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**Issue Date: 11 April 2013**

Case Nos. 2010-MSA-1 (formerly Parkwood)  
2011-MSA-2 (formerly Parkwood)  
2011-MSA-11  
2011-MSA-12

In the Matter of:

PARKWOOD RESOURCES, INC.,  
ROSEBUD MINING CO.,  
Petitioner,

v.

MINE SAFETY AND HEALTH ADMINISTRATION,  
Party Opposing Petition.

**DECISION AND ORDER GRANTING CONSOLIDATED PETITIONS FOR  
MODIFICATION**

This case arises from consolidated petitions for modification under Section 101(c) of the Federal Mine Safety and Health Act of 1977 (“the Act”), 30 U.S.C. § 811(c), and its implementing regulations at 30 C.F.R. Part 44. The petitions seek modification of the application of the mandatory safety standards at 30 C.F.R. §§ 75.507-1(a) and 75.500(d) such that Petitioner may use “non-permissible” electronic surveying equipment in return air, or in or inby the last open crosscut, at its underground coal mines. ALJ 1 at Stip. 1.<sup>1</sup>

Petitioners Parkwood Resources, Inc. and Rosebud Mining Co. (“Rosebud”) filed identical modification petitions for the following Rosebud mines: Cherry Tree; Twin Rocks; Dutch Run; Tracy Lynne; Tom’s Run; Penfield; Mine 78; Lowry; Logansport; Little Toby; Heilwood; Darmac No. 2; Clementine; Beaver Valley; and Brush Valley. *See id.* at Stip. 17. These mines are located in Pennsylvania.

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<sup>1</sup> References to my exhibits are designated “ALJ.” ALJ 1 contains the parties’ stipulations, which are also referenced as “Stip.” References to the joint exhibits are designated “JE.” References to MSHA’s and Rosebud’s exhibits are designated respectively “G.” and “RB.” References to the transcript of the hearings in September 2011 are designated “Sept. Tr.” References to the transcript of the hearings in August 2012 are designated “Aug. Tr.” References to transcript of the hearing in November 2012 are designated “Nov. Tr.” The designation “(E)” after the name of a witness indicates that the witness was permitted to testify as an expert. The educational backgrounds and qualifications of those expert witnesses are contained at Appendices I and II. Finally, a Glossary of mining terms, to which the parties stipulated, is also contained at the end of this Decision and Order.

Rosebud identified the following electronic equipment that would be used in return air and in or inby the last open crosscut. The petitions are not limited to such equipment but are limited to similar and equivalent electronic equipment. They are as follows:

1. A 6 volt Topcon DT209L theodolite
2. A 6 volt Topcon DT104L theodolite
3. A 7.2 volt Topcon GTS-213 total station
4. A 7.2 volt Topcon GPS-223 total station
5. A 7.2 volt Topcon GPT-3003W total station
6. A 7.2 volt Topcon GPT-3103W total station

ALJ 1 at Stip. 18.

For reasons stated below, I find convincing justification to approve Rosebud’s petitions. Specifically, I find that the proposed modification, when subject to the conditions contained in my Order, will at all times guarantee no less than the same measure of protection afforded by the mandatory safety standard. Also, taking into account both the advantages and disadvantages of the alternative method, including effects unrelated to the goals of the original standard, the modification will achieve a net gain, or at least equivalence, in overall mine safety. As will be seen below, I base my decision on the record before me, which establishes that the mechanical surveying equipment—endorsed by the MSHA for use in or inby the last open crosscut and in return air—is obsolete, far less accurate than electronic surveying equipment and, above all, not realistically available on the commercial market except in used condition.

## **FINDINGS OF FACT CONCLUSIONS OF LAW**

### **Findings of Fact**

#### **The Secretary’s Mandatory Permissibility Standards**

1. The Secretary of Labor’s mandatory permissibility standards require the use of permissible electronic equipment in or inby the last open crosscut and in the return airway. 30 C.F.R. §§ 75.500(d) and 75.507-1(a). “Permissible” means approved by MSHA for preventing mine explosions or fires. Aug. Tr. 247; Sept. Tr. 270. “Permissible” equipment includes equipment that is “intrinsically safe,” *i.e.*, that is incapable of releasing enough electrical or thermal energy, under normal or abnormal conditions, to cause an ignition of a flammable mixture of methane. Aug. Tr. 248. MSHA determines if a device is intrinsically safe “[t]hrough testing and evaluation, using [its] intrinsic safety criteria [known as] ACRI2001.” Sept. Tr. 274.<sup>2</sup>

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<sup>2</sup> Chad Huntley (E) explained the relationship between permissibility and intrinsic safety as follows:

Permissibility is a more general term. That’s what all the electrical equipment we approve for fire and explosion hazards fall[s] under. [Under the Regulations,] the three main . . . types of protection used [for electrical equipment] are intrinsic safety, explosion-proof, and encapsulation.

Aug. Tr. 248; *see also* Glossary at paragraphs 25-27, 29.

2. MSHA's Approval and Certification Center ("ACC") approves electrical equipment as permissible. Aug. Tr. 246-48. An applicant seeking approval must submit drawings describing the product. *Id.* at 249-53. Following successful completion of the approval process, MSHA issues "an approval plate design that [applicants] can affix to their equipment, [which indicates] that it's safe to use underground in the inby locations and returns." Aug. Tr. 248. ACC approval is internationally recognized. *Id.* at 249.
3. Another vehicle for securing MSHA's permission to use non-approved equipment is through the Agency's experimental permit program. Sept. Tr. 314-16 (discussing 30 C.F.R. § 18.82). Under that program, applicants may apply to MSHA for a permit to use specific devices for a period of six months. *Id.* at 314. These permits are often renewed so that the equipment may stay in use at the mine. *Id.* at 314-15.
4. "MSHA has granted a number of petitions for modification of 30 C.F.R. § 75.500(b) and 75.1002-1a for the use of low voltage or battery operated nonpermissible equipment such as laptop computers, oscilloscopes, vibration analysis machines, cable fault detectors, infrared temperature devices, voltage current and power measurement devices, pressure and flow measurement devices, signal analyzer devices, ultrasonic thickness gauges, electronic component tests and electronic vibrations inby the last open crosscut." ALJ 1 at Stip. 64.

#### Safety

5. As stated during the hearing, I accept the fact that an underground coal mine is a rugged environment. Aug. Tr. 335. It's a dangerous place to work; accidents due to an unplanned event or a series of unplanned events occur in underground coal mines. Some accidents result in multiple miner fatalities.

#### *Manufacturer's warnings*

6. MSHA argues that electronic surveying equipment is less safe than mechanical surveying equipment, in part because the electrical equipment at issue "carries manufacturer warnings either that the equipment must not be used in an explosive or dusty environment or that it must not be used in an underground coal mine, as an explosion could result." MSHA's closing brief at 13.
  - a. The equipment in question does in fact carry such warnings. G. 3 at 2 ("Safety Cautions; Warning; May ignite explosively. Never use an instrument near flammable gas, liquid matter, and do not use in a coal mine.").
7. The deposition of Topcon's global project manager, Raymond Kerwin, was taken for use at trial. *See* Aug. Tr. 164. Mr. Kerwin testified that he is in charge of product planning, and that he studied civil engineering and ended up with engineering management. G. II-7 at 23. He has been with Topcon off and on since 1989. *Id.* He also worked as a surveyor and engineer for five or six years. *Id.* He had no idea how or why the above-discussed warning was included in Topcon's manual. *Id.* at 31-32. He was aware that Topcon products were sold to mining companies. *Id.* at 30. He also explained that some of the manuals were written 10 or

15 years ago. *Id.* at 51. Therefore, I find that these warnings are not necessarily probative, as neither MSHA nor Mr. Kerwin was able to provide a rational basis for their inclusion.

*Risk of explosion due to methane exposure considering Conditions of Use*<sup>3</sup>

8. Underground coal mines may be assumed to liberate methane. *See* Sept. Tr. 98. In this case, there is potential for additional liberation of methane, “probably . . . from the coal face and ribs themselves, perhaps a little bit out of the floor [or] the roof.” *Id.* at 191.
  - a. Chad Huntley (E) and Noah Ryder (E) agree that, for an explosion, you would need an explosive mixture of methane and air. Aug. Tr. 108, 370. Methane is explosive between a range of 5 and 15 percent concentration. Aug. Tr. 108; Sept. Tr. 271. Mr. Huntley (E) agreed that methane ignites more easily at 8.3 percent concentration than at 5 percent or 15 percent. Aug. Tr. 364.<sup>4</sup>
9. The proposed Conditions of Use address the issue of methane exposure. Specifically, Rosebud’s Petitions for Modification state that:

Non-permissible surveying equipment shall not be used if methane is detected in concentrations at or above 1.0 percent methane. When 1.0 percent or more of methane is detected while the non-permissible surveying equipment is being used, the equipment shall be de-energized immediately and the non-permissible electronic equipment withdrawn outby the last open crosscut.

ALJ 2 at 6c.<sup>5</sup>

10. Mr. Huntley (E) testified that the possibility that both the methane detector would fail and the electronic surveying equipment would ignite at the same time is one in ten thousand. Aug. Tr. 330.<sup>6</sup>

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<sup>3</sup> Each time that the term “Conditions of Use” is mentioned, I am referring to the conditions set forth in the petitions for modification. *See* ALJ 2. However, I also note that, in my Order section, I have added to, and revised, those conditions.

<sup>4</sup> In more detail, Mr. Ryder (E) explained that:

[F]or ignition to occur with any fuel you have to have three components. You have to have sufficient air, you have to have . . . sufficient fuel, and you have to have an ignition source. So those three components are needed for ignition. So for methane there is a range of flammability that’s roughly from 5 percent to 15 percent, and that’s the concentration in air. So you’d have to have methane gas somewhere within that concentration in the presence of an ignition source that was sufficiently strong for ignition to occur.

Aug. Tr. 108.

<sup>5</sup> I note that MSHA previously entered into a Consent Agreement in the matter of Twenty Mile Coal Company (Foidel Creek Mine). RB. 7. In its agreement, which was approved by ALJ Daniel Sarno, MSHA consented to the use of battery-powered non-permissible surveying equipment inby the last open crosscut and in return air when equivalent permissible equipment did not exist. *Id.* The conditions set forth in that Consent Order are similar to the Conditions of Use contained herein.

11. Considering paragraphs 8-10, *supra*, I find that the use of the electronic surveying equipment, when subject to the Conditions of Use, does not pose a significant risk of ignition due to methane exposure.<sup>7</sup>

*Risk of ignition/spark absent explosive concentration of methane*

12. Mechanical surveying equipment poses no risk of ignition. Sept. Tr. 310.

13. Coal dust is combustible. Aug. Tr. 307. An ignition of coal dust can result in a mine fire, regardless of whether an explosive concentration of methane is present. *Id.* at 370. “There have been incidents where coal dust has resulted in explosion.” *Id.* at 172.

14. I find that report and opinion of Mr. Huntley (E) are entitled to substantial weight, considering his experience and educational background. *See* Appendix I. His detailed and credible findings, among other things, establish that the petitioned surveying equipment presents an ignition hazard that mechanical surveying equipment does not; in other words, the electrical equipment is not intrinsically safe. However, as Rosebud’s counsel has argued, “If it were intrinsically safe . . . it would not be an issue, and [Rosebud] would not have filed a petition for modification.” Aug. Tr. 255. Rosebud has *conceded* this fact; therefore, Mr. Huntley’s conclusion does not advance MSHA’s position. *See id.* at 254-55, 279.

15. While electronic surveying equipment is not “permissible,” as that term is defined by MSHA, or intrinsically safe, it has a low potential for ignition.

- a. Specifically, “solid-state” electronic equipment lacks physical switches, “so there’s a lot less probability of sparking.” Aug. Tr. 88; *see also* Glossary at paragraph 20. Also, electronic surveying equipment has a weak potential for ignition, as “there’s really no heat-generating portion” and “the voltage that’s associated with the batteries is similar to the voltages that you would find for a number of the other devices that are [similarly characterized].” Aug. Tr. 118-19.

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<sup>6</sup> Elsewhere, Mr. Huntley (E) expressed a concern that, under certain conditions, the electronic surveying equipment could overheat, glow red and ignite methane. Aug. Tr. 285-86. However, later in his testimony, he agreed that the equipment had a thermal breaker for de-energizing the battery pack at a temperature below the ignition temperature for methane. *Id.* at 366. Therefore, the product’s design addresses this problem. Additionally, I note that Michael Groff (E), who used electronic surveying equipment at least five days a week during the time he worked as a surveyor, testified that it does not get hot when it’s running. Sept. Tr. 124-25. Also, he has never seen a spark or arc when removing the battery. *Id.* at 126.

<sup>7</sup> MSHA argues that “methane detection is already part of mandatory underground miner safety; [t]hus, the proposal that a qualified person continuously monitor for methane immediately before and during the use of non-permissible surveying equipment adds nothing to miner safety.” MSHA’s closing brief at 13 (internal citations omitted). MSHA also argues that Rosebud has not accounted for the possibility of human error or of the methane detector malfunctioning. *Id.* However, I find this argument circular and unpersuasive. Firstly, whether or not methane detection is already required does not change whether proper methane detection can prevent an explosion resulting from the use of non-permissible equipment. Additionally, as stated above, Mr. Huntley (E) testified that the probability of ignition occurring at the same time as methane detector failure is very low.

- b. Coal dust must be in suspension to ignite. *Id.* at 123. To attain its lower explosive limit, the concentration of coal dust in suspension would have to be “sufficiently thick . . . that you couldn’t see a light bulb that was turned on about four feet in front of you.” *Id.* at 204.<sup>8</sup>
- c. When Mr. Ryder (E) performed a swab test on the Topcon machine, “to get some idea of the ability of dust to accumulate inside the unit,” the Topcon instrument “didn’t appear to have any dust that was readily visible.” *Id.* at 104-05. Mr. Ryder (E) also testified that the “potential for a coal dust ignition inside one of these electronic surveying devices” is “nonexistent.” *Id.* at 123.<sup>9</sup>

16. Mr. Huntley (E) testified that a break in the circuit, “either disconnecting the battery pack or [breaking] an internal conductor”, could cause a spark. Aug. Tr. 263. Mr. Ryder (E) agreed that there would be no sparking activity unless the battery was physically disconnected or an inside component broke. *Id.* at 121.

- a. The proposed Conditions of Use state that “[b]atteries contained in the surveying equipment must be ‘changed out’ or ‘charged’ in fresh air outby the last open crosscut.” ALJ 2 at 6e. My Order changes this Condition of Use and requires that “batteries must be changed out or charged in fresh air outside the mine.” *See* Order at paragraph 6. I am also Ordering Rosebud to modernize its equipment, a requirement that will mitigate the risk of mishap. *See id.* at paragraph 10.

17. Considering paragraphs 12-16, *supra*, I find that the Conditions of Use sufficiently mitigate any risk of battery spark or internal breakage, and that the risk of coal dust ignition is practically non-existent.

*Safety considering no reasonable alternative*

18. Mr. Huntley (E) acknowledged that MSHA has granted a number of petitions for Modification for the use of equipment that is not intrinsically safe; however, those devices are being used because there is no alternative. Aug. Tr. 299-300 (emphasis added); *see also* paragraph 4, *supra*.

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<sup>8</sup> Another proposed Condition of Use provides that “[n]on-permissible surveying equipment shall not be used where float coal dust is in suspension.” ALJ 2 at 6d.

<sup>9</sup> Specifically, Mr. Ryder (E) explained:

You’d have to have sufficient coal dust built up internal to the machine and in suspension, as well as in the presence of a suitable ignition source, which would have to be about . . . twice the order typically of what you would need for methane. So, if you had dust collect inside, it’s typically going to collect and settle on a component. So, if it settled there, it’s not in suspension and won’t ignite.

Aug. Tr. 123.

19. Mr. Ryder (E) compared the electronic surveying equipment to a range of equipment that had been approved by MSHA, including laptop computers, oscilloscopes, and other types of digital or electronic testing equipment. Aug. Tr. 116; RB. 30 at 16-19. He concluded that the electronic surveying equipment poses less of a hazard than most of the equipment that MSHA has approved via petition. Aug. Tr. 120. Additionally, “the batteries, if you compare voltages, are similar or less than the voltages that are found in virtually every laptop computer . . . and other equipment.” *Id.*<sup>10</sup>

- a. For reasons explained below, I find that there is also no viable alternative to the use of electronic surveying equipment. *See* paragraph 36, *infra*. Therefore, these comparisons are relevant.<sup>11</sup>

### Surveying

20. Modern surveying equipment includes theodolites and total stations. *See* Glossary at paragraphs 1-3. Theodolites measure horizontal and usually also vertical angles; total stations measure slope distances. *Id.* When theodolites are used, surveyors may use steel tapes to measure distances. *See* Nov. Tr. 442-43. When calculating distance using steel tapes, surveyors adjust for the sag in the tapes. *Id.* at 443. However, the steel tapes only go out 300’. *Id.* at 444. Surveyors usually measure distances over 300’ with an electronic distance meter. *Id.*; *see also* Sept. Tr. 54.

21. Rosebud uses electronic theodolites, along with steel tapes or “chains,” and electronic total stations at its mines. Sept. Tr. 118-19. The total station uses electronic distance measuring; it “shoots [a] beam of light [that] bounces back with a prism and gives” the surveyor his

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<sup>10</sup> MSHA argues the testimony of Mr. Ryder (E) “that the relative risk of the proper operation of a total station was less than, or equal to, other ‘allowable pieces of equipment’” is problematic because “MSHA modified the application of certain standards for these ‘other pieces of equipment’ in specific circumstances that brooked no practical alternatives.” MSHA’s closing brief at 17-18. MSHA tries to distinguish the present case, stating that “there are commercially available alternatives that would allow Rosebud to comply with the mandatory safety standards.” *Id.* at 18. However, for reasons explained throughout this Decision and Order, I believe that there are no viable commercial alternatives to electronic surveying equipment. Therefore, this argument is not persuasive.

<sup>11</sup> Mr. Cobaugh (E) explained that MSHA permits the use of cutting torches in any area of the mine as long as the methane level is less than one percent:

- Q. Okay. Are there any activities, besides operation of equipment, that MSHA permits any place in the mine, as long as you’re under one percent?
- A. Cutting, using cutting torches.
- Q. Okay. What do you mean by cutting torches?
- A. Well, it is a torch that is attached to a flammable gas that you strike [and] make an open flame. You can cut metal.
- Q. Can I do that in the returns?
- A. Yes, you can.
- Q. Can I do that [inby] the last open crosscut?
- A. Yes, you can.

Sept. Tr. 70-71; *see also* Glossary at paragraph 9. Therefore, if an open flame is permitted in these areas out of necessity, it seems that the use of electronic equipment, which poses a far lesser risk, should also be permitted.

distance. *Id.* at 119. When a surveyor runs a check survey, he wants the longer shots, which will minimize error. *Id.* That is why electronic measurements are used. *Id.*

### Surveying in Underground Mining

22. Mine operators in Pennsylvania are required to submit final mine maps to both MSHA and the state regulatory agency, DEP. Sept. Tr. 44, 82. The Pennsylvania requires mine maps to have a minimum closure error of 1 foot-in-10,000 feet for any given closed-loop survey. *Id.* at 145, 163, 351; *see also* Nov. Tr. 457-58; R. 8; Glossary at paragraphs 4, 18.
23. The majority of underground surveying can be done outside the return and outby the last open crosscut. Nov. Tr. 459. When surveying occurs in or inby the last open crosscut, it most often involves “putting in those spads that provide direction to the miners.” Sept. Tr. 361. This work requires less accuracy than 1 foot-in-10,000 feet. *See id.* at 352.
24. Surveys conducted with mechanical surveying equipment *can* meet Pennsylvania’s 1 foot-in-10,000 feet accuracy requirement. Sept. Tr. 145. However, the required level of accuracy is not always attainable with mechanical surveying instruments. *See id.* at 380; ALJ 1 at Stip. 21. Also, mechanical surveying equipment requires “short shots multiple set ups” and may take up to four set ups to actually get that closure. Sept. Tr. 145; *see also id.* at 463; paragraph 44, *infra*.

### Availability of Mechanical Surveying Equipment

25. MSHA’s position is that although mechanical surveying equipment is less readily available in the marketplace than electronic equipment, it is nevertheless available. *See* MSHA’s closing brief at 19 n. 6 (“the evidence belies Rosebud’s argument that mechanical surveying equipment and parts for that equipment are truly unavailable”). “For example, it is undisputed that Rosebud’s surveying contractor [Applegate] was able to buy, and use, a refurbished mechanical unit during the course of this proceeding.” *Id.* (citing ALJ 1 at Stip. 21); *see also* Sept. Tr. 63-64. This is true; however, accuracy was considerably less than a GTS-213 electronic total station. *See* ALJ 1 at Stip. 21.
26. The evidence is overwhelming that the only available mechanical surveying equipment is in used condition.<sup>12</sup> For example:
  - a. MSHA’s attorney, referring to mechanical surveying equipment as the “old equipment,” stated that it “may well be true [that mechanical equipment is no longer being manufactured]. However, there is a market for used equipment.” Sept. Tr. 24;
  - b. Michael Groff (E) testified that you cannot go out and buy a new mechanical transit. *Id.* at 123;

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<sup>12</sup> The subject of Qualitest mechanical surveying equipment will be addressed later in this Decision and Order.

- c. Randy Caramellino agreed that mechanical surveying equipment is not currently manufactured. *Id.* at 379. He personally hasn't shopped for mechanical equipment, but he is aware of websites that sell remainder or refurbished equipment. *Id.* at 363;
- d. John Arrington testified that "MSHA feels that mechanical surveying equipment is still available, [because it] can be refurbished back to new condition . . . ." *Id.* at 414;
- e. Dave Cobaugh (E) testified that mechanical transits are no longer manufactured, and he didn't want to purchase used equipment that was bought on the second-hand market. Aug. Tr. 214. For the most part, used equipment cannot be maintained or repaired, as "repair parts are not available." *Id.* Scavenged parts would not be up to his standards. *Id.*
- f. Gary Hartsog (E) explained that a woman in his office "regularly goes on eBay to look for used equipment . . . because that's the only place, other than garage sales, that [he knows] you can get it." Aug. Tr. 230. He tries "to pick up a piece now and again if it looks like a good piece [b]ut the availability of the equipment is spotty and questionable, and the availability of parts for calibration and repair is almost nonexistent." *Id.*

Modern-Day Surveyors Have Not Been Trained Using Mechanical Surveying Equipment and Do Not Know How to Use It

27. The record is uncontradicted that modern-day surveyors are not trained in mechanical surveying equipment and do not know how to use it. For example:
- a. Mr. Cobaugh (E) testified if one were to take a surveying class today, he would not be taught on a mechanical transit because they are not available. Sept. Tr. 63. Rather, "[a]ll training would be on the electronic surveying equipment." *Id.* He later testified that he doesn't "even have surveyors that know how to use [mechanical equipment]." Aug. Tr. 216.
  - b. Mr. Groff (E) was trained using electronic surveying equipment; mechanical surveying equipment wasn't even mentioned in his surveying course. Sept. Tr. 110;
  - c. Mr. Hartsog (E) has not hired anyone with mechanical surveying equipment experience in 12-15 years. *Id.* at 171.
28. I find, therefore, that modern-day surveyors are not trained using mechanical surveying equipment and do not know how to use it.

Qualitest

29. John Arrington testified that brand-new mechanical theodolites were on the market. Aug. Tr. 236-38. This product, which he found for sale on the Internet, was manufactured by a company called Qualitest. *Id.* at 240. Based on the product manual, it appeared that this

instrument was about as accurate as Topcon's. *Id.* at 239-40. Rosebud was given a chance to investigate whether Qualitest was a reliable alternative to the electronic surveying equipment. *See id.* at Tr. 396-402.

30. Mr. Hartsog (E) inspected Qualitest's equipment on two occasions. Nov. Tr. 413-15. The first time he looked at the instrument, he "noted that the instrument did not have any patent numbers [and] the serial number was a glue-on patch." *Id.* at 416-17. Also, the "dot on top of the scope to set up underneath a plum bob . . . was painted on with a paint dot instead of machined in." *Id.* at 417. Finally, "the bull's eye leveling bubble of the [tribrach] was considerably off from the vial leveling bubble that's on the body of the instrument." *Id.*; *see also* Glossary at paragraph 41. Based on his two visits, he came to the conclusion "that it was not an instrument that [he was] interested in purchasing . . . and using." Nov. Tr. 419. Specifically:

[T]he optics and the adjustments were not what I'd call terribly accurate. They weren't as precise and tight as I would expect. One of the tests I did in closing the horizon . . . was off by 12 to 20 seconds or so [and] that's unacceptable for an instrument that's straight out of the box on a beautiful sunny day, no heat waves, [and] what I would call pristine conditions.

*Id.* at 420. He also explained that "[t]he [tribrach] is a completely different construction from what we use in the United States. It would not be interchangeable with other readily available equipment." *Id.* at 421. Finally, "[t]he angle reading mechanism had a little more estimation to it that [he] was comfortable with." *Id.*

31. Mr. Hartsog (E) came to the conclusion that the Qualitest mechanical transit was probably reversed-engineered. *Id.*; *see also* Glossary at 43. He "made [this] assumption, based on what [he] was seeing and its similarity with other instruments like this." Nov. Tr. 421. He explained that:

[S]omeone might want to reverse engineer something like this, they would buy an instrument or acquire an instrument, take it apart and try to measure it, try to duplicate its parts, and then put it back together out of their made parts, using let's call it the original design as a go-by. By doing that, you leave behind a lot of the tolerances and the experience that goes into the original making of the instrument.

*Id.* at 421-22.

32. The deposition of Arash Behzadi, owner and president of Qualitest, USA, was taken for use at trial. RB. 32 at 4-6. The manufacturer of Qualitest equipment is in China. *Id.* at 13-14. There have been no sales of a Theo 2 instrument in the United States. *Id.* at 14-15. Qualitest just added a range of theodolites from the Chinese company to explore opportunities in the marketplace. *Id.* at 16. Although Qualitest added the product line to its website 4-5 years ago, it hasn't received a single inquiry in the United States. *Id.* at 16-17. Mr. Behzadi could find only two invoices for the product; one was sold in April 2012 to the United Arab Emirates and one went to Haiti in 2008. *Id.* at 20. Mr. Behzadi agreed that the product's

operation manual had been translated from Chinese to English, and that the English version is unclear. *Id.* at 24. Mr. Behzadi believes that the Chinese manufacturer sells a lot of these instruments worldwide, but he “think[s] they sell more of the electronic type.” *Id.* at 27-28.

#### Credibility of Witness Gary Hartsog

33. MSHA argues that no weight should be given the report and testimony of Mr. Hartsog (E) as to whether Qualitest is of acceptable quality. MSHA’s closing brief at 20. This is because Mr. Hartsog (E) acknowledged in August 2011, near the time of the first hearing in this matter, that he had filed a Mine Act modification petition on behalf of his firm, Alpha Engineering. *Id.* MSHA argues that, “[I]ike Rosebud’s petitions, [Mr. Hartsog’s] petition involves the use of non-permissible electronic surveying equipment.” *Id.* Therefore, MSHA concludes that his “affirmative interest in the outcome of this proceeding calls into doubt the accuracy and truth of his report and testimony.” *Id.*
34. I do not agree. Mr. Hartsog (E) testified before me several times over a long period of time. Based upon his demeanor, the consistency of his testimony with that of many other witnesses on the subjects of mine safety, accuracy of electronic equipment over mechanical equipment, whether surveyors are trained in the use of mechanical equipment, and the unavailability of mechanical surveying equipment, I find Mr. Hartsog (E) to be a highly credible witness, and I have no doubts what-so-ever that he is honest and worthy of belief.
35. Furthermore, regarding his testimony on the acceptability of Qualitest, there is no contrary evidence. No one from MSHA tested the equipment.
36. Considering paragraphs 29-35, *supra*, I find that Qualitest mechanical surveying equipment cannot be accepted as a viable alternative to Topcon. The opinion of Mr. Hartsog (E) is uncontradicted. His testimony regarding the availability of Qualitest in the United States is corroborated by Mr. Behzadi, who explained that Qualitest’s mechanical theodolites have never been sold in the United States. I also find that the only available mechanical surveying equipment is in used condition, and the availability of parts for calibration and repair is almost non-existent. *See* paragraph 26 e. and f., *supra*. Therefore, there is no viable alternative to electronic surveying equipment.

#### Map Making and the Need for Accuracy in Surveying in Underground Coal Mines

37. “Mine operators are required to prepare accurate maps of the underground workings of a mine.” ALJ 1 at Stip. 13. “[B]oth Pennsylvania and Federal law require that the mine map be prepared and/or certified by a Registered Professional Engineer or Registered Professional Surveyor for the Commonwealth of Pennsylvania . . . to ensure that the map is prepared to the standards of the profession and industry and it meets the requirements of the laws and regulations.” Glossary at paragraph 8.
38. In order to prepare accurate maps, surveying of the underground workings is required on a regular basis. *Id.*

39. The purpose of underground mapmaking is to “graphically represent the position, the extent, the boundaries and the orientation of the mine workings.” Glossary at paragraph 7. “Mine maps are the basis for safe mine planning, ventilation, operations, emergency operations, and ground control, etc.” *Id.* Accurate surveying is critical to the safe operation of the mine. Sept. Tr. 41-44, 384.
40. Accurate surveying prevents intersection of abandoned mines, which may be flooded. *Id.* at 41-42. Intersecting a flooded mine “[could] be obviously a mine disaster from a safety standpoint, but also from an environmental standpoint.” *Id.* Accurate surveying is also important in active mines to avoid sealed areas and to prevent crossing the permit boundary, for example. *Id.* at 43-49.
41. Accurate surveying also prevents intersecting gas wells, which would be hazardous. *See id.* at 38-40; Nov. Tr. 522-23; *see also* Glossary at paragraph 12.
42. Surveying must be of sufficient accuracy to comply with Section 224 of Pennsylvania’s Bituminous Coal Mine Safety Act. ALJ 1 at Stip. 14; *see also* paragraph 22, *supra*. These provisions were adopted after the incident at the Quecreek Mine. Sept. Tr. 143-45.<sup>13</sup>
43. Electronic surveying equipment provides a digital readout of angles; by comparison, a surveyor must interpolate the angle measurements when using mechanical equipment. *Id.* at 53, 64-65. Electronic devices also use lasers mounted within the equipment to provide an accurate measurement of distances. *See id.* at 53-54. This method is more accurate than the mechanical alternative. *Id.* at 54.
44. Electronic surveying equipment is 8-10 times more accurate than mechanical surveying equipment. *See* ALJ 1 at Stip. 21; Sept. Tr. 379-80. The use of electronic surveying equipment also minimizes surveyors’ exposure to hazardous conditions in the mine. Sept. Tr. 76, 177-78.<sup>14</sup>

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<sup>13</sup> “[O]n July 24, 2002, a non-fatal entrapment accident occurred at Quecreek #1 Mine when water broke through the working face from [an] adjacent abandoned . . . mine. MSHA determined that the primary cause of the water inundation was the use of an undated, uncertified mine map of the abandoned . . . mine that did not show the complete and final mine workings.” Glossary at paragraph 21. Brad Cole (E) explained that if Quecreek hadn’t been accurately surveyed, a successful rescue may not have occurred. Sept. Tr. 157. As it was, “they knew where to drill. They looked at a map, they put an X on the map and said, ‘We need to drill a hole here to rescue these men.’” *Id.* Quecreek mine surveyors were using Topcon instruments for their daily surveys. *Id.* at 158.

<sup>14</sup> The testimony of Mr. Groff (E) on cross-examination reinforces this finding. Specifically, he testified as follows:

Q. And if you just look in the return, would you agree that with multiple attempts, you could get the minimum accuracy required in Pennsylvania with mechanical transit, most likely?  
 A. I’ve been told. Now, another point I’d like to make is multiple attempts, I’ve got 14 surveyors who work for me. If you send them back in the return multiple times, why would you subject a guy to those hazards multiple times when you can do it once?

Sept. Tr. 463 (emphasis added).

This sentiment was echoed by Mr. Hartsog (E), who testified that the use of electronic equipment for daily work is advantageous because “[i]f we can go underground and do a particular section in two and a half hours

45. Electronic surveying instruments were introduced to the industry by the 1980s. Sept. Tr. 67-68; *see also* Aug. Tr. 214. Mechanical surveying equipment does not meet contemporary surveying standards. *See* Sept. Tr. 82-83; Aug. Tr. 389-90. Use of electronic surveying equipment is the standard in the industry. Sept. Tr. 66-67; 147-48; Aug. Tr. 389-90.

#### MSHA Has Tacitly Approved the Use of Electronic Surveying Equipment

46. Rosebud has been using electronic surveying equipment in all areas of the mine for more than 20 years. Aug. Tr. 216. It is used between the face of the mine and the last crosscut (inby) as well as in return air. *Id.* at 217. Since the day the mines opened, electronic surveying equipment has been used exclusively in all of Rosebud's 22 mines. *Id.* at 217-18.
47. Use of electronic surveying equipment for the past 20 years was the subject of a conference call with the attorneys on February 8, 2013. The attorneys agreed that the equipment has been used for 20 years and that MSHA has not issued citations. *See* transcript of the February 8, 2013 conference call at 5-6.
48. As such, I find that MSHA has tacitly approved the use of this equipment.<sup>15</sup>

#### Conclusions of Law

49. As explained above, the Regulations require that “[a]ll electric equipment, other than power-connection points, used in return air outby the last open crosscut in any coal mine shall be permissible except as provided in paragraphs (b) and (c) of this section.” 30 C.F.R. § 75.507-1(a). Additionally “[a]ll other electric face equipment which is taken into or used inby the last crosscut of any coal mine, except a coal mine referred to in § 75.501, which has not been classified under any provision of law as a gassy mine prior to March 30, 1970, shall be permissible.” 30 C.F.R. § 75.500(d).
50. Under Section 101(c) of the Act:

The Secretary may modify the application of any mandatory safety standard to a coal or other mine if the Secretary determines that an alternative method of achieving the result of such standard exists which will at all times guarantee no less than the same measure of protection afforded the miners of such mine by such standard, or that the application of such standard to such mine will result in a diminution of safety to the miners in such mine.”<sup>16</sup>

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instead of five or six,” exposure time is cut in half. Sept. Tr. 176-78. This minimizes the risk of exposure to moving equipment, bad cable splices, electrocution, and rock falls, among other “normal hazards of mining.” *Id.* at 178.

<sup>15</sup> MSHA actually allowed use of a Topcon total station to locate evidence during the Sago investigation. *See* Glossary at paragraph 22; Sept. Tr. 174-75.

<sup>16</sup> *See also* 30 C.F.R. § 44.4(a) (“A petition for modification of application of a mandatory safety standard may be granted upon a determination that (1) An alternative method of achieving the result of the standard exists that will at all times guarantee no less than the same measure of protection afforded by the standard, or (2) Application of the

51. Section 101(c) has been interpreted as setting forth a two-prong test in evaluating petitions for modification:

As interpreted by the Assistant Secretary, this provision calls for a two-step analysis of any proposed modification. The first step, corresponding to section 101(c)'s "result" clause, requires the Assistant Secretary to find that the proposed alternative method will promote the same safety goals as the original standard with no less than the same degree of success. The second step, keyed to section 101(c)'s "same measure of protection" requirement, contemplates a more global inquiry into the net safety effect of the modification. Taking into account both advantages and disadvantages of the alternative method, including effects unrelated to the goals of the original standard, the Assistant Secretary must consider how the modification will affect *overall* mine safety.

*UMWA, Intern. Union v. MSHA*, 928 F. 2d 1200, 1202 (D.C. Cir. 1991); *see also Intern. Union, UMW v. FMSHA*, 920 F. 2d 960, 963 (D.C. Cir. 1990)(noting that, "[i]n step two, the Assistant Secretary [must determine] whether the modification achieves a *net gain in mine safety (or at least equivalence)*, taking all effects into account.")(emphasis mine).

52. This standard does not require the operator to show that the alternative method "utilize[s] the same *method* of protection provided for in the standard." *Emerald Mines Co. v. UMWA*, 83-MSA-17, decision of Ass't Secretary O'Neal, at 8 (Sept. 22, 1989), *aff'd* in part and *rem.* in part, 920 F.2d 960 (D.C. Cir. 1990)(emphasis mine).

53. I find that non-permissible electronic surveying equipment, when used in conjunction with the Conditions of Use contained in my Order, will "promote the same safety goals as the original standard with no less than the same degree of success."

a. MSHA has presented no credible basis for Topcon's manufacturer warnings stating that the electronic surveying equipment at issue cannot be used in an underground coal mine; in fact, Topcon's own representative, whose opinion is entitled to considerable weight, had no idea why the warnings were included. *See* paragraphs 6 and 7, *supra*. Therefore, I find that these warnings have little probative value.

b. MSHA also argues that "Rosebud places undue weight on the argument that mechanical surveying equipment is unavailable" considering that "the appropriate cost/benefit analysis relates to miner safety, not operator convenience." MSHA's closing brief at 19.

i. While I agree with this general statement, MSHA has granted modifications where, as in this case, no viable alternative is available. *See* paragraphs 4, 18, *supra*. Therefore, operator convenience is not the only issue at play.

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standard will result in a diminution of safety to the miners.").

1. Furthermore, I give weight to the uncontradicted testimony of Mr. Ryder (E) that the electronic surveying equipment at issue in this case poses less of a hazard than most of the equipment that MSHA has approved via petition for modification. *See* paragraph 19, *supra*.
- c. Considering my findings at paragraphs 8-10 and 12-16, *supra*, I find that the proposed electronic surveying equipment, when subject to the Conditions of Use, does not pose a meaningful risk of explosion from methane exposure, dust ignition, battery spark, or internal breakage.<sup>17</sup>
54. I find that granting Rosebud's petitions for modification would engender a net gain in miner safety.
- a. I agree with MSHA that mechanical surveying equipment can meet Pennsylvania's accuracy requirement. *See* paragraph 24, *supra*. I also acknowledge that, when surveying occurs in or inby the last open crosscut, it most often involves putting in the spads, work that requires less accuracy than 1 foot-in-10,000 feet. *See* paragraph 23, *supra*.
    - i. However, the use of mechanical equipment may require multiple set ups, increasing the length of surveyors' exposure to hazardous conditions. *See* paragraphs 24, 44, *supra*.
  - b. As explained above, used mechanical parts cannot be reliably calibrated or repaired. *See* paragraph 26 e. and f., *supra*. Additionally, surveyors are not currently trained in their use. *See* paragraph 27, *supra*. Therefore, application of the standard is less safe than application of the modification, as it is unsafe to use equipment that is not calibrated or repaired properly, or that surveyors have not been trained to use.
  - c. Electronic surveying equipment is 8-10 times more accurate than mechanical equipment. *See* paragraph 44, *supra*. For reasons set forth above, greater accuracy leads to increased safety in the mines. *See generally* paragraphs 37-45, *supra*.
    - i. Furthermore, the use of electronic surveying equipment at Quecreek enabled an effective rescue of the trapped miners. *See* paragraph 42 n. 13, *supra*.

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<sup>17</sup> MSHA objects to the fact that Mr. Ryder (E) performed "dunk" testing to determine the instrument's resistance to gas entry, as "Mr. Ryder admitted that no scientific body recognizes that water ingress testing methods apply to gas, or methane, ingress, or to intrinsic safety [and] [w]hen asked [by MSHA's counsel] whether gas was, in fact, much thinner than water, Mr. Ryder conceded that they have different properties." MSHA's closing brief at 15-16 (internal citations omitted). However, even if the "dunk" test does not adequately measure methane ingress, I believe that it is probative as to the condition of the seals. *See e.g.*, Aug. Tr. 128, 165-66. Furthermore, as set forth in my Order, I am requiring Respondent to phase-out aging equipment, which will ameliorate the problem of degraded seals. *See* Order at paragraph 10.

## Conclusion

For the reasons set forth above, I find that the electronic surveying equipment considered in these petitions for modification meets the two-part test under Section 101(c), when used subject to the Conditions of Use contained in this Order. I also find that there is no viable alternative to this equipment, whose use MSHA has tacitly approved. Therefore, Rosebud has met its burden in establishing grounds for modification.

## Order

The above considered, it is Ordered that Rosebud's Petitions for Modification are hereby Granted subject to the conditions set out in paragraphs 1 through 12 below.<sup>18</sup> Specifically, Rosebud may use the following surveying equipment in return airways and inby the last open crosscut and similar low voltage surveying equipment:

1. A 6 volt Topcon DT209L theodolite;
2. A 6 volt Topcon DT104L theodolite;
3. A 7.2 volt Topcon GTS-213 total station;
4. A 7.2 volt Topcon GPS-223 total station;
5. A 7.2 volt Topcon GPT-3003W total station;
6. A 7.2 volt Topcon GPT-3103W total station.

ALJ 1 at Stip. 18.

1. Rosebud will maintain a separate log book for each piece of electronic surveying equipment. The log books will be kept in the mine office where the equipment is located and will be available for audit by MSHA inspectors. The log book will contain the date of manufacture and/or purchase of that particular theodolite or total station.
2. All non-permissible battery powered surveying equipment to be used in return or inby the last open crosscut shall be examined prior to use to ensure the equipment is being maintained in a safe operating condition. In addition, the equipment will be examined at intervals not to exceed seven days by a qualified person as defined in 30 C.F.R. § 75.153; examination results shall be recorded weekly in the equipment's log book. These checks shall include:
  - a. Checking the instrument for any physical damage and the integrity of the case;
  - b. Removing the battery and inspect for corrosion;
  - c. Inspecting the contact points to ensure a secure connection to the battery;
  - d. Reinserting the battery and power up and shut down to ensure proper connections;  
and
  - e. Checking the battery compartment cover to ensure that it is securely fastened.

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<sup>18</sup> See n. 3, *supra*.

3. A qualified person, as defined in 30 C.F.R. § 75.151, shall continuously monitor for methane immediately before and during the use of non-permissible surveying equipment in or inby the last open crosscut or in the return.
4. Non-permissible surveying equipment shall not be used if methane is detected in concentrations at or above 1.0 percent methane. When 1.0 percent or more of methane is detected while the non-permissible surveying equipment is being used, the equipment shall be de-energized immediately and the non-permissible electronic equipment withdrawn outby the last open crosscut.
5. Non-permissible surveying equipment shall not be used where float coal dust is in suspension.
6. Batteries contained in the surveying equipment must be “changed out” or “charged” in fresh air outside the coal mine.
7. Qualified personnel engaged in the use of surveying equipment shall be properly trained to recognize the hazards and limitations associated with the use of surveying equipment.
8. The non-permissible surveying equipment shall not be put into service until MSHA has initially inspected the equipment and determined that it is in compliance with all the above terms and conditions.
9. Within 60 days after the Proposed Decision and Order becomes final, Rosebud shall submit proposed revisions for its approved 30 C.F.R. Part 48 training plan to the Coal Mine Safety and Health District Manager. These proposed revisions shall specify initial and refresher training regarding the terms and conditions stated herein in this Decision and Order.
10. I would like Rosebud to use relatively new electronic surveying equipment. The use of new equipment will prevent the degradation of seals and require Rosebud to take advantage of new technology. For these reasons, Rosebud shall replace or retire from service any electronic surveying instrument that was acquired prior to December 31, 2001 within one year of this Order becoming final. Rosebud shall replace or retire from service any electronic surveying instrument that was acquired between January 1, 2002 and December 31, 2007 within two years of this Order becoming final. Within three years of the date that this Order becomes final, Rosebud shall replace or retire from service any theodolite that was acquired more than five years prior to the date that this Order became final or any total station acquired more than ten years prior to the day that this Order became final. After five years, Rosebud will maintain a cycle of purchasing new electronic surveying equipment whereby theodolites will be no older than five years from date of manufacture and total stations will be no older than 10 years from date of manufacture.<sup>19</sup>

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<sup>19</sup> Mr. Cobaugh (E) testified that the life expectancy of a theodolite is around five years, although a total station may last up to ten years. Aug. Tr. 211-12. However, Mr. Hartsog (E) testified that he expected a total station to be in service only five or six years. *Id.* at 222. That’s because his company uses total stations on a daily basis. *Id.* It does not use theodolites. *Id.*

11. Rosebud is to ensure that all surveying contractors hired by Rosebud are using relatively new electronic equipment, *i.e.* theodolites no older than five years from date of manufacture and total stations no older than 10 years of manufacture.
12. Rosebud will service all electronic surveying equipment according to the manufacturer's recommendations. Dates of service will be recorded in the equipment's log book and a description of the work performed.

IT IS SO ORDERED,

MICHAEL P. LESNIAK  
Administrative Law Judge

**NOTICE OF APPEAL RIGHTS:** To appeal, you must file a Notice of Appeal ("Notice") with the Assistant Secretary of Labor for Mine Safety and Health within thirty (30) days after service of the "initial Decision" of the Administrative Law Judge. *See* 30 C.F.R. § 44.33(a). The Assistant Secretary's address is: Assistant Secretary for Mine Safety and Health, U.S. Department of Labor, Room 2322 TT #2, 200 Constitution Avenue, N.W. Washington DC 20210. Once an appeal is filed, all inquiries and correspondence should be directed to the Assistant Secretary.

At the time you file the Notice with the Assistant Secretary, you must serve it on all parties. *See* 30 C.F.R. §§ 44.6 and 44.33(a). If a party is represented by an attorney, then service must be made on the attorney. *See* 30 C.F.R. § 44.6(c).

If no Notice is timely filed, then the administrative law judge's "Initial Decision" becomes the final decision of the Secretary of Labor. *See* 30 C.F.R. § 44.32(a).

## **APPENDIX I (MSHA's Expert Witnesses)**

1. Chad Huntley, P.E., was permitted to testify as an expert in electrical engineering.

Mr. Huntley has a bachelor's degree in electrical engineering from Gannon University, where he was a member of ETA Kappa Nu Association, an electrical engineering honor society. From 1995 to the present, Mr. Huntley has been employed as an electrical engineer at the MSHA Approval and Certification Center ("ACC"). The ACC laboratory is internationally-recognized and is the only facility in the United States that approves equipment for underground hazardous locations of mines.

For most of his career at ACC, Mr. Huntley has worked in the Intrinsic Safety and Instrumentation Branch. There, Mr. Huntley evaluates and tests products to determine whether they are intrinsically safe under ACRI2001 "Criteria for the Evaluation and Test for Intrinsically Safe Apparatus and Associated Apparatus." Mr. Huntley has approved equipment such as longwall shearer control systems, remote control systems, longwall communication and control systems, and communication and tracking systems and components as intrinsically safe. Mr. Huntley's duties have also included giving technical assistance to MSHA's enforcement divisions and serving as lead technical investigator in numerous mine accidents and fatalities. He has also provided assistance to other government agencies on projects that would improve underground mine safety.

Mr. Huntley is a registered professional engineer in Pennsylvania. Mr. Huntley has presented a paper on three phase rotary phase converters at the 1998 Institute of Electrical and Electronic Engineers (IEEE) Conference in St. Louis, Missouri. He is a member of the IEEE Mining Industry Committee, a committee member for Underwriters Laboratories Inc. Standards Technical Panel (STP) 913 involving intrinsic safety, and a member of the Instrumentation, Systems, and Automation Society (ISA) committees involving intrinsic safety. *See* Sept. Tr. 266-69, 272, 311; Aug. Tr. 249; G. II-6; G. II-1 at 1-2.

## APPENDIX II (Rosebud's Expert Witnesses)

2. Gary Hartsog, P.E. was permitted to testify as an expert in surveying and mining engineering.

Mr. Hartsog is the president of Alpha Engineering and has been for about 20 years. Alpha Engineering does work for coal operators and other natural resources companies. This work includes ventilation, shaft and slope design, mine design and mine planning. Mr. Hartsog has participated in the investigation of mine explosions including the Sago Mine explosion. His company does mine surveying, and he teaches courses on surveying principles for mine surveyors, professional engineers and governmental employees. Mr. Hartsog has both a bachelor's and a master's degree in mining engineering from West Virginia University. Prior to starting at Alpha Engineering, he worked for 15 years in the underground coal industry as a surveyor, engineer, chief engineer and division safety inspector. He is a registered professional engineer in eleven states and a professional surveyor in West Virginia. *See* Sept. Tr. 163-70; RB. 5.

3. Noah Ryder, P.E. was permitted to testify as an expert in fire and explosion protection engineering.

Mr. Ryder has both a bachelor's and a master's degree in fire protection engineering from the University of Maryland. Fire protection engineering includes courses in engineering, heat transfer, statics, fire and explosion related problems, as well as the physics associated with those issues. He is currently working toward a Ph.D. in mechanical and mechatronics engineering, which is a combination of multiple engineering disciplines including electrical and electronics engineering. Approximately 50 percent of his work is related to forensic investigation of fires and explosions and 50 percent to consulting concerning engineering and fire and explosion prevention. He has performed such work in the oil and gas industry, the petrochemical industry and the underground coal industry, among others. He is a licensed professional engineer specific to fire protection engineering in Delaware. He teaches courses at the University of Maryland in fire and explosion investigation and reconstruction. *See* Aug. Tr. 57-79; RB. 30.

4. Brad Cole, P.E. was permitted to testify as an expert in mining engineering.

Mr. Cole is a project director and safety director for CME Engineering, which is a consulting firm specializing in mining and environmental engineering. He has worked for this company for six years. Previously, Mr. Cole worked for the Pennsylvania Department of Environmental Protection as a mining engineer for approximately eight years. He participated in the investigation of the Quecreek Mine inundation where the miners encountered an abandoned and flooded mine that was not depicted on available maps. He worked in the underground coal industry for multiple mining companies between 1992 and 1998 as an engineer. He has a bachelor's degree in mining engineering from Penn State University. He is a registered professional engineer in Pennsylvania and Virginia. *See* Sept. Tr. 132-35, 154-60; RB. 6.

5. Dave Cobaugh, P.E, was permitted to testify as an expert in mining engineering.

Mr. Cobaugh has been a mining engineer since 1977. He has a bachelor's degree in mining engineering from Penn State University. He is a registered professional engineer in Pennsylvania. At Rosebud, he oversees mine planning, mine mapping, and mine surveying. Throughout his career, he has overseen mine surveys. *See* Sept. Tr. 30-38.

6. Michael Groff was permitted to testify as an expert in mine surveying.

Mr. Groff is the surveying manager for Rosebud. He manages the day-to-day activities of 14 surveyors. He had been an underground mine surveyor for about 10 years. He took a surveying course at Butler Community College. *See* Sept. Tr. 107-11.

THE FOLLOWING STIPULATIONS ENTERED INTO ON OR ABOUT MARCH 28,  
2013 REPRESENT A GLOSSARY OF MINING TERMS