

**Commonwealth of Pennsylvania  
Department of Environmental Protection  
Bureau of Deep Mine Safety**



***REPORT OF INVESTIGATION***

Underground Bituminous Coal Mine

Non-Injury Mine Inundation Accident  
(Entrapment)  
July 24, 2002

**Black Wolf Coal Company, Inc.**

**Quecreek No. 1 Mine**

CMAP # 56981301

**Quecreek, Somerset County, Pennsylvania**

**Accident Investigators**

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**Date:** July 22, 2003

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- D-2 1963 Department of Mines and Mineral Industries Annual Report
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- D-4 Module 8 from Quecreek No.1 Mine permit application
- D-5 Memorandum from RoxCoal, Inc. to Musser Engineering (December 28, 1998)
- D-6 Memorandum from RoxCoal, Inc. to Musser Engineering (January 6, 1999)
- D-7 Hydrology portion of 1999 Quecreek No. 1 Mine permit revision
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- D-9 Quecreek No. 1 Mine 1<sup>st</sup> Left Section daily production reports for July 2002
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## INTRODUCTION

This report<sup>1</sup> presents the findings of the Pennsylvania Department of Environmental Protection (“DEP”) Bureau of Deep Mine Safety (“BDMS”) investigation of the inundation accident that occurred on July 24, 2002, at Quecreek Mining Company, Inc.’s Quecreek No. 1 Mine located in Lincoln Township, Somerset County, PA. The investigation was conducted jointly between BDMS and the U. S. Department of Labor’s Mine Safety and Health Administration (“MSHA”). BDMS and MSHA agreed to conduct a joint investigation from which each agency would produce its own investigative report. However, during the course of this joint investigation, the agencies agreed to share their draft reports with each other prior to their issuance. BDMS shared its preliminary report with MSHA prior to its release in November 2002, and offered to share its final report with MSHA prior to its release. However, MSHA has not been forthcoming in satisfying its commitment to share its draft report with BDMS. Accordingly, BDMS has never seen any drafts of MSHA’s Report.

The purpose of this report is to:

- 1) document the cause or causes of the Quecreek accident;
- 2) present basic timelines and facts surrounding the accident and rescue;
- 3) consider whether any state laws or requirements were violated and recommend enforcement actions related to violations;
- 4) make any other recommendations for changing procedures and law to prevent similar accidents and;
- 5) evaluate whether precursors existed that would have given advance warning of a possible inundation.

Nine miners escaped from the mine shortly after the accident occurred; nine other miners were trapped within the mine for 78 hours before being rescued. The report is based on factual evidence gathered over the course of ten months from over 50 interviews, an inspection of the Quecreek No. 1 Mine, examination of mine maps and other records, and research. The investigation included the following topics:

- Details of the escape of the nine miners from the 2<sup>nd</sup> Left Section
- Survival of the 1<sup>st</sup> Left crew pending their rescue
- Notification and actions of BDMS personnel and others who responded to the accident

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<sup>1</sup> On November 7, 2002, the Department released a Preliminary Report of Investigation on this matter. When the Preliminary Report was issued the Department asked persons with additional information to come forward. Seven submissions were received, and as appropriate have been incorporated into this Final Report. In addition, Department personnel have conducted additional investigative work since the Preliminary Report was completed. In February 2003 the Department requested the Pennsylvania Office of Inspector General (“OIG”) to conduct a program evaluation into BDMS’ interpretation of Section 236 of the Act and also whether this interpretation was properly conveyed to the inspection staff, and implemented by the staff. The OIG provided a Report to the Department on April 25, 2003. The Report was embargoed at the request of the Office of Attorney General. The OIG’s Report will be released contemporaneously with the release of their Investigative Report.

- Rescue efforts
- Development, permitting, operation, and physical characteristics of the Quecreek No. 1 Mine
- History of the Harrison # 2 Mine
- Maps of the Harrison # 2 Mine

### GENERAL INFORMATION

The Quecreek Mining Company, Inc., Quecreek No. 1 Mine is a typical room and pillar drift mine opened within a typical box cut area. The Quecreek No. 1 Mine opened in March 2001 by developing 4 entries off the highwall face-up area then expanding to 7-entry mains. The mine operates in the Upper Kittanning (C') Coal Seam, which has an average height of 48 inches in this area. The Quecreek No. 1 Mine produced an average of 2,500 raw tons per day prior to the accident.

At the time of the accident, the mine operated two continuous miner sections, 1<sup>st</sup> Left and 2<sup>nd</sup> Left. These sections utilize Eimco continuous miners, Joy 21SC shuttle cars, Fletcher Dual-Boom Roof Bolters, and Eimco scoops. The 2<sup>nd</sup> Left Section is a 7-entry panel developed approximately two crosscuts off 5 Main. The 1<sup>st</sup> Left Section is a 7-entry panel developed on 60- by 60-foot centers and was developed 3,350 feet prior to the inundation. The mine map indicated that one additional crosscut was projected for the 1<sup>st</sup> Left Section beyond the mining completed when the inundation occurred.

Black Wolf Coal Company, Inc. ("Black Wolf") is the contract miner for the Quecreek No. 1 Mine. The Quecreek No. 1 Mine operates with three shifts per day, five days per week with two production shifts and one maintenance shift. The mine employs 59 men underground and 4 men on the surface. The Quecreek No. 1 Mine is classified as a non-gassy mine.

The principal officers of Quecreek Mining Company, Inc. are as follows:

Robert Scott	President/Director
Joseph Gallo	Vice-President
Timothy Phillips	Director

The principal officers of the Black Wolf Coal Company, Inc. are as follows:

David Rebuck	President
Charles Hankinson	Vice-President

The mine officials<sup>2</sup> of the Quecreek No. 1 Mine are as follows:

David Rebuck	Superintendent
Joseph Hoffman	Mine Foreman
Charles Hankinson	Mine Electrician
David Keller	Safety Director

### SUMMARY OF ACCIDENT

On July 24, 2002, at approximately 8:50 p.m., the barrier pillar between Quecreek Mining Company, Inc.'s Quecreek No. 1 Mine and the abandoned Saxman Coal and Coke Co.'s Harrison # 2 Mine breached, resulting in the flow of millions of gallons of water from the Harrison # 2 Mine into the Quecreek No. 1 Mine. The breach occurred in the mine's 1<sup>st</sup> Left Section. The water rushed in with such force and quantity that it presented an immediate danger to all miners in the mine. Prompt notification of the 2<sup>nd</sup> Left crew by the 1<sup>st</sup> Left crew enabled the 2<sup>nd</sup> Left crew to escape shortly after the accident occurred. However, the 1<sup>st</sup> Left crew was unsuccessful in its attempts to escape, resulting in their entrapment in the mine for 78 hours. Thanks to the efforts of many parties, including Governor Mark Schweiker, BDMS, MSHA, Black Wolf, the coal industry community, miners from other mines, community and emergency response organizations, Somerset County Emergency Management, Pennsylvania Emergency Management Agency, other state and federal agencies and the private sector, the nine trapped miners were safely rescued.

The Harrison # 2 Mine operated in the same coal seam as the Quecreek No. 1 Mine. The Harrison # 2 Mine was closed in 1964. The Investigation Team found no certified final maps for the mine, nor has the Investigation Team learned that anyone else has located such a map. The representation of the extent of the Harrison #2 workings presented in the Quecreek No. 1 Mine permit application was based on an undated map that does not depict the full extent of workings in the Harrison #2 Mine. The miners, permittee, mine operator, DEP, and MSHA stated, during the investigation, they believed the Harrison #2 mine workings were at least 300 feet away from the Quecreek No. 1 Mine. A 1964 map showing a portion of the Harrison #2 Mine was discovered in documents donated to the Windber Coal Heritage Center by the family of a former Department of Mines and Mineral Industries inspector who inspected the mine until its closure. It shows workings in the vicinity of the breach. The map and other documents were donated to the Center in June 2002. During the permitting of the mine, BDMS was informed that a certified map of the Harrison #2 Mine workings existed. BDMS requested a copy of the map and was

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<sup>2</sup> Under the Pennsylvania Bituminous Coal Mine Act, Act of July 17, 1961, P.L. 659, 52 P.S. 701-101 – 701-706, the Mine Foreman is in charge of the inside workings of the mine and primarily responsible for compliance with the Act's requirements. The Superintendent, who manages the mine on behalf of the operator, shares these responsibilities with the Mine Foreman. 52 P.S. 701-218, 701-221 – 701-226. The mine owner has limited responsibilities under the Bituminous Coal Mine Act. See D'Jorko v. Berwind White Coal Company, 231 Pa. 164, 80 A. 77 (1911) (interpreting similar provisions of 1893 statute). See also Section 279 of Bituminous Coal Mine Act, 52 P.S. 701-279.

informed that one would be provided. However, no such map was produced, and the investigation has not revealed the existence of such a map.

Though working conditions in the Quecreek No. 1 Mine were somewhat variable, the miners reported that the Quecreek No. 1 Mine was a wet mine since start up. Wet conditions were expected as documented in the hydrology section of the permit application. In interviews with 17 of the 18 miners on August 14-16, 2002, the miners indicated that the wet conditions were normal throughout the mine. Second interviews were conducted on December 4-6, 2002, with the nine-member 1<sup>st</sup> Left crew and three other persons from Black Wolf to ask specific questions regarding the conditions of the 1<sup>st</sup> Left Section. During the second interviews, several members of the 1<sup>st</sup> Left crew indicated there were excessive water conditions preceding the inundation. In addition to the water conditions, some miners described poor roof conditions in areas of the 1<sup>st</sup> Left Section. Several miners indicated they were unaware of the Harrison #2 Mine being flooded. Also their observations of a greater amount of water flowing from the roof in the 1<sup>st</sup> Left Section during the period prior to the inundation did not cause the miners to have concerns of an impending inundation, based on statements received in the interviews.

#### NOTIFICATION OF ACCIDENT

At approximately 9:30 p.m. on Wednesday July 24, 2002, BDMS District 15 Underground Mine Inspector Lynn Jamison received a telephone call from the Superintendent of Quecreek No. 1 Mine, David Rebuck. Rebuck reported a cut through into old flooded mine works and miners missing. At approximately 9:35 p.m. Jamison reported the cut through to Mine Inspector Supervisor Ellsworth Pauley and immediately proceeded to the mine. Pauley notified Bituminous Division Chief Joseph Scaffoni of the accident at approximately 9:40 p.m. and then proceeded to the mine. Scaffoni notified BDMS Director Richard Stickler who notified Engineering Supervisor 2 William Bookshar and Mining Engineer 2 Thomas McKnight. They all proceeded to the BDMS Uniontown Office to review maps and gather information.

Mr. Rebuck contacted MSHA Johnstown Field Office Manager James Biesinger at approximately 9:40 p.m.



## 2<sup>ND</sup> LEFT CREW ESCAPE

On July 24, 2002, the crew assigned to the 5 Mains/2<sup>nd</sup> Left Section started the afternoon shift at 4 p.m., working until 12 midnight.

The crew consisted of the following nine miners:

Frank Stewart, Section Foreman – 30 yrs. experience  
Joseph A. Kostyk, Continuous Miner – 10-½ yrs. experience  
David R. Petree, Roof Bolter – 31 yrs. experience  
Douglas Custer, Roof Bolter – 25 yrs. experience  
Wendell L. Horner, Shuttle Car Operator - 10 yrs. experience  
Ronald J. Schad, Shuttle Car Operator/Mechanic – 28 yrs. experience  
Ryan S. Petree, Scoop Operator - 9 yrs. experience  
Larry Summerville, Floating Mechanic – 33 yrs. experience  
Barry Carlson, Scoop Operator - 35 yrs. experience

No unusual conditions were observed at the beginning of the shift according to the interviews conducted with the miners and mine officials shortly after the accident. The continuous miner operator was moving the continuous miner from #6 entry to #5 entry. Larry Summerville, who had started at 3 p.m., was working at the belt drive, and Barry Carlson was placing conveyor belt structure along the belt entry. The remainder of the crew was working in 2<sup>nd</sup> Left Section.

At approximately 8 p.m., Frank Stewart proceeded outby to conduct pre-shift examinations. Shortly before 9 p.m. someone was heard yelling over the section pager phone. Ron Schad had just dumped a load of coal onto the feeder and responded to the call. Upon answering the phone, he learned it was the 1<sup>st</sup> Left Section warning them they had hit water and to get out of the mine.

After notifying the 2<sup>nd</sup> Left crew of the warning received, Schad went to get Summerville who was working outby on the belt drive. Schad and Summerville then traveled out of the section on Summerville's golf cart.

The remaining five men in 2<sup>nd</sup> Left (Horner, D. Petree, R. Petree, Kostyk, and Custer) boarded the section mantrip and began their escape. The five miners traveled out the #5 travelway and encountered Carlson. Carlson joined the others and continued the escape from the mine.

Summerville and Schad were ahead of the 2<sup>nd</sup> Left crew as they traveled out the #5 travelway. As Summerville and Schad approached a low spot in the Mains, near the mouth of 1<sup>st</sup> Left, they observed the water had reached the roof in the travelway. Realizing their escape route was blocked, they backed up to the first mandoor located at #24 crosscut. Summerville and Schad went through the mandoor into #6 entry. As Summerville and Schad traveled on foot out the #6 entry, they observed water leaking around the stoppings between #5 and #6 entries.

The remaining six men from the 2<sup>nd</sup> Left crew, seeing Summerville's golf cart and the open mandoor, abandoned their mantrip and entered #6 entry on foot. The entry was low and they crawled through the intake until the height increased enabling them to get off their knees. They could hear the roar of the water as it traveled through the adjacent entries. As they passed #19 crosscut, the force of the water blew open the mandoor and water rushed into the entry. The force of the inrush of water was so great that some of the men were knocked off their feet.

Stewart was conducting a pre-shift examination of the outby areas of the 1<sup>st</sup> Left Section. He traveled up the #5 entry in 1<sup>st</sup> Left, approximately 1,000 feet to examine a pump in the #7 entry at #18 crosscut. He heard the 1<sup>st</sup> Left belt shut off as he went through the mandoor into #6 entry. After passing through the mandoor, Stewart left it in the 'open' position. While examining the pump, he heard the mandoor slam shut. He noted the time as 8:50 p.m., as he had just placed his date and initials on the date board at the pump. As he traveled back to the #6 entry, he heard a roaring sound and felt the force of air traveling outby, which is opposite the normal airflow direction. When Stewart re-entered the #5 entry, he observed the discharge line being sucked out of the stopping into the #6 entry. He then proceeded to the 1<sup>st</sup> Left belt drive. When Stewart arrived at the 1<sup>st</sup> Left belt drive there was no water in the entry. While attempting to call the crews in 1<sup>st</sup> Left and 2<sup>nd</sup> Left, he observed water coming down the 1<sup>st</sup> Left belt entry. He continued traveling outby to the #5 Mains belt drive.

As Summerville and Schad traveled on foot out the #6 entry, the water was so swift that Schad was temporarily knocked off his feet. They continued to the top of the hill, looked through a mandoor into #5 entry and saw that it was dry. At this location, they met Stewart. Schad continued on foot to the outside, arriving prior to the others. When the remaining 2<sup>nd</sup> Left crew members reached the top of the hill, they kicked open a mandoor and saw they were ahead of the water. They entered the #5 entry and met Stewart. Seeing the water was rising, the crew all boarded Stewart's golf cart and rode to the outside, arriving around 9:40 to 9:45 p.m.

## 1<sup>ST</sup> LEFT CREW SURVIVAL

On July 24, 2002, the crew assigned to the 1<sup>st</sup> Left Section began the shift at 3 p.m. The crew consisted of the following nine miners:

Randall Lee Fogle – Section Foreman – 22-½ yrs. experience  
John R. Phillippi – Continuous Miner Operator – 12 yrs. experience  
Mark E. Popernack – Utility Man/Miner Helper – 21 yrs. experience  
John Richard Unger – Roof Bolter – 28 yrs. experience  
Ronald James Hileman – Roof Bolter – 27 yrs. experience  
Robert E. Pugh – Shuttle Car Operator – 31-½ yrs. experience  
Dennis J. Hall – Shuttle Car Operator – 28 yrs. experience  
Harry Blaine Mayhugh, Jr. – Scoop Operator – 5-½ yrs. experience  
Thomas D. Foy – Mechanic/Electrician – 29 yrs. experience

When the crew arrived in the 1<sup>st</sup> Left Section, the continuous mining machine was in the #1 entry, having been left there by the dayshift crew. Randy Fogle completed his on-shift examination of the faces and checked the ventilation. John Phillippi moved the continuous mining machine from the #1 entry to the #7 entry and began mining. Phillippi took a 20-foot cut out of #7 entry, moved to #6 entry and mined a 30-foot cut in the crosscut between #6 and #7 entries. Fogle and Foy bolted the roof in the #7 entry, then the crosscut between #6 and #7 entries. The third cut taken was a 30-foot cut in the crosscut between #5 and #6 entries. The fourth cut was a 30-foot cut mined in the crosscut from #4 to #5 entry. Phillippi then moved into the crosscut between #6 and #7 entries and finally to the #6 entry.

Ron Hileman and John Unger began bolting the roof in the crosscut between #2 and #3 entries with the left side bolter. When the inundation occurred, they were bolting in the crosscut between #4 and #5 entries.

Mark Popernack relieved Phillippi as miner operator at approximately 8 p.m. He took a 35-foot cut out of #6 entry. The miner was on the right side of the entry as he was preparing for the last “clean-up” shuttle car. Dennis Hall was on his shuttle car behind the miner and had turned in his seat, preparing to leave. Robert Pugh was on his shuttle car in the last open crosscut between #4 and #5 entries waiting for Hall to leave. Foy and Fogle had just finished bolting the crosscut between #5 and #6 entries and had backed the bolter out of the face area. Blaine Mayhugh was sitting on the scoop between #3 and #4 entries and Phillippi had gone over to the #3 entry to assist with supplies for the roof bolter.

At the time the breach occurred, Popernack, preparing to clean-up the cut, had looked back at the shuttle car. He then looked back towards the face and observed a wall of water coming out of the face. He thought about jumping onto the shuttle car. However, he had the remote control unit suspended around his neck with a strap and could not remove it in time. He ran out of the #6 entry through the crosscut to #7 entry.

Hall heard Popernack yell for him to “get out of there.” He stepped on the tram pedal and felt the water hitting him on the back. The shuttle car lost power as he turned into #53 crosscut. Hall exited his shuttle car, went to the mine phone and tried to contact the 2<sup>nd</sup> Left crew. He continued his attempts to contact 2<sup>nd</sup> Left, then called outside and informed the outside man of the situation. Hall stayed at the phone until he got in touch with the 2<sup>nd</sup> Left crew. He warned them of what had occurred and did not leave the phone until he was sure they understood the seriousness of the problem.

Pugh heard the sound of the water rushing into the mine. When he attempted to move his shuttle car, Pugh realized his car had lost power. Hileman was in the #4 entry attempting to position the roof bolter in the crosscut to #5 entry when the power went off. Foy and Fogle were in the #5 entry when they heard the inrush of water. The water had come in with such force that it pushed the power center, an 8,000 pound piece of equipment, from its location, tripping the power to the section. Fogle told Foy to get the other men and meet at the feeder. Fogle could see Popernack on the other side of the water, but due to the noise from the water, Popernack could not hear Fogle telling him to go down the intake entry.

The crew started out the belt entry toward the 1<sup>st</sup> Left belt drive. They traveled out the conveyor belt entry about 1,500 feet. The water was rapid and rising quickly. Fogle went over to the #5 entry and began looking for Popernack through several man doors between #5 and #6 entries. Due to excessive water, he had to stop and returned to the #4 belt entry. When Fogle caught up with the crew in the belt entry, the water had increased to a depth of approximately three feet. Hall nearly lost his footing and Fogle grabbed him and threw him onto the conveyor belt.

Before the crew could reach the belt drive, they saw that the water had reached the mine roof causing them to retreat back toward the section. The water was as high as the top of the belt. Due to the swift current, the men got onto the belt and crawled in by. The water continued to rise and the men had to keep their heads close to the roof to breathe.

They continued to a point where they were able to get off the belt and enter a crosscut where Fogle knocked a hole in a stopping to get over to #3 entry. They traveled out by to the regulator in the #1 entry between #3 and #4 crosscuts and saw the water was pushing against it with great force. They then went into #2 entry and tried, unsuccessfully, to knock out a stopping. The water continued to rise until their heads were under water. Fogle knew they could not get out and advised them to return to the section. The crew proceeded up the return entry to stay out of water, then traveled over to the belt entry to the feeder.

While at the feeder, Phillippi saw a light on the other side of the water and knew it was Popernack. Popernack had been trying to cross the water but stopped when he saw Phillippi's light. Phillippi told Fogle that Popernack was on the other side of the water. Popernack was in the #7 entry and the water was waist high. He went into the crosscut between #6 and #7 entries, as there was less water there.

Popernack knew he had to cross the water, but needed to calm down to do so. He thought about jumping into the water and floating down and across, but was concerned it would not work. Popernack made several unsuccessful efforts to cross the water. He took the water hose, wrapped it around himself and taped it. He then tried to cross the water on foot, but was unsuccessful. Next, he took “J” hooks and taped one to each hand, planning to hook into the roof bolt plates and cross the water while hanging from these hooks. On his third step he realized he could not make it and retreated.

When Fogle saw Popernack, he thought about ways to rescue him. He cut a Jabco cable and tried to throw it to Popernack. After ten attempts, Popernack grabbed the cable and secured it to the mechanic’s golf cart. Fogle then had Popernack cut a piece of bolter cable and tied it to the Jabco cable. Popernack had difficulty holding on to the cable and was unsuccessful in crossing the water.

Fogle then used the battery-operated scoop. He traveled about 900 feet down the return to verify the water location. He came back up to #52 crosscut to the belt. The men took the belt apart at #52 crosscut. Fogle, using the scoop, knocked out the stopping between #5 and #6 entries at #53 crosscut. Fogle then eased the scoop into the water toward Popernack. He was able to get close enough to enable Popernack to jump into the bucket of the scoop. Fogle pulled the scoop back, and carried Popernack across the water. Fogle and Popernack then joined the rest of the crew at the roof bolter in #4 entry. The men had gone there to rest and warm themselves at the roof bolter.

The crew all boarded the scoop. Fogle knew he could not make it out the return, so he took them down the travelway (#5 entry) until they encountered water. He knocked out a wall and crossed over into the intake (#6 entry) and traveled down the intake until he again encountered water. Fogle then knew there was no way out.

Fogle decided to return to the section. While enroute back to the section, they picked up three cases of distilled water for drinking. They took the water to the roof bolter in #4 entry. Fogle took a second trip on the scoop to check the water location. It was now 1,300 to 1,600 feet up the belt entry. He estimated the water was rising about 300 linear feet per hour toward the top of the section. Upon returning, he advised the crew they needed to start barricading to keep the water out. Fogle figured they had about 2,000 feet before the water reached them. There were two pallets of blocks on the section and stoppings were knocked out for additional blocks. Sealant was applied to one side of the wall to help keep out the water. The walls slowed the inflow of water, but the water was still coming in at a steady rate.

As they started to build the first wall, they could hear drilling from above, evidence of a gathering rescue effort (see Rescue Operations beginning on Page 11). Dennis Hall had moved the mine phone system up earlier and continued trying to contact someone outside. Since they did not know where the hole would come through, they delayed building the remaining walls until the drilling got closer and they could tell where the hole would break through into the section.

The 6-inch hole (the actual diameter of the borehole was 6 ½ inches) came through the roof outby the feeder in the center of the belt entry at #52 crosscut. Within 10 to 15 minutes the crew was able to breathe easier. The air coming through the drill steel was very loud, but it was fresh air. There was some oil in the air from the compressor that made some of them nauseous. When the 6-inch hole came through, they looked in their hard hats for the decal listing the signal for trapped miners. They then tapped on the drill steel to signal the surface.

The crew continued to build walls to barricade against the water. The water reached them before they could get the last wall built at #52 crosscut, between #4 and #5 entries. Around noon on Thursday, July 25, 2002, the rising water had forced them away from the 6-inch hole. Later, the water overtook the 6-inch pipe and air was bubbling through the water. They returned to the bolter in #4 entry. It was at this time they wrote letters to their families, placed the letters in a bucket, taped it, and hung it on the bolter.

The water continued to rise, and the men believed they only had an hour or so until the water reached them. In 20 to 30 minutes the water came up to the #4 entry. Some of the crew tied themselves together, so if they drowned they would all be found together.

The men then moved to #1 entry, as this was the highest point in the section. They erected a double canvas curtain across the entry. They used a "STOP" sign to shovel loose coal onto the bottom of the canvas. The men sat with their backs to each other to help keep warm. Tom Foy took the light from the carbon monoxide system and the battery from the telephone and wired them to have a little light. Most of the time they were in darkness. About every half hour someone would get up and hit a roof bolt, hoping the signal would be heard on the surface. Some of the water jugs collapsed inward from air pressure. The first wall built at #54 crosscut, between #4 and #5 entries, collapsed. Water continued to rise such that only #1, #2, and #3 entries were open through the last open crosscut. They marked the water's edge in #1 entry with a wedge and later that afternoon noticed the water had stabilized.

After the water had receded slightly, Foy tried to signal the surface by beating on the drill steel with a steel strap since he could not reach the drill steel with a hammer. He did not get a response from the surface. As the water receded, the crew felt better about their survival.

At one point the drilling had stopped for 14 to 16 hours, but Fogle maintained a positive attitude, informing the crew the bit had probably broken, but the rescuers would reach them.

Eventually, the water had receded so that the area of the 6-inch hole was no longer flooded; the rescue hole broke through about an hour later. The rescue hole entered the belt entry, just outby the 6-inch hole, on the belt. Hileman and Foy were the only ones near the 6-inch hole when the escape hole broke through. They knocked out a wall they had built and went to inform the others. Water was outby the escape hole when it broke through. The belt did not interfere with the rescue capsule. There was enough height to

get into the capsule. Since Fogle had been experiencing chest pains much of the time, he was sent out first. Prior to leaving the mine, Mayhugh went into the #6 entry. He observed the water running out of the old mine about 6-8 inches deep. The removal of the men from the mine continued; Popernack was the last crew member to be rescued at 2:45 a.m. on July 28, 2002.

## RESCUE OPERATIONS

### Initial Assessment of Accident

At approximately 10:20 p.m., on July 24, 2002, BDMS Inspector Lynn Jamison arrived at the Quecreek No. 1 Mine and immediately traveled underground to evaluate the water level. At approximately 10:30 p.m., BDMS Inspector Supervisor Ellsworth Pauley arrived and made the initial assessment of the mine and communicated his observations to BDMS personnel at the Uniontown Office.

Shortly after Pauley and Jamison arrived at the mine, personnel from Black Wolf, BDMS, and MSHA learned that nine miners had escaped from the flooding mine and nine miners were unaccounted for. Some personnel from BDMS, MSHA, and Black Wolf traveled underground to see the water and other conditions underground, while others remained on the surface to assess the situation and determine the likely location of the trapped miners. It was determined the most likely location for the trapped miners was the highest elevation of the 1<sup>st</sup> Left Section. Plans were immediately put into motion to start pumping water out of the mine as equipment became available and to drill a 6-inch borehole into the area where the miners likely took refuge.

### 6-Inch Hole

The rescue team decided to drill a 6-inch diameter bore hole into the location where the miners likely took refuge to attempt to establish communications and provide fresh air to the trapped miners. The location for the 6-inch hole was determined by a survey that was performed conducted by CME Engineering, Somerset, PA, using Global Positioning System ("GPS") instruments. This location was checked by a conventional overland survey traversed by Musser Engineering, Central City, PA. The surveys came within 6 inches of each other. The coordinates for the hole were scaled off the mine map located in the mine office trailer and later cross-checked with the actual coordinates on the office computer.

At approximately 2:50 a.m. on Thursday, July 25, 2002, the drilling of the 6-inch hole started. A rotary drill rig drilled the 6-inch hole from the surface into the #4 belt entry in 1<sup>st</sup> Left (Exhibit M-1). The 6-inch hole broke through at 5:06 a.m. at a depth of 231 feet supplying the miners with much needed fresh air.

### First Contact with the Miners

After the 6-inch hole bored into the mine, rescuers attempted to contact the trapped miners by striking the drill steel with a hammer. At 5:12 a.m. on July 25, 2002, the trapped miners responded by striking the drill steel three times. The miners signaled the surface a second time at 11:40 a.m. on July 25, 2002. This time nine taps were heard. No further contact was made with the miners until just prior to the miners' rescue.

### Air In The Mine

Following completion of the 6-inch hole, air quality was tested at the top of the 6-inch hole. The test showed marginal air quality of 19.3 percent oxygen. Rescue workers decided to continue pumping compressed air into the mine to provide fresh air to the trapped miners. The area around the 6-inch drill steel was sealed with inflatable air bags. The air was pumped into the mine at a rate of approximately 920 cubic feet per minute at a temperature of 197 degrees Fahrenheit, though it appears that the air lost heat as it traveled through the borehole. The rescue team also hoped to enhance the quantity and quality of air in the mine's air pocket. The drill rig produced 90 psi of pressure that, after frictional losses were considered, engineering calculations suggested was sufficient to augment the air pocket holding the water back.

### Pumping Water

Pumps were set up as they became available. Pumps were obtained from numerous sources locally, as well as from remote locations. Deep well pumps were installed in two boreholes drilled into the 1 Right area of the Quecreek No. 1 Mine. Six boreholes were drilled into the 5 Mains area. Four pumps with the following capacities, were installed in these holes:

- #1 hole ---- 3,000 gpm
- #2 hole ---- drilled into rib
- #3 hole ---- 2,500 gpm
- #4 hole ---- water monitoring hole
- #5 hole ---- 2,500 gpm
- #6 hole ---- 3,000 gpm

Eight pumps with the following capacities were installed in the mine portal area:

- 5 – 5,000 gpm diesel pumps
- 1 – 3,000 gpm diesel pump
- 2 – 1,000 gpm diesel-powered hydraulic pumps
- 1 – 1,500 gpm electric pump



At the peak pumping rate, in excess of 32,000 gallons of water per minute was being pumped from the mine.<sup>3</sup>

### 30-Inch Rescue Hole No. 1

The location for Rescue Hole No. 1 is adjacent to the 6-inch hole. The location was determined by Musser Engineering and verified by CME Engineering. At approximately 3:12 p.m. on July 25, 2002, an area was being prepared to drill a 30-inch escape hole.

At 6:45 p.m. on July 25, 2002, drilling of the 30-inch hole began. At 1:12 a.m. on July 26, 2002, drilling stopped because the 30-inch bit was lost in the hole. At 3:45 a.m. a portion of the bit was retrieved from the hole, but it was discovered that part of the bit had broken off and remained stuck in the hole. A special tool was needed to assist in retrieving the bit. One such tool was located in Clarksburg, WV, and another was being fabricated in Punxsutawney, PA. The bit was retrieved from Rescue Hole No. 1 at 4:09 p.m. on July 26, 2002, with the tool fabricated in Punxsutawney.

A new bit was located in West Virginia; it arrived at 7 p.m. on July 26, 2002. The new bit was unloaded and set up at Rescue Hole No. 1. At 8:40 p.m. final preparation was being made, and the hole would have to be reamed out because the new bit had a larger diameter. Reaming of the hole began at 1 a.m. on July 27, 2002, but later stopped to replace the sleeve. At 2:30 p.m. drilling was stopped again. Due to damage to the buttons on the side of the bit, it had to be replaced. At 3:30 a.m. a decision was made to change to a 26-inch bit since there was one available 7 miles south of the mine in Somerset, PA, and it would accommodate the rescue capsule.

At 6:30 a.m. the installation of the new 26-inch bit was completed and drilling resumed. Drilling continued until 1:38 p.m. on July 27, 2002, when it was stopped to install the air lock and wait for the water to be pumped down to an elevation of 1,829 feet mean sea level ("MSL"), approximately 10 feet below the portal elevation. The air lock was needed to guard against the potential of a sudden pressure differential between the mine and the atmosphere when the borehole was completed.

Drilling started again at 4:45 p.m. At 8:11 p.m. the rings in the airlock failed and had to be repaired. At 8:58 p.m. the repairs were completed on the No. 1 drill air lock and drilling resumed. At 10 p.m. the water elevation was 1827.92 MSL. The No. 1 drill holed through into the mine at 10:16 p.m. at a depth of 239.6 feet, which was lower than the elevation of the mine's portal ([Exhibit M-1](#)). After Rescue Hole No. 1 entered the mine, a pressure reading was taken on the surface. The pressure reading was zero, indicating that the pressures were equal and that the airlock would not be required.

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<sup>3</sup> The DEP has completed an assessment of Quemahoning Creek on the impacts of these mine water discharges pumped from Quecreek No. 1 Mine during and following the rescue operation. The Department's report ([Exhibit D-1](#)) concluded that the pumping did not adversely impact the water quality, aquatic environment and aquatic community in Quemahoning Creek.

### 30-Inch Rescue Hole No. 2

At 5:12 a.m. on July 26, 2002, surveying for a location of a second escape hole was conducted, in case one was needed. A drill rig for a second 30-inch hole was being set up and at 11:35 a.m. the hole was 28 feet deep and was being cased. At 1:15 p.m. drilling on the new 30-inch hole began.

At 7 a.m. on July 27, 2002, the hole was at a depth of 160 feet when drilling became very hard. At 1:31 p.m. the No. 2 drill lost its bit, hammer, and reamer in the borehole at approximately 204 feet. Repairs were being made when Rescue Hole No. 1 broke through into the mine. Drilling then ceased.

### Re-Contact With The Miners

At 10:20 p.m. on July 27, 2002, after Rescue Hole No. 1 broke through into the mine, rescuers signaled the trapped miners by tapping on the 6-inch drill steel with a hammer. A faint response was heard from the miners. The compressor was turned off and the drill steels were removed from the 6-inch hole. At 10:53 p.m. a microphone was lowered into the hole. Communication was established with the miners who confirmed that all nine miners were alive and well, except for the foreman who was experiencing chest pains.

### Rescue Of The Miners

At 11:45 p.m. on July 27, 2002, the drill steels at the Rescue Hole No. 1 were being retrieved from the hole and the drill rig was being removed from the pad. At 12:15 a.m. on July 28, 2002, the MSHA escape capsule was being attached to the crane. Supplies (blankets, rain suits, gas detectors, water, miners lamps, chewing tobacco, and candy bars) were loaded into the capsule, and at 12:30 a.m. the capsule descended into Rescue Hole No. 1. All nine trapped miners were safely rescued. The first rescued miner arrived on the surface at approximately 1 a.m. on July 28, 2002, and the ninth miner arrived on the surface at 2:45 a.m.

## HARRISON #2 MINE HISTORY

The abandoned Harrison #2 Mine is adjacent to the Quecreek No. 1 Mine. It is the mine that the Quecreek miners encountered on July 24, 2002, and resulted in the inundation.

### Mine Operation

In 1913 Quemahoning Creek Coal Company (“Quemahoning Creek Coal”) opened the Quecreek No. 2 Mine on the Upper Kittanning (C’) Coal Seam in Lincoln Township, Somerset County. Quemahoning Creek Coal Company operated the Quecreek No. 2 Mine until 1925 when the mine was sold to Saxman Coal and Coke Company (“Saxman Coal”). Saxman Coal’s main office was located at 1414 Commonwealth Building, Philadelphia, PA. According to “Commonwealth of Pennsylvania, Department of Mines and Mineral Industries, Annual Report 1947”, Saxman Coal changed the mine’s name to

the Harrison #2 Mine, a reference to the town of Harrison where the mine is located. The town name of Harrison was later changed to Quecreek. Saxman Coal operated the Harrison #2 Mine from 1925 until it was idled in 1933. Saxman Coal resumed operations at the Harrison #2 Mine in 1942 and produced coal at the mine until production ceased in 1963.

The mine assets were liquidated in 1965. Mr. Carlton D. Barron, a former Saxman Coal clerk, bought Saxman Coal's assets.

### Overview of Geology and Hydrology

The Harrison #2 Mine lies updip of the Quecreek No. 1 Mine. Several geologic anomalies are noted on the mine maps of the Harrison #2 Mine including a large "wash-out area," where the coal was replaced by sandstone. This wash-out area also affected a portion of the Quecreek No. 1 Mine. The Boswell Dome, an elongated geologic fold, is oriented in a northeast-southwest direction through the middle of the Harrison #2 Mine.

A barrier pillar was left within the Harrison #2 Mine. The barrier coal divides the mine into two sections that meet near the mine openings. It also created two distinct mine pools within the Harrison #2 Mine.

Following cessation of production in 1963, the Harrison #2 Mine filled with water. The mine eventually produced a surface discharge into an unnamed tributary to Quemahoning Creek at the old slope mine entrance at an elevation of approximately 1,875 feet MSL.

### Production

The Harrison #2 Mine began production in 1913 according to the *Commonwealth of Pennsylvania, Department of Mines and Mineral Industries, Bituminous Coal Division, 1913 Annual Report*. The mine was idled from 1914 to 1916. Production resumed in 1916 with one electric mining machine.

When Saxman Coal purchased the mine in 1925, a 450-foot slope entry was developed to more effectively remove coal from the mine. In 1927 the company listed four pieces of electrical equipment used in the mine. Records listing equipment used in the Harrison #2 Mine from 1942 to 1962 are not available. Former employees of the Harrison #2 Mine stated that in later years, up to 1963, Harrison #2 Mine utilized Wilcox continuous miners to mine coal. The team visually verified this statement during the underground investigation of the Quecreek No. 1 Mine conducted on September 5, 2002. Visual inspection of the breach area shows mining within the Harrison #2 Mine that is consistent with auger-type Wilcox mining machines.

Harrison #2 Mine produced a total of 4,174,972 tons of coal during its 50 years of existence. "*Commonwealth of Pennsylvania, Department of Mines and Mineral Industries, Annual Report 1963*" ([Exhibit D-2](#)) shows that the Harrison #2 Mine operated a total of 80 days in 1963. The Harrison #2 Mine is not listed in any subsequent

Department of Mines and Mineral Industries Annual Reports. No notations were made in the subsequent annual reports that denote the mine's continued operation. Former employees of the Harrison #2 Mine verified that the mine ceased production in 1963.

#### Coal Leased By Saxman Coal

At the Harrison #2 Mine, Saxman Coal mined coal leased from various parties. The coal, which was directly adjacent to the portion of the Quecreek Mine No. 1 where the break through occurred, was leased from Consolidation Coal Company ("CCC"). On October 18, 1945, Saxman Coal entered into a lease agreement with CCC to mine additional reserves that adjoined the Harrison #2 Mine. Harrison #2 Mine operated in the CCC reserves from approximately 1957 through the remainder of its life. Approximately 500,000 tons of coal were mined within the leased area, including final mining in 1963. According to Carlton Barron, royalty payments were sent to CCC on a monthly basis, and updated mine maps were sent to CCC on a semi-annual basis ([Exhibit D-3](#)). CCC retained ownership of these coal properties including the properties mined by Saxman Coal until these properties were sold in 1992. (See "[Mineral Rights Acquisition](#)" section, Page 16.)

#### Mine Mapping

Mine mapping of the Harrison #2 Mine appears to have been done by hand on hardback rolls. These hardback maps were purportedly updated regularly by the company to show the extent of mining. Copies were made from these original maps and certified by the company's engineer or surveyor whenever maps were required. The extent of mining was determined by mine surveys conducted by John E. Kimmel, Superintendent/Surveyor/Draftsman for the Harrison #2 Mine since at least 1947. Detailed descriptions of various mine maps of the Harrison #2 Mine that were uncovered by the investigation team can be found in the Mine Map Search Section on Page 40.

### QUECREEK NO. 1 MINE INITIAL PERMITTING

#### Mineral Rights Acquisition

CCC owned approximately 20,000 acres of mineral rights throughout Somerset County, PA. In the early 1990s, CCC presented a package of information regarding this acreage to various prospective buyers. CCC desired to sell the entire acreage to a single buyer or single group. W.J.M. Coal Company, Inc. ("WJM") purchased these 20,000 acres in 1992.

Quecreek Mining Company, Inc. ("Quecreek Mining") acquired several mineral leases in order to proceed with developing and permitting a mine. Lease agreements were reached with the following mineral owners: Carlton D. Barron, Jr.; PBS; W.J.M.; Shaulis Heirs; Friedline Heirs; and Faidley Bros., et al. W.J.M. leased approximately 95 percent of the Quecreek No. 1 Mine permit acreage to Quecreek Mining.

## Mine Map Searches

Musser Engineering, Inc., consultant to Quecreek Mining, conducted a search for all maps of abandoned mines surrounding the proposed permit area. Musser engineering searched the Consol repository in Library, PA, in 1994 and received a photocopy of a map of the Harrison #2 Mine (“Consol Map I”) ([Exhibit M-2](#)). Musser Engineering searched for mine maps at the Office of Surface Mining (“OSM”) repository in Greentree, PA, and the McMurray DMO. The company also contacted Mr. Carlton Barron about availability of mine maps for the Harrison #2 Mine. Additional maps found by Musser Engineering are in [Exhibits M-3](#) and [M-4](#).

In 1995 PBS Coals, Inc. (PBS) conducted an additional search for mine maps surrounding the permit area to assist Musser Engineering in their search. PBS searched the OSM repository, the MSHA District 2 Office, the McMurray DMO, and the BDMS Uniontown Office for additional mine maps of the Harrison #2 Mine. Maps found by PBS are in [Exhibits M-5](#), [M-6](#), [M-7](#), [M-8](#), [M-9](#), [M-10](#), and [M-11](#).

Thomas McKnight, a BDMS engineer, reviewed the maps for the proposed Quecreek No. 1 Mine, however, BDMS involvement began prior to the submission of a permit application. During the preparatory work for the Quecreek No. 1 application, McKnight met with PBS Engineer John Yonkoske. Prior to that meeting, McKnight reviewed all of the map resources available for adjacent mines. He realized that he did not have access to a final or certified map for the Harrison #2 Mine. The most recent map was a microfilm map dated 1957 and was not certified or final. Yonkoske advised McKnight that Musser Engineering, PBS’s consultant, had a certified map for the Harrison #2 Mine. McKnight requested a copy of the map.

PBS also contacted James Allenbaugh of Friedens, PA, about mine maps. Mr. Allenbaugh owns coal reserves within Somerset County and has several maps of the abandoned mines that surround his coal reserves. Allenbaugh did not have any mapping of the Harrison #2 Mine according to PBS.

The map used by Musser Engineering to show the outline of the Harrison #2 Mine on the initial permit maps was supplied by Consol to Musser Engineering in August 1995. Based on Musser Engineering’s further research, it was realized that the map previously supplied by Consol in 1994 (“Consol Map I”) was not complete. Mining was not shown within the Consol property, and subsequent conversations with Barron indicated that Saxman Coal had leased and mined Consol coal. In 1995, Musser Engineering requested additional mapping from Consol.

The map supplied in August 1995 (“Consol Map II”), like “Consol Map I”, was a property map prepared by Consol to show coal reserves that it owned within Somerset County, PA. The Consol Map II ([Exhibit M-12](#)) was drawn at a 1”=1000’ scale and was not dated or certified. The map does not show the workings of the Harrison #2 Mine in detail. It only showed an outline of the purported extent of mining at the Harrison #2 Mine and the property line for the area leased to Saxman Coal by CCC in 1945.

Of the various maps uncovered by Musser Engineering and PBS during their year-long search for maps, Musser Engineering believed that the Consol Map II showed the most extensive outline of the Harrison #2 Mine. Musser Engineering did not check production records for the Harrison #2 Mine to verify the date of final mining or production records for any other abandoned mine.

### Base Map Preparation

Musser began to prepare permit application maps in 1995. PBS produced digital topographic maps from aerial flyovers and supplied this data to Musser Engineering for use in the permit mapping. On June 27 and July 3, 1997, Musser Engineering conducted conventional closed-loop surveys to verify the location of various surface features and road intersections shown on the digital topography mapping. Musser Engineering utilized two known road intersections and property lines that were common to the Consol Map II and the base digital mapping to digitally transfer the outline of the Harrison #2 Mine (from the Consol Map II) onto the base digital map. According to Musser Engineering personnel, the location and alignment of the road intersections, property lines, and common surface features between the maps were “very good.” The other adjacent mines were digitally transferred from mine maps onto the base map following the same process used to transfer the Harrison #2 Mine outline. This mapping produced the Module 19.2 maps ([Exhibit M-13](#)) and other maps for the permit application. Edwin Secor, P.E., certified the maps.

### Initial Permitting

In 1994 Musser Engineering began a Small Operator Assistance Program (“SOAP”) permit application for the Double C Coal Company, owned by Joseph and Dennis Caola. The SOAP funded one round of background water sampling required in the permitting process. No additional SOAP funding was provided. PBS assumed the project in 1995. The project was transferred to Quecreek Mining, a subsidiary of PBS.

Quecreek Mining submitted the initial permit application to DEP’s McMurray District Mining Office (“DMO”) in March 1998. As required by law, Edwin Secor, P.E. from Musser Engineering certified the permit maps, and affixed his Professional Engineer’s seal to them. David Rebeck signed the application on behalf of Quecreek Mining.<sup>4</sup> This initial permit application sought approval for a permit consisting of 272 underground acres and 22 surface acres. No requests for an Informal Conference were received from the public regarding the application.

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<sup>4</sup> In 1998 and 1999 (when the initial permit application and the first revision were submitted) the officers of Quecreek Mining were David Rebeck, President; Joseph Gallo, Vice President; and Jay Zimmerman, Secretary/Treasurer. According to Department records, the current principal officers of the company are Robert Scott, President/Director; Joseph Gallo, Vice-President; and Timothy Phillips, Director.

During DMO's review of the application, various commenting agencies<sup>5</sup> received notice of the permit application, and were invited to comment on it. BDMS was one of the entities notified. A package, which included a portion of the application, was sent to BDMS for review and comment and was assigned to Thomas McKnight. Although Mr. McKnight believes that he contacted DMO via telephone and requested information regarding the mine pool elevations in the adjacent abandoned mines, no documentary record of BDMS comments could be found.

In 1998 during the Quecreek No. 1 Mine permit review, McKnight reviewed all of the maps of abandoned mines adjacent to the Quecreek No. 1 Mine that were available in the BDMS repository. Again, he found no final, certified map for the Harrison #2 Mine. In a 1998 meeting, Joseph Gallo, a PBS engineer, stated that Musser Engineering had a certified map for the Harrison #2 Mine. McKnight requested a copy of that map a second time. Based on prior experiences with PBS, McKnight stated he expected that PBS would submit the requested information, because its personnel had always done so in the past.

The Department relied upon the location of the abandoned Harrison #2 Mine workings as depicted on the permit maps submitted by Quecreek Mining. These maps were certified by a registered professional engineer and contained no qualification or uncertainty about the features depicted on the maps. It was not a routine Department practice to check mine production records<sup>6</sup> in the Annual Reports for adjacent abandoned mines during the permit review.

### Mine Barriers

There are several provisions in the Pennsylvania law and regulations that require barriers to be left between mines. Two distinct reasons for requiring barriers are 1) Safety, to protect miners (and others) from water or dangerous gasses that may be impounded in abandoned mines ("Safety Barriers") and, 2) Hydrology, to prevent discharges to the surface and fostering restoration of the pre-mining hydrologic balance ("Hydraulic Barriers"). Within DEP, Safety Barriers are primarily the responsibility of BDMS, and Hydrologic Barriers are mainly within DMO's purview.

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<sup>5</sup> Pursuant to regulation and policy DMO forwards portions of permit applications to numerous federal, state and local agencies and other sections of the Department ("Commenting Agencies") and solicits any comments or concerns that the Commenting Agencies may have on the application. The following Commenting Agencies were contacted regarding the initial Quecreek No. 1 Mine application: Deep Mine Safety, Mine Conservation Inspector, Somerset County Recorder of Deeds, Mining and Reclamation, Water Supply Management, Pennsylvania Fish Commission, Pennsylvania Game Commission, Pennsylvania Historical/Museum Commission, Somerset County Planning Commission, PennDOT, Somerset Historical Center, Lincoln Township Supervisors, and Christ Casebeer Church.

<sup>6</sup> Section 501 of the Act, 52 P.S. §701-501, requires the operator or superintendent of a mine to submit a report to the Department that, among other things, sets forth the total coal production for the preceding year. Prior to 1956, mines employing less than 5 persons were not required to submit this information.

1. Safety Barriers.

The Pennsylvania Bituminous Coal Mine Act (“Act”) requires the establishment of a barrier of unmined coal to protect miners. There are several parts of the law that establish safety barriers.

- Section 291 of the Act, 52 P.S. §701-291, requires that the Superintendent may not permit mining within fifty (50) feet of any abandoned mine or any mine containing dangerous accumulations of water, unless the water has been drained.
- Section 291 also requires that, even if no prior mining has occurred, the superintendent must leave a barrier of unmined coal measured from the property line. The barrier to be left is calculated using the following formula:

$$\text{Barrier} = 10 \text{ ft.} + (2 \times \text{seam thickness}) \text{ ft.} \\ + (5 \times (\text{distance from mine roof to surface}/100)) \text{ ft.}$$

This figure is to be doubled if the adjoining property mine operator failed to leave an adequate barrier on the property that he was mining.

- Section 224(b) of the Act, 52 P.S. §701-224(b), enacted in 1961, states that when mining operations come “within two hundred feet of any workings of an adjacent mine,” the mine foreman shall see that bore holes are drilled at least twenty (20) feet in advance of the mine face, and into the sides. This advance drilling would provide a warning that abandoned mine workings lie ahead.
- The Safety Zone Act,<sup>7</sup> 52 P.S. §§3101-09, passed in 1959<sup>8</sup>, prohibits underground coal mining within 200 feet (measured horizontally) “of any stream, river, or other natural or artificial body of water” that is large enough to constitute a hazard. Section 1 of the Safety Zone Act, 52 P.S. §3101. However, operators may obtain variances from this provision. Sections 2 & 3 of Safety Zone Act, 52 P.S. §§3102-03.

The net result of these provisions is not only to establish unmined coal barriers to protect miners, but also to require affirmative measures, namely advance drilling, to detect unexpected abandoned mine voids *when mining operations are believed to be within 200 feet of the abandoned workings*.

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<sup>7</sup> Act of December 22, 1959, P.L. 1994

<sup>8</sup> The “Safety Zone Act” was passed in the wake of the Knox Mine Disaster, a tragic mine inundation in northeastern Pennsylvania.



## 2. Hydraulic Barriers.

When permitting an underground bituminous coal mine, hydraulic barriers are to be left between a new mine and any abandoned adjacent mines, to prevent seepage and to allow the hydrologic regime to reestablish itself following the conclusion of mining. See 25 Pa. Code §§89.35-89.36, 89.54. This barrier is often determined by a rule-of-thumb formula:

Barrier thickness = 50 feet + 1 foot per foot of head in the abandoned mine

In practice, the barrier is set on a case-by-case basis.

## 3. Quecreek No. 1 Mine Barrier.

In the approved permit application, Musser Engineering calculated a hydraulic barrier using the rule-of-thumb formula. Musser estimated that approximately 48 feet of head was present in the Harrison #2 Mine. The Harrison #2 Mine pool elevation is shown in Module 8 of the permit application ([Exhibit D-4](#)). Thus, Musser Engineering calculated that a 98-foot hydraulic barrier between the Quecreek No. 1 Mine and the Harrison #2 Mine would be sufficient.

A 200-foot barrier was established between the Quecreek No. 1 Mine and the purported boundaries of all adjacent mines, including Harrison #2 Mine. If one assumes that the Harrison #2 Mine is accurately depicted in the Quecreek No. 1 maps, a 200-foot barrier is consistent with Section 224(b) of the Act, 52 P.S. §701-224(b), and the Safety Zone Act, and exceeds the protections of Section 291 of the Act, 52 P.S. §701-291. In addition, still assuming that the Harrison #2 Mine was accurately depicted in the mine maps, the drilling requirements of Section 224(b) of the Act would never be triggered. The miners, operator, and permittee stated during their interviews that at the time of the inundation they understood that the Harrison # 2 Mine was some 300 feet away from the 1<sup>st</sup> Left Section face. They were, in fact, mining within 200 feet of the Harrison # 2 Mine for approximately six days prior to the inundation.

Musser Engineering and PBS stated during their August 2002 interviews that they believed the accuracy and location of the abandoned adjacent mines on the Quecreek No. 1 Mine initial permit application were correct. Also, personnel from both companies asserted, during the interviews, that they believed the Consol Map II received from Consol, [see Mine Map Searches](#), page 17, was a final map of the Harrison #2 Mine.

### Permit Approval

The initial permit, CMAP No. 56981301, was approved and issued to Quecreek Mining on March 13, 1999.

## QUEECREEK NO. 1 MINE PERMIT PRE-ACCIDENT REVISIONS<sup>9</sup>

### Surface Acreage Addition Revision

On March 3, 1999, McMurray DMO accepted a permit revision application for review that proposed to add 25.3 surface acres to the Quecreek No. 1 Mine, primarily to add a coal conveyor system and coal storage area. Quecreek Mining submitted the application with the same officers as the original application. Rebuck again signed the application for Quecreek Mining and Secor sealed the maps. In accordance with DEP policy<sup>10</sup>, BDMS and other commenting agencies received notice of the application and were invited to comment on it. BDMS responded it had no underground safety issues regarding this permit application. No requests for an Informal Conference were received from the public regarding the application. The revision to add surface acres was approved on October 6, 1999.

### Underground Acreage Addition Revision

On June 24, 1999, McMurray DMO accepted a second revision application for technical review. This revision proposed to add 1,110 acres to the subsidence control plan area<sup>11</sup> and 3,394 acres to the underground permit area ([Exhibit M-14](#)). Quecreek Mining, Inc. submitted the application.<sup>12</sup> This revision placed the permit boundary of the Quecreek No. 1 Mine within 200 feet of abandoned Harrison #2 Mine as depicted on the permit maps.

Like the prior applications, Rebuck signed the application for Quecreek Mining, however, Mark Tercek, P. E. from RoxCoal sealed the maps. In accordance with DEP policy, BDMS and other commenting agencies received notice of the application and were invited to comment on it. No record of BDMS comments could be found.

RoxCoal, which provided engineering support for Quecreek Mining, contracted with Musser Engineering to prepare portions of this second permit revision application according to two memos dated December 28, 1998, and January 6, 1999. ([Exhibits D-5 and D-6](#)). These memos outlined the two companies' responsibilities for the revision

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<sup>9</sup> The Department issued a permit revision for the Quecreek No. 1 Mine on November 21, 2002, that authorized the resumption of production at the mine. This revision, among other things, included revised maps showing the updated location of the Harrison #2 Mine (based on 1964 Map, see Page 45), a 500-foot barrier between Quecreek Mine and adjacent abandoned mines, and long hole drilling done to verify the extent of unmined coal.

<sup>10</sup> This policy is memorialized in a memorandum dated December 29, 1998, between three Bureaus in DEP: Bureau of Deep Mine Safety, Bureau of District Mining Operations, and the Bureau of Mining and Reclamation. This procedure was not in place during the initial permit review of the Quecreek No. 1 Mine.

<sup>11</sup> The Subsidence Control Plan is the area where underground mining activities are allowed. It is typically smaller than the overall coal mine activity permit (CMAP) area. See 25 Pa. Code §89.141.

<sup>12</sup> This application identified the following principal officers for Quecreek Mining: Robert Scott, Director; Timothy P. Phillips, Director; David Rebuck, President; Joseph Gallo, Vice President; and Jay Zimmerman, Vice President/Secretary/Treasurer.

application. Consistent with these memos, Musser Engineering turned over all of the mapping and permitting files for the mine to RoxCoal. RoxCoal was responsible for duplicating and submitting the permit revision application.

Neither RoxCoal nor Musser Engineering modified the outlines of the adjacent abandoned Harrison #2 Mine or other adjacent mines in the permit revision materials. The outlines of the abandoned underground mines in the initial permit revision application remained as shown in the original permit application. Neither Musser Engineering nor RoxCoal conducted additional searches for maps for adjacent abandoned mines.

On July 2, 1999, McMurray DMO sent a letter to all landowners over the proposed subsidence control plan area that described the permit application and provided information. Residents of Sunny Acres Mobile Home Park and several citizens sent letters to DEP expressing their concerns about the proposed mining's potential adverse impact on their water supplies and requesting an Informal Conference pursuant to 25 Pa. Code §86.34. An Informal Conference was held on September 16, 1999, in Somerset, PA. During the Informal Conference a citizen raised concerns regarding mine voids encountered in the southern portion of the mine permit. Quecreek Mining addressed these concerns by updating the permit maps by showing the outline of the Zimmerman Mine. The Zimmerman Mine operated on the Upper Freeport Coal seam, which is about 90-100 feet above the Upper Kittanning seam mined in the Quecreek No. 1 Mine. The Zimmerman Mine overlies a portion of the southern end of the Quecreek Mine permit boundary.

On December 28, 1999, the Department approved the revision to add 1,110 acres to the subsidence control plan area and 3,394 acres to the underground mine permit area.

None of these permitting actions were challenged before the Environmental Hearing Board.

#### Informal Revisions

Two informal revisions were also approved for the Quecreek No. 1 Mine. Informal revisions are typically minor changes that are not covered by public notice requirements. 25 Pa. Code §86.54.

The first informal revision application sought to modify the surface facilities and Erosion and Sedimentation ("E&S") controls at the Quecreek No. 1 Mine. This minor informal revision was approved by McMurray DMO on May 8, 2000.

The second informal revision application sought to add Black Wolf as subcontract operator for the Quecreek No. 1 Mine. This informal revision was approved on July 30, 2001.

## QUEECREEK NO. 1 MINE CHARACTERISTICS AND OPERATIONS

### Mine Overview

In March 2001 Quecreek Mining opened the Quecreek No. 1 Mine in Lincoln Township, Somerset County, PA. Quecreek No. 1 Mine operates in the Upper Kittanning (C') Coal Seam, which has an average height of 48 inches in this area. Two continuous miner sections produced an average of approximately 2,500 raw tons of coal per day prior to the accident. Daily operations consisted of two production shifts and one maintenance shift. An additional maintenance shift operated on Sunday nights. The mine employed 59 employees underground and 4 employees on the surface.

### Geology and Hydrology

*“The permit boundary lies mainly on the east flank of the Johnstown Syncline with the Boswell Dome axis to the east. A portion of the permit boundary extends across the synclinal axis onto the western flank of the Johnstown Syncline and a very small part extends across the Boswell Dome axis. The Johnstown Syncline is a structural trough, which trends roughly N 30°-35° E in this vicinity. The Boswell Dome is an elongated fold trending approximately N 10° E. The permit is an area where the Johnstown Syncline is beginning to broaden out as the Boswell Dome begins to fade. Regional dip on the flank of these folds is approximately 3° northwest. The average strike over the Quecreek No. 1 Mine permit area is approximately N 10°-15° E with a dip of about 1.7° or 2.9% northwest”, according to the approved December 1999 permit application.*

The hydrology section of the approved December 1999 mine permit application describes the presence of substantial amounts of groundwater ([Exhibit D-7](#)) both above and below the Quecreek No. 1 Mine. Typically, mines located in the Upper Kittanning seam experience varying amounts of water infiltration, either through the roof or floor units. Groundwater present above the coal seam generally flows into the mine through natural discontinuities such as fractures or on occasion through artificial discontinuities, like open roof bolt holes.

According to the approved December 1999 mine permit application, *“five main water bearing zones occur above the Upper Kittanning coal and three additional zones occur below this coal. The water bearing zones are not distinct zones and grade vertically into one another. Numerous stratigraphic units including the Freeport, Mahoning, Brush Creek, Buffalo, and Bakerstown contain clay, shale, sandy shale, siltstone or interbedded sandstone and shale. Groundwater is obtained from these units where the permeability is slightly greater than adjacent strata.”*

The December 1999 mine permit application also states that the *“lowest water bearing zone above the coal to be mined is between the Upper Freeport and Upper Kittanning coals. This includes the Freeport and Butler Sandstone units along with the Lower Freeport coal where present. Extending from about 10 to 100 feet above the Upper Kittanning, this zone supplies 15 wells and 3 springs.”*

## Mine Layout

The Quecreek No. 1 Mine was opened in a box cut area with 4 initial entries developed southwesterly into the highwall and then expanded to a 7-entry mains approximately 200 feet into the mine. A wash-out, where sandstone replaced the coal, was encountered 1,200 feet into the mine causing a shift of the mains to the west. This wash-out is a continuation of the one that was encountered in the Harrison #2 Mine. The #4 Mains Section was developed in a west southwesterly direction in order to mine around the wash-out area. The #5 Mains Section was mined in a southwesterly direction. The 1<sup>st</sup> Left Section was mined 90 degrees off the #5 Mains Section in a southeasterly orientation. This section was developed approximately 3,350 feet prior to the inundation (Exhibit M-15).

## Mine Operations

Quecreek No. 1 Mine had produced an average of 2,500 tons of coal per day up to the time of the accident. Prior to the accident, the mine operated two continuous miner sections, 1<sup>st</sup> Left and 2<sup>nd</sup> Left. These sections utilized Eimco continuous miners, Joy 21SC shuttle cars, Fletcher Dual-Boom Roof Bolters, and scoops. The 2<sup>nd</sup> Left Section is developed 120 feet off #5 Mains and is projected as a 7-entry panel. The 1<sup>st</sup> Left Section is a 7-entry panel developed on 60- by 60-foot centers. The mine projection map showed one additional crosscut projected before ending the 1<sup>st</sup> Left Section.

Pillar dimensions in the mains are 50- by 50-foot blocks on 70- by 70-foot centers. As of the date of the accident, the Quecreek No. 1 Mine had no outstanding Compliance Orders from BDMS or any other DEP agency.

## Adjacent Mines

McKnight requested the certified map of the Harrison #2 Mine at two different meetings<sup>13</sup> with PBS and Black Wolf personnel during 2001. At these meetings, PBS and Quecreek representatives again assured him that a certified map existed, and that they would take steps to duplicate the “hardback” map and provide a copy to BDMS.

Neither PBS, Quecreek Mining, nor any other entity provided a certified map to BDMS. The investigation has not revealed the existence of any certified or final map that shows the full extent of the Harrison #2 Mine. The Investigation Team learned that the representation of the Harrison # 2 Mine on the permit maps is based upon an uncertified property map (“Consol II Map”) that is estimated to show the extent of mining up to approximately 1961.

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<sup>13</sup> These two meetings were in addition to two meetings between Mr. McKnight and PBS personnel prior to permit submission (1995) and during the initial permitting of the Quecreek No. 1 Mine (1998). See Pages 17 & 19.

## QUEECREEK NO. 1 MINE SURVEYING

### Mine Control Points

The mine's survey control points were established by locating two iron pin monuments. The iron pin monuments were set by GPS surveys conducted by Cps Surveying Inc. of Ebensburg, PA. These initial points were established along State Route 985 in Lincoln Township, Somerset County. These monuments were later replaced by two new monuments (Pin #1 and Pin #2), established on the mine surface site near the mine portals by a second GPS survey conducted by Cps Surveys, Inc. The EADS Group, a consultant engineering firm, conducted a GPS survey on March 16, 2001, to verify Pin #1 and Pin #2, and also tie them to the Shaffer United States Geologic Survey ("USGS") Monument. The Shaffer Monument is located 2.7 miles southwest of U.S. Route 30 along State Highway 601 in Jenner Township, Somerset County. This USGS monument is classified as a third order horizontal and second order vertical monument. Based on the March 16, 2001, survey, no adjustments were required for the coordinates of the two mine monuments. The Quecreek No. 1 Mine was surveyed utilizing the State Plane Grid System 1927 Datum.

### Spad Advancement

Once the mine developed the initial four openings, PBS set the initial survey stations (spads) in the four mine entries. RoxCoal surveyors did the underground surveying once the initial spads were established. Spads were generally advanced on a weekly basis with a Topcon theodolite and 300-foot Chicago Steel Tape "chain." Whenever spads were advanced, the surveyor would also note the take-ups (i.e. field notes showing the details of the mine entries). These survey notes were used to update the mine map utilizing CAD drafting software. The last survey in 1<sup>st</sup> Left occurred on July 19, 2002. Spads were placed in all entries except for #1 entry. Take-ups were also taken at this time.

### Check Surveys

One check survey was conducted underground at the Quecreek Mine. Musser Engineering was contracted to do this survey on February 8, 2002. This check survey, as explained during the engineering interviews by David Zwick of Musser Engineering, was a double-angle, triple distance survey conducted with a total station unit. This unit measures distances electronically, which is more accurate than the 300-foot "chain." The survey originated from Pin #1 and Pin #2 on the mine surface site and was run to Spad 309 along the 5 Main Section, 110 feet outby the 1<sup>st</sup> Left Section belt entry as shown on [Exhibit M-15](#). A return (closure) leg was not run for this survey. Zwick stated that return legs are not commonly run for check surveys if the end point coordinates are within acceptable tolerances. The survey data was provided to Joseph Gallo of PBS to cross check their coordinates to the mine spads. No additional check surveys were conducted in the Quecreek Mine prior to the accident.

## Mine Floor Elevations

Mine floor elevations were started from Pin #1 and Pin #2. The elevations were carried into the mine pit and advanced the belt entries throughout the mine and across the face areas of abandoned sections. Differential leveling with the use of the Topcon theodolite determines the mine floor elevations. Pin #1 and Pin #2 have surface elevations of 1921.1 and 1946.7 feet MSL respectively. The elevations of the four mine openings are: #1 – 1843.16 feet MSL; #2 – 1841.02 feet MSL; #3 – 1838.09 feet MSL; and #4 – 1836.27 feet MSL. Bottom elevations were shown in every crosscut of the belt entries on the mine map. The last floor elevation for the 1<sup>st</sup> Left Section was surveyed on July 9, 2002. This floor elevation was 1826.42 feet MSL in the intersection just outby Spad 587 in the #4 entry. This elevation was approximately 100 feet outby the location of the 26-inch rescue hole.

## ACCIDENT INVESTIGATION

### Investigation

The investigation of the Quecreek No. 1 Mine inundation was conducted as a joint effort between the DEP and MSHA. DEP assigned Bituminous Mine Inspector Supervisor Ellsworth Pauley, Bituminous Mine Inspector Thomas Shumaker, and Mining Engineer 2 Brad Cole to the investigation. MSHA assigned a nine-member team to the investigation. Members of MSHA's team were: Edwin P. Brady, District 4 Manager; James Bowman, Conference Litigation Officer; Arnold D. Carico, Mining Engineer; Richard Stoltz, Supervisory Mining Engineer; Howard Epperly, Mining Engineer; Stanley Michalek, Supervisor Civil Engineer; Kelvin Wu, Tech Support; Glenn Tinney, MSHA-Arlington; and William Denning, Civil Engineer.

BDMS and MSHA agreed to conduct a joint investigation from which each agency would produce its own investigative report. However, during the course of this joint investigation, the agencies agreed to share their draft reports with each other prior to their issuance. BDMS shared its preliminary report with MSHA prior to its release in November 2002, and offered to share its final report with MSHA prior to its release. However, MSHA has not been forthcoming in satisfying its commitment to share its draft report with BDMS. Accordingly, BDMS has never seen any drafts of MSHA's Report.

### Investigation Overview

The joint DEP/MSHA investigation team ("Team") met on August 6, 2002, at the MSHA District 2 Office, New Stanton, PA, to formulate a plan to conduct the investigation. Plans were made to conduct employee interviews during the week of August 12, 2002, and to conduct a search for mine maps.

The Team then traveled to Musser Engineering's offices in Central City, PA, to discuss Musser Engineering's involvement with Quecreek No. 1 Mine, including the permitting

of the mine. Musser Engineering informed the Team that it was responsible for preparing and submitting the initial permit application (see Page 18). Musser Engineering personnel responsible for the original permit application were present and represented by Musser Engineering's attorney.

Musser Engineering's personnel were questioned about the permitting process for the mine, map searches, and certifications of maps and creation of permit maps. The Team learned that Edwin Secor, P.E., who certified the initial permit maps, was now employed by The EADS Group in Clarion, PA. Musser Engineering supplied the team with copies of maps of the Harrison #2 Mine that were found during their initial searches, including the Consol II Map that was supplied in 1995 by Consol Energy showing the outline of the Harrison #2 Mine. This map was ultimately relied upon by Musser Engineering to represent the extent of workings for the abandoned Harrison #2 Mine. Other maps gathered by Musser Engineering and provided to the team are identified in the Mine Map Search Section (Page 40) of this report. The Team requested additional information about involvement in the permitting process from Musser Engineering at this meeting. Musser Engineering responded on August 12, 2002, by providing additional documents.

After reviewing the Consol Map II, it became apparent to the Team that this map was a portion of a larger map. The Consol Map II did not have any certifications, dates, or legends to describe the map. This map appeared to be a property ownership map prepared by Consol. Only a person familiar with the area depicted would recognize that this map showed the location of the Harrison #2 Mine. The mine name is not present, however, a coal property lease line states "Leased to Saxman C & C Co." The Consol Map II also shows surface features including roads, railroads, streams, property lines, property ownership, drill holes, and coal seam contours.

Following the Team's meeting with Musser Engineering, the Team met with PBS personnel at their main office in Friedens, PA. Present were Joseph Gallo, Vice-President; Chad Mostoller, Surveyor, RoxCoal, Inc.; James Hickman, Professional Engineer; and Julia Shreve, Attorney. These persons were asked questions concerning surveying, permitting, map searches, and map certifications related to the Harrison #2 Mine and Quecreek No. 1 Mine. The Team requested additional information from PBS concerning involvement in the permitting process and surveying information at this meeting. PBS responded to the request by supplying an information packet to the Team on August 14, 2002.

The Team next met on August 13, 2002, in Somerset, PA, to discuss the structure of the upcoming interviews of the miners and questions to be asked. The Team reviewed maps submitted to DEP with the original permit application, the permit revision applications, and the additional information supplied by Musser Engineering. The Team also reviewed Commonwealth of Pennsylvania, Department of Mines Annual Reports, which showed that the Harrison #2 Mine produced coal up to and including 80 days in 1963. The Team decided to search for additional mine maps. The Team assigned the task of conducting map searches to three MSHA members and one BDMS member. Results of the map searches can be found starting on Page 41 of this report.



Interviews of mine employees commenced on August 14, 2002, and ended on August 16, 2002. Details of the interviews can be found beginning on Page 30 of this report. Additional interviews of engineers involved in the initial permitting of the Quecreek No. 1 Mine and those with pertinent information of the Quecreek No. 1 Mine occurred on August 27 and 28, 2002. Details of the interviews can be found on Page 36. On December 4-6, 2002, the Team conducted second interviews with each member of the nine-member 1<sup>st</sup> Left Crew, David Rebuck, Charles Hankinson, and Lawrence Petree. Hankinson and Petree were not interviewed in August 2002. Details of these second interviews can be found in this report beginning on Page 32.

The Team interviewed Mr. Carlton Barron at his home in Boswell, PA, on August 22, 2002. Barron stated that he was the current owner of the remaining assets of Saxman Coal and Coke Company. He informed the Team that the mine utilized Wilcox continuous mining machines at the time of abandonment in 1963. He also stated he did not have any copies of the Harrison #2 Mine maps in his possession. Barron did possess an original “hard shell” map of the mine at one time. He gave this map to Gallo to make additional copies of the map for him. Barron stated that, when he asked for the map to be returned, Gallo indicated that the map was not in his possession. To date Barron’s original “hard shell” has not been returned to him. The Team met with Barron a second time on September 19, 2002, to show him the 1964 Harrison #2 Map (see Page 45). He indicated that this map was similar to his original “hard shell” that he had given to Gallo, but his map had a different scale.

### Site Investigations

The Team, accompanied by Black Wolf officials, conducted an underground investigation of the Quecreek No. 1 Mine on September 5, 2002. The Team traveled to the 1<sup>st</sup> Left Section to examine the location of the breach between Harrison #2 Mine and Quecreek No. 1 Mine. Mine recovery efforts progressed as far into the mine as the escape hole location, but were not permitted to go any further until the investigation team examined the area located in by the rescue hole. Nearly the entire mine was stained orange from the mine water that flooded the Quecreek No. 1 Mine. Pursuant to Section 103(k) of the Federal Mine Safety and Health Act of 1977, MSHA issued an order to Black Wolf Coal Company. Pursuant to Section 401 of the Bituminous Coal Mine Act, BDMS issued an order to the operator. These orders were issued to preserve the accident scene until an accident investigation was completed.

The Team broke into small groups to map the mine workings from the escape hole to the face areas. The groups measured the locations of all pertinent items, including but not limited to equipment, supplies, and stoppings. The Team also noted the water levels from the time of the accident throughout the 1<sup>st</sup> Left Section and also the location of where the water reached the mine roof. Several small air pockets were noted in local high spots and outby areas of the section.

The Team's examination of the breach area in the #6 Entry of the 1<sup>st</sup> Left Section confirmed location of the abandoned Harrison # 2 Mine workings. The breach opening measured approximately 6 feet in width and 4 feet in height. The two mines intersected at an approximate angle of 30 degrees. It appears that less than 1 foot of coal remained between the two mines immediately prior to the inundation. This barrier was insufficient to support the Harrison #2 Mine Pool, which was reported to have a static head of 48 feet.

The Quecreek No. 1 Mine intersected what appears to be a "blind" driven off the entry in the Harrison #2 Mine. This "blind" does not appear on the 1964 map that was found at the Windber Coal Heritage Center during the investigation (see Page 45). The force of the water rushing into the Quecreek Mine moved the continuous mining machine approximately six feet back from the face and turned the machine at an angle. The force of the water also moved the section power center approximately 70 feet outby where it became lodged across the #6 entry along with a personal golf cart and the section mantrip.

The underground location of the 6-inch airhole and the 26-inch escape hole both intersected the #4 Entry of the 1<sup>st</sup> Left Section. The holes pierced the roof in the center of the entries just outby the section feeder. The trapped miners removed the conveyor belt and structure from its position underneath the 6-inch hole.

On December 7, 2002, MSHA personnel mapped all roof support systems located inby crosscut 35 of the 1<sup>st</sup> Left Section. This mapping detailed the location of all cable bolts, roof straps, cribs, posts, roof bolts, and roof defects in the section.

On February 11, 2003, the DEP Team met with Mr. William Winter, R.P.G., a hydrogeologist employed by the United States Office of Surface Mining Reclamation and Enforcement, to request his assistance in understanding the hydrologic regime associated with the mine and inundation, and determining whether hydraulic precursors existed in the Quecreek No. 1 Mine leading up to the July 24, 2002, inundation accident. A copy of his report is found in [Exhibit D-8](#).

The Team visited the Somerset County and Cambria County Libraries on March 10 and 25, 2003, to view microfilmed copies of the Somerset Daily American and Johnstown Tribune Democrat newspapers from 1963 and 1964. The purpose of these visits was to determine if any information was available regarding the closing of the Harrison #2 Mine. The Team found no information in any of the daily papers for 1963 or 1964 regarding the Harrison #2 Mine.

### August Interviews

The first interviews of the Quecreek No. 1 miners commenced on August 14, 2002, and ended on August 16, 2002. These interviews were conducted at the mine office trailer and were conducted by two 2-man teams. Each team consisted of one MSHA investigator and one DEP investigator. Persons interviewed included the 2<sup>nd</sup> Left Crew

members, 1<sup>st</sup> Left Crew members, Mine Foreman, Mine Superintendent, Mine Safety Director, 1<sup>st</sup> Left Dayshift Foreman, and 1<sup>st</sup> Left Dayshift roof bolters.

A predetermined format for conducting accident investigation interviews was followed. Prior to the beginning of each interview, each interviewee was advised that he or she had the right to have a personal representative present. The interviewees were not under oath. Their statements were completely voluntary, and the miners had the option to not answer any question posed to them with or without legal representation. The miners also had the option to terminate the interview at any point.

One miner exercised his right to representation and had his attorney present. Counsel terminated this interview approximately 40 minutes into the interview. The miner's attorney indicated that he believed that continuing the interview might create a conflict with his client's contract with Disney.

All miners confirmed that they were giving voluntary statements to the investigation team. A stenographer took down the interview verbatim, and a transcript of each interview was subsequently prepared. Each interviewee had the opportunity to review the transcript of the interview, and make corrections to the transcript.

The miners were also informed that Joseph Yuhas, attorney for Black Wolf, was present. Mr. Yuhas was permitted to participate in the interviews of the Quecreek miners. One miner objected to the attorney's presence. The company's attorney complied with the objection and left the interview.

The miners were questioned on a broad range of topics relating to the accident and rescue. Information learned concerning the accident, the miners' efforts to survive, and the ultimate rescue are largely recounted in earlier portions of this report. (See "1<sup>st</sup> Left Crew Survival" section, Page 7).

All miners who were questioned as to their knowledge of the abandoned Harrison #2 Mine, stated that they were aware of the abandoned mine as depicted on the Quecreek No. 1 Mine map. A copy of the map was posted on the wall map in the office as required by Section 237 of the Act. The miners stated during the initial August interviews that they believed they were at least 300 feet from the abandoned Harrison #2 Mine when the inundation occurred. All of the miners that were questioned on the conditions of the 1<sup>st</sup> Left Section indicated that they observed nothing unusual in the section prior to the accident. Specifically, they stated that there was nothing abnormal about the water conditions in the mine prior to the cut-through. Miners who worked in other sections of the mine indicated the 1<sup>st</sup> Left Section was much dryer than the Mains or 2<sup>nd</sup> Left Section. The roof bolters of the 1<sup>st</sup> Left Section agreed, but added that they encountered water in almost every bolt hole in the last area that they were bolting prior to the inundation. However, they also stated that this was not uncommon for the Quecreek No. 1 Mine. The furthest extent of 2<sup>nd</sup> Left Section when the accident occurred was approximately 2,700 feet away from the Harrison #2 Mine as depicted on the Harrison #2 1964 Mine map.

## December Interviews

The Team conducted follow-up interviews with seven miners from the 1<sup>st</sup> Left crew on December 4-5, 2002, at the law offices of Courtney and Courtney, 142 North Court Avenue, Somerset, PA 15501. Mr. Howard Messer, Esquire represented these seven miners. Five additional interviews were conducted on December 6, 2002, at the MSHA District 2 Office in Hunker, PA. Randall Fogle, Mark Popernack, Lawrence Petree, and Charles Hankinson were represented by Mr. William F. Manifesto, Esquire. David Rebuck was represented by J. Alan Johnson, Esquire and Joseph Yuhas, Esquire. The intent of these interviews was to ask specific questions regarding the conditions of the 1<sup>st</sup> Left Section to determine whether precursors existed that would have given advance warning of an impending inundation. There were five primary topics covered in the interviews: 1) Production, 2) Water, 3) Roof Conditions, 4) Roof Supports, and 5) Pumps.

Five of the nine miners interviewed on December 4-5, 2002, stated they were unaware that the abandoned Harrison #2 Mine was flooded, three were not asked if they believed the mine was flooded, and one indicated that he knew the mine was flooded. Five of the nine miners believed the mine was at least 300 feet ahead of the 1<sup>st</sup> Left Section. One miner was not asked if he knew the Harrison #2 Mine was ahead and three miners stated that they knew the mine was ahead but did not specify a distance. Most of the miners interviewed stated they did not examine the mine map posted in the mine trailer. This mine map was available for all employees to view. However, on the night of and prior to the inundation, this map did not have a legend affixed describing the various features contained on the map. Without this legend, persons would have difficulty determining the meaning of various lines drawn on the map.

### *Production*

Several of the persons interviewed in December stated that coal production was significantly reduced during the two weeks preceding the inundation, while others stayed silent on the issue. Some miners indicated that an increased number of “short” (10- to 20-foot) cut depths were taken during this time period, while the others did not discuss “short” cuts.

An inspection of Black Wolf’s daily production reports ([Exhibit D-9](#)), which are completed by the section foreman, show a decrease in production during the week of July 15-20, 2002 ([Exhibit D-10](#)). The Department generated [Exhibit M-16](#) to illustrate the approximate active mine face locations on particular days based on the daily production reports supplied to the Team by Black Wolf. [Exhibit M-16](#) shows that the 1<sup>st</sup> Left Section encountered the geologic discontinuity, sometimes called a “clay vein” area during the week of July 15, 2002. This geologic discontinuity caused poor roof conditions, which slowed mining and reduced daily coal production. However, production was on an upward trend during the week of July 22, 2002, when the inundation occurred

## *Water*

The approved mine permit referenced the presence of several ground water aquifers overlying the mine permit area. Mine hydrology is discussed in greater detail in the “QUEECREEK MINE NO. 1 CHARACTERISTICS AND OPERATIONS” section, above beginning at Page 24, and in the Hydrologic Investigation Report ([Exhibit D-8](#)).

All persons interviewed in December 2002 confirmed that this mine has encountered water coming out of the roof and bottom since operations began. Water dripped out of cracks in the roof and roof bolt holes randomly throughout the mine. When drilling the roof, water was often encountered approximately 4 feet above the mine roof. There were areas of the mine where excessive amounts of water were observed either in the roof or the bottom. These areas were the 1 Right, Mains and 2<sup>nd</sup> Left Sections.

During the December interviews some of the miners stated a great deal of water was encountered at various locations throughout the development of the 1<sup>st</sup> Left Section. In particular, they stated greater amounts of water were encountered during roof bolting operations from approximately 51 crosscut inby to the face areas.

A geologic anomaly, beginning at 51 crosscut, #1 entry and traversing the section inby to 54 crosscut, #7 entry, exists in the 1 Left Section. Typically, such anomalies cause bad roof conditions and may cause increased amounts of water to flow from the roof. Apparently adverse roof conditions and increased water flow were associated with the anomaly in the 1<sup>st</sup> Left Section. Some witnesses stated the amount of water flowing from the anomaly decreased after mining through it.

However, the miners stated they did not consider the increased amount of water from the roof to be a precursor to an impending inundation due to the wet nature of this mine and the presence of roof water in other portions of the mine.

Some persons stated during the second interviews on December 4-6, 2002, that an increased amount of water began flowing from the roof in the 1<sup>st</sup> Left Section just prior to the inundation. Four of the miners stated they had observed water coming out of the faces and ribs, however, others interviewed did not observe this condition.

## *Roof Conditions*

Based on the interviews and in mine observations, the overall roof conditions of the Quecreek No. 1 Mine are considered to be generally fair to good. There are indications of isolated instances of poor roof conditions in various locations of the mine. Only one reportable roof fall incident occurred<sup>14</sup> ([Exhibit D-12](#)). This roof fall occurred in the Mains section approximately 3,500 feet from the faces of 1<sup>st</sup> Left. There is testimony that

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<sup>14</sup> Pursuant to Department guidance ([Exhibit D-11](#)) only certain significant roof fall incidents are required to be reported to BDMS.

indicates that, occasionally during the mining cycle, some draw rock would fall while cutting coal.

Witnesses stated the roof conditions of the 1<sup>st</sup> Left Section were normal until the section encountered the geologic discontinuity which crossed the section from 51 crosscut, #1 entry to just outby 54 crosscut in #7 entry. Based on the Team's underground investigation of the 1<sup>st</sup> Left Section on September 5, 2002, the roof conditions in the area surrounding the geologic discontinuity deteriorated resulting in some falls of the immediate roof and roof scaling. Once mining progressed inby this geologic discontinuity, roof conditions appeared to improve.

The roof bolters reported some bolt holes had excessive amounts of water flowing from them when drilling occurred, however it was not uncommon to encounter such water when drilling in this mine. Some witnesses stated that water continued to flow from roof bolts despite using grouted resin bolts, however, others did not substantiate these statements.

### *Roof Support*

According to the approved Roof Control Plan<sup>15</sup>, primary roof supports are 36-, 42- and 48-inch fully grouted resin roof bolts. Supplemental roof supports, to be used in areas of adverse roof conditions, include but are not limited to: cable bolts; roof straps; cribs; and posts. The minimum roof bolt length approved was 36 inches whenever 4 feet of sandstone roof is present. The roof control plan allows for 42-inch roof bolts in places with firm shale or sandstone roof ([Exhibit D-13](#)).

During the December interviews, the miners were questioned about their knowledge of the various roof support systems (primary and supplemental) that were used in the 1<sup>st</sup> Left Section of the Quecreek No. 1 Mine. Several of the miners said that cable bolts, cribs, straps, and 6-foot roof bolts were used in addition to 42- and 48-inch fully grouted resin bolts. Some interviewees stated that 12-foot cable bolts were used often, especially inby crosscut 48. In addition to the use of cable bolts, some 1<sup>st</sup> Left miners indicated that numerous cribs were set in crosscuts 46-52 between the #5 and #6 entries and in the #6 entry. The witnesses explained that the length and type of supports installed is determined by the judgment of the roof bolter operators.

Personnel from MSHA conducted an underground investigation of Quecreek No. 1 Mine on December 7, 2002, to verify the roof support systems used in the 1<sup>st</sup> Left Section. They conducted an inventory of all roof supports used starting at the 37 crosscut and proceeded inby to the face areas. This inventory mapped the location of all cable bolts, straps, cribs, posts, and roof bolt lengths found in the 1<sup>st</sup> Left Section inby 37 crosscut ([Exhibit M-17](#)). This investigation showed that, of over 9,500 roof bolts installed inby 37 crosscut, only five were cable bolts. Three were installed in the #2 entry at the

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<sup>15</sup> A Roof Control Plan is required for all bituminous underground mines. 52 P.S. §701-253. The purpose of roof control and the roof control plan is to hold up the overlying rock units, thus, preventing pieces of rock from falling on miners.

37 crosscut and two were installed in the #4 entry at 51 crosscut. Roof straps were used in various locations throughout the section. These roof straps were used as roof surface control to reduce the likelihood of draw rock falling between roof bolts.

There was no evidence of any cribs installed from the 37 crosscut inby to the faces. Exhibits M-17 and M-18 support this statement. Several 6-foot roof bolts were installed between #4 and #5 entries at crosscut 52. The remaining section was bolted with a combination of 42- and 48-inch roof bolts.

Some issues have been raised after the accident regarding a statement attributed to one member of the 1<sup>st</sup> Left crew in Goodell, Jeff, *Our Story: 77 Hours that Tested our Friendship and our Faith*: Hyperion, 2002, a book about the Quecreek No. 1 Mine accident and rescue. The statement referring to “something big” ahead of the 1<sup>st</sup> Left Section was clarified in the December interviews. The person to whom the statement is attributed explained that the statement referred to possible bad roof conditions ahead of the active mining faces, not a fear of pending inundation.

### *Pumps*

During the December interviews the miners were questioned about the number of pumps located in the 1<sup>st</sup> Left Section of the mine. A wide spectrum of answers about the number and locations of pumps was given to the Team by those interviewed.

The mine’s “Examination of Electrical Equipment” book for the 1<sup>st</sup> Left Section and underground investigations by the team, show three electrical pumps existed in the 1<sup>st</sup> Left Section (Exhibit D-14).<sup>16</sup> One pump was located in the #7 entry at 18 crosscut approximately 2,200 feet outby the face area. A second pump was located in the #6 entry around the 19-21 crosscuts, and a third pump was located in the #4 entry around the 19-21 crosscuts.

The interviewees stated face pumps were used in the 1<sup>st</sup> Left Section. During the Team’s underground investigation on September 5, 2002, no evidence of these pumps was found in the active section. Flexible discharge line, pumps, and pump cables strung in the face areas were absent. However, it is not uncommon for mines to utilize face pumps to dewater local dips where water would accumulate. The 1<sup>st</sup> Left Section was mined in an uphill direction, and any water that would flow into the face areas would flow outby the section toward the #7 entry. The pump located in the #7 entry at the 18 crosscut was used as a gathering point for all of the water from the 1<sup>st</sup> Left Section. Witnesses stated in the December interviews this pump was able to handle all water generated from the 1<sup>st</sup> Left Section and was often running “on air.” There was no indication of increased water volume at this pump during the two weeks prior to the inundation as stated in testimony. The water was pumped from this location to a sump location in another part of the mine and then is relayed to the treatment ponds located on the surface.

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<sup>16</sup> There is no apparent dispute that the section also had a hydraulic pump that was coupled into the PTO of the scoop.

During the underground investigation on September 5, 2002, the Team noticed only one area where water had pooled after the mine was pumped down. The #7 entry between the 53 and 54 crosscuts had a pool of water remaining. This pool was due to a dip in the floor caused by the presence of the geologic discontinuity, which crossed the section from the #1 entry to the #7 entry.

### Engineer Interviews

Engineers and technical personnel involved with the permitting, operation, and other aspects of the Quecreek No. 1 Mine were interviewed on August 27 and 28, 2002, at the BDMS Uniontown Office. One investigation team member from MSHA and one from BDMS conducted the interviews. Persons from PBS, RoxCoal, Musser Engineering, CME Engineering, EADS Group, W.J.M., Black Wolf, and a former employee of RoxCoal were interviewed. The purpose of these interviews was to ascertain a better understanding of the processes used to prepare the mine permits, to determine the location of abandoned mines, the search for abandoned mine maps and related topics.

All interviewed stated when the maps were submitted with the original permit application, they believed that the maps accurately depicted the extent of mining in the Harrison #2 Mine and its location. All agreed that the map supplied by Consol (Consol II Map, See [Exhibit M-12](#)) to show the outline of the mine was not certified or dated.

Edwin Secor, P.E, who certified maps for the Quecreek No. 1 Mine permit, stated when he sealed the Quecreek No. 1 Mine permit maps, he was certifying the entire map. However, he also added that he was not certifying the actual workings of the Harrison #2 Mine. Mark Tercek, P.E., CME Engineering, and James Hickman, P.E., RoxCoal, indicated that when they certified maps of the Quecreek No. 1 Mine, they were certifying only the work that they had direct control over. They stated they believed the work completed by Secor was true and accurate, in particular, the depiction of the Harrison #2 Mine, and they did not need to re-do his work.

Musser Engineering personnel stated that, after a year long search of abandoned mines maps in the vicinity of the Quecreek No. 1 Mine, they accepted the Consol Map II ([Exhibit M-12](#)) as the most extensive map depicting the extent of mining for the Harrison #2 Mine. A more detailed discussion of the map search process can be found in “QUECREEK NO.1 MINE INTIAL PERMITITNG” section, above, beginning on Page 16, and in the “MINE MAP SEARCH” section, below, beginning on Page 40.

Musser Engineering and PBS personnel made no notations on the maps submitted with the permit application or any of the revision applications prior to the accident, which indicated reservations, questions, or uncertainty about the depicted location of the adjacent abandoned mines, including Harrison # 2 Mine.

Interviews of Musser Engineering personnel revealed that the company did not investigate production records for the Harrison #2 Mine nor any other adjacent mine during work on the permit application. The Commonwealth publishes annual reports



detailing coal mining operations throughout the Commonwealth, including mine by mine production data. These reports are public documents and can be viewed upon request. For example, an entire set of these reports is available at the BDMS Uniontown Office.

William McIntire, owner of W.J.M., was asked to describe his acquisition of coal reserves in Somerset County from Consol and his knowledge of and access to any mine maps of the Harrison #2 Mine. He stated that he purchased the coal reserves from Consol in 1992 without reviewing any maps prior to the acquisition. Approximately 3-4 months after the sale, Consol made maps of the area available. An employee of McIntire's acquired these maps and delivered them directly to Musser Engineering. Consol only provided maps after the sale was completed, and the maps were delivered directly to Musser Engineering without his review. McIntire asserts that he owns approximately 95 percent of the coal reserves located within the Quecreek No. 1 Mine permit boundary.

Following the conclusion of the engineering interviews, the Team invited David Rebeck to the BDMS Uniontown Office on August 28, 2002. Mr. Rebeck brought counsel for Black Wolf to the meeting. The Team revealed that an additional mine map was found at the Windber Coal Heritage Center (see "Harrison #2 1964 Mine Map" Page 45). In light of the recovery operations occurring at the Quecreek No. 1 Mine, the Team believed that Rebeck should be made aware of the additional mining that had occurred in the Harrison #2 Mine. The Team advised him that this map was only a portion of a larger map and was not certified by a registered engineer or registered land surveyor. A paper reproduction of the mine map was given to Rebeck at this time.

### Mine Inspections

Section 1 of the Act of June 3, 1943, P.L.848, 52 P.S. § 11, commonly called the Mine Officials Act, states that mine foremen, assistant mine foremen, and fire bosses are representatives of the Commonwealth. As such representatives, these persons are deemed officers of the Commonwealth in enforcing the provisions of the Act. Black Wolf employed persons in these capacities as well as a safety director. These persons were responsible to ensure compliance with the mining laws on a daily basis and to make corrections whenever non-compliance was encountered.

Pursuant to Section 117 of the Act, Mine Inspectors shall thoroughly examine each underground coal mine within their district at least once every 3 months. As part of this quarterly examination, the inspector shall ensure compliance with all provisions of the Act and to assure that mine officials are maintaining compliance with all requirements of the Act and other regulations.

Pursuant to Section 103(a) of the Federal Mine Safety and Health Act of 1977, inspectors are required to conduct a minimum of four inspections of an underground mine per year. The requirements of these inspections are to ensure compliance with all health and safety regulations pertaining to federal law.

Prior to the July 24, 2002, accident, State Mine Inspector Lynn Jamison conducted an inspection of the Quecreek No. 1 Mine on July 16, 2002. MSHA Inspector Donald Huntley conducted an inspection of the mine on July 18, 2002. In addition to these two inspections during the week preceding the accident, Black Wolf mine officials were conducting required examinations.

In their interviews, mine officials, Jamison, and Huntley stated that they did not observe any precursors to an impending inundation. They indicated that mine conditions did not present any unusual concerns that would alert persons to pending dangers.

The Team's review of the mine examination books show no unusual dangers during the weeks preceding the inundation.

### Tax Record Search

The Investigation Team also explored Somerset County property tax records, another potential source of information, about past mining activities. In Pennsylvania, surface and mineral estates are assessed and taxed separately by local taxing authorities. The owners of the coal typically report to the taxing authority when coal is mined so that the assessed values and taxes are reduced.

On May 29, 2003, the DEP Team visited the Somerset County Tax Assessment Office to review the tax files for the Elias G. Bittner Tract ("Bittner Tract"). The Quecreek No. 1 Mine inundation accident occurred within this tract. The Bittner Tract is a 121-acre tract located just south of the Casebeer Church on Rt. 985 in Lincoln Township, Somerset County. It is a mineral estate (coal) property. Elias Bittner severed the surface estate from the mineral estate in 1902. Upon severance, the mineral estate became known as the Elias G. Bittner Tract containing all coal seams upon 121 acres. Geologic records show that five coal seams exist on all or part of the tract.

This tract was controlled by the Pittsburgh Coal Company (now Consolidation Coal Company ("CCC")) in 1945 when Pittsburgh Coal Company and Saxman Coal entered into a coal lease. Saxman Coal mined the Upper Kittanning (C') Coal Seam within this tract. Based upon the 1964 Harrison #2 Map (see page 45), Saxman Coal mined the C' seam in this tract primarily from 1960 through 1963.

In 1950 Pittsburgh Coal Company sold the Bittner Tract and other coal properties to Acosta-Gray Company. Acosta-Gray, however, neglected to pay taxes on the Bittner Tract, and the property was sold at a sheriff sale in 1955. PCC purchased the Bittner Tract and approximately 20,000 acres of other coal properties through the sheriff sale. Many, if not all, of these coal properties, including the Bittner Tract, were later sold to WJM by CCC in 1992. (See "Mineral Rights Acquisition," Page 16).

According to documents obtained from the Assessment Office's records, the coal on the entire tract (121 acres) was exhausted by 1963. Though this filing could be construed as meaning that all coal seams being exhausted on the tract, there is no record that any seam

other than the C' seam was mined on the Bittner Tract. Therefore, the Upper Freeport, Lower Freeport, Middle Kittanning, and Lower Kittanning Seams should still be in their unmined condition on the tract. All tax records from 1963 to 1992 report that all coal on the Bittner Tract was completely exhausted. Accordingly, the mineral estate value was reduced to nothing.

The tax records for the Bittner Tract were amended in 1992 to show that the Bittner Tract had not been mined at all. The 1993 assessment record shows coal remaining on all 121 acres of the tract and indicates no mining had occurred within the Bittner Tract. The Team was unable to determine the reasons that the Bittner Tract's status was changed from 121 acres of coal exhausted to 121 acres of coal present in 1993. However, in 1992 CCC sold all of their coal reserves in Somerset County, including the Bittner Tract, to WJM Coal.<sup>17</sup>

Other information available to the Team shows that mining of the C' Seam on a portion of the Bittner Tract occurred prior to the permitting of the Quecreek No. 1 Mine. However, it appears that the majority of the Tract was not been mined prior to the Quecreek No. 1 Mine. Based on the 1964 Harrison #2 Mine map, approximately 49.9 acres or 41% of the C' Seam on the Bittner Tract was mined out by Saxman Coal. [Exhibit D-15](#) is a graphical depiction of the Bittner Tract and the coal reserves mined and those remaining. Quecreek No. 1 Mine mapping shows that Quecreek Mining removed coal on about 6 acres within the Bittner Tract. In addition, the horizontal boreholes that Quecreek Mining was required to drill in October 2002 prior to resuming mining operations definitively shows that a significant portion of the Bittner Tract, at least 33.1 acres and as much as 65.1 acres, remained unmined in the C' Seam as of the date of the inundation.

The Department's staff did not examine tax records during the review of the Quecreek No.1 Mine permit. Since the Department was led to believe by the permittee that a certified map of the Harrison #2 Mine existed and would be provided (see Pages 17, 19, and 25), there was no reason to look to secondary collateral sources, such as tax records. The tax records for the Bittner Tract demonstrate the problems of relying on tax records. Neither the 1963-1992 records, showing that all coal was exhausted, nor the 1993-2002 records, showing that all coal is unmined, were correct. In fact, the Team concluded, if the Department reviewers had consulted the 'then current' tax records when the Quecreek No. 1 Mine permit was being reviewed in 1998, these records would have provided no clue that the Quecreek No. 1 Mine was in dangerous proximity to the abandoned flooded Harrison #2 Mine. Rather the records would have suggested that Bittner Tract was previously unmined and safe to mine as proposed by Quecreek Mining.

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<sup>17</sup> In the past, in order to change a coal property's status, the Somerset County Tax Assessment Office did not require property owners to provide any proof that coal had actually been mined. The Tax Authority relied upon documents filed with the office concerning the amount of coal remaining on the Bittner Tract in the 1960s and in 1992. However, today the Tax Assessment Office requires property owners to provide an engineering study that proves the extent of coal removal prior to changing the tax records for the property.

## MINE MAP SEARCH

### Mapping Requirements

The Pennsylvania Bituminous Coal Mine Act requires operators or superintendents of mines to survey the workings of their mines and to create maps, certified by a registered professional engineer or registered professional surveyor from those surveys.

Section 235 of the Act, 52 P.S. §701-235. The map must be updated every six months.

Section 238 of the Act, 52 P.S. §701-238. Pursuant to Section 239 of the Act, a copy of this mine map must be provided to the inspector every six months, after it is updated.

52 P.S. §701-239. This section also requires the inspector to take custody of the mine maps as “official records pertaining strictly to the office or mine inspector in the district,” and to transfer all of the maps to his successor as district mine inspector. 52 P.S. §701-239.

Historically, the Department has interpreted Section 236 of the Act, 52 P.S. §701-236, to apply to the mapping of adjoining active mines. It is apparent that some confusion existed among Department staff who believed that Section 236 mapping requirements should also apply to abandoned mines and that it also included test drilling requirements. The Department’s position is that Section 236 only applies to the mapping of adjoining mines that are active. Active mines are mines that are ventilated and inspected regularly. There are no test drilling requirements in Section 236. Test drilling requirements are identified in Section 224(b) of the Act, 52 P.S. §701-224(b).

The law imposes additional requirements on mine operators or superintendents upon abandonment of a mine. Within sixty days of abandonment, the operator or superintendent must update the mine inspector’s map and must also send the Department a “complete original tracing or print of the complete original map.” Section 240 of the Act, 52 P.S. §701-240. A registered professional engineer or registered surveyor must certify that the map is a true and correct copy, and a “true, complete and correct map and survey of all the excavations made in such mine.” 52 P.S. §701-240. Substantially, similar provisions have existed in Pennsylvania mine safety law since 1911.<sup>18</sup>

These mine mapping provisions are independent of mine maps required pursuant to the Bituminous Mine Subsidence and Land Conservation Act, 52 P.S. §§1406.1-1406.21 (“Mine Subsidence Act”), and implementing regulations. Specifically, Section 5(a) of the Mine Subsidence Act, 52 P.S. §1406.5(a), requires that mine permit applicants must contain a map that contains information required by the Department. By regulation, the Department specifically sets forth the information that must, at a minimum, be on the maps. 25 Pa. Code §89.154(a). Among other things, the maps must show the location of adjacent active or abandoned underground mines. 25 Pa. Code §89.154(a)(4). Every six months permittees must also submit maps to the Department that show the extent of mining in the past six months and the projected mining for the next six months. Section 8 of the Mine Subsidence Act, 52 P.S. §1406.8; 25 Pa. Code §89.154(b). Permittee is

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<sup>18</sup> Act of June 9, 1911, P.L. 756. The prior mine safety law, Act of May 15, 1893, P.L. 52, did not require the submission of a final map to the Department.

required to file copies of the maps with the recorder of deeds in the county where the mine is located. Section 8 of the Mine Subsidence Act, 52 P.S. §1406.8; 25 Pa. Code §89.154(c).

The Federal MSHA regulations also contain requirements for mapping underground coal mines. See generally 30 CFR Subpart M. These requirements are similar to Pennsylvania's requirements. For example, the map required under Federal regulations is required to show "adjacent mine workings within 1,000 feet." 30 CFR 75.1200(h) (See also 30 CFR 75.372(b)(3) - ventilation map requirements). How these requirements are carried out and enforced by MSHA, either in general or with respect to the Quecreek No. 1 Mine, is beyond the scope of this Pennsylvania state report and would properly be within the purview of MSHA's report.

Exactly how the various agencies responsible for administering Section 240 since 1911 have carried out the final map filing provisions is unknown. According to the Governor's Commission on Abandoned Mine Voids and Mine Safety Report, "*The Bituminous Act does not clearly state where the final bituminous map is to be submitted. It states only that a map shall be provided to "the Department."* (Section 240 of the Bituminous Act, 52 P.S. § 701-240) *This ambiguity may account for some of the difficulty the DEP has in locating "final" maps, and the many gaps in the official map repositories. There is anecdotal evidence that during some periods in the past mine owners and operators filed final bituminous mine maps with state mine inspectors, but no clear policy or agency directives have been uncovered. Today it appears that, pursuant to DEP policy, final closure maps are filed in the Bureau of Deep Mine Safety (BDMS) office in Uniontown.*"

### Team Map Search

As part of the accident investigation the Team retraced the steps taken during the initial permitting process and searched for maps of the Harrison #2 Mine.

The Team traveled to the OSM repository in Greentree, PA, on July 31, 2002, to request all maps showing the Harrison #2 Mine workings. Several different search criteria were used to find all maps of the mine. A copy of the search results is shown in [Exhibit D-16](#). All of the maps received were reproductions of microfilmed maps and were not printed to scale.

The following maps were received from the OSM repository:

[M-19](#) shows a detailed portion of the Saxman Coal, Harrison #2 Mine. This map has no dates or certifications. The map does show the town of Quecreek by its former name, Harrison. BDMS possesses a microfilm copy of this map also.

[M-20](#) has the words "Harrison No. 2, Saxman Coal & Coke, Quecreek, Somerset Co." written on the map by hand. There is no title block or legend on the map. The date of this map is unknown. The map shows detailed workings near the

mine opening locations, including mine survey points, floor elevations, and notations regarding a fault. This map appears to be a section of a much larger map. The location of the remaining portion is unknown. BDMS possesses a microfilm copy of this map also.

[M-21](#) is a map titled, “Property Map, The Saxman Coal & Coke Co., Lincoln Twp., Somerset Co., PA.” The map has a date of July 1, 1957. This map does not show detailed mine workings. Single lines depict the mine workings. Pillared areas within the Harrison #2 Mine are cross-hatched. The map does indicate the location of the Consolidation Coal Company property. BDMS Uniontown possesses the original paper copy of this map.

The map repository in Uniontown possesses only one hardcopy map of the Harrison #2 Mine ([Exhibit M-21](#)). This map contains no certifications regarding the map’s accuracy. This map is also available on microfilm. All of the microfilmed maps that were received from the OSM repository are present in the Uniontown Office as well.

As a result of the August 6, 2002, meeting with Musser Engineering, the following maps were provided to the joint team:

[M-4](#) is an earlier version of [Exhibit M-21](#). This map was dated December 31, 1948. It contains the same features as [Exhibit M-21](#) however, this map shows the location of drill holes located above and surrounding the Harrison #2 Mine. This map references an airshaft near the mine slope that does not appear on [Exhibit M-21](#). Musser received this map from Carlton Barron.

[M-12](#) is the Consol Map II that was used to determine the extent of workings for the Harrison #2 Mine during the initial permitting process. Consol provided this map to Musser Engineering in 1995. This map is a reproduction of a property map prepared by Consol. It shows coal tracts owned by Consol in addition to drill holes and coal contour lines. The property line designating the area covered by the 1945 lease between Consol and Saxman Coal is shown. The map shows a detailed outline of the Harrison #2 Mine workings in addition to the detailed mine workings of the Consol #120 Mine. Reference points used by Musser Engineering to locate Harrison #2 Mine during the permitting process are shown. Using [M-12](#), the Team calculated that approximately 80 acres of Consol coal was mined by Saxman Coal.

[M-2](#) is the Consol Map I received by Musser from Consol in 1994 according to statements taken from David Lucas (of Musser Engineering) on August 28, 2002. This map is identical to [M-20](#), which was found at OSM and BDMS.

[M-3](#) is the same map as [M-19](#). Musser received this map from the OSM repository.

During the engineering interviews on August 28, 2002, Musser Engineering presented the Consol Marketing Package that was used during the 1992 sale of Consol's coal reserves to W.J.M. This package had two maps ([Exhibit M-22](#) and [M-23](#)) detailing reserves within the Quecreek permit area. Discrepancies in the extent of mining for the Harrison #2 Mine between these maps and Consol Map I caused Musser Engineering to seek a more accurate map from Consol and lead to the acquisition of the Consol Map II in 1995.

As part of the information requested from PBS on August 6, 2002, PBS provided copies of seven maps that PBS had obtained during its search for mapping of the Harrison #2 Mine in 1995 to the Team. The following maps were provided:

[M-5](#) is a final certified map of the Saxman Coal & Coke Company, "E" No. 2 Mine. This mine is located adjacent to the Harrison #2 Mine in the Upper Freeport coal seam. Map was received from McMurray DMO.

[M-6](#) is a final certified map of the Saxman Coal & Coke Company, "E" No. 1 Mine. This mine is adjacent to the "E" No. 2 Mine in the Upper Freeport coal seam. Map was received from the OSM repository.

[M-7](#) is a map showing the detailed workings of the Consol Mines 120 and 121. The map also shows a small portion of the Harrison #2 Mine. This is a reproduction of a microfilm map located in the McMurray DMO.

[M-8](#) is a microfilmed map showing the workings of the Consol 123 Mine dated 1942. The map was received from McMurray DMO.

[M-9](#) & [M-10](#) is a reproduction of a microfilmed map received from OSM. This map shows the mine workings for the Quemahoning Creek Coal Company mines, which were later purchased by Saxman Coal. The map is dated May 31, 1924, and shows detailed workings of the Harrison #2 Mine east of the breach area.

[M-11](#) is a reproduction of the microfilmed map received from OSM. It shows the mine workings of the Consol 120 Mine, which is located north of the Quecreek No. 1 Mine.

The Team met with Consol personnel at their suburban Pittsburgh office. Consol showed the team the entire map from which a portion was given to Musser Engineering in 1995 (Consol Map II). This map confirmed the Team's suspicions that no dates or certifications were present on the full map. Consol also showed the Team an additional map from 1979 ([Exhibit M-24](#)). This map was identical to the Consol Map II supplied to Musser Engineering, except that it shows more extensive and updated Harrison #2 Mine workings than the Consol Map II. This map was not supplied to Musser Engineering in response to its requests for maps. [Exhibit M-24](#) shows mining approximately 300 feet further north than the extent of mining for the Harrison #2 Mine depicted in the initial permit application and in Consol Map II. [Exhibit M-24](#) was not certified or otherwise qualified by a P.E. or P.L.S.

The Team visited the Berwind Natural Resources Corporation in Windber, PA, and was provided with one map of the Harrison #2 Mine ([Exhibit M-25](#)). This map is titled “Barron-Saxman Coal & Coke, Scale 1”=500’, C’ Mine.” The map shows the location of drill holes with elevations of the coal seams in addition to the surface elevations. A rough outline of the extent of mine workings is shown in relationship to property lines. Comparison between this map and maps received from OSM indicates that this rough outline is the Harrison #2 Mine. However, the extent of workings is more limited than those shown on the Consol Map II.

BDMS personnel from the Team searched the Somerset County Recorder of Deeds for abandoned mine maps. The Recorder’s Office possessed 4 boxes of old mine maps for Somerset County mines, including some final certified maps. A Harrison #2 Mine map was not found. The only maps in its possession are dated post-1966. Mining companies are required to file 6-month projection maps with the county Recorder of Deeds Office. Whenever updated maps are filed, the operator is required to retrieve the old maps. The Recorder’s Office does not have a map retention policy.

BDMS personnel from the Team searched the Somerset County Tax Assessment Office for any abandoned mine maps. The Assessment Office possesses two boxes of mine maps received from the Recorder of Deeds Office. These maps are for mines that operated in Somerset County in the 1990s. The Assessment Office also possesses several maps showing coal ownership and some other mine workings. A copy of the map identified in this report as [Exhibit M-24](#) was located in the Assessment Office with the exception that an outline of the Harrison #2 Mine was not shown.

The Team also searched the Cambria County Courthouse for mine maps of the Harrison #2 Mine. The Courthouse possesses some old mine maps, however, a Harrison #2 Mine map was not located.

The Team visited the University of Pittsburgh’s archive center in late August 2002. Consol donated all of its old hardback maps to the University for preservation in the early 1990s since they did not possess the facilities to archive the maps. The team did locate the original mapping for the Harrison #2 Mine. The workings were dated in the early 1920s. However, the map that could have shown the area near the breach point was not in the collection. The map for “E” (Upper Freeport) seam was available. However, the C’ (Upper Kittanning) map was missing. These maps were 1”=100’ scale maps.

BDMS visited Mr. Bud Davis, a consulting engineer in Somerset County, to search for any mapping for the area surrounding the Quecreek Mine. Davis informed BDMS that he did not have any mapping of that area.

BDMS contacted the State Records Center in Harrisburg, PA, to inquire about any mine maps that might be stored there. BDMS received a copy listing all records retained for DEP by the Record Retention Center. There was no indication that mine maps are included in the Record Retention Center’s files.



BDMS personnel contacted former State Mine Inspector Wayne Reynolds regarding mine maps for the Harrison #2 Mine. Reynolds assumed inspection duties for Clyde H. Maize (see “[Harrison #2 1964 Mine Map](#)” section, below) upon Maize’s retirement in 1970. BDMS was informed that Reynolds did not receive any files or maps from Maize.

### Harrison #2 1964 Mine Map

On August 20, 2002, two Team members traveled to the Windber Coal Heritage Center (“Heritage Center”) in Windber, PA, to search for old mine maps germane to the investigation. The Team members located an untitled map ([Exhibit M-26](#)) at the Heritage Center (“1964 Harrison #2 Map”), which showed mine workings and a survey index. Property owner names on the map seemed similar to names observed on mine maps previously received by the Team. When the Team rolled the map up, the words “*Saxman C & C Co., Harrison #2, Final 1964, C.H. Maize*” were found hand written on the backside of the map.

The Team learned that Royce Boyd, granddaughter of Clyde H. Maize, a former state mine inspector, donated this map to the Heritage Center in June 2002. Maize, who retired in 1970, was the District 20 Mine Inspector for the Department of Mines and Minerals Industries, a predecessor agency to DEP. His district included the Harrison #2 Mine<sup>19</sup>. Maize passed away in 1976, and family members retained his personal effects and other materials that he had accumulated. Boyd was “cleaning out” the family’s home when she found this map and other items in the attic. Boyd donated this map and other documents to the Heritage Center, and donated other miscellaneous items to the Somerset County Library in June 2002. The map was not catalogued; it was lying in a corner in the museum’s attic.

The 1964 Harrison #2 Map is a 1”=100’ scale map showing the southwestern portion of the Harrison #2 Mine where mining occurred during the final years of operation. Team inspection of the map verified that this map depicts the Harrison #2 Mine. In particular, the area of the map where the Quecreek No. 1 Mine breach occurred shows more mining than any other map uncovered by the investigation. The 1964 Harrison #2 Map does not have a title block or other notations regarding the mine name, and is not sealed or otherwise certified. However, it contains an “Index” to mine surveys; the final survey was dated January 1, 1964.<sup>20</sup>

The original permit map for the Quecreek No. 1 Mine shows Harrison #2 Mine workings in the First West Heading extending approximately 480 feet off its 2 South Main. The 1964 Harrison #2 Map shows surveyed workings in the First West Heading extending approximately 1,080 feet from the Harrison #2 Mine 2 South Main, an additional 600 feet. According to the survey index on the map, J.E. Kimmel surveyed this area of

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<sup>19</sup> It is unknown if the inspection district assigned to Mr. Maize immediately prior to his retirement in 1970 still included the area of the Harrison #2 Mine.

<sup>20</sup> The surveys were apparently performed by J. E. Kimmel, who was the Harrison Mine #2 superintendent, engineer and surveyor. See Section Mine Mapping, Page 16.

First West Heading on January 1, 1964. The areas surveyed in January 1964 depicting the extent of mining in 1963 are highlighted in yellow in the original copy of the 1964 Harrison #2 map.

This map also shows additional mining south of the First West Heading. An area of approximately 1,400 feet by 1,200 feet was mined and pillared in the Harrison #2 Mine. This area is also within the approved permit boundary for the Quecreek No. 1 Mine.

Comparing the 1964 Harrison #2 Map with the Quecreek No. 1 Mine permit maps shows that the permit maps only reflect mining up to the 5 Butt Right Section in Harrison #2 Mine. Saxman Coal mined rooms north off the 5 Butt Right section and also room and pillared the 4 Butt Right panel, however the extent of this mining is not shown on the Quecreek No. 1 Mine permit maps. The Survey Index on the 1964 Harrison #2 map shows that the Consol Map II reflects mining that was completed through 1961 as indicated by the “d” and “e” survey marks. These markings correspond to surveys dated 1961. Further comparison between the 1964 Harrison #2 Map and [Exhibit M-24](#), provided by Consol to the Team, reflects mining was completed through 1962 as indicated by the “f” survey marks. These markings correspond to surveys dated 1962 in the Survey Index. Consol did not provide [Exhibit M-24](#) to Musser Engineering during Musser’s search for mine maps of the Harrison #2 Mine.

No final, certified map of the Harrison #2 Mine was found by the Team.

## CONCLUSIONS

The following conclusions are drawn from facts presented in this report. No weight or significance should be implied by the order of the conclusions.

- There is no evidence that Saxman Coal mined coal beyond the areas for which it held coal leases at the Harrison #2 Mine. Saxman Coal mined coal within Consolidation Coal Company property pursuant to a 1945 coal lease.
- The area of the inundation was within the area leased by Saxman Coal from Consolidation Coal Company.
- Following cessation of operations of the Harrison # 2 Mine in 1964 the mine flooded and became an underground reservoir.
- A “true, complete and correct map and survey of all the excavations made in [the Harrison #2 Mine]”, required under Section 240 of the Act, 52 P.S. §701-240, was not uncovered during the Team’s investigation. Nor was any evidence showing that such a map ever existed, or that such a map was filed with the Department or its predecessors found.
- Though the 1964 map of the Harrison #2 Mine donated to the Windber Coal Heritage Center by Maize’s heirs and located during the investigation is not a “true, complete and correct map and survey of all the excavations made in [the Harrison #2 Mine]” required under Section 240 of the Act, 52 P.S. §701-240, it is the most complete rendering of the extent of mining in the Harrison #2 Mine located by the Team. In addition, the map appears to be a reliable depiction of the area of the break through based upon correlation with mapping of the Quecreek No. 1 Mine.
- The Consol Map II, which Musser Engineering relied upon to depict the outline of the Harrison #2 Mine on the permit maps for the Quecreek No. 1 Mine, does not accurately depict workings and excavations in the Harrison #2 Mine. It is not dated and is not certified by a registered professional engineer or registered professional surveyor.
- The Consol Map II, which Musser Engineering relied upon to depict the outline of the Harrison #2 Mine on the permit maps for the Quecreek No. 1 Mine, is not a “true, complete and correct map and survey of all the excavations made in [the Harrison #2 Mine]” required by Section 240 of the Act, 52 P.S. §701-240.
- Pennsylvania DEP staff in the Bureaus of District Mining Operations and Deep Mine Safety relied upon information provided in the application and from public comment. During the permit review process the Department did not typically review historic production reports for abandoned adjacent mines.
- Mine maps which inaccurately depicted the extent of mining led the miners, Quecreek Mining and Black Wolf to incorrectly believe that the workings in the 1<sup>st</sup> Left Section were at least 300 feet from the Harrison #2 Mine when the accident occurred on July 24, 2002. With this presumption, drilling in advance of mining was not necessary pursuant to Section 224(b) of the Act, 52 P.S. §701-224.

- The wet conditions in the Quecreek No. 1 Mine were common from the onset of mining, and were common in the Main, 1<sup>st</sup> Left Section and 2<sup>nd</sup> Left Section.
- The mine was wet due to aquifers located above the mine.
- The production reports for the in 1<sup>st</sup> Left Section leading up to the July 24 accident do not indicate any evidence of an upcoming inundation. Though production decreased during the week prior to the accident, the reduction appears to relate to the geologic anomaly (“clay vein”) encountered during this period. Production had increased to normal or near normal levels in the days leading up to the accident.
- Poor roof conditions are not unexpected when mining through a geologic discontinuity, like the one encountered by the 1<sup>st</sup> Left Section. It is also not unusual for some draw rock to fall from the roof during the cutting of coal.
- Conditions in the mine show a few areas of poor roof conditions that required longer roof bolts or supplemental roof supports. However, the absence of pervasive use of longer bolts and supplemental roof supports, particularly in the areas mined just before the accident do not support allegations of very bad roof conditions that may have suggested an imminent inundation. Approximately 9,400 of 9,500 (99.9%) of the roof supports used in by 37 crosscut of the 1<sup>st</sup> Left Section were minimum primary roof supports (i.e. 42-inch and 48-inch length roof bolts).
- Testimony of significant amounts of water flowing from roof bolt holes after installation of resin grouted roof bolts could not be substantiated.
- Only three electric pumps were found in the 1<sup>st</sup> Left Section. These pumps were located approximately 2,000 feet outby the active section. There is no evidence of electric pumps being used in the faces of the 1<sup>st</sup> Left Section.
- PBS personnel asserted that a certified map of the Harrison #2 Mine existed. BDMS personnel requested a copy of the map on at least four occasions. It was never provided to BDMS, and no such map was located by this investigation.
- The absence of a legend on the mine map posted in the Quecreek No. 1 Mine trailer made it difficult for miners and others to fully understand the map.
- Edwin Secor, P.E. acknowledged the map used to depict the extent of the Harrison #2 Mine was not a final, certified map.
- Consolidation Coal Company did not fulfill Musser Engineering’s request to provide the most up-to-date mapping of the Harrison #2 mine for the purpose of permitting the Quecreek No. 1 Mine.
- Before, during and after the permitting of the Quecreek No. 1 Mine, sealed maps were submitted to the Department by Musser Engineering, PBS, and Black Wolf which inaccurately represented the basis for and the reliability of the Harrison #2 Mine workings.
- The Department relied upon information in the Quecreek No. 1 Mine application and assertions that a certified map of the Harrison #2 Mine workings existed from company personnel, who had previously proven to be reliable.

- The depiction of the Harrison #2 Mine workings on the initial Quecreek No. 1 Mine permit maps did not fulfill the requirements of the Bituminous Mine Subsidence and Land Conservation Act and regulations. In light of this, after the accident the Department prohibited resumption of mining operations until the maps were corrected and accepted by the Department, the mining plans were revised, and drilling that verified the location of intact coal was completed.
- Though Section 235 of the Bituminous Coal Mine Act, 52 P.S. 701-235, states that the operator or superintendent of any bituminous coal mine shall delineate the location of adjoining mines and the “relation and proximity of the workings of the [active] mine to all adjoining mines ...” the maps prepared for the Quecreek No. 1 mine failed to accurately depict the location and extent of the Harrison #2 Mine workings. Corrected maps have been provided to the Department. The Team did not uncover evidence that the operator, Black Wolf Coal Company, Inc., or the superintendent, David Rebuck, knew that the maps inaccurately depicted the location and extent of the Harrison #2 Mine workings.
- Historically, the Department had interpreted Section 236 of the Act, 52 P.S. §701-236, to apply to the mapping of adjoining active mines. Prior to the accident, it is apparent that confusion existed with some Department staff believing that Section 236 mapping requirements applied to both active and abandoned mines and could be used to require drilling at distances greater than 200 feet as specified in Section 224(b), 52 P.S. §701-224(b). Other Department staff believed Section 236 applied only to mapping of adjacent active mines and Section 224(b) required drilling only when mining closer than 200 feet.
- Tax records may be unreliable and, thus, should only be considered in the absence of reliable information about the location of abandoned mine workings, such as a certified mine map, and used in concert with other corroborating information. Whenever using tax records the information contained in them should be used only with great care and after great scrutiny.

## RECOMMENDATIONS

The following recommendations are made based on conclusions drawn from the report. No weight or significance should be implied by the order of the recommendations.

- The Bureau of Deep Mine Safety should be actively involved in the permitting process for underground coal mines and required to comment upon relevant portions of coal mine activity permit applications. The Surface Mine Inspector and Underground Mine Inspector should jointly review and comment on the application.
- Future applicants for underground mining permits need to demonstrate that all maps are credible and reliable as part of the permit application.
- If a permit applicant cannot demonstrate that maps of adjacent abandoned mines are reliable and credible the Department should limit mining until the applicant satisfactorily demonstrates the location and extent of adjacent abandoned mine voids by other methods, such as horizontal or vertical drilling.
- The Department should establish a system to ensure all materials in the possession of any person who is vacating the position of BDMS District Mine Inspector that are related to mines within his jurisdiction are transferred to his successor as District Inspector.
- The Department should review the underground mine maps in its repository to determine which maps in the repository meet the requirements of Section 240 of the Bituminous Coal Mine Act, 52 P.S. §701-240.
- The Department should update its current system to a clear unambiguous system to ensure that the owner or operator of an abandoned mine provides the required final maps to the Department in accordance with Section 240 of the Act, 52 P.S. §701-240.
- The District Mine Inspector should have the responsibility to conduct underground inspections to determine the exact location and if the operator is in compliance with the maps indicating 6-month mining projections. This will also enable the District Mine Inspector to have knowledge of mining projections 6-months in advance of actual mining. Copies of 6-month projection maps should be provided to the District Mine Inspector.
- Coal operators should have their final map approved by BDMS prior to any bond release.
- The Department should establish one central map repository database of mine maps to inventory, digitize, catalogue, and preserve known existing paper mine maps and coal production reports. Sufficient funding should be made available to complete this task.
- The Department should establish a procedure to gain access to and copy mine maps that are privately held.
- Restrictions should be removed from the Department in releasing copies of mine maps in its possession to mine operators.
- Legislation should be introduced to amend the current mine safety law to authorize promulgation of mine safety regulations.

- Legislation should be introduced to allow the Department to take enforcement action against mine operators for violations of mine safety standards.
- Violations of the Act should become part of the compliance record examined by the Department in granting new or revised deep mine permits.
- Legislation should be introduced to allow the Department to assess monetary penalties for violations of the Act.
- All new permitted mines should be required to utilize the Pennsylvania State Plane Coordinate System as a standard surveying system. All existing mines not utilizing the Pennsylvania State Plane Coordinate System should be required to provide formulas on their mine maps to convert their coordinate system to State Plane Coordinate System.
- Environmental Resource Maps (Coal Mine Activity Permit Module 6) submitted with mine permit applications should indicate the maximum mine pool elevations of abandoned adjacent mines. If this value is unknown, steps should be required to determine this elevation.
- At least one of the permanent physical surface features that will remain after a mine is abandoned should have a permanent monument affixed with State Plane coordinates to assist in locating abandoned mine workings.
- Training procedures for DEP staff and the mining industry should incorporate the lessons learned from the Quecreek No.1 Mine accident.
- Operators should ensure that mine maps posted on the mine site for the use of inspectors, miners and others contain a legend and other features needed to fully understand the map.
- The Department should better coordinate the efforts of its BDMS and DMO staff to ensure that any requests for information are fulfilled in a timely manner.
- In light of the Quecreek No. 1 inundation, a more rigorous and coordinated permit review procedure is needed.
- The practice of reviewers should be changed; reviewers should refer to production records for adjacent abandoned mines when reviewing new or revised underground mine applications.
- More rigorous review of maps should be conducted, to ensure that features are accurately depicted on maps submitted to the Department.
- The Department should develop formal policy and a technical guidance document which establishes whether Section 236, 52 P.S. Section 701-236, applies to all active and abandoned underground mines, or only applies to active underground mines.
- Measures should be taken to ensure that final certified surveyed maps of underground mines abandoned by bankrupt entities are prepared and filed with the Department. All parties involved, including the debtor, bankruptcy trustees, the Department, utilities and creditors, should take all possible measures to ensure that the mine is mapped at the outset of the bankruptcy. If necessary and appropriate, motions to require surveying and mapping of mine workings should be filed with the Bankruptcy Court before conditions that would preclude surveying develop in the mines.

## **ACKNOWLEDGEMENT**

The Department thanks the United States Department of the Interior, Office of Surface Mining Reclamation and Enforcement for allowing Mr. William Winters, R.P.G. to assist the Investigation Team by conducting a hydrogeologic study of the Quecreek No. 1 Mine.