

UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Underground  
(Lead-Zinc Ore)

Fatal Powered Haulage Accident  
February 22, 2021

Immel Mine  
Nyrstar Tennessee Mines, Strawberry Plains LLC  
Mascot, Knox County, Tennessee  
I.D. No. 40-00170

Accident Investigators

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On February 22, 2021, at 3:36 p.m., Cody Scott Maggard, a 26 year-old locomotive operator and chute puller with five years of mining experience, died when he was crushed between the 484 Gallery chute and the deck of the locomotive.

The accident occurred because the mine operator did not: 1) properly maintain the braking system on the locomotive, 2) have adequate procedures and rail devices to prevent locomotives from traveling into the chute, 3) have a warning sign or light to alert miners of the low clearance hazard between the chute and operator's deck of the locomotive, 4) properly conduct an examination of the locomotive, 5) properly maintain the track, and 6) report track hazards or locomotive deficiencies on the workplace examination record.

#### GENERAL INFORMATION

Nyrstar Tennessee Mines, Strawberry Plains LLC, operates the Immel Mine, an underground mine in Mascot, Knox County, Tennessee. The Immel Mine employs 114 miners and operates two 12-hour production shifts, seven days per week. The underground mine extracts lead-zinc

ore by blasting. Front-end loaders load the material into haul trucks, which transport the ore to a hopper. The ore is fed down from the hopper into a chute. Locomotives move the train cars under the chute where ore is loaded and transported to the underground dump. From the underground dump, the ore is loaded into a skip hoist that then transports the ore to the surface.

The principal officers at Nyrstar Tennessee Mines, Strawberry Plains LLC at the time of the accident were:

Troy Wilson  
Willie Smit  
Himar Rode  
Frank Ritter

Vice President, North America  
Chief Human Resource Officer  
Chief Executive Officer  
Chief Operating Officer

The Mine Safety and Health Administration (MSHA) completed the last regular safety and health inspection at this mine on November 3, 2020. The 2020 non-fatal days lost (NFDL) incident rate for the Immel Mine was zero, compared to the national average of 1.29 for mines of this type.

#### DESCRIPTION OF THE ACCIDENT

On February 22, 2021, at approximately 7:00 a.m., Terry Pratt, Development Miner/Step-Up Team Leader, conducted the daily safety meeting with the day shift B Crew, including Maggard. After the meeting, at approximately 7:20 a.m., Maggard and Harold Hackney, Locomotive Operator and Chute Puller, traveled underground to begin their duties. The two miners had worked together for about five months, loading and hauling mined ore using a track-mounted locomotive.

The two miners examined the locomotive before it was placed in operation on that shift. The miners then traveled to an area known as the 484 Gallery to begin loading ore. The chute was empty at the beginning of the shift, so Maggard and Hackney waited in this area for the chute to fill up. While waiting, the two worked to clean up spillage under the chute and greased the wheels of the locomotive and ore cars.

At approximately 10:00 a.m., the chute was full and Hackney and Maggard began loading the ore into the ore cars. While loading the cars with ore, Maggard operated the locomotive and Hackney operated the control valve for the chute that is located on the rib opposite the chute. As each car was loaded with ore, Hackney closed the chute and Maggard pulled the next car under it for loading (see Appendix A). Once all the cars were loaded with ore, Maggard moved to the passenger's seat, and Hackney drove the locomotive to the underground dump.

After dumping the ore, Hackney and Maggard returned to the chute for another load. Hackney, operating the locomotive, pushed the cars under the chute and stopped the locomotive just after the back of the last car was under the chute. The same loading process continued until all cars were loaded with ore. Hackney and Maggard made four trips to and from the chute in this manner.

At 3:36 p.m., on the fifth trip, the locomotive approached the chute. The locomotive crossed the track switch, approximately 75 feet from the chute, and traveled onto the chute side of the track. (See Appendix A). After reviewing video surveillance footage, investigators determined that when the locomotive was within 20 feet from the chute, the locomotive was not decelerating. From the video, investigators could see that Maggard glanced at Hackney. Hackney was not looking in the direction of travel. When the locomotive was within 15 feet of the chute, Maggard reached over to the locomotive operator's control panel in an attempt to remove Hackney's hand from the throttle. At approximately ten feet from the chute, Maggard applied the locomotive's service brake. Hackney reached for the service brake as well (see Appendix B). Just before the locomotive collided with the chute, both miners stood and braced for impact. Upon impact, Hackney reached for the chute with his hands as it entered the operator's deck of the locomotive. The locomotive crushed Maggard between the chute and locomotive deck. After impact, Hackney drove the locomotive away from the chute. Hackney checked Maggard's condition and called for help on his hand-held radio.

Pratt and Pat Russell, Hoist Man, answered Hackney's call and contacted mine management, mine emergency personnel, and mine rescue personnel. After hearing about the situation on the mine radio, Justin Dalton, Interim Superintendent, trained in first aid and cardiopulmonary resuscitation (CPR), contacted Hackney and walked him through the steps to assess Maggard's condition. Hackney assessed Maggard's condition and determined that he was not breathing and had no pulse. Justin Griffin, Mine Superintendent, also heard the call on the radio and called 911 at 3:41 p.m.

Hackney attempted to remove Maggard from the locomotive to administer CPR, but was unable to lift him out of the locomotive. Other miners heard Hackney asking for help on the mine radio and began traveling toward the 484 Gallery chute. Matthew Shelley, Haul Truck Operator, was the first person to arrive on the scene to assist. David Breeden, Utility Foreman; Jonathan Purkey, Utility Crew Member; Ron Lowery, Utility Crew Member; and Willie Stanley, Electrician, also traveled to the accident scene. Stanley brought an automated external defibrillator (AED) and first aid equipment. The crew placed Maggard on a backboard, and miners performed CPR and applied an AED. Brian Millington, Health & Wellness/Mine Rescue Coordinator, traveled to the accident scene, assessed Maggard's injuries and verified there was no pulse. The crew transported Maggard to the surface.

Emergency Medical Services (EMS) personnel from American Medical Response, Inc. and Detective Kenny Allen of the Knox County Sheriff's Office arrived at the mine at 3:55 p.m. Upon arrival on the surface, the crew took Maggard to the training room. EMS took over responsibility for his care at 4:34 p.m. EMS personnel transported Maggard to the Regional Forensics Center in Knoxville, Tennessee where Phillip Verso, Medico-Legal Death Investigator, pronounced him dead at 5:10 p.m.

## INVESTIGATION OF THE ACCIDENT

On February 22, 2021, at 3:52 p.m., Justin Griffin contacted the Department of Labor National Contact Center (DOLNCC) to report the accident. At 4:09 p.m., the DOLNCC notified MSHA of the accident. After receiving the report of the accident, Samuel R. Creasy, District Manager, and Craig Plumley, Assistant District Manager, contacted Ryan O'Boyle, Supervisory Mine Safety and Health Inspector. O'Boyle sent Dustan Rutherford and David Smith, Mine Safety and Health Inspectors, to the mine. Plumley called Ronald Caudill, Mine Safety and Health Specialist, to inform him of the accident and sent him to the mine to serve as the lead accident investigator.

Smith arrived at the mine at 4:30 p.m. and issued an order under the provisions of Section 103(k) of the Mine Act to assure the safety of the miners and preservation of evidence. At 7:42 p.m., Caudill and Rutherford arrived at the mine. The accident investigation team members assembled in the mine superintendent's office to observe the video surveillance of the 484 Gallery that recorded the accident. The team members then traveled underground to conduct the initial examination of the accident scene. On the mine surface, Smith obtained statements from miners and collected pertinent records and general mine information.

On February 23, 2021, investigators held interviews with miners and mine management at Nyrstar's Beaver Creek office located approximately five miles from the Immel Mine. See Appendix C for a list of persons participating in the accident investigation.

## DISCUSSION

### Location of the Accident

The accident occurred at the 484 Gallery chute located on the 484 level in the underground mine. The mine operator's video surveillance continually monitors the loading process at the 484 Gallery. Monitors are located on the mine surface, which allows the mine operator to observe the loading process in real time. One of the monitors is located in the mine superintendent's office, however, no one witnessed the accident because the mine operator did not require continuous observation of the monitors.

### Equipment Involved

At the time of the accident, miners were operating a 12-ton rail-mounted diesel locomotive manufactured in 1993 by the Brookville Corporation (company number 21001/model BCC-12-UP). Five Sanford Day bottom drop ore cars are coupled to the locomotive. Investigators examined the locomotive's acceleration controls and found they operated properly.

### Locomotive Braking System

The braking system consists of a spring brake air chamber connected to the brake shoes via a pushrod and linkages. The service brakes are air-applied spring-released, and the parking brake is spring-applied air-released. This style of brake has separate chambers for the parking and service brakes.

The investigators found worn brake shoes on the left side of the locomotive. According to the mine operator's maintenance records, the mine operator changed the brake shoes on this locomotive on November 19, 2020. Investigators performed a functionality test at the mine site and determined the brakes on the locomotive were not functioning properly.

The mine operator removed braking components and MSHA took the components into evidence. Investigators sent the components to the MSHA Technical Support Approval and Certification Center's Mechanical & Engineering Safety Division (M&ESD) in Triadelphia, WV for examination.

The original equipment manufacturer (OEM) issued two Product Information Bulletins (Bulletins 70 and 71). On February 8, 2013, the OEM issued Bulletin 70 that described the proper procedures for inspecting brake shoes for maximum allowance. On April 11, 2014, the OEM issued Bulletin 71 that clarified the proper procedure for performing a brake test. MSHA determined that the mine operator did not follow the procedures provided in these bulletins.

M&ESD examined the braking system components according to Bulletin 70. The examination revealed that the left front and rear brake shoes' average thickness was less than OEM recommendations and the left and right side brake shoes were unevenly worn. Also, the hanger pins were too small for the linkage holes allowing for excessive movement. These findings indicate the mine operator did not maintain the braking system or follow the proper maintenance intervals according to Bulletin 70.

The Bulletin 71 brake test procedure requires the mine operator to set the parking brake on the locomotive, place the transmission in the highest gear, and then move the throttle to the full position. The mine operator installed a transmission shifter interlock on the locomotive that would not allow the transmission to engage without releasing the parking brake. Bulletin 71 states that a locomotive with this interlock must have an emergency/park brake test button on the operator's control panel to allow performance of this brake test. The locomotive involved in the accident did not have an emergency/park brake test button and the mine operator could not perform the brake test according to Bulletin 71.

#### Locomotive Examinations

The miners examined the locomotive before it was placed in operation on that shift. This examination was conducted in accordance with a pre-printed checklist by the mine operator, which also serves as a record of the examination. Miners did not note any deficiencies on day of the accident or on the previous shifts.

The mine operator's logs indicated that on February 15, 2021, Roger Griffith, Preventative Maintenance Technician, completed a 500-hour service, seven days before the accident. The record of the examination notes that the brakes functioned and adjusted properly.

#### Chute/Track Clearance and Conditions

The suspended stationary chute is two inches above the front plate of the operator's compartment on the locomotive (see Appendix D). In addition, the chute extends 40 inches into the track

haulageway. The ore cars are lower than the chute and can pass underneath it. However, the operator's compartment in the locomotive is higher than the front plate and cannot pass under the chute. Testimony indicated miners did not realize that the front plate of the locomotive would pass under the chute resulting in the chute intruding into the operator's compartment of the locomotive (see Appendix D).

The mine operator did not install low clearance warning signs or lights along the track leading to the 484 Gallery chute to alert miners of a low clearance area. The mine operator also did not mark the chute as being a low clearance hazard.

At the time of the accident, water was over the top of the rail at the 484 Gallery. This was a recurring condition at this track location. Water reduces the cohesive friction of the track, which increases the stopping distance for the locomotive. The mine operator did not identify water on the track, which existed for several shifts, as a hazardous condition in the mine's workplace examination record.

#### Loading Process

The locomotive pushes empty cars under the chute during the loading process, and the locomotive stops when the last car is under the chute. The locomotive is not designed to travel under the chute because of the low clearance between the chute and the passenger side of the locomotive. The locomotive operator uses the braking system to stop the locomotive short of the chute. The mine operator did not have stopblocks or derail devices in place in the ore loading area to stop the locomotive and prevent the locomotive from traveling into the chute.

The investigators found the mine operator's written safety practices and procedures were inadequate to safely examine and operate the locomotive. Safety procedures are necessary to assure that all locomotive operators and chute pullers follow safe practices when loading ore into cars. Typically, the locomotive operator would stop the locomotive prior to the locomotive operator getting out to pull the chute while the passenger moved to the locomotive operator's seat.

#### Speed

Investigators reviewed video surveillance to calculate the locomotive speed for the evening shift prior to the accident and for the day shift on the day of the accident. The average locomotive speed on the evening shift was 3.8 feet per second (fps) and 4.3 fps on the day shift.

On the fifth load on the date of the accident, the locomotive sped up from 4.1 fps to 5.6 fps during the last 30 feet from the chute until it collided with the chute. As shown on the video surveillance, the locomotive operator did not apply the brake as it approached the chute. The locomotive operator did not maintain control of the equipment while it was in motion.

#### Training and Experience

Deborah Combs, Mine Safety and Health Training Specialist, reviewed training records. Maggard had approximately five years of mining experience with 11 months experience as a locomotive operator and chute puller. Maggard received task training for operating the



locomotive in accordance with MSHA Part 48 training regulations on March 9, 2020, and completed the company's locomotive practical assessment on June 10, 2020. Maggard received initial task training as a chute puller on March 20, 2020, but was still in training at the time of the accident.

Harold Hackney had approximately 8 years and 7 months of experience as a locomotive operator and chute puller, all at the Immel Mine. Hackney received task training for operating the locomotive in accordance with MSHA Part 48 training regulations on September 27, 2012, and completed the company's locomotive practical assessment on August 2, 2012.

## ROOT CAUSE ANALYSIS

MSHA conducted an analysis to identify the fundamental causes of the accident. Investigators identified root causes that, if eliminated, would have either prevented the accident or mitigated its consequences. The root causes identified during the analysis and the mine operator's corresponding corrective actions, implemented to prevent a recurrence, are listed below.

1. Root Cause: The mine operator did not properly maintain the braking system of the locomotive.

Corrective Action: The mine operator hired OEM personnel to retrain on how to repair brakes on all locomotives. In addition, the mine operator conducted a training session for all maintenance technicians on brake inspection procedures.

2. Root Cause: The mine operator did not have procedures or rail devices to prevent locomotives from traveling into the chute.

Corrective Action: The mine operator developed a written program containing proper procedures for operating the locomotive. The procedures require the first ore car, behind the locomotive, to be loaded in the middle of the car, which adds an additional five feet of clearance from the locomotive to the chute. Additionally, the mine operator installed two concrete bin blocks and a Nolan derail system behind the chute near the end of the track to prevent the locomotive from contacting the chute (see Appendix E). The mine operator also turned the locomotive engine around so that the locomotive engine is closest to the chute and the operator's deck of the locomotive is farther from the chute. The mine operator trained all locomotive operators/chute pullers on these procedures.

3. Root Cause: The mine operator did not have a warning sign or light to alert miners of the low clearance area at the 484 Gallery chute, nor was the chute clearly marked as being a low clearance hazard.

Corrective Action: The mine operator installed a visual and audible alarm to alert the locomotive operator of an upcoming low clearance hazard. The chute was also clearly marked as being a low clearance area. The mine operator installed cameras and monitors in the operator's deck of the locomotive to ensure visibility of track conditions.

4. Root Cause: The mine operator did not properly conduct an examination of the locomotive.

Corrective Action: The mine operator established written procedures and trained personnel on how to properly examine the locomotives in accordance with the manufacturer's recommendations.

5. Root Cause: The mine operator did not properly maintain the 484 Gallery track. Water accumulations were present above the top of the rail.

Corrective Action: The mine operator installed a drainage system at low areas on the track to prevent water from accumulating on the 484 Gallery track.

6. Root Cause: The mine operator did not identify hazardous track conditions during the workplace examination.

Corrective Action: The mine operator established written procedures and trained personnel on how to properly examine the tracks for hazards and notify miners of hazards as appropriate.

#### CONCLUSION

On February 22, 2021, at 3:36 p.m., Cody Scott Maggard, a 26 year-old locomotive operator and chute puller with five years of mining experience, died when he was crushed between the 484 Gallery chute and the deck of the locomotive.

The accident occurred because the mine operator did not: 1) properly maintain the braking system on the locomotive, 2) have procedures and rail devices to prevent locomotives from traveling into the chute, 3) have a warning sign or light to alert miners of the low clearance hazard between the chute and operator's deck of the locomotive, 4) properly conduct an examination of the locomotive, 5) properly maintain the track, and 6) report track hazards or locomotive deficiencies on the workplace examination record.

Approved by:

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Samuel R. Creasy  
District Manager

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Date

## ENFORCEMENT ACTIONS

1. A 103(k) order was issued to Nyrstar Tennessee Mines, Strawberry Plains LLC.

A fatal accident occurred on February 22, 2021, at approximately 3:35 p.m. This order is being issued under the authority of the Federal Mine Safety and Health Act of 1977, under Section 103(k) to insure the safety of all persons at the mine, and requires the operator to obtain the approval of an authorized representative of MSHA of any plan to recover any person in the mine or to recover the mine or affected area. This order prohibits any activity in the affected area. The operator is reminded of the obligation to preserve all evidence that would aid in investigating the cause or causes of the accident in accordance with 30 CFR 50.12.

2. A 104(d)(1) citation was issued to Nyrstar Tennessee Mines, Strawberry Plains LLC for violation of 30 CFR § 57.14102.

A fatal accident occurred at this mine when a miner was a passenger of the Co. #21001 Brookville Equipment Corporation (Brookville) locomotive and was crushed between the 484 Gallery chute and the deck of the locomotive. The braking system on the locomotive was not maintained in functional condition. The following deficiencies were observed during an inspection immediately after the accident:

1. The left front and rear brake shoes were not inspected as required and the brake shoes were excessively worn. Brookville published Program Information Bulletin (PIB) 70, dated February 8, 2013, which states that at the beginning of each shift or after every 10 hours of operation, brake shoe wear is to be measured and compared to the brake shoe condemning limit. These brake shoes were not inspected after 10 hours of use and were worn beyond the condemning limit, an average of less than  $\frac{3}{8}$ -inch, as specified by Brookville.
2. The emergency/park brake could not be tested because the locomotive was equipped with a feature that would not allow the transmission to engage unless the emergency/park brake is released. Brookville published PIB 71, dated April 11, 2014, which states that locomotives with this feature should be provided with an emergency/park brake test button on the operator's control panel that will allow the brake test to be performed.
3. The uneven wear between the left and right-side brake shoes indicates that the brake system was not maintained in proper adjustment.
4. The slack adjusters on both the operator and offside brake canisters had excessive travel that measured approximately 2.25 inches. The maximum travel of the slack adjuster for this type of canister is 2.50 inches. The further the slack adjuster travels results in decreased pressure inside of the chamber. This condition reduced the braking capability of the locomotive.

5. The hanger pins had a noted diameter difference between their respective linkage holes. The minimum difference was approximately 1/8-inch. The space between the hanger pins and linkage diameters causes excess play and movement which contributes to uneven wear and component deterioration.
6. Brake components were rusted and muddy from traveling through water over the track rails.

The braking system on rail-mounted equipment must be inspected and maintained to ensure miners are able to always maintain control of these machines and safely come to a complete stop when needed. The improperly inspected and maintained brake components of this system increased the stopping time and distance of the locomotive. These deficiencies contributed to the fatal accident by not allowing the locomotive operator to stop the locomotive before colliding with the 484 Gallery chute.

The operator engaged in aggravated conduct constituting more than ordinary negligence in that the locomotive was allowed to be operated by miners without a properly inspected and maintained braking system. A 500-hour service record of the locomotive on February 15, 2021, noted that the brakes were both functioning and adjusted properly. MSHA inspected the braking system of this locomotive and determined that the brake shoes were not properly adjusted and excessively worn. Section 2.16 of the operator's preventative maintenance procedures requires the technician to inspect the clearance of the brake shoes. While conducting this examination, a competent technician would have recognized the excessive wear on the brake shoes. The operator was also not following Brookville PIB 70 and PIB 71 which were published in 2013 and 2014, respectively, and were publicly available from Brookville. According to Brookville's recommendations in these PIBs, the locomotive should have been removed from service due to the condition of the braking system.

3. A 104(d)(1) order was issued to Nyrstar Tennessee Mines, Strawberry Plains LLC for violation of 30 CFR § 57.9302.

A fatal accident occurred at this mine when a passenger of the Co. #21001 Brookville locomotive was crushed between the 484 Gallery chute and the deck of the locomotive. The mine operator did not install stopblocks, derail devices, or other devices to stop the locomotive before colliding with the 484 Gallery chute. The mine operator assigned a team of two miners to operate the locomotive to load ore cars under the chute. The chute protrudes into the track haulageway directly in the path of the locomotive's passenger side. The deck of the locomotive is open with no protection for the passenger. While pushing the ore cars under the 484 Gallery chute on February 22, 2021, the locomotive did not stop before colliding with the chute. A stop block or derail device would have prevented the operator's deck from contacting the chute.

The mine operator engaged in aggravated conduct constituting more than ordinary negligence, by permitting the practice of driving the locomotive dangerously close to the chute during the loading process without protection against moving or runaway rail equipment. The 484 Gallery is under video surveillance with monitors located in the mine office, one of which is in the mine superintendent's office. This violation is an unwarrantable failure to comply with a mandatory standard.

4. A 104(a) citation was issued to Nyrstar Tennessee Mines, Strawberry Plains LLC for violation of 30 CFR § 57.9101.

A fatal accident occurred at this mine on February 22, 2021, when a miner was a passenger in the Co. #21001 Brookville locomotive and was crushed between the deck of the locomotive and the 484 Gallery chute. The operator of the locomotive did not maintain control of the locomotive while it was in motion, and did not operate the locomotive at a speed that was consistent with the conditions at the time of the fatal accident. The conditions were:

1. The stopping distance of the locomotive was increased because the track was wet in the area of the 484 Gallery chute. Water was over the ball of the rails.
2. The chute protruded into the track haulageway, directly in the path of the passenger's side of the locomotive, with no stop blocks or derail devices to prevent the locomotive from contacting the chute.
3. There were no warning devices to alert miners of the upcoming low-clearance hazard, nor was the chute conspicuously marked as being a restricted clearance hazard.

These conditions required the locomotive operator to maintain a high level of awareness to operate the locomotive in a safe manner. These conditions, along with the manner in which the locomotive was operated, resulted in the loss of control of the locomotive and caused the locomotive to contact the chute.

5. A 104(a) citation was issued to Nyrstar Tennessee Mines, Strawberry Plains LLC for violation of 30 CFR § 57.18002.

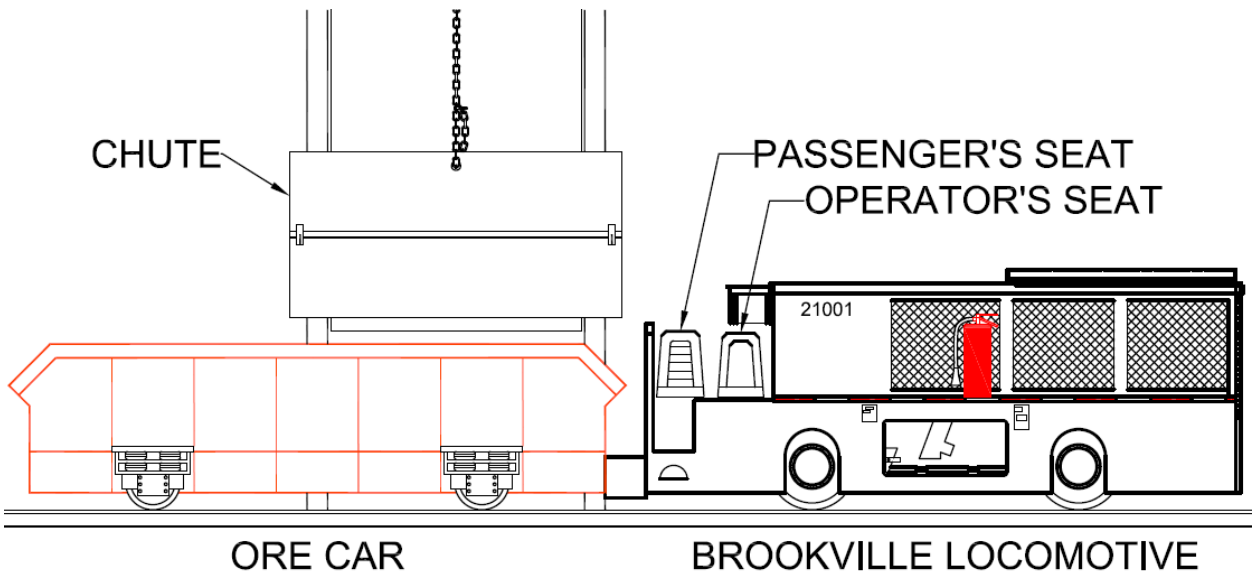
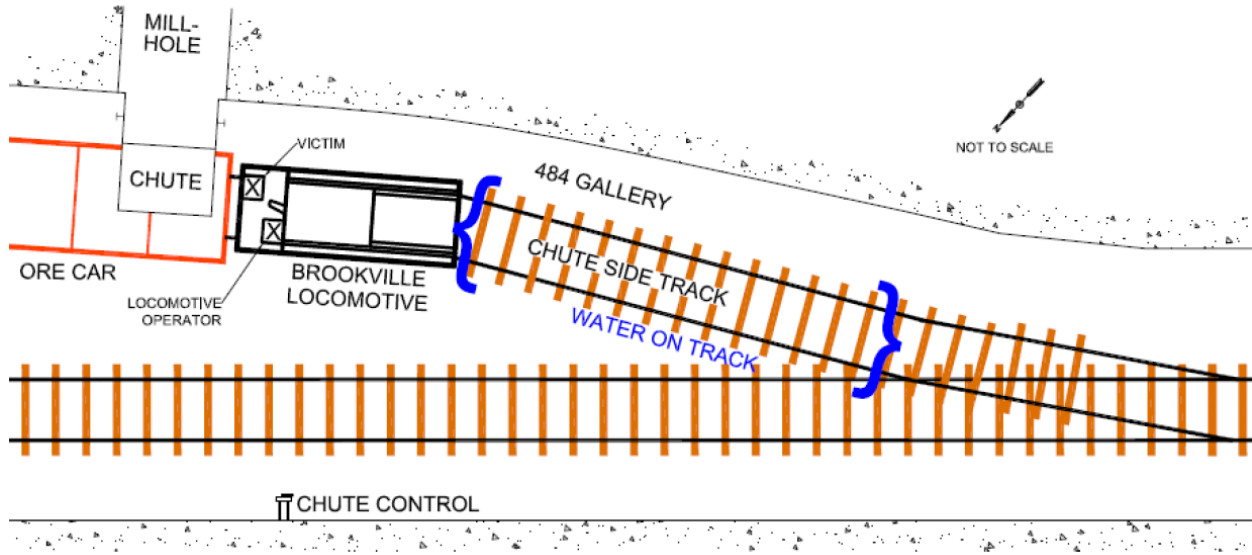
A fatal accident occurred at this mine on February 22, 2021, when the Co. #21001 Brookville locomotive collided with the stationary 484 Gallery chute. Prior to the accident, the operator did not conduct an adequate examination for conditions that may adversely affect safety and health at the 484 Gallery chute track.

1. Stop blocks, derail devices, or other devices were not installed to stop the locomotive before colliding with the chute.

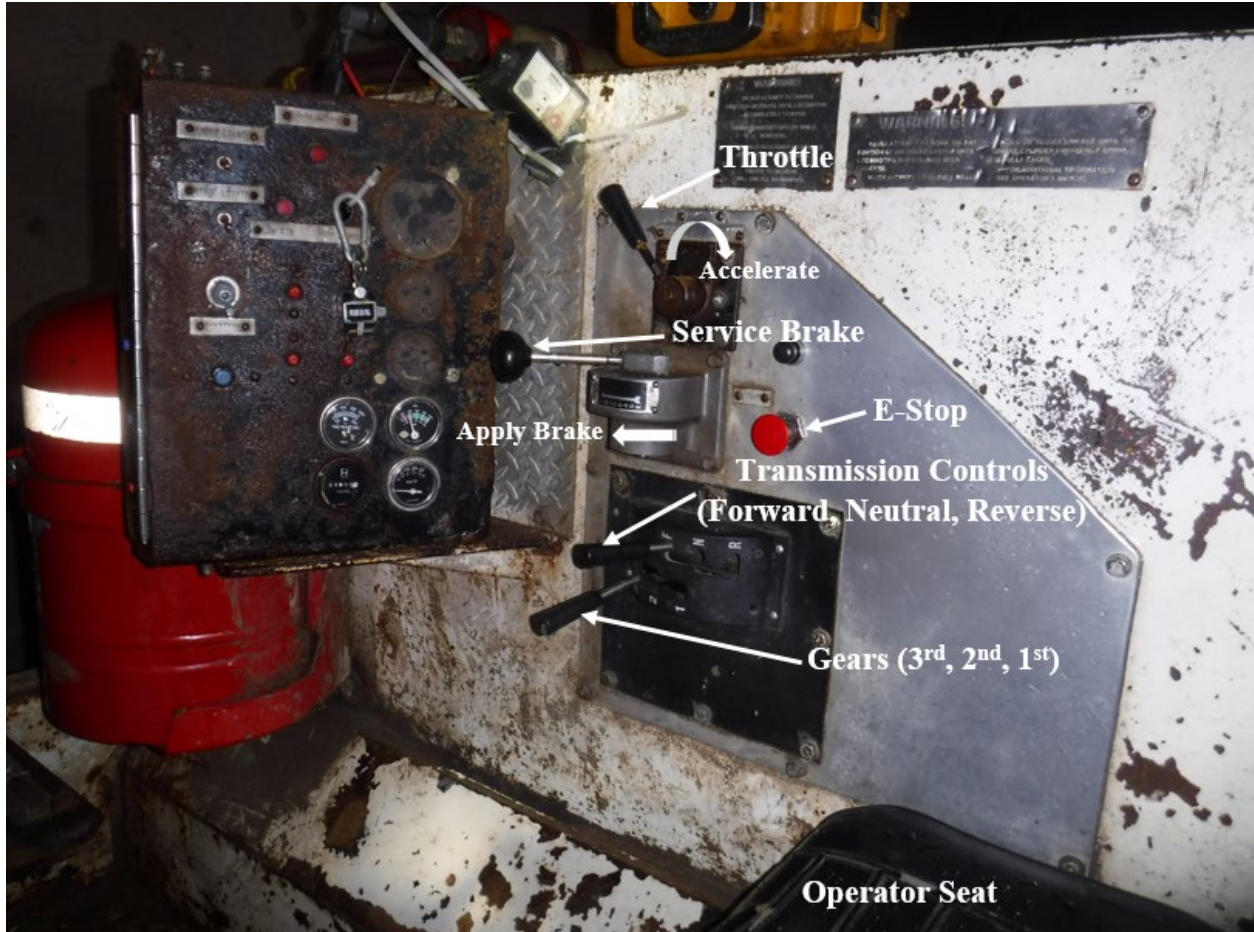
2. There were no “restricted/low clearance” warning devices to alert miners of the low clearance hazard under the chute. Also, the chute was not conspicuously marked as being a low clearance hazard.
3. Water was permitted to accumulate over the ball of the track rails in this area. This condition reduced the braking capability of the locomotive and deteriorated brake components.

These hazardous conditions were not recorded in the workplace examination record and miners were not alerted to their presence in the work area.

Appendix A – Drawing of the Accident Scene



Appendix B – 12 Ton Locomotive Control Deck





Appendix C – Persons Participating in the Investigation

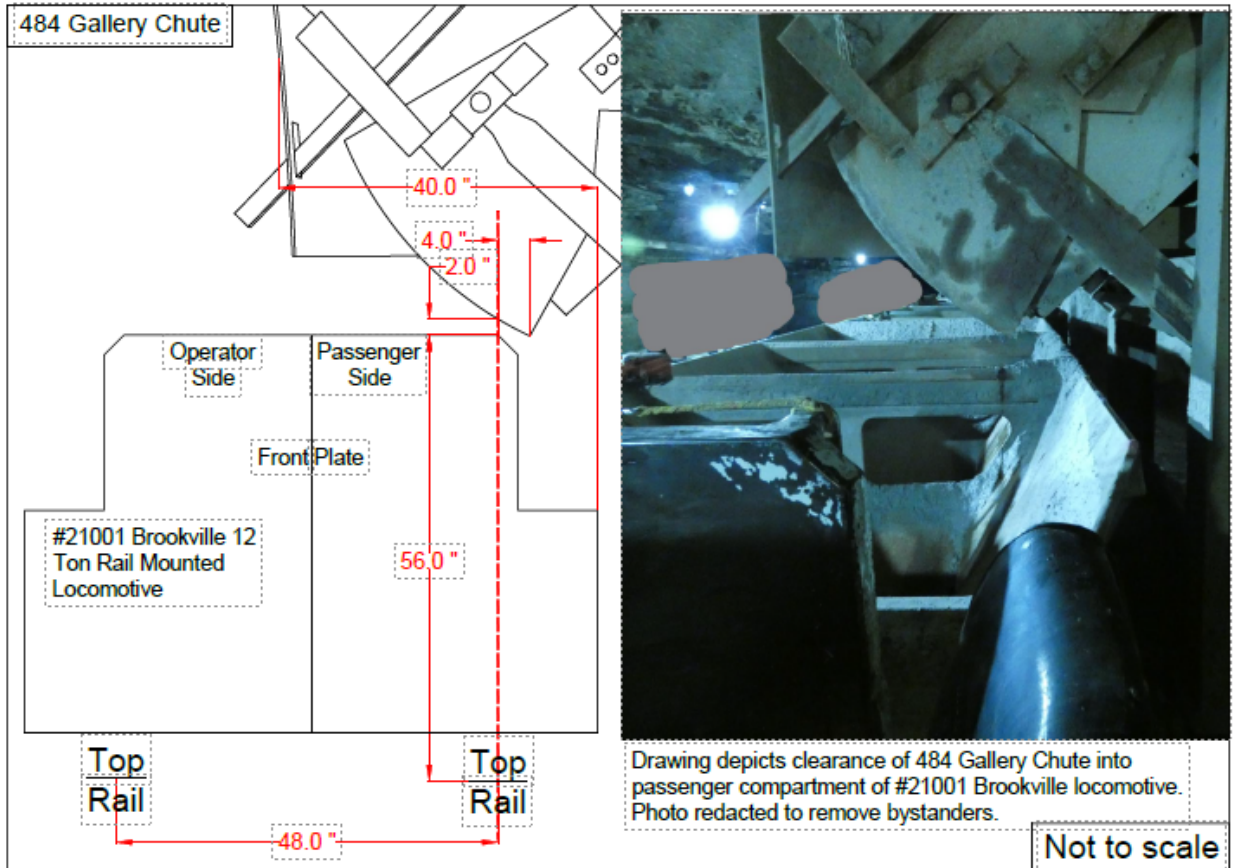
Nyrstar Tennessee Mines, Strawberry Plains LLC

Jason Davis	General Manager
Nick Porivchak	Coy Mine Manager
Chris Michael	Young Mine Manager
Justin Griffin	Mine Superintendent
Justin Dalton	Interim Superintendent
Tom Needs	Planning Manager
Brad Davenport	Safety Coordinator
Darrell Short	Mobile Maintenance Planner
Winona Roy	Human Resources
James Stratton	Maintenance Supervisor
David Breeden	Utility Foreman
Terry Pratt	Development Miner/Step-Up Team Leader
Brian Millington	Health & Wellness/Mine Rescue Coordinator
Harold Hackney	Locomotive Operator and Chute Puller
Jeremiah Walker	Locomotive Operator and Chute Puller
Lorrie Gibson	Miner
Ron Lowery	Utility Crew Member
Jonathan Purkey	Utility Crew Member
Willie Stanley	Electrician
Matthew Shelley	Haul Truck Operator
Adam Houk	Mechanic
Pat Russell	Hoist Man
Roger Griffith	Preventive Maintenance Technician

Mine Safety and Health Administration

Ronald Caudill	Mine Safety and Health Specialist
Dustan Rutherford	Mine Safety and Health Inspector
David Smith	Mine Safety and Health Inspector
Deborah Combs	Mine Safety and Health Training Specialist
Gary Rethage	Mechanical Engineer

Appendix D – Measurements at the Accident Scene



Appendix E – Nolan’s HDM Derail Device and Concrete Bin Block



**Nolan's HDM mine derail**



**Concrete Bin Block**