Reports

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River Slope Mine

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

District A

REPORT OF MAJOR MINE INUNDATION DISASTER
RIVER SLOPE MINE
MAY SHAFT SECTION, SCHOOLEY COLLIERY
KNOX COAL COMPANY, INCORPORATED
PORT GRIFFITH, LUZERNE COUNTY, PENNSYLVANIA
(Post Office - Pittston, Luzerne County, Pennsylvania)

January 22, 1959

By

William Rachunis
District Supervisor

and

Gerald W. Fortney
Federal Coal-Mine Inspector

Originating Office - Bureau of Mines
223 Federal Building, Wilkes-Barre, Pennsylvania
William Rachunis, District Supervisor
Health and Safety District A

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INTRODUCTION

The Susquehanna River broke into the River Slope area of the May Shaft section, Schooley colliery, Knox Coal Company, Incorporated, Port Griffith, Luzerne County, Pennsylvania, at 11:42 a.m., Thursday, January 22, 1959, entombing 12 men and causing extensive property damage. A total of 82 men was in the mine at the time of the river break-in, of whom 38 escaped unassisted and 32 were rescued. The break-in occurred in the Pittston vein at or near the point where the shaker chute crosscut, which was driven at about a right angle off the slope and over an anticlinal, intersected a chamber that was previously driven from a lower level. The shaker chute place was driven from a point where the rock slope first intersected the Pittston vein. The aforementioned places had been driven 90 feet beyond a safety stop line, and within 70 feet of borehole No. 1146 where core drillings indicated the rock strata to be only 19 inches in thickness between the river bed and the Pittston vein, see appendix D. The break-in was caused by mining in an area beyond the safety stop line beneath the river where the thin rock strata was insufficient to support the weight of the ice-laden river. The ice-laden river had risen from 2.1 feet above the zero mark at elevation +512.07 feet at the Federal-State Flood Forecasting Service Station at Wilkes-Barre, Pennsylvania, at 7 a.m., January 19, 1959, to 15.6 feet at 10:45 a.m., January 22, 1959, the day of the occurrence.

The names of the entombed men, their ages, marital status, number of dependents, and mining experience are listed in appendix A.

A withdrawal Order was issued January 22, 1959, under Sec. 203(a)(1) of the Federal Coal Mine Safety Act due to an imminent inundation hazard.

Withdrawal Orders were also issued to operators of the following mines because of imminent flooding danger, however, company officials had voluntarily withdrawn and debarred all persons from entering the mines, except officials and pumpmen:

January 22, 1959:

Schooley Colliery
Knox Coal Company, Incorporated
Exeter, Luzerne County, Pennsylvania

Henry Shaft Mine, Henry Colliery
Lehigh Valley Coal Company
Plains, Luzerne County, Pennsylvania

Enterprise Slope Mine, Henry Colliery
Lehigh Valley Coal Company
Plains, Luzerne County, Pennsylvania

Capone Colliery
Sam Capone Coal Company
Plains, Luzerne County, Pennsylvania

No. 2 Slope Mine
P. and J. Coal Company
Pittston, Luzerne County, Pennsylvania

No. 14 Colliery
Number 14 Coal Company
Pittston, Luzerne County, Pennsylvania

No. 6 Colliery
Inkerman Coal Mining Company
Inkerman, Luzerne County, Pennsylvania

No. 7 Shaft Mine
C. and P. Coal Company
Pittston, Luzerne County, Pennsylvania

January 23, 1959:

No. 14 Drifts Mine
No. 14 Drifts Coal Company
Hilldale, Luzerne County, Pennsylvania

No. 42 Tunnel Mine, Delaware Colliery
Glen Coal Company
Plains Township, Luzerne County, Pennsylvania

January 24, 1959:

Wyoming No. 8 Slope Mine, Henry Colliery
Lehigh Valley Coal Company
Plains, Luzerne County, Pennsylvania

The officials of the following Title I mines were notified of the seriousness of the situation and were requested to refrain from mining until such time as the danger of inundation of their workings had subsided or until the extent of the hazard could be determined. The officials and operators cooperated fully.

January 23, 1959:

No. 9 Colliery
Panzitta Coal Company
Kingstown Township, Luzerne County, Pennsylvania

No. 14 Slope Mine
Maffei Coal Company
Exeter, Luzerne County, Pennsylvania

Masci Slope Mine
Benny Masci Coal Company
Exeter, Luzerne County, Pennsylvania

No. 14 Drifts Mine
M. and D. Coal Company
Hilldale, Luzerne County, Pennsylvania

Scatena and Vennarini No. 1 Slope Mine
Scatena and Vennarini Coal Company
Jenkins Township, Luzerne County, Pennsylvania

Kassa Slope Mine
Kassa Coal Company
Wyoming, Luzerne County, Pennsylvania

No. 52 Slope Mine
No. 52 Slope Coal Company, Incorporated
Duryea, Luzerne County, Pennsylvania

K. and K. Slope Mine
Kerechuk Coal Company
Moosic, Lackawanna County, Pennsylvania

Nardone Slope Mine
Macarelli Coal Company
Yatesville, Luzerne County, Pennsylvania

Rex Slope Mine
Rex Coal Company
Yatesville, Luzerne County, Pennsylvania

Pittston Slope Mine
Gigliello Coal Company
Yatesville, Luzerne County, Pennsylvania

No. 3 Slope Mine
Zurek Coal Company
Pittston Township, Luzerne County, Pennsylvania

Rossetti No. 9 Mine
Rossetti Coal Company
Pittston, Luzerne County, Pennsylvania

No. 4 Slope Mine
C. and J. Coal Company
Laflin, Luzerne County, Pennsylvania

January 24, 1959:

No. 10 Tunnel Mine
Musti Coal Company
Pittston, Luzerne County, Pennsylvania

GENERAL INFORMATION

The River Slope mine, May Shaft section, Schooley colliery, Knox Coal Company, Incorporated, is located in Port Griffith, Luzerne County, Pennsylvania. The mine is served by the Erie Railroad.

The Pennsylvania Coal Company, Smith and Mill Streets, Dunmore, Lackawanna County, Pennsylvania, owner of the property, leased it to the Knox Coal Company, Incorporated, on May 26, 1954.

The names and addresses of the operating company officials at the time of the last Federal inspection conducted December 5, 8-9, and 11-12, 1958, were as follows:

Louis Fabrizio, president and treasurer
10 Stout Street
Yatesville, Pennsylvania

Joseph Sciandra, vice president
507 Cedar Avenue
Exeter, Pennsylvania

Josephine Sciandra, secretary
1308 Wyoming Avenue
Exeter, Pennsylvania

Robert Groves, superintendent
South Main Street
Pittston, Pennsylvania

Frank Handley, mine foreman
121 Division Street
Kingston, Pennsylvania

William Receski, engineer and section foreman
244 Marcy Street (River Slope section)
Duryea, Pennsylvania

During the last Federal inspection, a total of 174 men was employed, 23 of whom worked on the surface and 151 underground. The average daily production was 710 tons of anthracite, all of which was loaded by hand onto chain or shaker conveyors.

The principal mine openings are the River slope and May shaft. Three other shafts in adjoining areas were available for emergency escape from the underground workings. The River slope,

about 245 feet long, was driven in rock on about a 25° pitch to where it intersected the Pittston vein. The depths of the shafts were as follows: May shaft 332.37 feet; Hoyt shaft 528.84 feet; Schooley shaft 579.90 feet; and Eagle air shaft 60 feet.

Mining was being done in the Marcy and Pittston veins which lie from flat to a maximum inclination of 45°. The average thickness of the Marcy vein is 4½ feet and the Pittston vein 11 feet. The immediate roof overlying the Pittston vein was slatestone ranging from 2 inches to 37 feet in thickness, and the main roof was sandstone ranging from 1 foot 5 inches to 51 feet in thickness, see borehole data appendix D. The roof overlying the Marcy vein is sandstone. The floor of the Pittston vein ranged from slatestone to dark sandstone and the relative thicknesses, as shown in borehole No. 1137, were 4 feet 4 inches and 9 feet 4 inches, respectively. The floor of the Marcy vein is sandstone.

MINING METHODS, CONDITIONS, AND EQUIPMENT

Mining Methods: Generally, the mine was developed and the chamber-and-pillar method of mining had been followed. Partial and complete pillar recovery was being done following the skip and split methods where written permission, as authorized by the property owners, was granted. Some development was being done in large pillars left during previous mining, and the chamber-and-pillar method of mining was followed.

The immediate roof overlying the Pittston vein is slatestone and that overlying the Marcy vein is sandstone. The main roof overlying both veins is sandstone. Cogs, three-piece timber sets, and single props were used for roof supports where roof conditions warranted. The company timbering rules required that supports be stood not more than 6 feet apart, or closer where needed.

All coal produced was loaded by hand or by gravity flow onto shaker or chain conveyors.

Mine Rescue: A mine rescue team was not maintained at the mine, however, a record was kept of the names and addresses of men employed at the mine who had completed such training. Refresher courses in mine rescue training had not been given any of these men in the past several years. At least six emergency escapeways were available from the mine via adjacent slopes and shafts. A check-in and check-out system was in force, but a written record was kept only of the number of men in the mine.

STORY OF INUNDATION AND RECOVERY OPERATIONS

Participating Organizations: The main opening of the break-in was plugged with railroad gondolas, mine cars, and other various materials through the combined efforts of the officials and workmen of numerous coal companies and contracting firms, both large and small, from Lackawanna and Luzerne Counties, and officials and workmen of the Lehigh Valley Railroad and numerous interested persons on January 25, 1959.

Two sinking pumps, twenty-two deep-well pumps, and sixteen compressed-air-driven water-air-lift pumps were installed at the various affected openings to unwater the involved area, see appendixes B and C. The sinking and deep-well pumps were installed by crews of the Glen Alden Corporation, The Hudson Coal Company, Pagnotti Interests, and the United States Steel Company, and the water-air-lift pumps were installed by Merritt-Chapman & Scott Corporation. This pumping work began soon after the break-in occurred, and the last of the deep-well pumps was placed in operation at 11:30 a.m. on March 17, 1959.

The No. 1 Contracting Company of Pagnotti Interests erected a cofferdam, installed bulkheads underground, and drilled boreholes from the surface into areas within the bulkheads; the Santarelli Vibrated Block Company poured the concrete. This work provided the seal under and adjacent to the river in the involved break-in area.

Communication and power facilities were provided by the Bell Telephone Company and the Pennsylvania Power and Light Company.

This entire program was under the direct supervision of the Pennsylvania Department of Mines and Mineral Industries.

Activities of Bureau of Mines Personnel: Gerald W. Fortney, Federal coal-mine inspector, learned of the break-in from a radio newscast at 1:10 p.m., January 22, 1959, and immediately telephoned William Rachunis, district supervisor, at the Wilkes-Barre office. Mr. Rachunis immediately directed several Federal inspectors to report to the scene of the occurrence. The inspectors' names and time of their arrival are as follows: Frank Retsel and William T. Cummings, 2:20 p.m.; Gerald W. Fortney, William Rachunis, and William T. Torrance, 2:25 p.m.; Clair S. Sigworth, with rescue truck, 4 p.m.; James A. Merrick, 4:30 p.m.; and Charles E. Jones, 6:30 p.m. Mr. Rachunis directed the work of Bureau of Mines personnel at the scene. James Westfield, Assistant Director--Health and Safety, Washington, D. C., arrived at the scene at 7:45 p.m. the day of the disaster. Bureau of Mines personnel was

informed that 82 men were in the mine at the time of the break-in and that 37 of the men had escaped via the various openings, but that 45 men were still unaccounted for. Also, that all adjacent mine operators had been notified of the occurrence and workmen had either been or were being removed from such operations.

At approximately 2:45 p.m., an observer came running over the hill adjacent to River slope shouting that some of the missing workmen were at the bottom of the abandoned Eagle air shaft. One workman, Amedeo Pancotti, company laborer, had climbed unassisted up the 60-foot-deep shaft. Inspectors Cummings, Fortney, and several workmen then proceeded to the air shaft with an insulated power cable, who together with State Mine Inspectors Andrew Wilson, Warren L. Shirey, and Thomas M. Beaney assisted three more men up the shaft. The mine foreman, colliery engineer, and an assistant mine foreman were then lowered down the air shaft where they encountered three more men who had left the seven-man group after they had reached the bottom of the air shaft to go for tools they expected to use to scale the shaft wall. These men were assisted up the shaft. A further search by the three officials failed to locate the other missing men and they returned to the surface up the shaft.

After studying the mine maps, it was decided that a six-man rescue squad composed of four mine officials and two mine workmen would go back into the Eagle air shaft area to search for the missing men. The rescue squad was lowered by rope at 5:30 p.m. Plans were to leave a man posted at 300-foot intervals beginning near the bottom of the shaft and extending into the active working areas familiar to the men in the searching party. The purpose of posting the men was to serve as a guide through unfamiliar areas. Inspectors Shirey and Fortney were at the top of the shaft. At 6 p.m., when no response was received by calling down the shaft, Inspector Fortney was lowered down the shaft to ascertain the trouble. He located the first man on post about 200 feet from the shaft bottom and then proceeded along the line of posted men into the area that was being probed. Returning to the shaft bottom, Fortney informed Shirey that all was going according to plan and that he had instructed the men to contact each other at short intervals and report their progress to Shirey on the surface.

Inspector Fortney then returned to the first man on post and informed him that he was going to make a short probe in the opposite direction from the general probing to where a rock hole had been driven from the Pittston vein to the Marcy vein. The inrushing

water could be heard at that point. During this probe, 26 of the missing men were located at 6:45 p.m. by Inspector Fortney. After ascertaining that the men were all in fair condition, Fortney led them to the bottom of the shaft, attached the rope to each man, and assisted them over a rough spot near the bottom of the shaft as the men were pulled to the surface. After the last man had been pulled to the surface, Fortney informed Shirey that from information given him by the survivors, he believed that further probing and exposing rescue men to the hazard of the inrushing water should be discontinued, and that as soon as he could locate the probers, the search would be ended, to which Shirey concurred. The entire group returned to the surface at 9:15 p.m. Communications between the top and bottom of the shaft were by voice.

Other Bureau of Mines personnel who participated during the critical period following the river break-in were Federal Inspectors Nicholas M. Benson, Joseph R. Lindsey, and Joseph E. Stanton.

Mine Conditions Immediately Prior to the Inrush of Water: The mine was operating on the day of the occurrence. The temperature soared from a low of 7 degrees Fahrenheit on January 19, 1959, to a high of 62 degrees Fahrenheit on January 21 and 22, 1959. This accounts for the ice-laden river at the time of the occurrence, as thick ice had formed upstream during November and December 1958 and the early part of January 1959. Precipitation during January 1959 was above normal, according to the U. S. Weather Bureau at Avoca, Pennsylvania; the official reading was 2.99 inches, which is 0.73 inch above the normal of 2.26 inches. The fireboss' book did not indicate any unusual condition underground prior to the inrush of water. It is believed that the extra weight of the swollen ice-laden river was a contributing factor in the river break-in at the River Slope mine.

Two Federal inspections were made of the River Slope section within 5 months of the disaster. (1) During the September 1958 Federal inspection, mining in the two involved chambers driven beyond the stop line had been completed, data from the survey thereof, that had been made in September, had not been posted on the maps, and there was no indication or evidence of inundation danger. (2) During the December 1958 Federal inspection, the "fatal" crosscut that was later driven over the anticlinal to tap the faces of the two aforementioned chambers had not been started, there was no information available then that such a crosscut would be driven, and there was no indication or evidence of inundation danger.

Evidence of Activities and Story of Inrush of Water:

Six men reported for work at the River Slope section at their usual starting time, 7 a.m., on January 22, 1959. Three of the workmen were assigned to continue the work of developing a slope in the Marcy vein, and two were directed to remove shaker pans in the Pittston vein where mining had been completed. The sixth man was a certified assistant mine foreman who examined the two working areas during the preshift and on shift. Other workmen at the colliery were assigned their respective tasks and area locations at the May shaft office. The assistant foreman visited both working areas and instructed the men in the Marcy vein to pull down some loose roof and to stand a timber set. Reportedly, there was no evidence of weight and the supports were intact in the Pittston vein area during the examination; the workmen assigned there began removing the shaker pans. About 11:30 a.m., the men heard a prop crack in the place that had been driven over the anticlinal. The miner-in-charge went down to the Marcy vein working place and informed the assistant foreman of the condition, and the assistant foreman informed the Marcy vein workmen that he was going up to ascertain conditions in the Pittston vein and inquired of them if they wanted to go outside for lunch while he was examining the upper area. Reportedly, the men stated that they would finish the car they were loading before eating lunch. The assistant foreman and miner proceeded up the rock slope to the Pittston vein intersection where they met the other workman. As they were starting into the chamber off the slope, the roof gave way and water and debris rushed in with tremendous force; this was at 11:42 a.m. The three men, realizing that the river had broken through and that it was impossible for them to be of assistance to the three workmen in the Marcy vein, which was almost directly below the inrushing raging water and debris, hurried up the slope to the surface. The assistant foreman telephoned the colliery superintendent informing him of the situation, and the superintendent then telephoned the various underground working sections issuing orders that all men be notified to get out of the mines immediately. He also notified the operators of adjacent active mines of the serious situation and suggested that they remove workmen. Such prompt and thoughtful action undoubtedly saved many lives. All the affected companies removed underground personnel immediately upon notification.

As mentioned previously, three men escaped immediately following the break-in, up the River rock slope. Twenty-three men working in the vicinity of the May shaft area escaped via the shaft at various intervals, some of whom traveled through ice-laden water

and debris. Reportedly, one of the victims was lost in this area when he stopped to change his grease-covered clothing, which was his regular habit before leaving the mine. Eleven men working in the Hoyt shaft area escaped via that shaft, but traveled through water to reach it. Thirty-three men escaped via the abandoned Eagle air shaft, after wandering around for several hours. The first seven of these men found their way to the bottom of the shaft at approximately 2:45 p.m.; one of the men was able to ascend the shaft unassisted and reported the location of his fellow workers to the people standing by on the surface. The remaining six of the seven-man group were assisted up the shaft by insulated wire cable pulled by men on the surface. Rescue men entered the mine at 5:30 p.m., and the remaining 26 men were located at 6:45 p.m. These men were assisted up the shaft in the same manner, except that a 1-inch hemp rope was used instead of the insulated wire cable. As of this writing, the 12 missing men are still entombed in the mine, see appendix B showing escape areas.

Extensive damage was evident in areas that were in the direct path of the inrushing ice-and-debris-laden water where examinations were made in areas that were unwatered. Roof supports and heavy equipment in these areas have either been swept away or moved from their original positions. Mine workings, some active and some inactive, were either inundated or partially flooded as far northeast as No. 4 shaft, Pennsylvania Coal Company, and as far southwest as Henry colliery, Lehigh Valley Coal Company. See appendix C for pump installations during the unwatering project.

Recovery Operations: Work of blocking the breach was begun soon after it occurred. The westbound track of the Lehigh Valley Railroad was broken and diverted toward the area of the break-in. Railroad gondolas, small mine cars, bales of excelsior, and other available materials were dumped into the opening. Heavy equipment, such as autotrucks, bulldozers, and cranes were placed in operation on January 23, 1959, the morning following the break-in, and large boulders were dumped and pushed into the opening along with the other materials. This work continued around-the-clock, and on January 25 the opening was blocked sufficiently to stem the fast inflow of water to a much lesser degree. Following this lessening of inflow, the break-in area was surrounded with a semi-circle of large rocks and earth materials having a radius extending into the river about 185 feet and on a level with the railroad bed. This work lessened the inflow of water further, but an estimated 20,000 g.p.m. of water was still inflowing, as indicated in appendix F, figure 5, which was photographed where water was flowing from the Pittston vein to the underlying Marcy vein on March 23, 1959.

Two sinking pumps of 4,000-g.p.m. pumping capacity were installed, one at the River slope and the other at No. 2 slope; these pumps were placed in operation on January 30 and February 2, respectively, and remained in operation only a few days due to the receding water. Twenty-two deep-well pumps ranging in capacity from 3,000 to 6,000 g.p.m. were installed at the various shaft openings affected by the break-in. The first of these deep-well pumps started operating at 3:26 p.m., February 3, at Schooley shaft and the last one at 11:30 a.m. on March 17 at Hoyt shaft. The affected area was unwatered from a high water elevation of +502.25 feet reached at 8:30 p.m., January 25, to an elevation of approximately +200.00 feet, which is being maintained by the operation of four deep-well pumps at the time of this writing, June 5, 1959. As of June 6, 1959, more than 11 billion gallons of water had been pumped from the involved area, see appendix C.

Work of installing a concrete bulkhead in the underground break-in area began March 11, 1959. Workmen erected two underground bulkheads of heavy planks and timbers across openings adjacent to the plugged area after reinforcing the inside area adjacent to the railroad gondolas with steel rods inserted into the floor, roof, and ribs. Four boreholes 8½ inches in diameter were drilled from the surface into the break-in area, and 1,230 cubic yards of concrete were poured into the void. This work reinforced the involved area sufficiently to stop pressure on pillars and timbers along and over the slope where the Pittston vein was first intersected and where the break-in occurred. Further sealing and reinforcing is being done, continuing from this area and extending to the offcourse and under-river chambers to the lower end of the slope, see appendix E. Work of erecting an earth cofferdam to surround the break-in area began March 25, 1959, by extending two dikes from the eastern shore line of the river (one above and the other below the break-in area) to Wintermoot Island in the river. The third side of the dam was erected on the island. This work was done to divert the river to the western side of the island while a permanent seal was being erected in the break-in area. The cofferdam was completed on May 27, 1959, which decreased the inflow of water into the underground area to an estimated 400 g.p.m., see appendix F, figure 6.

Workmen began relaying the washed-out track on May 11, 1959, down to where the water was overflowing from the Pittston vein into the Marcy vein. Water was bottled up in this area because a 4-inch borehole, used for drainage in the area, was blocked. This area was unwatered by installing a portable sinking pump of 1,200 g.p.m. capacity. The area down to the third left chamber off the lower

Pittston vein intersection has been recovered. These three chambers lead to the two offcourse and three under-river chambers in the Pittston vein in the break-in area. Present plans are to erect bulkheads in these and other recovered chambers and to drill boreholes from the surface into the involved area, to flush a large part of the area mined under the river, and to complete the sealing with concrete.

Searches were made in accessible openings of the affected areas, however, no trace was found of the bodies of the 12 victims.

INVESTIGATION OF CAUSE OF INRUSH OF WATER

Investigation Committee: Official State hearings were conducted on February 16 and 17, 1959, in the auditorium of St. Cecilia's Church, Exeter, Luzerne County, Pennsylvania, and at the Anthracite Institute Building, Wilkes-Barre, Luzerne County, Pennsylvania, on March 25, 1959. State officials invited the Bureau of Mines to participate in the hearings. Officials of the Pennsylvania Coal Company, property owner and lessor, and officials and workmen of Knox Coal Company, Incorporated, lessee, and State and Federal coal-mine inspectors were interrogated.

The investigating committee was comprised of the following:

Pennsylvania Department of Mines and Mineral Industries

Thomas M. Beaney	District Mine Inspector and Chairman of the Investigating Committee
John R. Edwards	District Mine Inspector
Willard G. Ward	District Mine Inspector

United States Bureau of Mines

Harry F. Weaver	Chief, Division of Coal Mine Inspection
William Rachunis	District Supervisor
Gerald W. Fortney	Federal Coal-Mine Inspector

First Assistant District Attorney Arthur Silverblatt, representing the Luzerne County District Attorney's office, participated in the questioning of witnesses.

On March 26, 1959, when the area had been unwatered below the May shaft level at +273.31 feet, probing to ascertain underground conditions was done via Eagle air shaft by the following:

Pennsylvania Department of Mines and Mineral Industries

Daniel H. Connelly	Deputy Secretary
Thomas M. Beaney	District Mine Inspector
John R. Edwards	District Mine Inspector
Willard G. Ward	District Mine Inspector

Knox Coal Company, Incorporated

Frank Handley	Mine Foreman
Joseph Hopkins	Assistant Mine Foreman

United States Bureau of Mines

Joseph E. Stanton	Federal Coal-Mine Inspector
Gerald W. Fortney	Federal Coal-Mine Inspector

Further probing was done by representatives of the above-mentioned group via May shaft on April 2, 1959.

The United States Bureau of Mines investigation began on the day of the occurrence, and daily visits to the scene to observe recovery work are still being made by a Federal coal-mine inspector.

Summary of Evidence: Evidence used in this report was acquired from numerous visits to the scene of the occurrence and from a transcript of sworn testimony of witnesses during the State hearings. The evidence and testimony are summarized as follows:

1. Mining had been done to within 70 feet of a borehole that indicated the rock strata to be only 19 inches in thickness overlying the Pittston vein, which is the immediate coal bed underlying the river.

2. Mining was done beyond a safety stop line area, established by the lessor, under the river for a distance of 90 feet.

3. The safety stop line was extended, and written permission was granted by the lessor that allowed mining in an area that was approximately 50 feet inland from the low water mark of the river, where the rock cover, estimated by the lessor to be at least 35 feet, based on interpolating the thickness of rock cover between nearby boreholes, was, due to an anticlinal, less than 35 feet. A pothole occurred in this area on January 31, 1959, where the rock was estimated to be from 5 to 10 feet in thickness.

4. Remedial action was not taken after a survey made by the lessor in September 1958 definitely showed that mining had been done beyond a safety stop line.

5. Additional mining was done in a dangerous area after a survey made by the lessor in September 1958 definitely showed that mining had been done beyond a safety stop line under the river in a thin rock strata area.

6. An additional skip of from 4 to 6 feet of coal was removed from the left side of No. 1 shaker place that was driven over an anticlinal; this mining further weakened the strata beneath the river in the area that had been mined beyond the safety stop line.

7. Mining was done without a written permit from the property owner, in the area of the break-in.

8. The official authority for safety of the workmen and the mining in the River Slope area was in doubt.

9. The ice-laden river had risen from 2.1 feet above the zero mark at elevation +512.07 feet at the Federal-State Flood Forecasting Service Station, Wilkes-Barre, Pennsylvania, at 7 a.m., January 19, 1959, to 15.6 feet at 10:45 a.m., January 22, 1959, the day of the occurrence.

Cause of the Inrush of Water: The cause of this disaster was the removal of the natural support (coal) in the immediate vein beneath the river where the rock strata was insufficient to support the river. The contributory cause was the swollen ice-laden river.

RECOMMENDATIONS

The following recommendations are made to prevent similar disasters:

1. Mining should not be done in the immediate vein beneath rivers where the rock strata is insufficient to withstand the extreme pressure exerted by such river water. In all mining done beneath rivers, sufficient support should be left to assure surface protection.

2. Mining should not be done beyond an established safety stop line.

3. All factors, such as anticlinals, closer spacing of test boreholes, and other pertinent data should be considered before extending a safety stop line, and these conditions should be discussed with the State and Federal mine inspection agencies before permission is granted.

4. When it has been established that mining has been done unknowingly in a dangerous area, all mining should be discontinued immediately and prompt action should be taken to correct the condition.

5. Promiscuous mining, such as removing an additional skip of coal from the side of a pillar in an area where a chamber has been driven into a dangerous thin rock cover area, should not be done.

6. Mining should not be done without a written permit issued by the lessor and this permit should be made available to the State and Federal mine inspection agencies.

7. There should be no doubt as to the official authority for safety of workmen in a mine, and such designated official should take prompt action immediately upon learning of a dangerous condition.

8. Extreme vigilance should be maintained, when rivers are on the rise, in and around mines where mining has been done beneath or along the river.

The following additional recommendations have no direct bearing on the cause of this disaster, but would have been beneficial in recovery work following the disaster:

1. Any surface opening close to active workings (such as the Eagle air shaft) that can be used as an emergency outlet should be maintained in a safe travelable condition, and escapeway signs should be posted conspicuously from the underground active workings.

2. The daily check-in and check-out system should include a written record of names and titles of personnel concerned with underground workings.

ACKNOWLEDGMENT

The United States Bureau of Mines gratefully acknowledges the courtesies extended by workmen and officials of the Knox Coal Company, Incorporated; officials of the Pennsylvania Coal Company; representatives of the Pennsylvania Department of Mines and Mineral Industries; representatives of the United Mine Workers of America; and others.

Commendation is extended to the people who worked so diligently during the initial recovery work following the disaster, and to the men who served on the rescue team composed of company personnel who entered the mine in search of survivors while the river was pouring into the workings. Also, to the Salvation Army, the Red Cross, and others who offered their assistance and performed a magnificient job in subfreezing weather. Special commendation is extended to James Jamieson, assistant mine foreman, Knox Coal Company, Incorporated, who, after a very narrow escape at the Hoyt shaft, experienced a second narrow escape while searching for survivors in the May shaft and still reentered the workings that were being inundated by the fast inflowing water and ice on a rescue mission via the Eagle air shaft on the day of the occurrence, and to Joseph Stella, chainman and inspector for the Pennsylvania Coal Company, who through his knowledge of the workings and experience, led seven men to safety through Eagle air shaft.

Respectfully submitted,

/s/ William Rachunis

William Rachunis
District Supervisor
Health and Safety District A

/s/ Gerald W. Fortney

Gerald W. Fortney
Federal Coal-Mine Inspector

Approved by:

/s/ James Westfield

James Westfield
Assistant Director--Health and Safety

/s/ Marling J. Ankeny

Marling J. Ankeny
Director

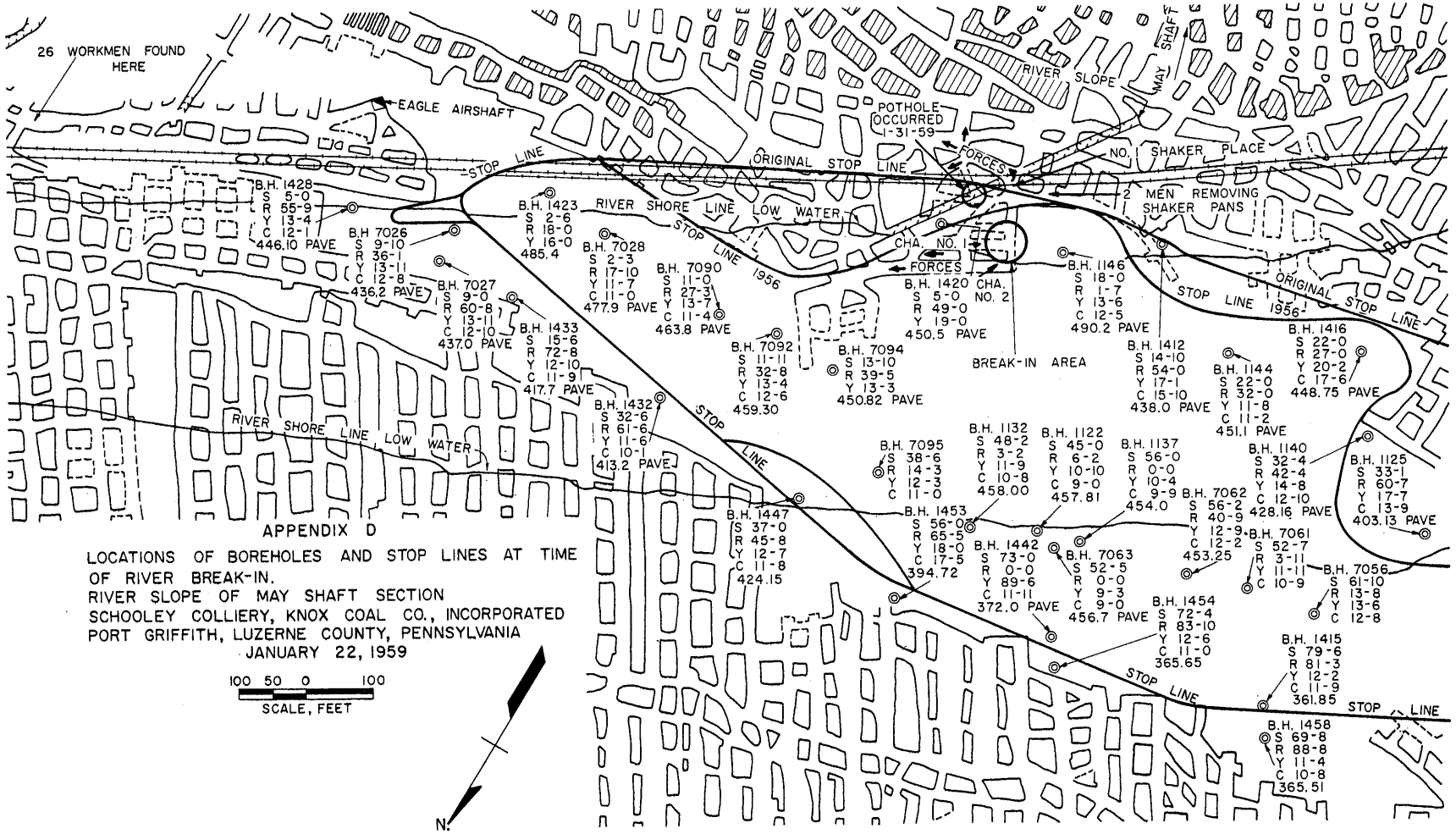
APPENDIX A

ENTOMBED VICTIMS OF INUNDATION
RIVER SLOPE MINE
MAY SHAFT SECTION, SCHOOLEY COLLIERY
KNOX COAL COMPANY, INCORPORATED

January 22, 1959

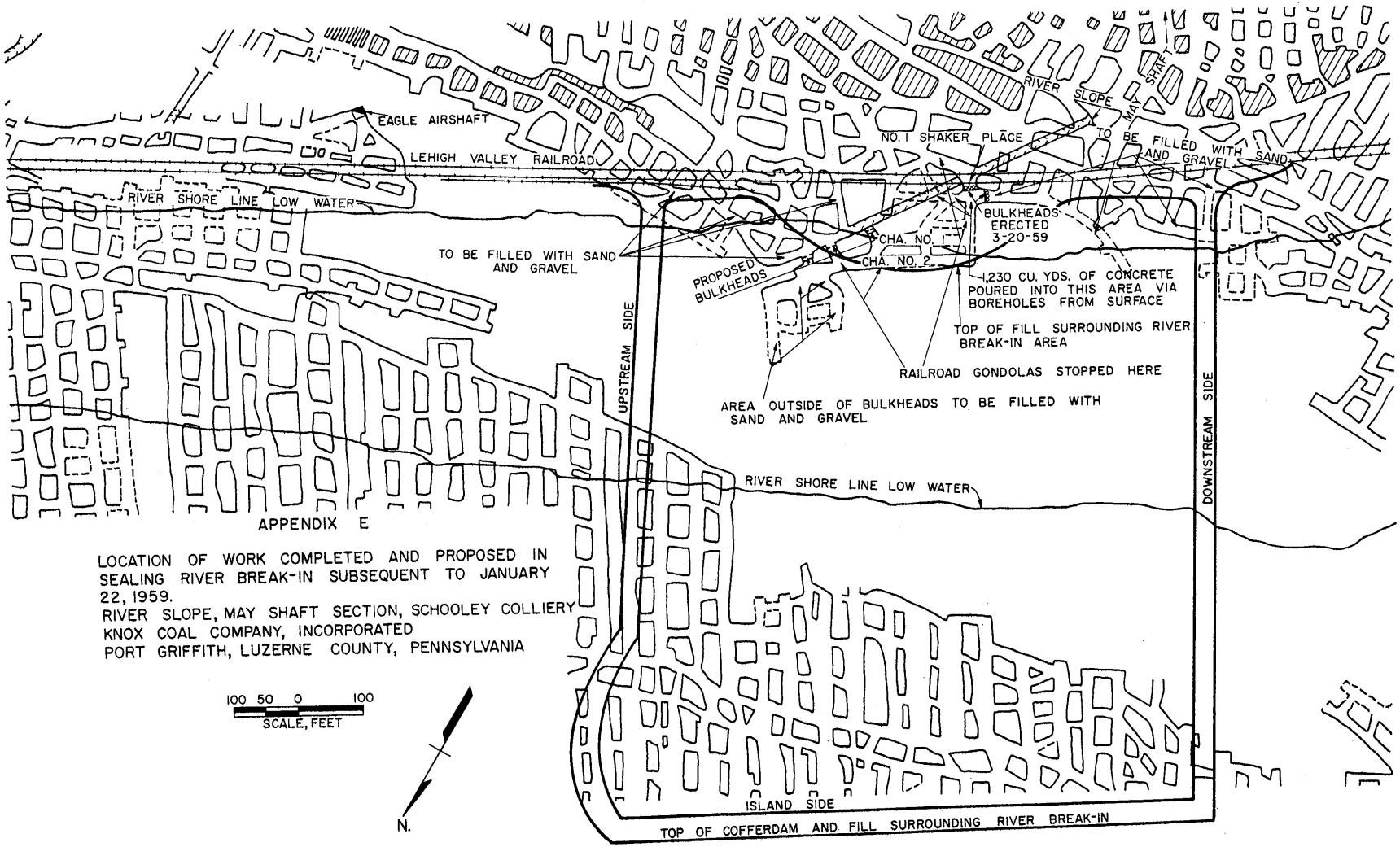
NAME	AGE	OCCUPATION	MARITAL STATUS	NUMBER OF DEPENDENTS	YEARS EXPERIENCE IN MINES
John Baloga	54	Miner	Married	4	35
William Sinclair	48	Miner's Laborer	Married	2	35
Daniel Stefanides	33	Miner's Laborer	Married	5	16
Samuel Altieri	62	Electrician	Married	2	40
*Francis Burns	62	Lessor's Inspector	Married	1	40
Eugene Ostroski	34	Miner's Laborer	Married	4	16
Joseph Gizenski	37	Miner	Married	4	22
Charles Featherman	37	Laborer	Married	2	12
Herman Zalonis	58	Company Man	Single	0	40
Frank Orlowski	41	Laborer	Married	2	20
*Benjamin Boyer	55	Electrical Foreman	Married	3	28
Dominick Koveleski	52	Laborer	Married	1	25

*Employee of Pennsylvania Coal Company (lessor)



APPENDIX D

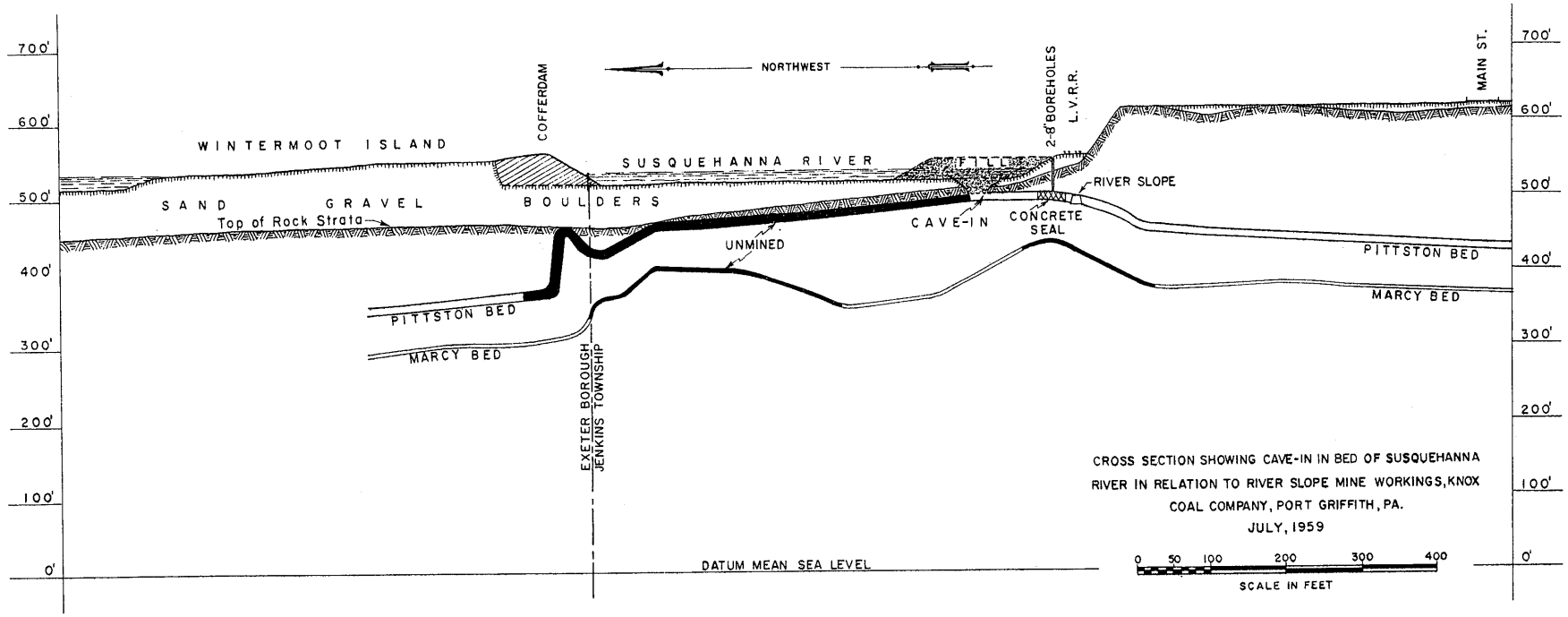
LOCATIONS OF BOREHOLES AND STOP LINES AT TIME OF RIVER BREAK-IN.
RIVER SLOPE OF MAY SHAFT SECTION
SCHOOLEY COLLIERY, KNOX COAL CO., INCORPORATED
PORT GRIFFITH, LUZERNE COUNTY, PENNSYLVANIA
JANUARY 22, 1959



APPENDIX E

LOCATION OF WORK COMPLETED AND PROPOSED IN SEALING RIVER BREAK-IN SUBSEQUENT TO JANUARY 22, 1959.
RIVER SLOPE, MAY SHAFT SECTION, SCHOOLEY COLLIERY
KNOX COAL COMPANY, INCORPORATED
PORT GRIFFITH, LUZERNE COUNTY, PENNSYLVANIA

FIGURE 13. - Upstream, Downstream, and Southeast Sides of Cofferdam, and River Slope Tipple.



CROSS SECTION SHOWING CAVE-IN IN BED OF SUSQUEHANNA RIVER IN RELATION TO RIVER SLOPE MINE WORKINGS, KNOX COAL COMPANY, PORT GRIFFITH, PA.

JULY, 1959

APPENDIX F

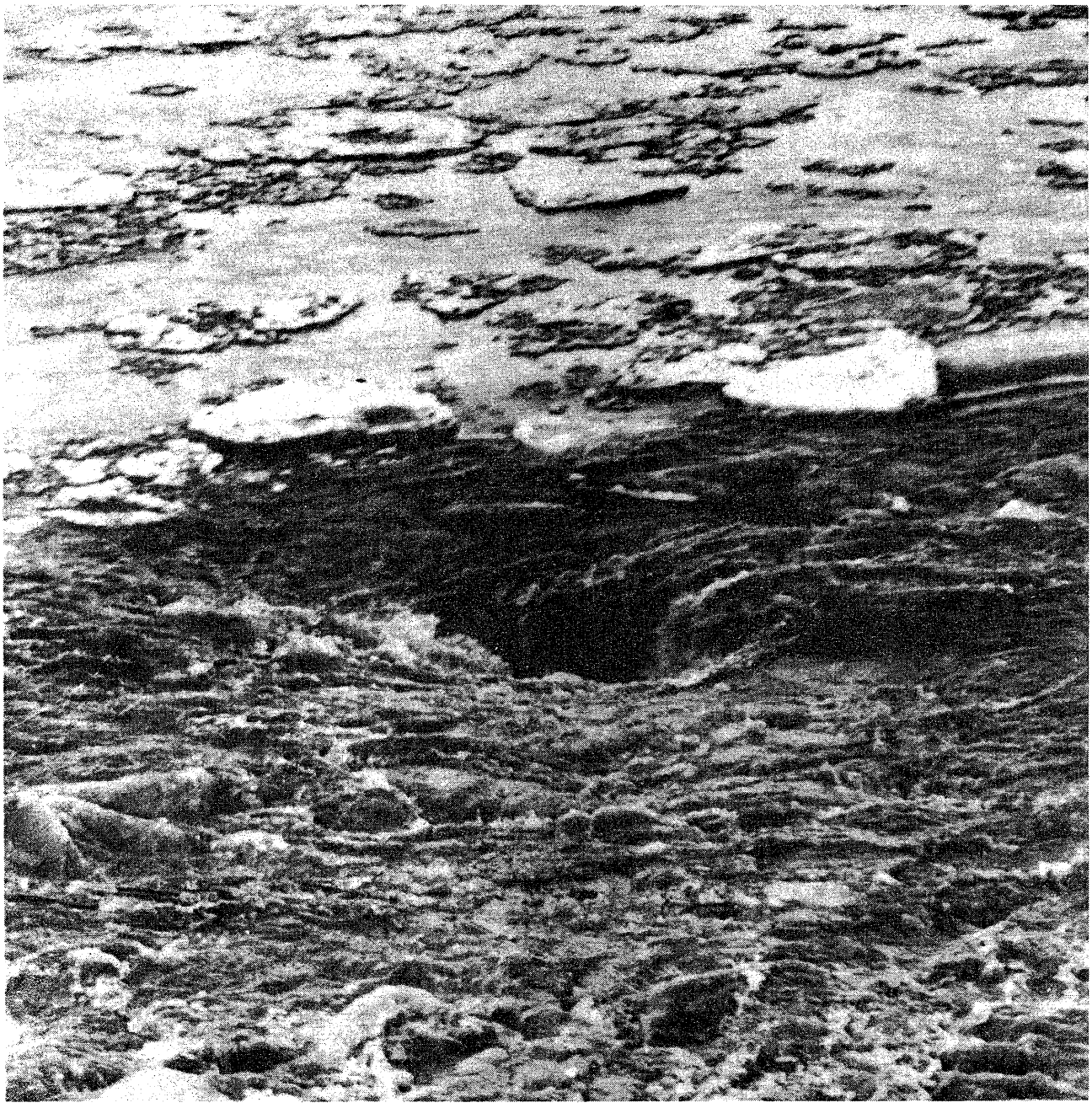


FIGURE 1. - Swirling Water and Ice Entering Break-In to Mine Workings.

FIGURE 2. - Materials Being Dumped Into River Break-In Area.

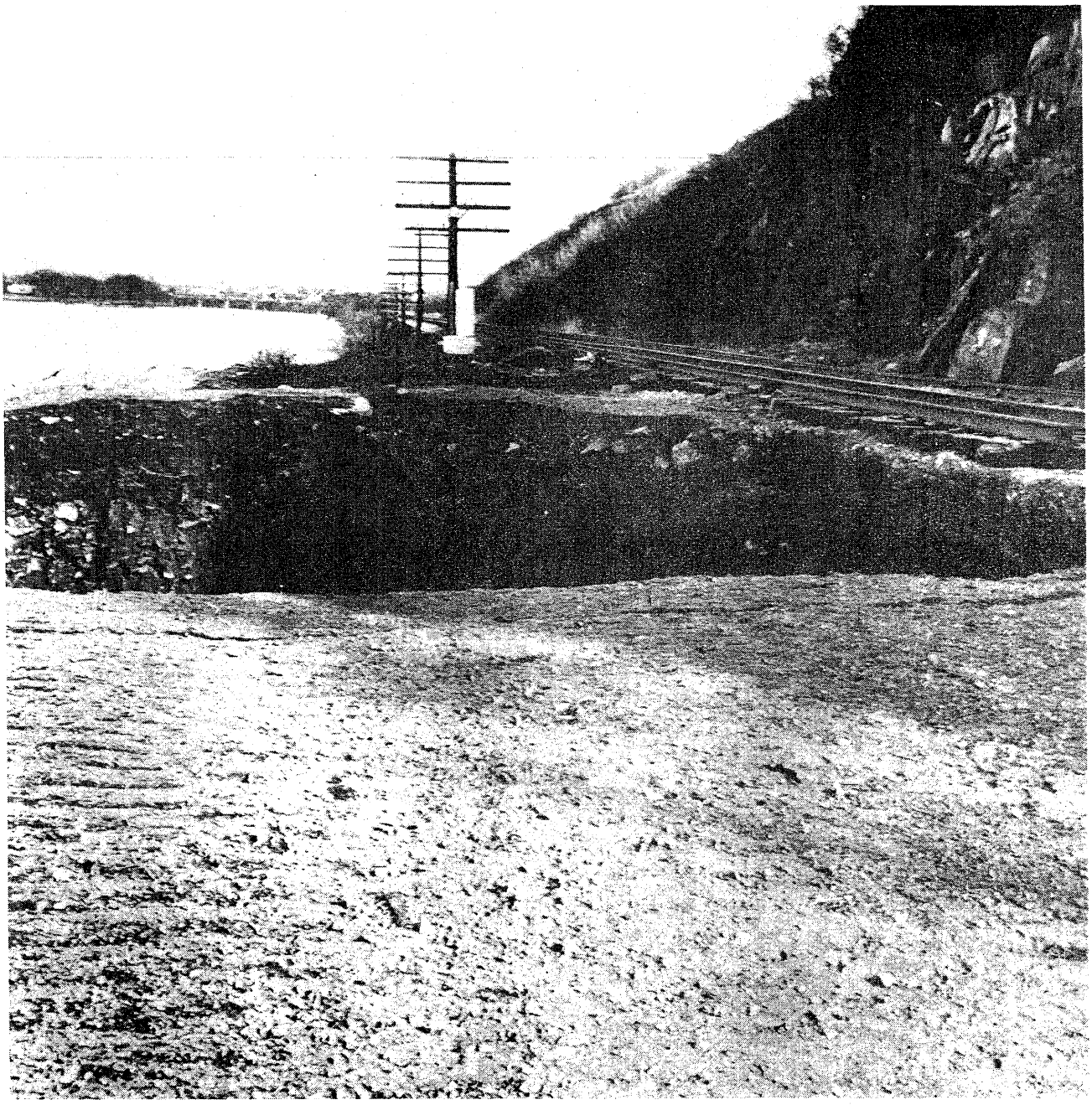


FIGURE 3. - Pothole That Occurred Within Safety Stop Line on January 31, 1959.

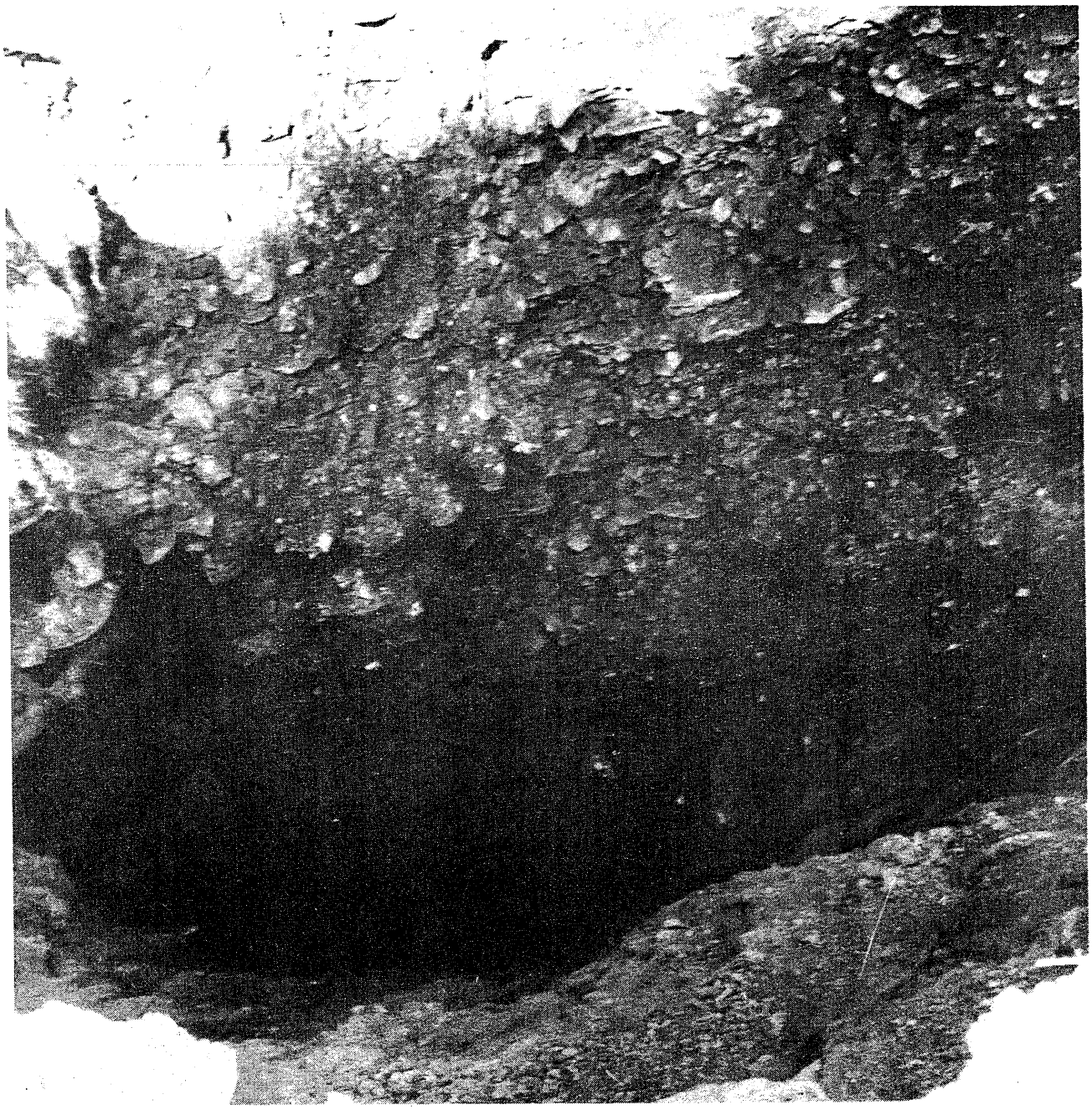


FIGURE 4. - Inside of Pothole That Occurred January 31, 1959, Revealing Thin Rock Strata.