



Lake Byllesby, Minnesota – Dam Monitoring

CLIENT: FRONTIER PRECISION / DAKOTA COUNTY

How wireless monitoring helped safeguard local people and an aging hydroelectric dam during an essential repair

Challenge

Constructed in 1910, Lake Byllesby Dam is a 75-foot (23 m) hydroelectric concrete gravity dam located in southern Minnesota that is owned and operated by Dakota County. The dam serves the region by controlling flooding along the Cannon River and provides a 1,432 acre (580 ha) recreational lake used by people across the region for boating, swimming, and fishing. The dam is federally regulated as “high hazard” due to the potential lives and property that would be affected downstream in the event of failure.

In 2020, Dakota County embarked on an improvement project to replace the dam’s 100-year-old turbines and adjacent aging powerhouse. The improvements will help to preserve and increase the clean energy generation capacity of the dam, as well as address dam safety concerns.

Due to the necessary complete teardown of the existing powerhouse, large quantities of concrete were required at the back of the dam in order to reinforce the structure and provide stability during demolition.

To ensure the stability and security of the overall dam structure throughout construction, strict monitoring requirements were implemented. The use of a traditional wired monitoring solution was deemed infeasible based on the inaccessibility of the monitoring locations and the lack of an external power supply.

Key Points:

- **Essential improvements to 100-year-old hydroelectric dam included demolition and construction of new powerhouse building**
- **Wireless monitoring solution was needed to measure rotational movement of dam during construction**
- **Near real-time data from triaxial tilt sensors provided reassurance that any irregular or sudden movements would be quickly detected**

Solution

Frontier Precision, a US-based Senceive distributor, was commissioned to provide their expertise on the project and recommended the installation of five wireless Triaxial Tilt Sensors - each situated on independent vertical beams to collectively monitor the total area and rotation of the reinforced concrete. Following installation, data was relayed from the tilt sensors at a 5 minute reporting rate via a solar-powered Gateway, and then on to WebMonitor™, Senceive’s cloud-based visualization software.

Senceive’s wireless FlatMesh™ platform allowed the project team to remotely set all network configuration parameters without stepping foot on site.

A continuous stream of data is now provided 7 days a week, 24 hours a day, all viewable from any location with an internet connection. Josh Petersen, Senior Water Resources Engineer for Dakota County commented that the sensors “seemed very simple to install, and Frontier Precision helped with the entire process and has been helpful throughout by providing changes to alarms, monitoring data and other needs.”



Outcome

On a site where traditional, wired monitoring was deemed infeasible, Senceive's wireless solution boasts the clear advantage of being fully autonomous.

With up to a 15 year battery life and the fast reporting capabilities of the FlatMesh™ platform, the wireless sensors were the ideal solution to provide stakeholders with the confidence that any irregular or sudden movement of the dam would be quickly detected.

Since installation, the engineers at Dakota County have been viewing the data in WebMonitor™, and the corresponding reports have not identified any concerning movements.

“The sensors are definitely proving what we were hoping, which is that the structure isn't moving at all. We did get an alarm early in the project from a piece of debris that shot up during demolition and hit the sensor and moved it, which triggered our team to respond immediately,” says Mr Petersen. “It definitely provided peace of mind that the sensors are working great. The wireless system provided great value in satisfying our regulatory concerns as well as providing peace of mind to our engineers and ownership that the structure is being constructed in the safest way possible,” he added.

After the demolition and construction of the new powerhouse, Dakota County plans to use the sensors across the entire dam structure for long term monitoring, providing added value for all stakeholders.

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Josh Petersen, PE
Senior Resources Engineer
Dakota County

