Engineering
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MEA MARINO ENGINEERING ASSOCIATES, INC. • Issue 27

From Research to Practice

Bright Ideas

Over the past three decades of service, we have come to recognize the different approaches taken by clients to more advanced engineering projects. Engineering projects with challenges, however, are typically synonymous with "more costly" and some clients or managers who are accustomed to routine projects will try to approach a more challenging project with the same approach as they would with a routine project. Challenging or more advanced projects involve many significant variables which can influence key engineering decisions. Such projects benefit from bright ideas to solve the problem rather than conventional ones.

As such, a good manager selects people he can trust and then trusts them; whether in house staff or consultants. This is exemplified by positive reinforcement by the manager, which in turn improves confidence in those serving the project. This reinforcement can become stressed in the presence of short-sided finances. The manager's or client's trust in the competent staff or consultants can then become compromised and in turn, the judgment of that staff member or consultant can be affected.

The truly good managers "see the forest through the trees" and focuses on the big picture, or in other words, focus on the ultimate cost of the completed project or project savings without risking safety.

In the engineering of a challenging project, our focus is to always use bright ideas to reduce the ultimate project costs to our clients.

Gennaro G. Marino Ph.D., P.E.

BOREHOLE RADAR USED TO IDENTIFY DEEP COAL PILLARS

This project involved the use of MEA's borehole radar to assess the presence of solid coal barrier pillars in an abandoned mine. These old works were developed during the 1905-1953 time frame and were about 350 ft deep. A map, which recorded the rooms and pillars, showed the presence of significant coal barriers that were left below the project site.

Upon retreat out of the mine, barrier coal can be second-mined or ("robbed") without being recorded. To assess the presence of the 40 ft and 100 ft wide coal barriers noted on the map, ray paths were run longitudinal to the pillars drawn on the map. To provide contrast, ray paths were also taken across areas with entries. The location of the drilled holes and ray paths with the mine map superimposed are shown in Figure 1.

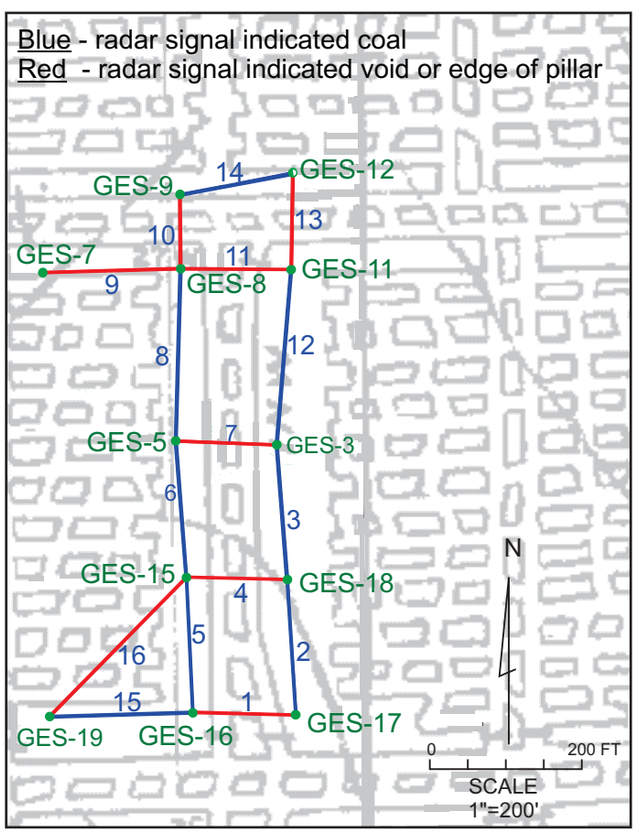

FIGURE 1 LOCATIONS OF DRILL HOLES AND CROSS-HOLE RADAR RAY PATHS SUPERIMPOSED OVER THE MINE MAP.

Void detection is accomplished by measuring the strengths of many signals through various ray paths between pairs of boreholes drilled through a coal seam. The attenuation rate of solid coal for the area can be established and compared with other measured attenuations to determine which ray paths pass through solid coal and which pass through, or near, mine voids. By using this method, the presence of a void in a ray path can be determined.

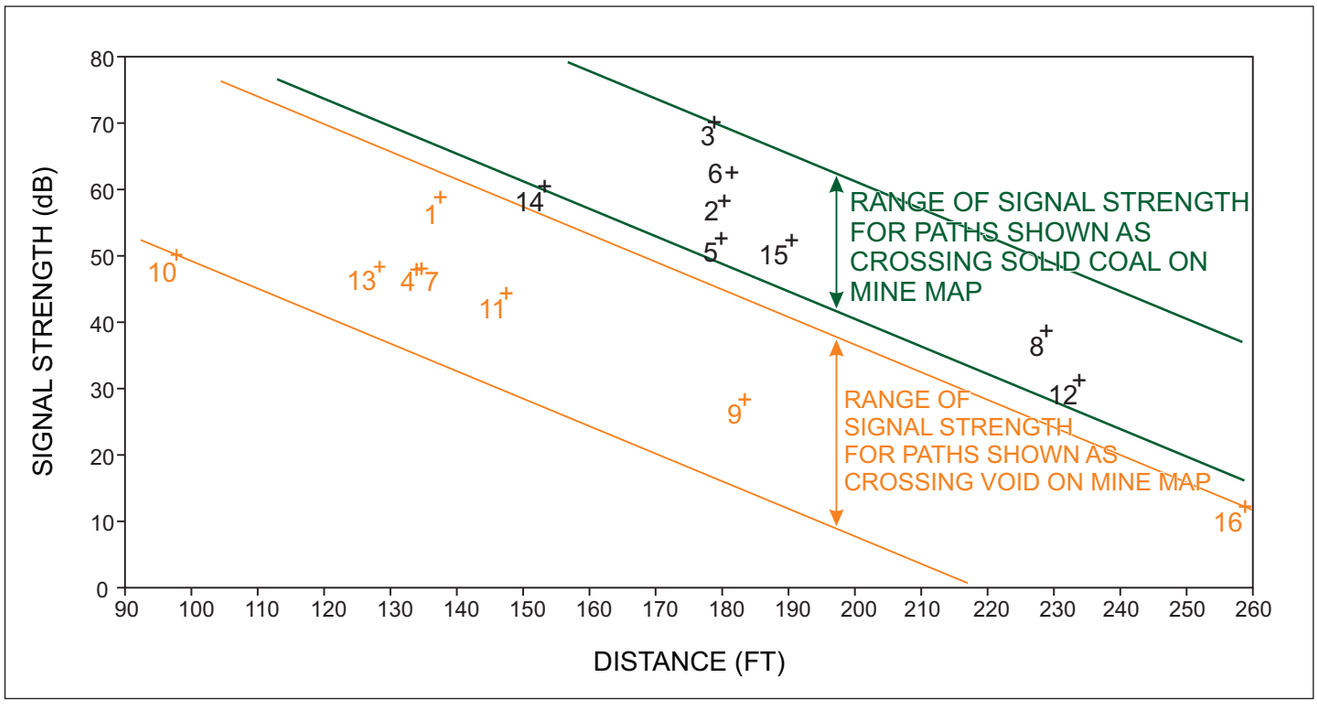

FIGURE 2 PLOT OF RADAR ATTENUATION RATES VERSUS RAY PATH DISTANCE

A total of 16 ray paths were measured at the project site. In Figure 1, the ray paths marked in blue are those expected to be in solid coal. Those marked in red indicated that voids in the coal were present along the transmissions. The attenuation value versus distance for each pair of boreholes that were measured are plotted in Figure 2. Two green lines are shown bounding the ranges of measurements on ray paths which passed through solid coal according to the mine map. Two orange lines are shown bounding the ranges of measurements on ray paths which passed through voids. As shown in Figure 2, the points corresponding to ray paths which should be through solid coal and the paths which should be through voids fall into two distinct, separate categories. Therefore, the location and accuracy of the mine map as aligned with the borings and ray paths shown in Figure 1 can be considered to be correct (i.e. no robbing of the barrier coal can be assumed).

As a result of the crosshole radar investigation, the mine map was determined to be valid which was further confirmed by later, unrelated drilling. When questions exist about the accuracy of old mine maps, or where no map exists for the project site, crosshole radar can be used to determine the presence of voids or barrier coal. The use of borehole radar surveys provide a fairly reliable geophysical tool for both shallow to deep mine investigations.

ABOUT MARINO ENGINEERING ASSOCIATES, INC. (MEA)

MEA is a recognized expert in mine subsidence engineering. With 32 years of experience, MEA's staff have provided services across the full scope of mine subsidence engineering, including significant work in research, site subsidence studies, mine stability analyses, prediction of subsidence displacement and damage potential, subsidence damage evaluation, repair design, and mine grouting design and monitoring. Being foremost in this field, MEA staff have authored over 100 publications on related topics and have worked on projects in coal fields across the U.S.

MEA has also been hired by coal mining companies and others to provide consulting services on active or new operations for both room-and-pillar and longwall mining. These services are included in those listed above. Because of the amount of coal mining related work MEA has done, it has designed and developed a cross-hole radar to detect mine voids for cases where mining may exist.

Having extensively worked on old coal mines and both low and high extraction active mines, MEA is uniquely qualified and separates itself from other geotechnical and mining engineering companies across the United States. MEA also has expertise in a full scope of services in geotechnical and pavement engineering, as well as construction material testing and monitoring.

Gennaro G. Marino, Ph.D., P.E. is president and principal engineer of Marino Engineering Associates, Inc., and has been a licensed professional engineer since 1984.

NEW OFFICE LOCATION

MEA is pleased to announce the opening of our Southern Illinois branch office in Belleville, Illinois. The Belleville office will be servicing projects in the Southern Illinois and Eastern Missouri regions, including St. Louis, Missouri. Our corporate office will remain in Urbana, Illinois.

ADDITIONAL COPIES

If you know someone who would like to receive a copy of MEA's Engineering Update, please let us know.

FOR MORE INFORMATION

There is a significant amount of additional information available on the above subject. For more information please contact Dr. Marino at the address listed below, or e-mail: gmarino@meacorporation.com.

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