

UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Underground Coal Mine

Fall of Face, Rib, Pillar, or Highwall  
August 29, 2019

Enlow Fork Mine  
Consol Pennsylvania Coal Company LLC  
Prosperity, Washington County, Pennsylvania  
ID No. 36-07416

Accident Investigator

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Coal Mine Safety and Health Inspector

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## OVERVIEW

On Thursday, August 29, 2019, at 6:30 p.m. Tanner McFarland, a 25-year-old section foreman with 6 years of mining experience, died after a section of rib fell on him. At the time of the accident, the victim was exiting the longwall face. The section of fallen rib measured 25 feet long, 3 feet thick, and 8½ feet high.

The accident occurred because the engineering controls were not adequate to prevent the rib from falling onto the victim.

## GENERAL INFORMATION

Miners access the Enlow Fork Mine by three shaft openings and a slope opening into the 96-inch Pittsburgh bituminous coal seam. The mine is ventilated with nine air shafts, all with exhausting mine fans. The mine liberates 11,564,125 cubic feet of methane every 24 hours. Because of the excessive methane liberation, MSHA inspects this mine every five working days at irregular intervals as stated in section 103(i) of the Mine Act. The mine operator employs 640 miners at this mine and 500 work underground. The mine has nine mechanized mining units (MMUs) producing 42,000 tons of raw coal daily. Two MMUs are longwall sections and seven are continuous mining machine (CMM) sections. After coal is extracted from the CMM face, it is transported by shuttle cars or ram cars to the section loading point. Belt conveyors transport coal to the surface. Rail-mounted diesel

locomotives and personnel carriers transport miners, materials, and supplies between the entrances and work area.

The principal officers for the mine at the time of the accident were:

Eric Schubel..... Vice President of Operations  
Josh Koontz..... General Superintendent  
Michael Koffler..... Mine Foreman  
Frank O'Brien..... Safety Supervisor  
Todd Moore..... Director-Safety Services

The Mine Safety and Health Administration (MSHA) was in the process of conducting a regular health and safety inspection (E01) at the time of the accident. The previous E01 inspection was completed on June 27, 2019. The non-fatal days lost (NFDL) incidence rate for the mine in 2018 was 4.84, compared to a national rate of 3.15 for mines of this type.

#### DESCRIPTION OF ACCIDENT

On Thursday, August 29, 2019, at 4:00 p.m., the G1 Longwall Section (MMU 010-0) crew, including Tanner McFarland, Longwall Section Foreman, began their regular afternoon production shift. The miners entered the Archer Portal and traveled underground to the working section (See Appendix A), arriving at approximately 4:45 p.m.

McFarland conducted an on-shift examination of the working section while the afternoon shift crew replaced the day shift crew. At approximately 5:15 p.m., McFarland completed his examination of the longwall face and tailgate entry. McFarland traveled from the tailgate to the headgate of the longwall face where he joined Mike Randolph, Headgate Operator; Chad Smith, Shearer Operator; and Daniel Letavish, Shearer Operator. Mining on the longwall then started.

At approximately 6:30 p.m., McFarland walked past Smith and Letavish, who were located at the No. 6 shield waiting for the shearer to return to the headgate. McFarland exited the longwall face at the No. 1 shield to travel outby the longwall face in the No. 1 belt entry. At this time, Randolph was working on the opposite side of the belt conveyor and saw McFarland at the No. 1 shield.

As Randolph was traveling over the belt conveyor bridge, he saw the rib fall on the south side of the No. 1 entry at crosscut 17½. Smith and Letavish heard the rib failure. Randolph called out for McFarland and received no reply. Randolph saw a cap lamp on the inby side of the rib failure, and realized that it belonged to Smith and Letavish, who had travelled to the headgate to investigate. Randolph told them that McFarland did not

make it through the rib failure. He de-energized the longwall panline and, along with Smith and Letavish, began to remove rib material to locate McFarland.

Anthony Cashdollar, Mechanic, received a call from Randolph and traveled to the accident scene. Cashdollar, Smith, and Letavish followed the sound from McFarland's radio and the light from his cap lamp to locate McFarland. Cashdollar called the Tracking Center and then Mark Rapp and Kay Roupe, Tracking Center Employees, called emergency medical technicians (EMTs) and a life flight. Brian Brottish, Mechanic/EMT, who was working outby, heard the call from the G1 Longwall section and obtained an EMT kit, and began to travel to the section.

When Cashdollar located McFarland, he reached through the rib material and stated that he felt McFarland's pulse. The miners continued to remove material to uncover McFarland as medical oxygen was administered.

At approximately 6:55 p.m., McFarland was partially uncovered and Cashdollar could no longer feel a pulse. McFarland was then completely uncovered and Cashdollar stated they held his cervical spine until Brottish arrived with the EMT Kit. Chest compressions were started on McFarland. An automated external defibrillator (AED) was applied but did not indicate that a shock should be given.

McFarland was secured to a backboard and transported to the surface of the Sparta Portal, where attendants from Washington Ambulance and Chair were waiting to treat him. Paul Shiring, Washington County Deputy Coroner, pronounced McFarland dead at 8:51 p.m. at the Sparta Portal.

## INVESTIGATION OF THE ACCIDENT

At 7:05 p.m. on August 29, 2019, Frank O'Brien, Safety Supervisor, notified the Department of Labor National Contact Center (DOLNCC) of the accident. The DOLNCC notified Paul Pelesky, Health Supervisor, at 7:18 p.m. Pelesky then notified Thomas Bochna, Waynesburg Field Office Supervisor. Bochna contacted the mine operator and reminded them of their responsibility to secure the accident site and to preserve evidence that may aid in the investigation. Bochna along with Andrew Whiteman, Mine Safety and Health Inspector, traveled to the mine.

At 10:09 p.m., Whiteman issued a 103(k) order to the mine operator to ensure the safety of miners and preserve the accident scene for investigation. Whiteman and Bochna conducted witness interviews in conjunction with the Pennsylvania Bureau of Mine Safety and the mine operator. Investigators obtained statements from miners who had knowledge of the facts and circumstances relating to the accident. After the witness interviews were completed, the investigation team traveled underground to the accident

scene. Investigators took photographs and made measurements. The mine operator provided training records.

On August 30, 2019, Bernard Caffrey, Mine Safety and Health Inspector/Accident Investigator, and Michael Kelley, Assistant District Manager, were briefed at the MSHA Waynesburg field office by Bochna and Whiteman. Caffrey and Kelley then met with Paul Tyrna, Geologist, MSHA Technical Support; Daniel Colby, Enlow Fork Mine Safety Inspector; and Todd Moore, Director-Safety Services, at the Enlow Fork Mine, Archer Portal. The inspection party then traveled underground to the accident scene. Caffrey and Tyrna took additional photographs. See Appendix B for persons interviewed and those who participated in the investigation.

## DISCUSSION

### Accident Scene

The accident occurred at the headgate of the G1 longwall panel on the south side of the No. 1 entry at crosscut 17½. Based on excavated debris, the victim was located adjacent to the stage loader approximately 14 feet inby the crosscut 17½ pillar corner. The rib failure extended 25 feet from the outby pillar corner at crosscut 17½ to a point 5 feet inby the longwall shield tips.

The longwall face was adjacent to the rib failure and the longwall shearer was mining toward the headgate at the time of the accident. The G1 longwall panel was 1,492 feet wide, approximately 14,000 feet long, and had retreated approximately 4,000 feet. The G1 longwall panel was the first panel in a projected five panel longwall district.

### Geological and Related Physical Factors

Investigators determined that several factors likely contributed to the rib failure. These factors include: the depth of cover, mining height, front abutment load, pillar corner angle, pillar geology, coal cleat and longwall panel orientation, and inadequate rib control.

The depth of cover over much of the G longwall panels is some of the deepest cover (over 1,000 feet) that has historically been encountered in the Pittsburgh seam. The depth of cover was 1,040 at the scene of the accident and the mining height was 8½ feet. The weight from the rock above the G1 longwall panel coupled with the significant extent of exposed ribs due to the mining height, are believed to be contributing factors to the instability of the failed rib. Technical Support has documented that the two most important physical factors related to the stability of ribs are the depth of cover and the mining height.

The pillars adjacent to longwall panels are continually subjected to enormous weight (front abutment load) as the longwall face is mined, because the weight of the rock strata above the longwall gob is transferred to the pillars. As previously stated, the longwall face

was adjacent to the rib failure and the longwall shearer was mining toward the headgate at the time of the accident.

The G1 headgate had three entries with the abutment pillars developed on 135-foot by 275-foot centers. The smaller flanking pillars were mined on 70-foot by 137½-foot centers. Ribs are generally less stable at pillar corners, because the coal at the corners is less confined. The sharp angled corners on the small pillars at the mine are particularly vulnerable to instability.

The ribs consisted of coal and a significant amount of rock. Approximately the top half of the rib consisted of rock and coal while the bottom half was coal. Fragments of material from the rib failure showed numerous compaction slickensides. It is likely that the rib conditions at the accident site were a result from increased stress levels that caused the lower portion of the rib to roll, or fall out. This would reduce vertical support for the upper portion of the rib.

Cleats are naturally occurring orthogonal joints in coal seams. In coal seams where cleats are well defined, ribs that are parallel with the dominant cleat tend to be less stable. At the mine, the orientation of the coal face cleat is nearly parallel with the direction of the longwall panel, which facilitates rib failure.

#### Roof Control Plan

The approved roof control plan required rib supports to be installed in by the tailpiece when the cover was greater than 700 feet and where the mining height was greater than 7 feet. Bolts installed in the ribs were required to be at least 3 feet long, spaced no more than 10 feet apart, and to be installed with a plate, strap, wooden plank, or surface control plate during the active mining cycle.

#### Rib Control

Ribs in the failure zone were supported in two stages or passes. During the first pass, a single row of 3-foot-long mechanically anchored bolts, installed through 4-foot-long T3 channels, were installed. The T3 channels were oriented vertically with the upper end near the mine roof. These rib bolts were installed by rib bolting drills mounted on the continuous mining machine behind the roof bolting stations. The purpose of the first pass rib support was to protect the miners in the face area immediately after coal is mined.

Miners installed second pass rib supports with a different bolting machine after the CMM was trammed out of the working place. During the second pass, the ribs were supported with 4-foot-long mechanically anchored bolts installed through surface control plates or T3 channel and 5-foot-wide geogrid mesh. The second pass rib support protects miners during the time between advancement and longwall panel extraction. This is particularly important in those areas like the headgate corner that are subjected to the front abutment load and where miners regularly work and travel in close proximity to the ribs.

Investigators saw five T3 channels in the failed rib debris. Three T3 channels were pressed tight against the side of the stage loader at points 8, 12, and 19½ feet from the inby pillar corner. All three were oriented vertically and were behind mesh, indicating that they were installed on advance with 3-foot long mechanically anchored bolts. Two other channels and bolts were visible in displaced fall blocks. Based on observations, investigators determined that the average maximum spacing of the first pass rib support was 5 feet. One other bolt tip, without the anchor shell, was visible protruding from the failed rib debris.

The roof adjacent to the rib failure was relatively undamaged and supported with 6-foot-long, 7/8-inch-diameter, grade 75, fully grouted point-anchor (mechanically anchored, resin assisted) bolts installed through T3 channel on approximate 4 foot centers with one 16-foot-long, 0.7-inch-diameter cable bolt installed between every third row of bolts.

While the mine operator's practice of installing rib support in the failure zone exceeded the minimum requirements in the approved roof control plan, it was insufficient to prevent the rib failure. The fact that the anchorage horizon for the 3-foot-long mechanically anchored rib bolts installed on advancement roughly coincided with the depth of failure indicates that longer bolts would have been required to prevent or lessen the severity of the failure.

No 4-foot secondary bolts were observed in the rubble, though the tip of one bolt of unknown length was visible protruding from the fall debris. The empty ends of two bolt holes were observed in the rib, but their depth coincided with the depth of failure, indicating that they were originally 3 feet deep. Observations just outby the accident site showed that the rib mesh was secured by just a single row of secondary rib bolts installed with a highly variable spacing ranging from 6 to 12 feet. Bolts installed in this manner would have been too widely spaced to prevent a large rib failure like the one that occurred.

Investigators determined that while the first pass rib support was adequate to protect miners in the face area during advancement, it was not sufficient for rib control during longwall mining. The concept of the second pass rib support was appropriate; however, its implementation was not adequate at the accident site because a sufficient number of longer secondary rib bolts were not in place.

### Examinations

On-shift and pre-shift examinations were made on the G1 longwall section as required. No hazardous conditions related to large roof and rib failures were recorded in examination records for the day of the accident and previous shifts.



### Training and Experience

McFarland had over 6 years of underground mining experience with 3 years as a longwall foreman. All of his experience was at the Enlow Fork Mine. McFarland received his Mine Examiner Certificate of Competency from the Pennsylvania Department of Environmental Protection, Bureau of Mine Safety, on February 1, 2016. He received his Assistant Mine Foreman Certificate of Competency from the Pennsylvania Department of Environmental Protection, Bureau of Mine Safety, on March 8, 2017. McFarland's last Annual Refresher training was on January 16, 2019.

## ROOT CAUSE ANALYSIS

MSHA conducted an analysis to identify the fundamental cause or causes of the accident that are correctible through reasonable management controls. A root cause was identified that, if eliminated, would have either prevented the accident or mitigated its consequences.

Root Cause: The mine operator did not adequately support or otherwise control the mine ribs.

Corrective Action: The mine operator developed an action plan to continue mining the G1 longwall panel. The provisions in the action plan required floor to roof support to be installed in strategic locations in the No. 1 entry along the south rib. MSHA agreed to the action plan.

The action plan addressed the longwall headgate operator positioning himself in the intersection during the mining process. In adverse rib conditions, longwall crews were to access the face through the stage loader (with the power disconnected) or the tailgate entry.

After an evaluation by Technical Support, which involved observing pull tests conducted by a bolt manufacturer, the mine operator submitted, and MSHA approved a revision to the roof control plan. The revised roof control plan contains enhanced minimum requirements that provide adequate rib support during advancement and longwall mining. The revised plan requires first pass rib bolting in areas where there is more than 700 feet of cover and the mining height is higher than seven feet. In these areas, bolts must be metal, not more than five feet apart (horizontally), at least 36 inches long, and installed with 48-inch long T3 channel, or other surface control. Also where this cover and mining height exist, second pass rib bolts and mesh are required on the walkway side of headgate entries. Second pass bolts must be metal, at least 60 inches long with at least 24 inches grouted length of resin, spaced no more than five feet horizontally, and installed in a "W" pattern unless conditions warrant a different pattern. Corners must have additional 60-inch bolts and mesh.

## CONCLUSION

On Thursday, August 29, 2019, at 6:30 p.m. Tanner McFarland, a 25-year-old section foreman with 6 years of mining experience, died after a section of rib fell on him. At the time of the accident, the victim was exiting the longwall face. The section of fallen rib measured 25 feet long, 3 feet thick, and 8½ feet high.

The accident occurred because the engineering controls were not adequate to prevent the rib from falling onto the victim.

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Russell J. Riley  
District Manager

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Date

## ENFORCEMENT ACTIONS

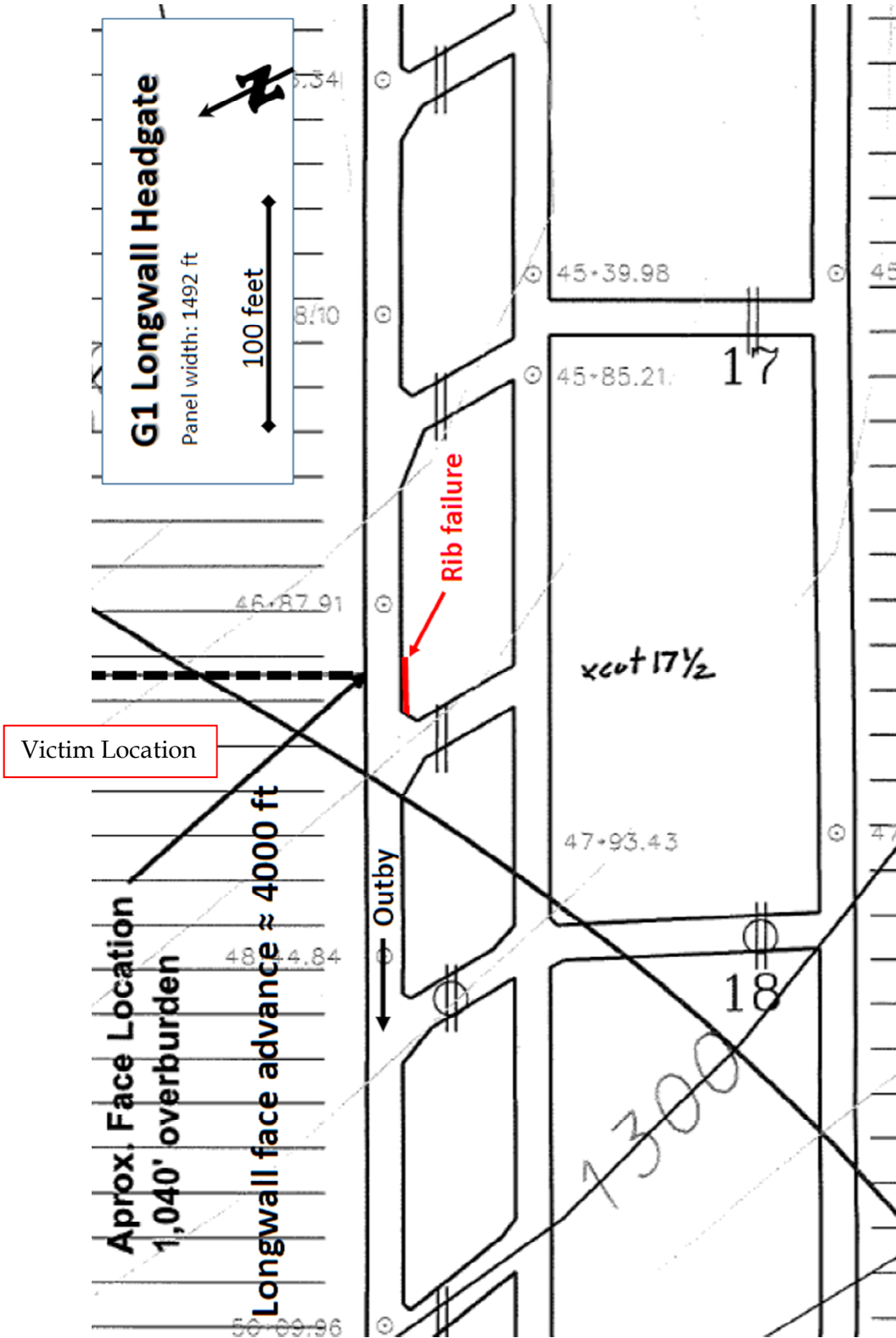
1. A Section 103(k) Order No. 9076309 was issued to Consol Pennsylvania Coal Company LLC, ID No. 36-07416.

A Fatal Injury Accident in the form of a Rib Roll/Rock Burst has occurred on the G-1 MMU 010-0 Longwall Section in the Number 1 entry at Spad Number 102+75 inby Last Open Crosscut Number 18. This order is being issued under 103(k) of the Mine Health and Safety Act of 1977 to protect the safety of persons on-site, including those involved in rescue and recovery operation or investigation of the accident. The mine operator shall obtain prior approval from an Authorized Representative of the Secretary for all actions to recover and/or restore operations in the affected area. Additionally, the mine operator is reminded of its existing obligations to prevent the destruction of evidence that would aid in investigating the cause or causes of the accident.

2. 104(a) Citation No. 9200567 was issued to Consol Pennsylvania Coal Company LLC, for a violation of 30 CFR § 75.202(a).

On August 29, 2019, a miner died after he was struck by a section of rib that fell while he was exiting the longwall face on the G-1 Longwall section (MMU 010-0) in the No.1 entry at Spad No. 102+75, inby 18 crosscut. The mine operator did not adequately control the rib to protect persons from hazards related to falls of the roof, face, or ribs and coal or rock bursts. The rib failure measured 25 feet long, 3 feet thick, and 8½ feet high.

Appendix A  
Section Map  
(Not to Scale)



Appendix B  
 Persons Participating in the Investigation  
 (Persons interviewed are indicated by a \* next to their name)

Consol Pennsylvania Coal Company LLC

Don Blumetti ..... Assistant Mine Foreman  
 Dan Bragg ..... Longwall Coordinator  
 \*Brian Brottish ..... Mechanic/EMT  
 \*Anthony Cashdollar .....Mechanic  
 Daniel Colby .....Enlow Fork Mine Safety Inspector  
 Josh Koontz..... General Superintendent  
 \*Daniel Letavish..... Shearer Operator  
 Todd Moore ..... Director-Safety Services  
 Frank O'Brien ..... Safety Supervisor  
 \*Mike Randolph ..... Headgate Operator  
 Matt Roebuck .....Enlow Fork Safety Inspector  
 Eric Schubel ..... Vice President of Operations  
 \*Chad Smith..... Shearer Operator

Pennsylvania Bureau of Mine Safety

Harry Casteel..... Underground Mine Inspector  
 Tony Galey..... Underground Mine Inspector  
 Richard Wagner ..... Bureau of Mine Safety Director

Mine Safety and Health Administration

Thomas Bochna ..... Waynesburg Field Office Supervisor  
 Bernard Caffrey ..... Mine Safety and Health Inspector/ Accident Investigator  
 Michael Kelley .....Assistant District Manager  
 Paul Tyrna.....Geologist, Technical Support  
 Andrew Whiteman..... Mine Safety and Health Inspector

Appendix C  
Accident Scene Photograph

