



## *From Research to Practice*

*At times the politician, the lay person, the attorney, and the administrator believe all engineers have the same ability because they don't understand the field of engineering. This opinion can go so far as to say one expert's opinion is as good as another.*

*Adjudication when determined by one of these non-technical parties then leans toward the emotional side of the situation and toward their own project biases.*

*For important issues, it is the responsibility of the engineer to communicate, as they are the only participants with the capability to flesh out and resolve technical issues. This is the best chance for such conflicts to be appropriately resolved.*

*Inactivity along these lines by the engineer, especially one considered as an expert, can be misconstrued and used to justify agreement with emotional reaction and inappropriate engineering judgment.*

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

## IMPROVEMENT OF MINE SUPPORT SAVES PIPELINE FROM SUBSIDENCE EVENT

A mining company proposed underground extraction of some coal reserves. Unfortunately, several significant pipelines traversed over the proposed mined-out area. Because of the potential for unplanned ground subsidence, the pipeline companies became concerned about possible subsidence damage and pipeline safety. In order to have an independent evaluation to determine if sufficient mine support would be left after coal extraction; a number of the pipeline companies retained the geotechnical engineering services of MEA, Inc. Based on review of the available information and the proposed mine design, MEA determined that the risk for subsidence was too great.

The mining company said sufficient permanent support would be provided by the planned pillars. However, concern for pipeline damage from short or long-term mine subsidence after the mining was complete still existed.

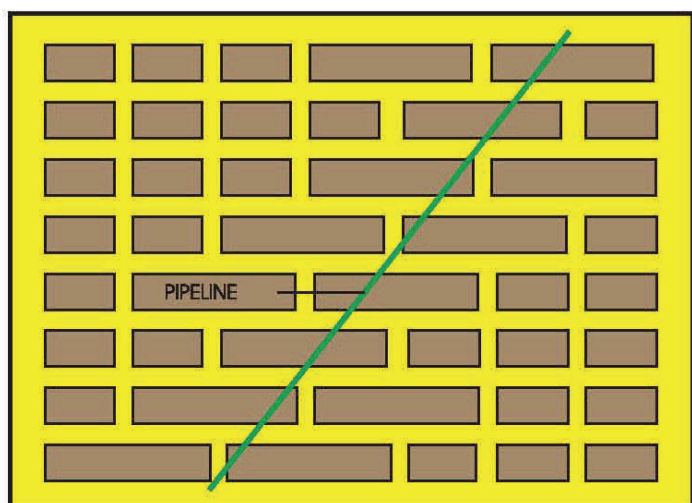


FIGURE 1 INITIAL LAYOUT OF PILLAR SUPPORT CONTEMPLATED OVER THE PIPELINE

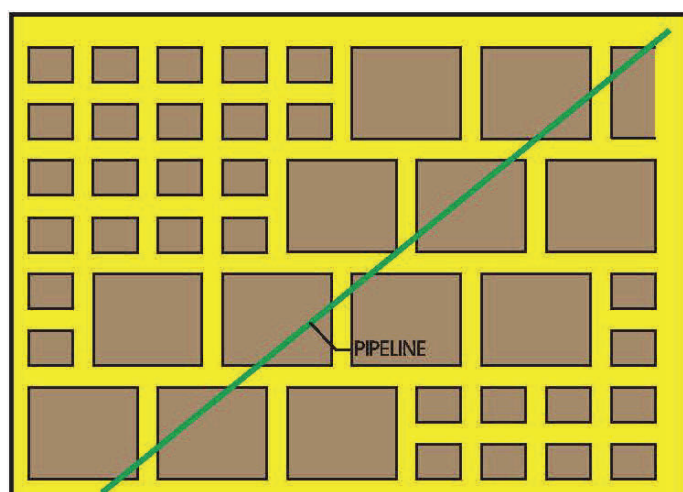


FIGURE 2 FINAL LAYOUT OF PILLAR SUPPORT USED BENEATH THE PIPELINE

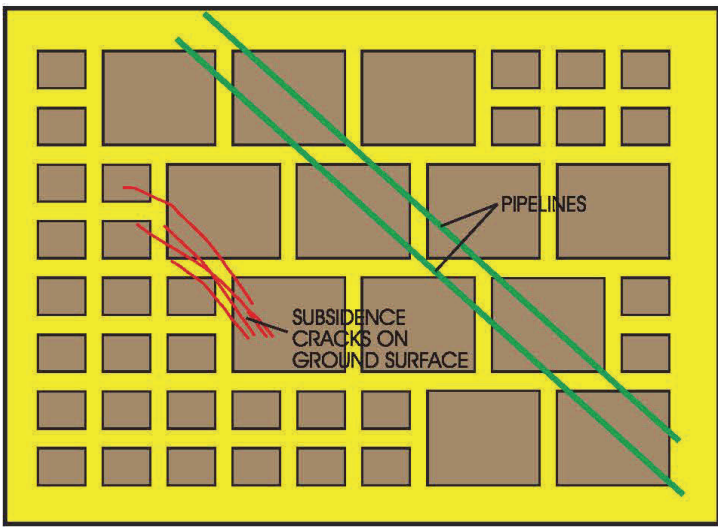


FIGURE 3 MINE SUBSIDENCE WITH SURFACE CRACKING TO LIMIT PILLAR SUPPORT FOR PIPELINES

As a result of the concern for pipeline safety from the proposed subjacent mining, a consortium of pipeline companies brought legal action. The court determined that mediation was appropriate.

Pursuant to this order, MEA met with the mining company. A number of “one on one” technical discussions took place. As a result, considerably wider pillars were left to support the pipeline. The improved support can be seen by comparing Figure 1 to Figure 2. Figure 1 depicts the mine plan approved by the state regulatory agency while Figure 2 is the layout used after discussions with MEA.

Note that the supported pillars were made about twice their intended width.

The added support provides significantly greater methodology used and recognized by the State. The concern was summarized in a report and pertains to the added support which provides significantly greater protection for the pipelines involved. MEA had a further concern, however, regarding the design methodology used and recognized by the state. The concern was summarized in a report and pertains to the softening of the mine floor (especially from pooling water). Based on computer modeling results, MEA found the effect of floor softening to be substantial, and recommended it be accounted for in the design.

Despite MEA’s warning, sludge (a water suspension of coal processing waste) was injected into the mine. The injection of sludge was followed by mine collapse and subsidence (see Figure 3). MEA believes the mine floor was softened by the water in the sludge. The now softened floor couldn’t hold up the coal pillars, resulting in a massive collapse of the mine. The subsidence propagated up to the ground surface with ground cracking towards its limit. As can be seen in Figure 3, the added support has suppressed the subsidence from progressing under the pipeline.

In summary, from the “one on one” discussions with the mine design engineer, MEA was able to provide the coal company an engineering understanding of the concerns for mine stability. The result was the added protection to the pipeline from increasing the width of support pillars. Ultimately, these wider support pillars provided enough resistance to suppress an adjacent massive mine collapse from propagating into the Zone of Influence of the pipeline.

**Other Engineering UPDATES of Interest:**

**UPDATE 33: Investigation of Excessive Fill Shrinkage from Embankment Construction**

**UPDATE 25: Transmission Pipeline Subsidence from Mining**

**UPDATE 14: Establishing Mine Subsidence Risk**

**ABOUT MEA:** Marino Engineering Associates, Inc. focuses on engineering research, practice and expert evaluations and is licensed in 24 states in the U.S. Our projects primarily have an emphasis on Geotechnical Engineering, however, we also have significant experience in projects involving transportation, subsidence engineering, laboratory testing, training, and geophysical exploration. Gennaro G. Marino, Ph.D., P.E., D.GE is president and principal engineer of Marino Engineering Associates, Inc., and has been a licensed professional engineer since 1984. To obtain additional information on MEA, one can also visit our website at [www.meacorporation.com](http://www.meacorporation.com).

**FOR MORE INFORMATION:** There is a significant amount of additional information that is available on the above subject. For more information, please contact Dr. Marino at the address listed below.