



# Case Study: New Hampshire Dept of Environmental Services



## Using Geospatial AI to help improve dam safety

### Dam Monitoring

#### Overview

New Hampshire Department of Environmental Services' (NHDES) Dam Bureau is responsible for the safety, monitoring, maintenance, and repair of around 300 state-owned dams. In total, there are around 2,600 dams spread across the US state of New Hampshire and just over 800 of those are classified as hazardous.

#### The Challenges

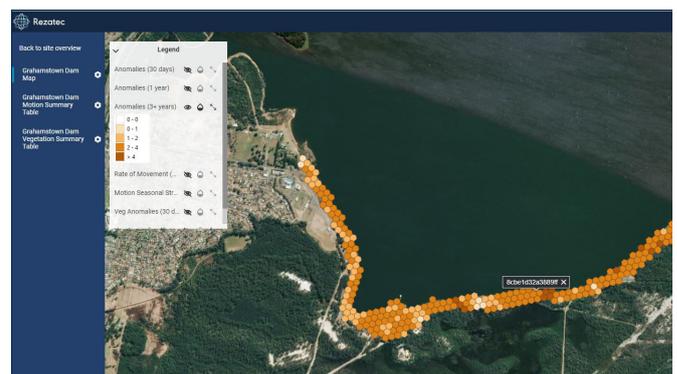
Many of the dams in New Hampshire were built during the industrial revolution to support the region's growing textiles industry and are now reaching an average age of about 100 years. Some of the dams in New Hampshire are 200 years old, making them some of the oldest engineered structures in the US.

While these dams have been repaired and renovated in that time, they still don't necessarily meet current design standards. With the practice of dam safety engineering changing over the past 40 years, many of the dams don't meet current standards, according to James W. Gallagher, Jr. P. E., Chief Engineer of the Dam Bureau in NHDES.

As well as facing increasing challenges, such as climate change leading to more extreme weather events, the body responsible for ensuring dam safety in New Hampshire has

a staff of just 32 people. This includes a mix of dam safety engineers, dam operators, engineers, a construction crew and support staff. In addition, the cost for drilling necessary borings and installing instrumentation is around \$300,000, although drilling boreholes for the instrumentation also allowed necessary soils data to be derived which helped design a seepage collection system, evaluate seismic stability and determine overall stability of the dam.

The instrumentation that was installed at the borings cost around \$35,000 but doesn't provide real time readings and requires biannual site visits to download the data. Installing instrumentation right across the state with 200-odd dams is a massive and costly project, but the team saw an avenue for more effective resource deployment. "Budget constraints are an issue and it is a big mission to undertake. Probably we could do more if, say on the maintenance side, we weren't relying on our operators to also do the monitoring."





## The Solution

Goose Pond, a manmade lake and valuable natural resource, was selected as the location for remote dam monitoring using Rezatec's Geospatial AI platform. The technology combines historic and current satellite imagery with advanced AI algorithms to detect the causes of damage and potential failure. This 625-acre (253 Ha) lake is approximately three miles (5 km) long and has a maximum depth of about 10 metres. The earthen dam structure is now over a century old and was chosen as a good representative size of NHDES's inventory, with known seepage issues and a site scheduled for refurbishment.

Goose Pond Dam also already had a fair amount of instrumentation installed, for example to measure pore water pressure inside the dam. The hope was that this instrumentation could be used to verify information that was being provided by the Rezatec dashboard.

Gallagher said NHDES saw the potential for the geospatial AI solution to help quantify changes from month to month. He said: "Our operators certainly can pick out if this seepage that was once clear is now cloudy. But they are a little less able to clearly assess the quantity and see if the seepage is increasing or decreasing. What appealed to us about Rezatec technology was to be able to quantify changes in seepage."

Rezatec began with a three-year retrospective analysis of satellite data. This data helps to establish a baseline of 'normal' behaviour for a dam structure. With that baseline in place, a unique and advanced algorithm enables the tool to flag any potentially anomalies in movement or other changes. Once out-of-the-ordinary behaviour has been identified and located, dam owners can deploy targeted resources for either further investigation or repairs if needed. And all before failure occurs.

## Results

Initial results have been positive for NHDES. The satellite observations can detect even the smallest movements and have even identified some deformation at Goose Pond Dam. "There is movement detected even though it's very, very, very small. The Rezatec data, including the three-year look-back, is showing that the dam continues to subside even though it is over 100 years old," says Gallagher. The technology, allows owners to prioritize both repairs but also instrumentation where it is needed, as it is not feasible or cost effective to instrument the full length of all high hazard dams.

NHDES is now expanding the program to include the two other dams that were proposed for investigation; Murphy Dam and Mendums Pond Dam.



"The concept of remote sensing is very appealing. What we have found with Rezatec is technology that allows us to do a better job at deploying the right resources and identifying risks".

James W. Gallagher, Jr. P. E., Chief Engineer of the Dam Bureau in NHDES