# AT WORK

TOPCON

**Construction**
Spring 2009


# Reconstructed acid mine drainage system


Jim Irey, Berner Construction.

The Mountain Watershed Association, Melcroft, Pennsylvania, and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) recently awarded a contract to Berner Construction of Gap, Pennsylvania, to reconstruct a failed acid mine drainage system. The new system protects Indian Creek, which is located near the drainage system, and the Youghiogheny River, into which the creek empties; the area's economy is now based entirely on tourism—and clean water for leisure activities.

Like much of Pennsylvania, the area has numerous abandoned coal mines with a great deal of pyrite residue from the mining. When pyrite is exposed to air and water, sulfuric acid and iron hydroxide are formed, lowering the pH of stormwater flowing through the mines and coating stream bottoms with iron hydroxide. The state calls acid mine drainage its

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**Company:** Berner Construction
**Location:** Gap, Pennsylvania

**Project:** Acid mine drainage system remediation
**Location:** Springfield Township, Fayette County, Pa.
**Scope:** 10 acres site, four water treatment ponds and pipe network

**Topcon Products:**
HiPer Lite + base and rover stations

**Topcon Dealer:**
Boyd Instruments
Horsham, Pa.
www.boydinstrument.com

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'If another company that we bid against has to carry survey costs, well, that's an asset to us…every time they come out they're maybe going to charge you a half day rate for two guys—those are costs that we don't carry.' – Jim Irey, vice president, Berner Construction

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biggestwater pollution problem.

The watershed association had an acid mine drainage system constructed in 1999 to treat runoff from a large mine just north of State Route 711/381. It is believed that the original system had been rendered ineffective when mine-contaminated stormwater immediately contacted the open air in an open channel before reaching the first sediment pond, raising the pH too abruptly and separating the iron hydroxide particles from water molecules, eventually clogging up the gaps between the limestone and the inlet end of the pond. The inlet pipe to the first sediment pond got clogged up and the pressure caused it to rupture, creating an upward flow of water and forming a puddle and a stream of untreated acid mine runoff that eventually made its way to Indian Creek.

**ABOVE: Laurel Mine pond. BELOW: Inflow shaft.**

In the new system, the first sediment pond is designed as a vertical upflow pond—that is, stormwater contacts the limestone by flowing from the bottom up. The redesigned system also prevents the first sediment pond from clogging through the use of a network of intersecting perforated pipe that was constructed beneath the limestone. Three valves were installed near the point of convergence, which will allow access for future maintenance.

The first stage of the system was where Jim Irey, vice president of Berner Construction, first relied on Global Navigation Satellite System (GNSS) technology on this project. In 2006, he had purchased a Topcon Positioning Systems HiPer Lite + from Boyd Instruments of Horsham, Pennsylvania. Irey moved the rover around the site by foot to check grades.

Using the receiver, Irey recorded the position of the pipe intersections and the location of the pipe for an as-built survey. He also used the unit to check grading throughout the site to ensure that effluent would gravity-flow from one pond to the next at a lower elevation.

"This is a passive system—there is no electricity or telecommunications out here," says Irey. "Pipe alignment, grades and slopes are critical since everything flows by gravity" as the system is on a downslope toward the creek. "That is where the [GNSS] was invaluable."

Berner Construction excavated a 100-foot-long channel between the first two sediment ponds. Effluent fills the first pond and overflows a bank on one end, filling up the limestone-lined channel. The second pond is effectively divided into thirds by two limestone baffles constructed on two concrete weirs; as the pond fills up, effluent flows over the baffles and is treated for iron hydroxide contamination and acidity by the pond's limestone a second time.

With most of the iron hydroxide removed and the pH raised after the second stage, the effluent flows into a third pond containing a 1-foot layer of mushroom compost sitting on another 4-foot layer of limestone. The effluent flows across a final limestone baffle in the compost pond and the final sediment pond is where more iron hydroxide settles onto a muddy surface. Finally, the effluent flows out of the final sediment pond via a 12-inch PVC pipe onto a final apron of limestone before flowing onto a 200-foot-long wetland buffer that further treats the effluent before it makes its way into Indian Creek.

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