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Op-Ed Commentaries

February 22, 2009

Barry Thacker

Outlawing leaky dams on coal property would be a mistake

My guess is that Dam Design 101 is not taught in journalism school. How else can the Gazette justify its opinions and recommendations on the topic?

When I took the class, my engineering professor said, "Lesson 1 is that all dams leak, which is why control of seepage is Lesson 2. Lesson 3 is to study the first two lessons and learn that our control measures may cause a substantial increase in seepage rather than a decrease."

Here are some additional lessons I've learned over the past 30 years as a dam designer at the school of hard knocks.

Buffalo Creek was a "crude" coal refuse dam that was not designed with safety in mind, but built to meet water quality discharge standards. Why? Water quality can be measured easily and cited, but safety is harder to evaluate. Not until a coal refuse dam failed did safety merit equal consideration with water quality.

The initial investigators of that failure jumped to the conclusion that the dam failed as a result of excessive seepage and internal erosion, also called piping. Detailed investigation by the U.S. Bureau of Mines concluded: "There were earlier reports of piping. Neither field evidence nor engineering analysis substantiates this condition [piping] as the principal cause of failure."

According to the Bureau of Mines, the Buffalo Creek dam failed due to "high internal pore pressures." Coal refuse dams today are designed with extensive internal drainage provisions to reduce pore water pressures. Such control measures can substantially increase the rate of seepage as predicted by Lesson 3.

Furthermore, modern coal refuse dams are designed and built to strict standards such as storing and safely passing runoff from a 40-inch rainfall event. Just as with other types of dams, coal refuse dams serve as flood control structures to reduce peak storm flow for areas downstream of the dam.

Each lift of fill placed in a coal refuse dam must be tested to verify that it has been compacted to the same standards as fill placed beneath multi-story buildings. Instrumentation installed to measure internal pore water pressures is monitored at least once a week and an annual certification report is prepared by a licensed professional engineer. Design, construction and performance monitoring are evaluated by experts from at least three government agencies.

During closure, the impoundment is capped to eliminate impounding capability. The reclaimed dry fill can then be returned to productive use such as the site that is now part of a shopping complex in Morgantown, West Virginia.

The stringent dam safety regulations promulgated after the Buffalo Creek disaster scared some owners of coal refuse dams into purchasing refuse dewatering presses and switching to disposal in fills that do not impound water. In December 1981, one of those non-impounding fills in Kentucky, the Ages Refuse Fill No. 3, was examined by government inspectors. No seepage was detected, no citation was issued, and the facility was judged to be safe.

Four days later, Fill No. 3 failed and killed one person. During the failure investigation, high pore water pressures were measured in an adjacent fill even though it had been built at a slower rate than Fill No. 3. Post-failure engineering calculations showed that Fill No. 3 failed because it was built too quickly. Its lack of internal drainage provisions kept seepage to a minimum, but allowed pore water pressures to exceed critical levels. Safe seepage would have reduced pore pressures and averted the failure.

After the Ages failure, most owners of dry-handling press systems converted back to disposal of coal refuse in impounding structures, due in large part to the excellent safety record of engineered coal refuse dams. No coal refuse dams have failed in the United States since the promulgation of dam safety regulations following the Buffalo Creek disaster. The failure in Kentucky in 2000 referenced by the Gazette occurred in the basin of an impoundment, not in the dam that held back the impounded water and fine refuse.

What lessons from Dam Design 101 might the Gazette apply to the Tennessee ash failure in future editorials? First, recognize that ash produced by burning coal is not the same material as in coal refuse dams and impoundments. Then, recommend that TVA produce site-specific data on the ash failure and retain engineers from outside TVA to perform analyses to assess the cause of the failure. Publish results of that study so they can be peer-reviewed by other experts.

Finally, don't jump to conclusions and promulgate regulations until the facts are known.

Most elected officials never took Dam Design 101 in school, either. They might do something silly and outlaw leakage from all future dams. Such a regulation would not only violate the laws of nature that proclaim that all dams leak, but more importantly, such a regulation would set the stage for even more dangerous failures.

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