

INSIGHT

Emergency project saves water intake and supply

When the bank of Lake Sakakawea began to slide after heavy rains, there was limited time to respond. Those slopes hold the access road and pipelines for Fort Berthold Rural Water's intake, which serves the Mandaree water treatment plant and supplies raw water to the Bakken oil field.

The 2,000 gallon-per-minute, 3MGD intake is in western North Dakota. It sits within the Fort Berthold Indian Reservation and servers the Mandan, Hidatsa and Arikara Nation, also known as the Three Affiliated Tribes. Maintaining the intake and pipeline is critical to supply water for the tribe.

Heavy rains compromise the intake

After a weekend of heavy rainfall in late September 2019, the bank of the intake began to slide. The landslide measured approximately 1,000 feet in width and length, covering a vertical elevation range of about 250 feet. As James Landenberger, a professional engineer at Bartlett & West, said, "I've been involved in civil engineering for 20 years and I've never seen a slide like this." Landenberger said the bank looked like lava flow as it slid away.

The damage caused by the slide was massive and called for emergency repairs. A team from Bartlett & West, Braun Intertec and various contractors sprang into action. They had to work quickly because if another shift occurred there was potential to lose all water supply, the entire site and the intake.

The water pipeline that serves the Mandaree water treatment plant was damaged and needed repair. Thankfully, the team was able to use a secondary pipeline and storage tank to make sure water supply to the treatment plant and tribe wasn't interrupted. Landenberger said, "We knew the clock was ticking because if the other line was lost from another shift, we were done."

The access road to the site was also destroyed during the slide—moving approximately 50 feet down the bank. Workers had to use all-terrain vehicles to access the area while a contractor worked to create an emergency access road.

Joseph Silveria, the lead construction engineering technician for Bartlett & West on the project, said, "It was a 24-hours-a-day until the repairs were done. It was a big effort with Fort Berthold Rural Water, (the Bureau of) Reclamation, Bartlett & West, Braun and everyone involved." He said he remembers a couple nights when he slept in his truck at the site due to the continuous and fast-paced work.

Previous work prevented a catastrophic failure

Even prior to the slide, that intake site was already a cause for concern. In fact, in 2017, Bartlett & West and Braun Intertec worked together to protect key infrastructure and secure the intake after analysis showed that the hillside was compromised. At that time, movement of the landslide mass produced a pattern of ground cracks that suggested the intake's booster station, along with the water lines that extend south from the booster station toward Mandaree, could be at risk. Piles were drilled into the bank to help reinforce it, shown in Figure 1. Fast-forward to late 2019. Landenberger points out that the bank erosion all occurred directly below the line of the previously buried piles, with the pump station and bank located above and safely protected.



Figure 1. From Slide Area Pile Line Site Plan

Landenberger said, “Drilling into an already unstable bank is not ideal. We were concerned that doing so might further contribute to the destabilization. However, those piles definitely saved the intake from being a complete loss when the slide occurred. They prevented a catastrophic failure.”

Team considers how to move forward

Ultimately, in just a few months after the slide, all repairs were completed. Two new raw water pipelines were installed at the site, with the other line abandoned. Those new lines were horizontally, directionally drilled rather than trenched to limit further effect on the already compromised site. The access road and intake were also repaired.

The team continues to monitor the intake site and discuss if any additional work should be done to try to further secure the bank. They are also evaluating other potential options and sites for the tribe’s intake but realize that despite the instability of the current site, a new intake is a very costly investment.