Engineering
UPDATE©
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CONSTRUCTION SLIDE CAUSES SIGNIFICANT DELAY AND ADDED COSTS

Presented herein is a case example of construction earth movement. The case exemplifies the significant effect such an event can have on the completion cost/time. This project involved the construction of a river intake facility to provide drinking water to area communities. To provide access to river water, two 3 ft. horizontal steel pipes were to be installed from the wet well, through the riverbank, and laid on the river bottom to the point of intake (see Figure 1).

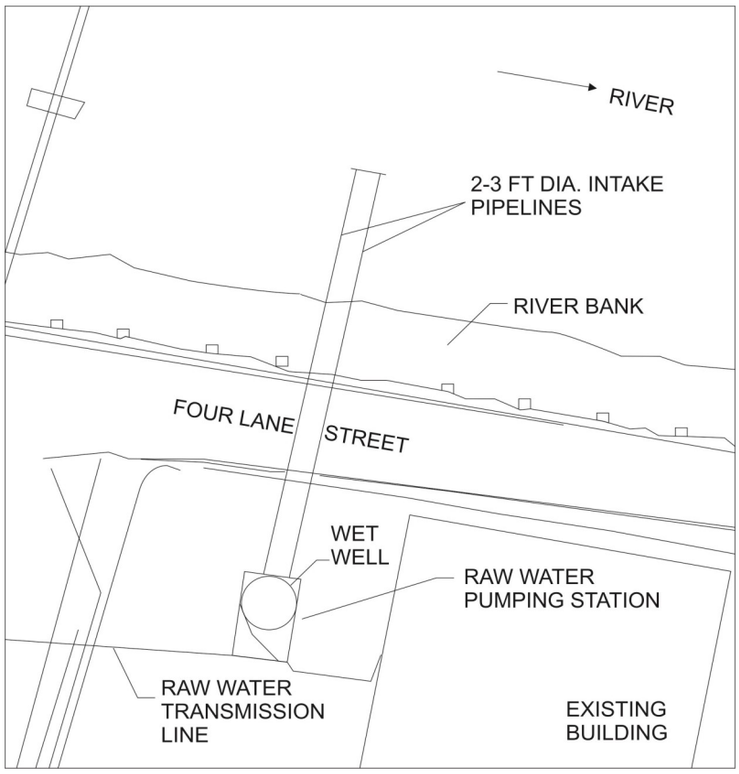

FIGURE 1 PLAN SHOWING THE LAYOUT OF THE WATER INTAKE FACILITY

The design of how the construction was to be accomplished was left to the bidding contractor without any significant technical review of how the installation would be done. The contractor chose to install the intake pipes by constructing two 5 ft. diameter cased horizontal bores from the wet well to near the riverbank face. The 3 ft. intake pipes would be installed inside these bores. The remainder of the intake pipe would be installed by subaqueous excavation from the riverside. Consequently, this would require underwater excavation into the riverbank to connect to the pipe installed form the wet well. This pipe intake construction methodology was allowed under the contract, and this methodology seemed feasible based on the available design borings which indicated that bedrock was at an elevation which would adequately support the overlying soils when the riverbank excavation was made (see Figure 2).

The contractor subaqueously advanced the excavation into the riverbank, but due to the limited visibility conditions, there was no warning that the soil portion of the slope was unknowingly undermined as the bedrock surface was significantly lower than anticipated (see Figure 2). Ultimately, this resulted in two successive slides (see Figure 3) and a halt in the project due to potential retrogressive movements encompassing the adjacent 4-lane state highway. During construction, none of the slope stability issues were analyzed by any of the project team members. After much time and expense, the project was eventually complete.

SUMMARY

Inadequate attention to geo-construction during a design which involves significant earth slopes can result in added costs and delays in the project, and in fact, can even cause cancellation of the project. Furthermore, as demonstrated here, the construction slide does not need to be massive to result in critically hazardous conditions.

The problem occurs when the design of the plans and specifications of challenging earthwork projects only considers the final construction conditions, and the "how do you get there" is left up to the contractor. This "start-to-finish" design gap exists because of added time and money for borings, testing, and viability analyses, and the owner/designer's reluctance to assume any responsibility. This puts stress on the contractor to optimally bid the project and tends to result in the winning contractor having taken the most optimum assumptions, performing minimal, if any, added exploration. Oftentimes the contractor's thought here is that "if the site information is good enough to bid off, it is good enough to construct from". The designer of the plans and specifications, however, puts the responsibility of any construction instability on the prequalified contractor who will have varying levels of training and experience. This set of circumstances can result in inadequate engineering guidance and responsibility, and in turn, a greater construction risk of uncontrolled mass movement.

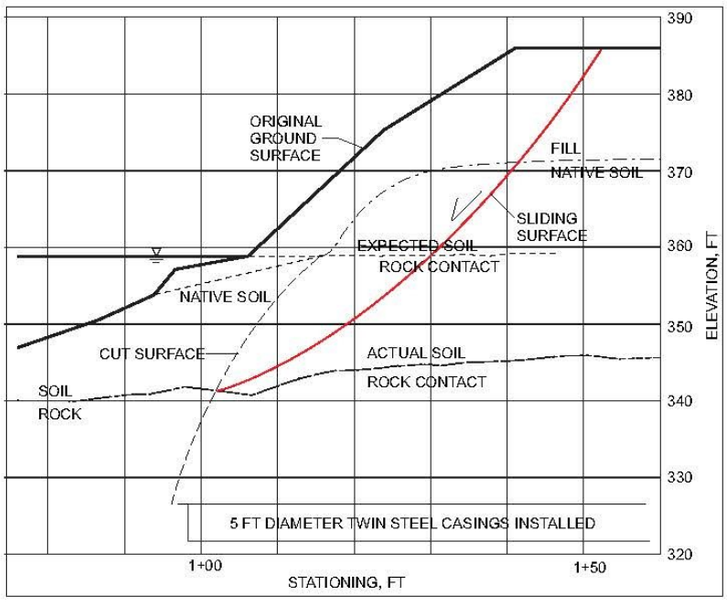

FIGURE 2 SOIL/ROCK PROFILE AT THE RIVERBANK

FIGURE 3 PHOTOGRAPH SHOWING THE RESULTING SLIDE FROM RIVERSIDE EXCAVATION

Other Engineering UPDATES of Interest:

UPDATE 17: Landslide During Land Development

UPDATE 23: Anatomy of Canal Geo-Construction Difficulties

UPDATE 7: Soil Provides Poor Road Construction Support

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.

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.

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