

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Underground
(Salt)

Fatal Fall of Roof Accident
December 14, 2020

Avery Island
Cargill Deicing Technology
Avery Island, Iberia County, Louisiana
ID No. 16-00509

Accident Investigators

Darren Conn
Supervisory Mine Safety and Health Inspector

Sammy Elswick
Supervisory Mine Safety and Health Inspector

Michael LaRue
Mine Safety and Health Inspector

Emily Muto
Geologist, MSHA Technical Support

James Vadnal
Mining Engineer, MSHA Technical Support

Originating Office
Mine Safety and Health Administration
Administrator for Mine Safety and Health Enforcement
201 12th St South Suite 401
Arlington, VA 22202-545

Timothy Watkins, Deputy Administrator for Mine Safety and Health Enforcement

TABLE OF CONTENTS

OVERVIEW	1
GENERAL INFORMATION	1
DESCRIPTION OF THE ACCIDENT	2
INVESTIGATION OF THE ACCIDENT	3
DISCUSSION	4
Location of the Accident	4
History of Ground Conditions and Related Events	4
Sinkhole	4
Stationary Drill and Grouting Process	4
Email Reporting Changing Conditions	5
Blasting, Portable Drill, and Additional Grouting in the H-13 Intersection	5
Five Days before the Accident	6
Roof Movement Observed by the Mine Operator	7
Additional Email Regarding Ground Conditions	7
Geology and Associated Failure	7
Roof Fall Dimensions and Weight	8
Previous Roof Falls and Adverse Ground Conditions	8
Ground Control Plan and Practices	8
Examinations	9
Training and Experience	9
ROOT CAUSE ANALYSIS	10
CONCLUSION	11
ENFORCEMENT ACTIONS	12
APPENDIX A – 1904 Drill Site	14
APPENDIX B – Persons Participating in the Investigation	15
APPENDIX C – Map of the 700 Level	16
APPENDIX D – Froggy Bottom Sink Hole	17
APPENDIX E – Map of the I-13 Area	18
APPENDIX F – Three-Dimensional Representation of the Fall Cavity	19



OVERVIEW

At approximately 2:30 a.m. on December 14, 2020, Lance Begnaud, a 27 year-old grouter with approximately five months of mining experience, and Rene Romero, a 41 year-old grouter with approximately six months of mining experience, died in a roof fall accident. At the time of the accident, the miners were drilling holes in the roof in order to inject grout to prevent or control water inflow.

The accident occurred because the mine operator did not: 1) have adequate procedures to assure proper workplace examinations, 2) have adequate procedures to assure proper ground condition examinations, 3) adequately test and monitor adverse ground conditions by following their Ground Control Plan to use roof control monitors with trip mechanisms, as well as scratch holes and a borescope to identify adverse conditions, and 4) comply with the requirements to post warning signs or barricade areas with hazardous ground conditions, or correct hazardous ground conditions before allowing work or travel in the affected area.

GENERAL INFORMATION

Cargill Deicing Technology (Cargill) owns and operates the Avery Island Mine in Avery Island, Iberia County, Louisiana, and employs 200 people. Cargill assumed operation of the underground room-and-pillar mine in June of 2005. The underground mine operates three eight-hour shifts per day, six days per week. Crews rotate shifts from week to week. The mine produces and transports bulk deicing salt to locations around the country.

The mine is located in a salt dome. A salt dome is a structural dome formed when a column of salt intrudes into surrounding rock strata. The Louann salt bed is located an estimated 20,000 to 40,000 feet below sediments of the Mississippi Delta. The top of the dome lies approximately 190 feet below the surface and is covered by sediment.

The mine has seven levels, referenced as depth by feet from the surface at the shaft collar. The levels are designated as 500, 700, 900, 1100, 1300, 1600, and 1850. At the time of the accident, active mining was being conducted on the 1850 level. The operator has routinely used injection grouting on the 500 and 700 levels to control and prevent water from entering into the mine from a sinkhole.

The principal management officials at the Avery Island Mine at the time of the accident were:

Nathan Boles
Gil Elrod
Lane Lancaster

Mine Manager
Water Management Superintendent
Grouter General Foreman

The Mine Safety and Health Administration (MSHA) completed the last regular safety and health inspection at this mine on December 11, 2020. The non-fatal day's lost (NFDL) incident rate for Avery Island Mine in 2019 was zero compared to the national average of 1.77 for mines of this type.

DESCRIPTION OF THE ACCIDENT

Lance Begnaud and Rene Romero reported for work at 11:00 p.m. on December 13, 2020. Begnaud and Romero, along with Randy Rochon, Grouter, rode the hoist to the 700 level and continued to the grouter shop, located on that level. Dean Pontiff, Grouter Supervisor, entered the mine and proceeded to the J-10/K-11 junkyard area to check the status of water inflow from the roof. Pontiff returned to the grouter shop and conducted a safety meeting with the crew before assigning work locations.

Begnaud and Romero were assigned to the 1904 drill site located in the H-14 room on the 700 level (see Appendix A). From the 1904 drill site, Begnaud and Romero were instructed to drill and inject grout toward the J-10/K-11 pillars.

At approximately 12:15 a.m., Pontiff traveled with Begnaud and Romero to the H-13 intersection on the 700 level. The H-13 intersection is adjacent to the 1904 drill site in the H-14 room. Pontiff performed the workplace examination and directed Romero to plug in an extension cord for the water pump to the distribution box on the west side of the H-13 intersection. Begnaud and Romero then went to the 1904 drill site. Begnaud placed the drill control box and a work chair approximately 15 feet west of the drill platform toward the H-13 intersection. As instructed, Begnaud began drilling the roof toward the J-10/K-11 pillars.

Pontiff remained on the 700 level and returned to the J-10/K-11 junkyard area. Pontiff traveled to the T-27 area, which is east of the grouter shop, to check the status of water inflow at that location. Pontiff returned to the 1904 drill site at approximately 2:00 a.m. to talk to Begnaud and Romero about the work performance of new miners, Rochon and Lane Richard, Grouter, during

their 60-day evaluation period. Pontiff then traveled to the air shaft area on the 500 level to determine the progress of Dustin Bourque, Grouter; Richard; and Rochon, who were preparing to pressure test recently drilled holes.

At approximately 2:30 a.m., Pontiff started traveling back to the 700 level when he heard the word “fell” on the radio. He answered the radio and Drake Thibodeaux, Grouter Mechanic, who was in the grouter shop repairing a mechanical scaler, told him the H-13 intersection had fallen. Pontiff met Thibodeaux, who was traveling from the H-13 intersection, at the grouter shop. Thibodeaux told Pontiff the entire intersection came down and that Begnaud and Romero were still in the area. Pontiff drove to the H-13 intersection and tried to make contact with Begnaud and Romero, but there was no response. Pontiff returned to the grouter shop and initiated the emergency response plan. Pontiff directed Thibodeaux to guard the area while he contacted Lane Lancaster, Grouter General Foreman, and Gil Elrod, Water Management Superintendent, on the surface.

Heath Segura, Production General Foreman, arrived at the mine at approximately 7:00 a.m. for his shift. He immediately went to the 700 level to assist Pontiff. Pontiff returned to the H-13 intersection and again tried to contact Begnaud and Romero, but there was no response. Pontiff contacted Marty Maynard, Mine Rescue Coordinator, to initiate a mine rescue.

Rescue efforts continued through December 14 and 15. The mine rescue team found Begnaud at 8:14 a.m. on December 15, 2020. Devrick Toups, Senior Environmental Health and Safety Professional, and Ricky Eskind, owner of Vital Safety, Cargill’s safety consultant, brought Begnaud to the surface. Shane Crochet, Iberia Parish Coroner’s Office Investigator, transported Begnaud to the Louisiana Forensic Center and pronounced his death at 10:03 a.m.

The mine rescue team found Romero at 5:45 p.m. on December 15, 2020. Toups and Eskind brought Romero to the surface. Crochet transported Romero to the Louisiana Forensic Center and pronounced his death at 8:10 p.m.

INVESTIGATION OF THE ACCIDENT

On December 14, 2020, at 3:00 a.m., Toups called the Department of Labor National Contact Center (DOLNCC) to report a possible fatal accident. The DOLNCC contacted Brett Barrick, Assistant District Manager, who contacted Joseph Olivier, Supervisory Mine Safety and Health Inspector, who contacted the mine operator and verbally issued an order under Section 103(j) of the Mine Act and sent O’Neal Robertson, Mine Safety and Health Inspector, to the mine. At 4:23 a.m., Robertson arrived at the mine site, secured the accident scene, and modified the 103(j) order to a 103(k) order. MSHA personnel were on-site continuously until the victims were found.

MSHA’s Technical Support Team including Emily Muto, Geologist; James Vadnal, Mining Engineer; and Ahmad Z. MdAzmi, Mining Engineer, arrived on-site December 15, 2020, around 9:00 a.m.

On December 16, 2020, the decision was made to send investigators from the Birmingham District. Mary Jo Bishop, District Manager, sent Darren A. Conn, Supervisory Mine Safety and Health Inspector, and Sammy D. Elswick, Supervisory Mine Safety and Health Inspector, to the mine. Michael LaRue, Mine Safety and Health Inspector, arrived on December 20, 2020, to assist with the investigation. MSHA conducted the investigation with the participation of the mine operator, miners, and miners' representative. The miners at this mine are represented by United Steelworkers. See Appendix B for a list of persons participating in the investigation.

DISCUSSION

Location of the Accident

The roof fall occurred in the H-13 intersection on the 700 level of the mine (see Appendix C). The mine refers to this area, which includes the H-13 intersection, I-13 room, and H-14 room, as the I-13 area. This level was used for escapeways and for drill site maintenance associated with water inflow mitigation since 1950, when mining in this area ended.

History of Ground Conditions and Related Events

Investigators determined that the roof fall occurred after ground conditions deteriorated. As ground conditions deteriorated, the hazard to miners increased. As the hazard increased, the mine operator continued to perform inadequate examinations and did not correct or support hazardous ground conditions before allowing work and/or travel in the affected area. Additionally, the mine operator did not adequately follow their Ground Control Plan which required testing and monitoring hazardous roof conditions. Previous roof falls, including one related to a surface sinkhole, should have put the mine operator on heightened awareness of adverse ground conditions in the H-13 intersection.

Sinkhole

In 2013, the mine operator became aware that water was entering the underground mine through the Froggy Bottom sinkhole. The operator retained Alpha Geoscience to investigate and report on the sinkhole. Alpha Geoscience documented in their 2013 Surface Stability Report that the Froggy Bottom sinkhole (see Appendix D) near the mine entrance was approximately 490 feet from the I-13 area (the location of the roof fall). Alpha Geoscience also noted that the sinkhole had a hydraulic connection to the J-10 and the I-13 areas. The sinkhole was between 125 and 150 feet in diameter in 2013. The sinkhole encompassed a large part of a neighboring yard, as well as the paved entry road to the mine. Since 2013, the mine operator continually filled in the area and repaved the road several times. At the time of this accident, the sinkhole was between 50 and 75 feet in diameter.

Stationary Drill and Grouting Process

In September 2019, the mine operator determined that water from the sinkhole was entering into the J-10/K-11 junkyard area (see Appendix E). On September 11, 2019, the mine operator used injection grouting to prevent water movement.

In September 2019, the mine operator installed a stationary Diamec U6 PHC (U6) drill at the 1904 drill site located in the I-13 room approximately ten feet east from the roof fall. The mine

operator used the U6 drill to drill and inject grout into two-inch diameter holes 150 feet deep toward the J-10/K-11 junkyard area. Investigators observed 68 drill casings in this area.

Email Reporting Changing Conditions

On October 1, 2020, Pontiff sent an email to Andrew Johnson, Grouter Supervisor; Renaldo Boutte, Grouter Supervisor; Eric Blinkhorn, Production Management Engineer Associate; and Lancaster to report that water and unconsolidated sand was flowing in an uncontrollable manner in the H-13 intersection on the 700 level.

Blasting, Portable Drill, and Additional Grouting in the H-13 Intersection

On November 2, 2020, the mine operator attempted to find the source of water inflow in the H-13 intersection. The mine operator detonated two separate blasts at the west (left) side of the H-13 intersection (see Appendix E) to remove crusted salt in an attempt to see the source of water inflow. Interviews with Boutte and Johnson revealed that neither blast yielded the results intended, as minimal amounts of material were removed, and the mine operator could not see the source of water inflow.

After the blasts, the mine operator implemented mechanical scaling operations in the H-13 intersection, where a crack in the roof was clearly visible. According to the mine operator's grouter logs, the crack was approximately one-half to two inches wide by about 20 feet long. Sand, rocks, and water were discharging from the crack.

Because sand and rocks, in addition to water, were discharging from the crack, investigators determined that the mine operator should have realized that these were indications of adverse ground conditions. The mine operator, however, did not believe adverse ground conditions existed in this area. All members of Cargill management that were interviewed stated that they believed they were only dealing with water inflow issues. Since November 2020, several miners told the mine operator that they were concerned about adverse ground conditions in the I-13 area. When miners expressed these concerns, the mine operator told them that ground conditions were not hazardous.

To prevent water from entering the I-13 area, the mine operator decided to use an Atlas Copco portable drill (U4) and began drilling and injecting grout in the H-13 intersection of the I-13 area. In an attempt to stem or redirect the water, the mine operator drilled a hole into the northwest corner of the H-13 intersection. The purpose of the hole was to consolidate the flow of water in one location to make it easier to grout. A one-inch diameter plastic pipe was inserted into the hole to direct water away from the work area. According to the grouter logs, on November 3, 2020, the grouting crew and the mine operator noticed a small horseshoe shaped crack extending from the drill hole toward the center of the intersection.

According to the grouter logs, on November 5, 2020, the grouting crew and the mine operator noted that the initial one-inch-diameter hole drilled in the corner of the H-13 intersection was growing progressively larger. A two-inch-diameter pipe was installed to replace the one-inch-diameter pipe as the horseshoe-shaped crack continued to lengthen and widen. Using the U4 portable drill, the mine operator drilled holes toward the crack to prevent water inflow into the H-13 intersection area. The mine operator drilled 39 holes into the loose unsupported roof in the

H-13 intersection, which according to Blinkhorn, “start[ed] in good ground and drill[ed] toward bad ground.” Three grouting crews supervised by Pontiff, Johnson, and Boutte, struck water in every hole drilled. Prior to injecting grout, the grouting crew installed material in the crack to hold the grout in place. This material included oakum rope, cap wedges, rags, and balloon plugs. Investigators observed this material in the fall material. As the drilling and crack plugging efforts continued, on November 30, 2020, the grouting crew used a four-inch-diameter pipe to replace the two-inch diameter pipe in the corner of the H-13 intersection.

On November 30, 2020, supervisors and miners on all shifts noticed that the crack had expanded to approximately 75 feet long and approximately two to five inches wide. Drilling and injection grouting continued with the U4 portable drill in the H-13 area. Investigators concluded that the mine operator should have performed ground condition testing and examinations once the mine operator became aware of these hazardous ground conditions.

Five Days before the Accident

On December 9, 2020, Boutte and his graveyard shift crew observed that the crack in the H-13 intersection was getting larger and continued to discharge sand, rocks, and water. Boutte noted on his grouter log that the crack had two separate “blow outs,” defined as abrupt, uncontrolled, and pressurized discharges of water, sand, and rocks. At the east end of the crack toward the I-14 room, the blowouts lasted anywhere from a few seconds to several minutes. The blow outs happened 20 minutes apart and each time sand, rocks, and water were discharged from the crack, they fell on the 90 degree pipeline, which was located at the southeast corner of the intersection. Boutte also noted that the crack had grown to approximately 75 feet long, and five and one-half to six inches wide. Boutte inserted a 16-foot-long pole into the crack, but was unable to determine the depth of the crack because the pole was not long enough to reach a solid surface. The crack created a hanging slab of roof material. Due to safety concerns raised by the miners, Boutte placed cones to danger off the area and removed the crew from the H-13 intersection area.

The following day shift on December 9, 2020, Lancaster examined the crack in the H-13 intersection. Lancaster determined the roof to be competent after he examined it on December 9. During this shift, Lancaster removed the cones placed by Boutte as a barricade to hazardous conditions on the previous shift, and allowed work and travel to continue in the affected area.

Also on December 9, 2020, the miners’ representative asked the Mine Safety and Health Administration (MSHA) inspector, who was conducting an inspection in another area of the mine, to check the area of the water leak. The MSHA inspector inspected the crack and spoke to Lancaster and the miners. The inspector and Lancaster discussed the mine’s plan moving forward to address the crack. Mine management assured the inspector that the mine had a plan to correct the crack which included mechanical scaling of the roof. Further, management assured the inspector that they would not send miners back in the area until the roof had been mechanically scaled. The inspector told management that they needed to correct the ground issue before the water issue. After the inspector talked to mine management, he talked to the miners’ representative and miners and informed them of management’s plan. The inspector also told the miners to watch for changing conditions because conditions change quickly. The miners continued to express concern. After the MSHA inspector left the area, Lancaster held a safety

meeting with concerned miners directly beneath the hazardous roof. Lancaster did not withdraw miners from the affected area and continued to deem the H-13 intersection area safe for work and travel. Lancaster continued to determine the roof to be competent as work continued that week through the afternoon of December 12. From December 9 to December 14, crews resumed normal operations, traveling through the area to access the 1904 drill site in the H-14 room, and to the J-10/K-11 junkyard area.

On the evening shift of December 9, 2020, Andrew Johnson, Grouter Supervisor, noted in the grouter log that the crack in the H-13 intersection had expanded from five and one-half to six inches wide, which was reported on the first shift, to eight to 12 inches wide. On December 11, 2020, Johnson directed the use of a mechanical scaler, which had been out of service since December 7, 2020, to scale the H-13 intersection. He gave specific instructions to not scale near the crack due to concerns that the crack might widen. During this shift, the scaler operator noticed that the mechanical scaler had a hydraulic leak that rendered it inoperable, and he drove it to the grouter shop for repairs.

Roof Movement Observed by the Mine Operator

During the day shift on December 12, 2020, Pontiff directed the removal of sediment from the roof on the west side of the H-13 intersection. The sediment removal was necessary because sand, rocks, and water were still discharging from the crack in the roof of the H-13 intersection. Scaling was performed with the mechanical scaler that had been repaired. Investigators learned that Lancaster observed the mechanical scaling operations in the H-13 intersection and stopped the scaling when he saw roof movement. Lancaster subsequently contacted a contractor to discuss drilling test holes in the roof to detect voids for the purpose of possibly installing roof bolts to attempt to narrow the crack opening. Lancaster, assisted by Romero, painted six red marks on the roof of the H-13 intersection to mark proposed test hole locations.

Additional Email Regarding Ground Conditions

On December 12, 2020, Lancaster sent an email to Elrod about the I-13 area. In the email, Lancaster describes his contact with the contractor, “about drilling some vertical exploratory holes to establish the extent of the crack.” In this email, Lancaster wrote that the “leak stayed quiet” on the day shift, and that mechanical scaling and cleaning was performed. Lancaster also wrote, “Keeping fingers crossed that whatever is plugging up the system stays there for a while.” Lancaster did not barricade the area or post warning signs in this area after the previous day’s attempted scaling. The mine operator had scheduled test drilling for mid-morning on December 14, 2020.

Grouting crews did not work the day shift on December 13, 2020, because it was a scheduled off day. When the graveyard shift started late that evening, Pontiff determined the roof to be competent and that it was safe to work in the H-13 intersection/H-14 room. Pontiff discussed his examination with Romero and Begnaud, who were the next crew to work in the area. The fatal accident occurred in the early morning hours on December 14, 2020.

Geology and Associated Failure

The mined material in the Avery Island mine consists of halite (NaCl), or common salt, which is interbedded with anhydrite (CaSO₄), a material similar to gypsum. The salt beds are nearly

vertical. Towards the top of the dome, salt and anhydrite form a series of complex folds. The surfaces of the folds create a plane of preferential weakness. Removing material below the folds during the mining process can cause remaining material to fall.

Roof Fall Dimensions and Weight

The mining dimensions of the intersection between Drift H and Crosscut 13 were roughly 100 feet by 100 feet. These dimensions were calculated from Light Detection and Ranging (LiDAR) scans provided by the mine operator and are compatible with measurements taken underground by the accident investigation team. LiDAR is a remote sensing method that uses light in the form of a pulsed laser to measure distances and digitally recreate surfaces. The volume calculated using the LiDAR scan was approximately 70,400 ft³ (see Appendix F). The roof fall material weighed approximately 4,743 tons.

Previous Roof Falls and Adverse Ground Conditions

Investigators saw evidence of three additional roof falls on the 700 level. One roof fall occurred in the T-27 area in 2012. For the other two roof falls, investigators were unable to determine when they occurred. According to the mine operator, the T-27 area roof fall had communication with a different sinkhole on the surface and also had an area in the rib with water flowing from it. The water flow area from the T-27 rib was six feet by four feet. Statements during interviews indicated that the roof fell twice at T-27 and then the mine operator filled the area with foam. Because the T-27 area was filled with foam, investigators were unable to measure the height of the roof fall. Water is still being pumped from this area.

Investigators also saw arched roof falls on the 500 level that they determined had occurred within the previous five years. One roof fall occurred about two years ago with a pre-fall roof height of about 23 feet and a post fall maximum height of 35 feet. These roof falls were not reportable to MSHA.

Investigators determined these previous roof falls should have put the mine operator on heightened awareness of potential adverse ground conditions in the H-13 intersection. These roof falls were at or near drill sites that were installed to control water. Most of the roof falls had an arched profile. Prior to the roof fall in the T-27 area, water was flowing similar to that in the H-13 intersection. Both flow areas increased in diameter over time. The T-27 roof area fall also was associated with a sinkhole on the surface. The operator should have recognized the similarities between the T-27 area and the H-13 intersection.

Ground Control Plan and Practices

Cargill's December 2019 Ground Control Plan references three components of monitoring ground conditions: visual examinations, mechanical roof monitors with trip mechanisms, and scratch holes. The mine operator performed inadequate visual examinations. The mine operator was well aware of the crack in the mine roof, yet had not identified the loose ground condition during visual examinations.

The mine operator had conducted borescoping in each intersection on the production level, but had not borescoped each intersection on the non-producing 700 level. Borecoping is performed with a borehole periscope, an optical instrument used for visual inspection of boreholes.

Important subsurface geologic information can be readily obtained by borescope examination of boreholes. The H-13 intersection had never been borescoped. The ground failure in the H-13 intersection may have been identified prior to the roof fall through borescoping, and/or other monitoring systems, as roof conditions deteriorated. Investigators learned during interviews with Greg Border, Senior Mine Engineer, that the mine operator had three borescopes on site that reached up to 32 feet. According to Border, the H-13 intersection could have been borescoped during the same shift that hazardous ground conditions were first observed.

There were no mechanical roof monitors or boreholes located in the H-13 intersection prior to the fatal roof fall. Although there was a monitor in the adjacent G-13 room, investigators learned that the monitors became inoperative in September 2020, and the mine operator did not install replacements.

There was no ground support installed in the H-13 intersection. The lack of ground support demonstrates the mine operator's misconception that there was no danger of the roof falling. Investigators found roof bolts in the fall material, however these roof bolts did not provide ground support and were only installed to hang electrical cable.

Examinations

A competent person designated by the operator is required to examine each working place for conditions that may adversely affect safety or health at least once each shift before miners begin work in that place. The competent person is required to make a record describing each condition found during the examination that may adversely affect the safety or health of miners. Examinations and testing are also required during the work shift as ground conditions warrant.

Investigators reviewed the workplace examination conducted on the 700 level before the December 14, 2020, roof fall and also reviewed examinations for the previous six months. The competent persons, including the mine operator and miners, did not identify and report the obvious and extensive deteriorating roof conditions, nor did they promptly initiate appropriate actions to correct the hazardous conditions. Failure to properly identify and report conditions exposed miners to hazards affecting their safety and health.

Training and Experience

Each new miner is required to receive no less than 40 hours of training before duties are assigned. Training is required to be conducted in conditions that, as closely as practicable, duplicate actual underground conditions. Approximately eight hours of training is required to be given at the mine site. Prior to their employment with Cargill, Begnaud and Romero had no mining experience. Begnaud and Romero completed new miner training in accordance with MSHA Part 48 training regulations on July 17, 2020, and June 6, 2020, respectively. Records indicated both miners were task trained on the equipment they were operating. On the morning of the accident, both miners were working unsupervised on the drill for the first time after completing their training.

ROOT CAUSE ANALYSIS

The accident investigation team conducted an analysis to identify the underlying causes of the accident. The team identified the following root causes, and the mine operator implemented the corresponding corrective actions to prevent a reoccurrence.

1. Root Cause: The mine operator did not have adequate procedures to assure proper workplace examinations and ground condition examinations.

Corrective Action: The mine operator developed and implemented written procedures to adequately identify and address hazardous ground conditions that include the appropriate methods to barricade areas where these conditions exist when prompt corrective action cannot be accomplished. A system of tracking miners and communicating hazardous conditions has been implemented by the mine operator as part of these procedures. The mine operator conducted training for all affected personnel on the new procedures.

2. Root Cause: The mine operator did not adequately test and monitor adverse ground conditions by following their Ground Control Plan to use roof control monitors with trip mechanisms, as well as scratch holes and a borescope to identify adverse conditions.

Corrective Action: The mine operator revised their Ground Control Plan to emphasize and address testing and monitoring adverse ground conditions. In addition, the mine operator installed additional roof control monitors with trip mechanisms on the 500 and 700 levels. Also, test holes were drilled in the roof on the 500 and 700 levels, borescoped, and examined for separation or other ground conditions. The mine operator conducted training for all affected personnel in the new policies, procedures, and revisions.

3. Root Cause: The mine operator did not have adequate procedures to post warning signs or barricade areas with hazardous ground conditions, or correct hazardous ground conditions before allowing work or travel in the affected area.

Corrective Action: The mine operator installed a barricade and warning signage in the entry of the H-13 intersection to identify the hazardous ground condition and prevent further work or travel in the affected area. Areas of concern on the 500 and 700 levels were bolted and supported or blocked from access with barricades and warning signage to prevent entry. In addition, specific language regarding evaluation and determination of ground conditions was developed to address water and ground support. Also, the mine operator established and implemented new written procedures that address proper scaling where hazardous ground conditions are identified. The mine operator conducted training for all affected personnel on the new procedures.

CONCLUSION

At approximately 2:30 a.m. on December 14, 2020, Lance Begnaud, a 27 year-old grouter with approximately five months of mining experience, and Rene Romero, a 41 year-old grouter with approximately six months of mining experience, died in a roof fall accident. At the time of the accident, the miners were drilling holes in the roof for grout to be injected in an effort to control water inflow.

The accident occurred because the mine operator did not: 1) have adequate procedures to assure proper workplace examinations, 2) have adequate procedures to assure proper ground condition examinations, 3) adequately test and monitor adverse ground conditions by following their Ground Control Plan to use roof control monitors with trip mechanisms, as well as scratch holes and a borescope to identify adverse conditions, and 4) comply with the requirements to post warning signs or barricade areas with hazardous ground conditions, or correct hazardous ground conditions before allowing work or travel in the affected area.

Approved By:

Timothy Watkins
Deputy Administrator for Mine Safety and Health Enforcement

Date

ENFORCEMENT ACTIONS

1. A 103(k) order was issued to Cargill Deicing Technology.

A verbal 103(j) order was issued on December 14, 2020 at 3:23 a.m. for the rescue of two miners who were deemed missing in the 700' level of the mine. This order is being issued under 103(k) of the Federal Mine Safety and Health Act of 1977, to assure the safety of all persons at this operation. This order was initially issued orally to the mine operator at 4:23 a.m. and has now been reduced to writing.

2. A 104(d)(1) citation was issued to Cargill Deicing Technology for a violation of 30 CFR § 57.3200.

An accident occurred on the 700 level of the mine on December 14, 2020, at approximately 2:30 a.m., when two miners were fatally injured in a roof fall while drilling holes to grout voids through which water was entering the mine. The roof fall occurred in the H-13 intersection area and the H-14 room where the miners were working. The salt mass that fell was approximately 120 feet in length by 60 feet in width by 20 feet in height. A crack in the roof of the H-13 intersection had formed prior to the roof fall and was approximately 75 feet long by 8 to 12 inches wide at the time of the roof fall. The mine operator became aware of the crack in November 2020 and observed growth in the length and width of the crack prior to the accident. On December 9, 2020, the mine operator held a safety meeting with concerned miners directly beneath the hazardous roof instead of withdrawing them from the affected area. The mine operator was in the area again on December 12, 2020, directing a mechanical scaler performing work on the crack and stopped the scaler operator when movement of the roof was observed. After observing the movement of the roof and aware of other indicia of hazardous ground conditions, the mine operator failed to make reasonable efforts over several shifts to assure work and travel did not occur in the affected area until the hazardous ground conditions were corrected. The mine operator engaged in aggravated conduct constituting more than ordinary negligence by failing over several shifts to post warning signs against entry or install barriers to impede entry until the hazardous ground conditions were taken down or supported. This violation is an unwarrantable failure to comply with a mandatory standard.

3. A 104(d)(1) order was issued to Cargill Deicing Technology for a violation of 30 CFR § 57.18002(a).

An accident occurred on the 700 level of the mine on December 14, 2020, at approximately 2:30 a.m., when two miners were fatally injured in a roof fall while drilling holes into the roof to grout voids through which water was entering the mine. A crack in the roof of the H-13 intersection had formed prior to the roof fall and was approximately 75 feet long by 8 to 12 inches wide at the time of the roof fall. Proper workplace examinations were not performed on the 700 level of the mine. Mine management observed hazardous conditions on December 12, 2020 when roof movement occurred while scaling the crack in the H-13 intersection. The mine operator did not notify miners working in the area and did not promptly initiate appropriate actions to assure the safety of miners, or to correct the

condition. On December 14, 2020, a workplace examination was not conducted prior to allowing miners to work in this area. The roof fall occurred in the H-13 intersection and the H-14 room. The mine operator engaged in aggravated conduct constituting more than ordinary negligence by not identifying and notifying miners of unstable ground conditions in the roof of the H-13 intersection and H-14 room, while continuing to direct work in the area. This violation is an unwarrantable failure to comply with a mandatory standard.

APPENDIX A – 1904 Drill Site

I-14 Pillar

68 Drill Casings

1904 Drill & Platform



Victim Locations

APPENDIX B – Persons Participating in the Investigation

Cargill Avery Island Mine

Heath Segura	Production General Foreman
Gil Elrod	Water Management Superintendent
Lane Lancaster	Grouter General Foreman
Nathan Boles	Mine Manager
Greg Border	Senior Mine Engineer
Vitaly Sikorskiy	Water Management Engineer
Devrick Touns	Senior Environmental Health and Safety Professional
Renaldo Boutte	Grouter Supervisor
Andrew Johnson	Grouter Supervisor
Dean Pontiff	Grouter Supervisor
Eric Blinkhorn	Production Management Engineer Associate
Cory Hilton	Grouter Mechanic
Drake Thibodeaux	Grouter Mechanic
Dustin Bourque	Grouter
Dwane Daigle	Grouter
Timothy Lemaire	Grouter
Lane Richard	Grouter
Randy Rochon	Grouter

United Steelworkers Local 27C Miners' Representatives

Steve Seneca	Electrician
Larry Comeaux	Electrician
Larry Gaspard	Mechanic

United Steelworkers Local 27C Union Representative

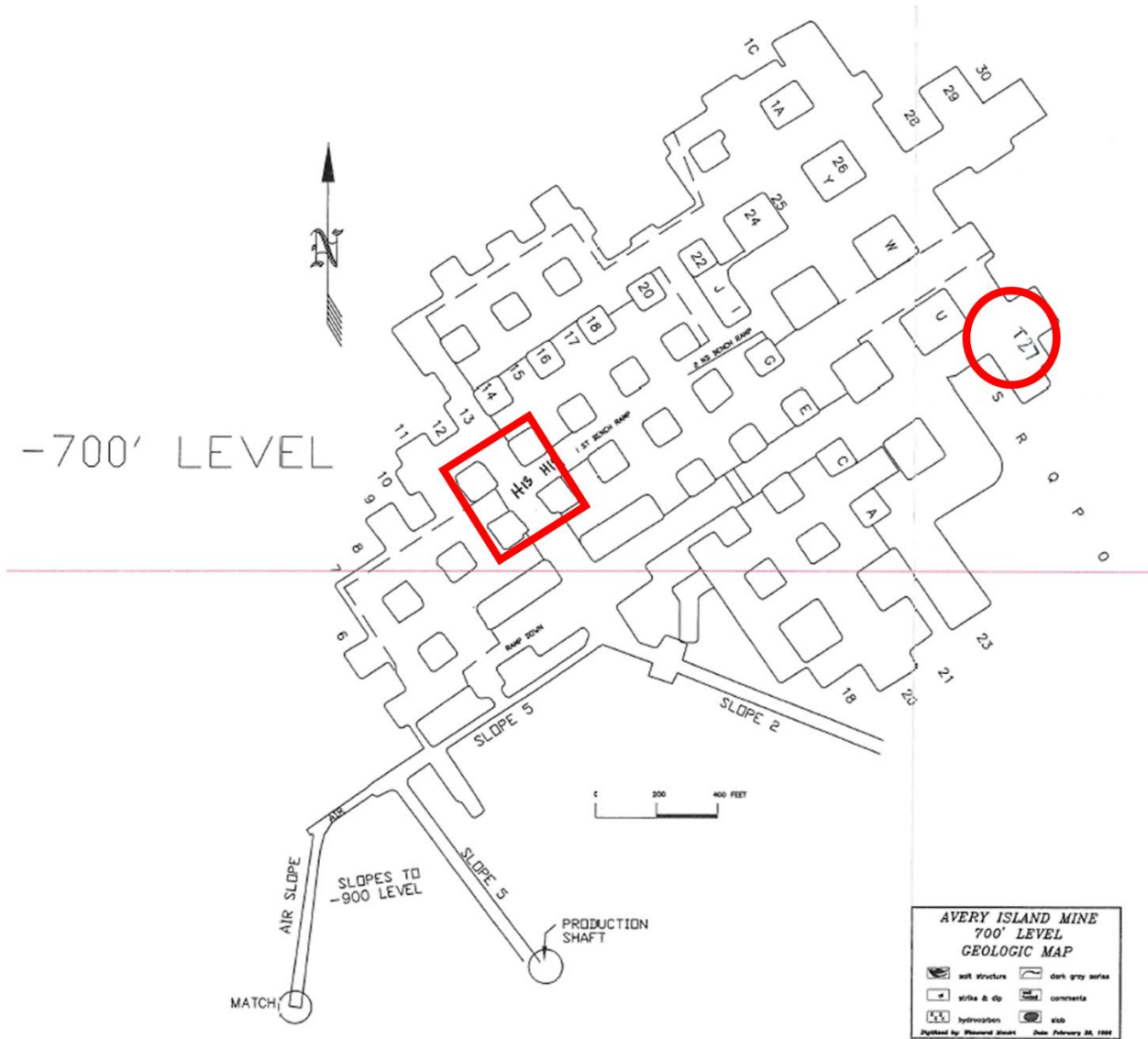
Thomas Crotchet	Vice President
-----------------	----------------

Mine Safety and Health Administration

Darren A. Conn	Supervisory Mine Safety and Health Inspector
Sammy D. Elswick	Supervisory Mine Safety and Health Inspector
Michael LaRue	Mine Safety and Health Inspector
Emily C. Muto	Geologist, Technical Support
Ahmad Z. MdAzmi	Mining Engineer, Technical Support
James G. Vadnal	Mining Engineer, Technical Support
Lindsay Wofford	Office of the Solicitor

APPENDIX C – Map of the 700 Level

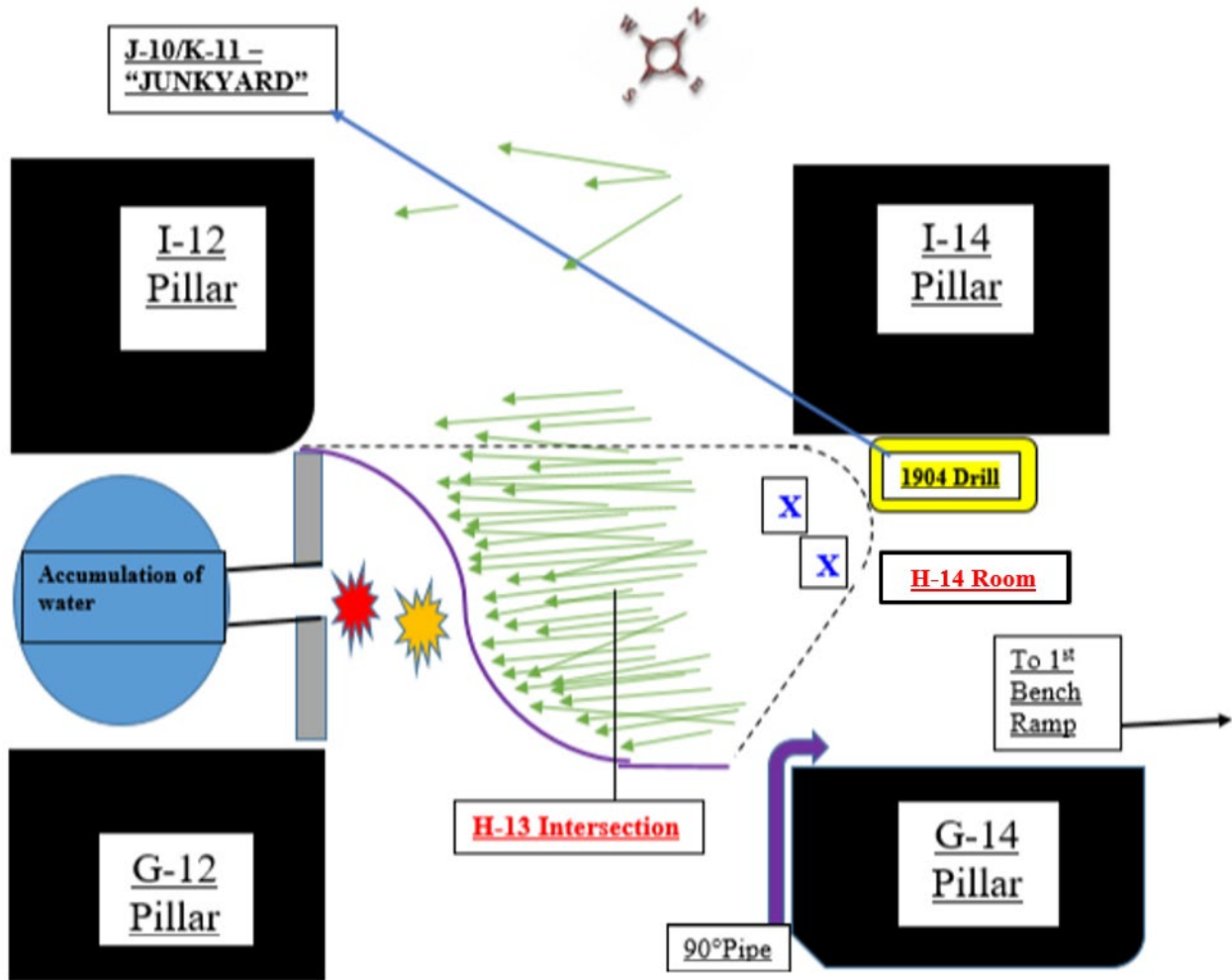
The area within the red square is referred to as the I-13 area. Details of this area are in Appendix E. The red circle shows the T-27 area.



APPENDIX D – Froggy Bottom Sink Hole



APPENDIX E – Map of the I-13 Area



- Blue X's show the locations of the victims
- Purple line shows the crack in the roof beginning at the southeast corner of the I-12 pillar and extending toward the northwest corner of the G-14 pillar.
- Purple line and dotted line shows the area of the roof fall.
- Blue Arrow – holes drilled with U6 drill beginning in September 2019. 68 drill casings found.
- Green Arrows – 39 holes drilled with the U4 drill between November 3, 2020 and December 10, 2020
- Red Explosion Symbol – Location of first blast on November 2, 2020
- Orange Explosion Symbol – Location of second blast on November 2, 2020

APPENDIX F – Three-Dimensional Representation of the Fall Cavity

Three-dimensional representation of the fall cavity, based on the mine operator's LiDAR scans.

