encountered when men were lowered. After the hoist for the capsule was rigged, one of the capsules was cycled twice down the borehole to the 4800 level. In making these tests, it was found that the weight of the capsule loaded with 600 pounds of sand caused the portable compressor to labor heavily. The compressor was replaced with two others.

Shortly after 9 p.m., on May 8, the first two-man crew was lowered into the No. 12 borehole in the AEC capsule selected as most suitable for the operation. They discovered that the borehole not only was irregular and rough, but contained many slabs of loose rock which could endanger the lives of men making the descent. Therefore, as the men were lowered, they scaled loose rock. In the first hour, they progressed less than 150 feet of the total 1,100-foot distance and were hoisted because of fatigue. Other crews followed, scaling the walls of the hole. By 3 a.m. on May 9, the capsule had descended 450 feet.

After the crews reached a depth of 580 feet, conditions improved and the manned capsule reached 4800 level shortly after 7 a.m. A new crew with equipment was lowered and began exploring 4800 level for survivors.

This crew searched the area around the bottom of the borehole and the drifts west and east of the hole for a distance of 1,000 feet each direction before they made the ascent back to the 3700 level. Another Bureau crew was lowered and started to search the remaining areas on the 4800 level east of the borehole. At 5:43 p.m., May 9, they found two miners, Tom Wilkinson and Ron Flory, alive and in good condition at a diamond drill station 1,800 feet west of the No. 10 Shaft. Wilkinson and Flory were taken to No. 12 borehole and hoisted. They were the last survivors found in the mine.

Early on May 9, the Sunshine Tunnel and Big Hole exhaust fans were regulated and balanced to increase the flow of exhaust air. A plan for bypassing the cave-in on 3700 level to reach No. 10 Shaft could not be developed, so the decision was made to concentrate all recovery efforts on 3100 level. Increased air flow had been established on this level from the Jewell Shaft by 5 a.m., and fresh air leaks were reduced by reinforcing bulkheads. Electrical crews continued to remove moisture, condensed on the No. 10 hoist and its associated equipment, to prevent electrical short circuits. The hoist was energized at 10:34 a.m. The exhaust fan in the Sunshine Tunnel vibrated excessively and was turned off at 11:55 a.m. The flow of exhaust air was maintained by activating an auxiliary 100-hp. fan on the 1900 level. The fan on the exhaust borehole was adjusted to an increased output at 4:15 p.m., and an acceptable atmosphere was again created on 3100 level. The task of recovering bodies continued during the afternoon and succeeding shifts.

Because access to No. 10 Shaft had already been achieved via 3100 level from the Jewell Shaft, and recovery efforts could be conducted from that direction, efforts were discontinued from the Silver Summit mine and crews were moved to the Sunshine mine at the start of day shift, May 10. Work continued on activating No. 10 hoist, as some electrical difficulties were encountered while the hoisting system was being fully energized. As a result of a discussion between electrical crews, engineers, and personnel of the Washington Water Power Company, the voltage from the Bonneville Power Administration was reduced at 2:15 p.m. to accommodate the hoist circuits. By 3:15 p.m. the hoist was again operating. Other delays in hoisting were encountered, due to failures in the shaft signaling system, and it was necessary to repair the system to each level before proceeding to the next level below. The first rescue crew was able to descend No. 10 Shaft at 9:22 p.m. to 3400 level where four additional bodies were found. Another crew reached 3700 level about 11 p.m. and began searching for victims.

Upon activation of No. 10 hoist, which provided access to all levels, rescue operations at No. 12 borehole were discontinued. Alternate plans had been prepared should difficulties continue with No. 10 hoist. An electric hoist was installed May 10, as a backup for the compressed-air-operated hoist which serviced the rescue capsule at No. 12 borehole. A backup hoist was considered for installation at No. 10 Shaft on 3100 level.

On May 11, at 12:40 p.m., a crew reported that the atmosphere was uncontaminated at No. 10 Shaft, 3700 level, and that seven additional bodies had been found in the tail drift behind the shaft. Another crew made a more thorough search of 3700 level in the vicinity of No. 10 Shaft and found no bodies except the four which had been located by a crew working from the Jewell Shaft.

Initially, no bodies had been found on 4200 level, but three were located at 8:15 p.m. at the 42-539 raise. At 7:13 p.m. seven bodies were found on 4400 level. These victims had attempted to remain alive by inhaling oxygen from a cylinder on a welding unit. The "chippy" hoist cage with no one aboard was found at 4500 level. Since the atmosphere appeared satisfactory on 3100 level, work there was directed toward strengthening the bulkheads and sealing off about 20,000 c.f.m. of air leaking to upper levels between No. 4 and No. 5 Shafts.

A valve near No. 10 Shaft, 3700 level, was closed to stop compressed air escaping from the 12-inch-diameter air line ruptured by the cave-in at 910 raise. Heat was building up in the area as bulkhead construction continued to reduce circulation of air. Additional seals were constructed to isolate No. 10 Shaft station from the remainder of the 3700 level.

By late May 11, all victims had been located as shown:

<u>Level</u>	<u>No. of victims</u>
3100	31
3400	4
3700	16
4200	3
4400	7
4800	7
5000	2
5200	<u>21</u>
Total	91

By May 13 all bodies were recovered. The Shoshone County, Idaho, coroner issued a finding that all had died of "Suffocation from carbon monoxide and smoke." A copy of the coroner's report is included as Appendix C.

Sunshine mine officials on May 15, 1972, provided Bureau officials with an updated accounting of personnel in the mine when the fire was discovered. The final figure was determined when it was confirmed that only 13 of a possible 33 mechanics, only 5 of a possible 17 electricians were underground at the time of the fire, and four other employees did not go underground during the day shift on May 2.

On the morning of May 12, a meeting between company and Bureau of Mines personnel was held to consider methods of extinguishing or containing the fire, and of conducting an investigation to determine the origin and cause of the fire. Two approaches to extinguishing or containing the fire were considered: (1) Complete sealing of the mine or (2) Sealing only the fire area. It was recognized that both the Jewell and No. 10 Shafts had to be protected, and that this would require many leakproof seals.

It was agreed that efforts would be concentrated on suffocating the fire by sealing the fire area with sandfill plugs and bulkheads.

The Sunshine Mining Company had about 60 men qualified to wear oxygen-breathing apparatus, and the Bureau of Mines, about 26 at the property. It was planned to supplement these numbers by training additional persons in the care and use of oxygen-breathing apparatus, and by offering premium pay to induce experienced men to participate in firefighting or fire containment efforts.

Additional seals were placed in all areas which might allow oxygen leakage into the fire area. Many areas on the 09 and 08 veins, however, were caving due to the burning of the timber ground support. These occurrences not only seriously hampered control efforts but posed additional serious risks to persons who were to go underground to investigate the burned-out areas.

Thereafter work was directed toward fire extinguishment by sealing and sandfilling, isolation of the fire area, and mine reclamation as well as continuing the investigation. In conjunction with mine reclamation, a mine reopening plan was developed jointly by company officials, employee representatives, State mine inspector, and Bureau of Mines officials.

Activities of Bureau of Mines Personnel

A Federal Bureau of Mines inspector, Martin R. Castellan, heard of a mine fire at the nearby Sunshine mine while at the Galena mine, American Smelting and Refining Company, May 2, 1972. He telephoned the news from the Galena mine to the Bureau's field office, Spokane, Washington, at 1:15 p.m., and was instructed to proceed immediately to the mine. The Bureau's Seattle, Washington, Subdistrict office was advised at 1:20 p.m. At 1:35 p.m., Castellan, after he arrived at the Sunshine Mine, verified that smoke was issuing from the Sunshine tunnel, and so notified the Spokane field office.

Roland V. Wilson, supervisory mining engineer, accompanied by William S. McCullough, mining engineer, left the Spokane office immediately and arrived at the mine, a distance of 70 miles, at 3 p.m. After assessing the situation, Wilson made several recommendations and issued Withdrawal Order No. 1 at 3:30 p.m., May 2, 1972, because of imminent danger (fire). This Order prohibited entry into the mine by any persons except those actively engaged in rescue or recovery work. Under this Order, rescue and recovery operations were subject to Bureau of Mines approval.

Bureau of Mines personnel who arrived at the mine served initially as advisors and assisted company personnel in tests for ventilation and toxic gases, while the company was sending local rescue crews underground and was contacting other mines in the Coeur d'Alene Mining District, neighboring States, and Canada for additional crews and equipment. Supervisors and miners throughout all of the district responded promptly to the company's request for aid. Experienced mining engineers in the district also arrived at the site to contribute, along with Bureau personnel, their expertise and assistance.

Leaders of the Bureau's Technical Support Group, including Bruce Grant and Don Ward, arrived at 7 a.m. on May 3, to establish liaison with the Sunshine Mine management. They were accompanied by key personnel of the Mine Emergency Operation Staff, Westinghouse Electric Corporation, under contract with the Bureau.

At 8:30 a.m., May 3rd, Arthur P. Nelson, then Assistant Deputy Director--Health and Safety, and Stanley M. Jarrett, then Assistant Director--Metal and Nonmetal Mine Health and Safety, along with William Wood, Technical Assistant; Allen D. Look, Western District Manager; Kenneth U. Russell, Seattle Subdistrict Manager; and other health and safety officials arrived at the property.

After assessing the situation, an immediate conference was requested by S. M. Jarrett to examine the organizational needs of the rescue operations. Called into conference were key personnel of the Sunshine Mine, officials

from nearby mines that responded to the fire, and top Bureau of Mines personnel. An organization and a chart were developed to cover the functions and relations needed to coordinate the rescue and recovery effort, mechanical and electrical assistance, issuing supplies, making acquisitions of additional items as needed, releasing information to relatives and to the press and television groups, and plant security. All the functions were assigned to appropriate managers and manned on a 12-hour shift basis. It was evident that by the morning of May 3rd, an extended rescue mission was likely; personnel on the property were showing signs of being tired, and a higher degree of coordination was needed to avoid worsening the disaster. Coordination would also assure that vital information was properly collected and made available to all those who needed it.

The organization not only served to establish order but also provided coordination with State officials and mine worker representatives. The organization chart showing the assigned duties and responsibilities is attached to this report as Appendix D.

Also decided at the meeting was that daily logs would be kept to record events. Further, it was decided to establish immediately a program for training additional men in mine rescue work so that any eventual need might readily be met.

