WaterOne: validating the accuracy of geospatial AI to drive proactive distribution network management

Water SAT – Pipeline Risk

Overview

Founded in 1957 as an independent, non-profit public water utility, WaterOne is the largest utility in Kansas, serving 17 cities across Johnson County. With a mission to provide a safe, reliable, high-quality water supply with exceptional service and value, the company looks after close to a half a million customers.

The challenge

WaterOne's water distribution team maintains 2,800 miles of a buried pipeline network to ensure this promise is met. "We're hyper-focused on setting the standard for utility excellence by proactively managing our infrastructure," explains Jason Beyer, GIS Lead, Distribution Engineering. "Our teams realize that the shift to proactivity requires us to put GIS data at the forefront of everything we do, so we can make the most accurate risk assessments possible and utilize our people and investments efficiently. That means our GIS system becomes the one definitive system of record, with accurate maps, GPS assets and locations, along with historical break data and operational information, instead of only relying on an asset management or ERP system."

"Our financial model helps us figure out where to allocate funds for replacement projects and what materials to focus on," Jason continues.

"The model indicates that in the next 20 years, we'll be replacing water mains at a rate that is unprecedented. In fact, in ten years' time, we'll replace double the miles of mains than this year."

"You can only rely on being reactive for so long before you have to start getting ahead and proactively planning."

"For us, that's about knowing what material and precisely where pipe replacements need to be concentrated so we can stay on budget, hire the appropriate size crews and type of resources, meet our cost per foot goal, and get the work done before failure is likely to occur."

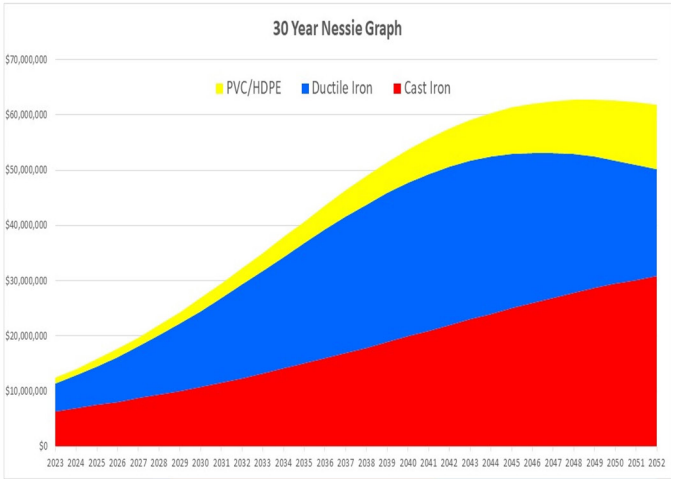
The Distribution Engineering team is already ahead of the curve in their use of in-house developed risk analysis and modeling to prioritize water main replacement and prepare condition assessments. Convinced they can add next-level precision and reliability to their water main replacement prioritization, Jason looked for a geospatial AI partner whose artificial intelligence (AI) and machine learning models predict the location of future main breaks with measured success.

The solution

Having explored a variety of solutions and met with several potential vendors, Jason selected Rezatec's Pipeline Risk solution. "With a new technology like AI, it's important to build trust and confidence that it works and is reliable," explains Jason. "We needed to prove that Rezatec's models do work – and that they can genuinely provide us with the accuracy we need and expect to bring precision to our planning."

Nessie Model used to project the future miles/cost of main replacement.

- 2019–11.5 mi ($8.5M)
- 2023–14.4 mi ($12.4M)
- 2025–17.1 mi ($15.7M)
- 2030–24.8 mi ($26.8M)
- 2035–32.2 mi ($40.7M)
- 2042–36.8 mi ($57.5M)

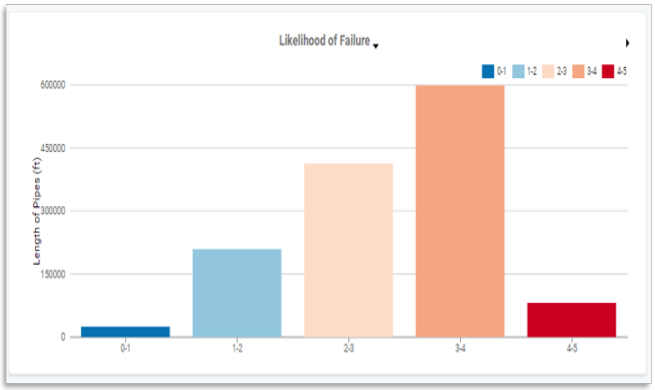


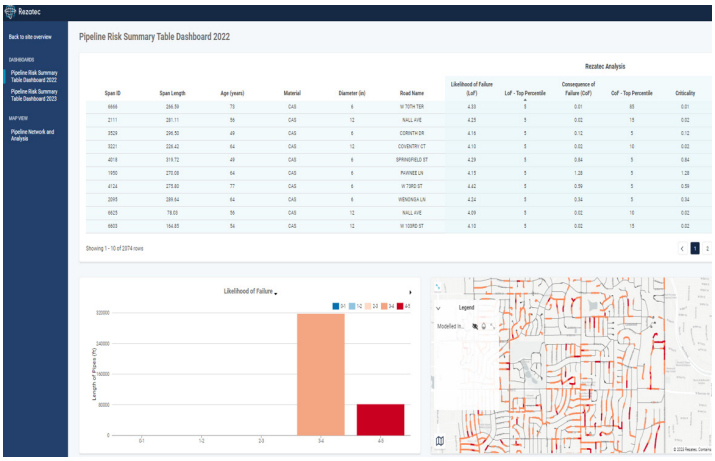
WaterOne
Water District No. 1 of Johnson County

Setting the measure for success

"Rezatec needed to predict at least 70% of breaks in the top 30% highest risk mains to hit our benchmark for success," continues Jason. "The team was positive this could be achieved and were keen to work with us to prove it."

"We talked to many vendors who are building big models containing as much utility data as they can get to compare against ours, but Rezatec was different because they bring their industry and data science expertise to only our data. That means we get best-in-class analytics, refined through the experience of working with dozens of water utilities across many different scenarios, applied to our own data sets which are enhanced by additional variables through satellite data. It's a powerful combination."





Validating geospatial AI

WaterOne began with a validation project to substantiate Rezatec's risk model on an initial 250 miles, or 10% of the distribution network, which has a good variety of age and materials plus a relatively high break rate. The model was built using 3 years of historical mains break data from 2019 to 2021 and it used 2022 data for validation. The fourth year of data from 2023 was withheld, because it was important to check back to the model as 2023 breaks came in to provide an almost real-time additional layer of validation.

WaterOne's data on historic break location and attributes, as well as pipe material, diameter and age were fused with Rezatec's satellite data providing ground motion and vegetation growth changes.

"The result? We proved that Rezatec's risk model was 78% accurate in predicting likelihood of failure."

Jason Beyer, GIS Lead, Distribution Engineering
WaterOne

Miles of Main 180.42 Transmission Main [Potable]	Hydrants 18,880	Residential Connections 140,641
		Commercial Connections 14,384 [includes Exempt, Special Agreement, Wholesale]
Miles of Main 2,635.17 Distribution Main	System Valves 50,180	Control Valves 4,837
		Main Breaks Last Month 53 219 this year

"Our initial review of the results showed some challenges which we dug into, then we worked closely with the Rezatec team to identify and re-associate some of the data classifications."

"The result? We proved that Rezatec's risk model was 78% accurate in predicting likelihood of failure."

"Confidently identifying the sections of network that are likely to fail is significant for us. We have robust and accurate GIS data but Rezatec's model includes data and factors that we don't have at our disposal and it takes our ability to make more precise predictions and act on them to another level."

What's next for WaterOne?

The company now has a validation model covering 2019 to 2021 and they're adding 2022 data. "We're treating it as a look ahead of where we can focus on areas that are not currently on our radar for 2024," says Jason. "We have a backlog of projects lined up for the rest of 2023, so we're using the data to tackle 2024 data."

"Going forward, I'm looking at modeling new network growth and more established areas. I'd like to have the entirety of our older established areas modeled across 1,200 miles because we think that's where 99% of our replacement projects will occur."

"This has the potential to change our capital program by reviewing how crews operate and replacing pipes ahead of time instead of repairing main breaks," continues Jason. "It costs around $7,000 to fix a main break.

We fixed 105 mains breaks last month, so the cost adds up. In the last couple of years, we've had periods of drought which affects break rates. In 2022 we fixed 845 breaks, and we're on our way to a similar number this year."

Meeting the cost per mile metric

"The payback is having 1,000 miles of modeled data that you can reliably trust and provides more robust data when doing replacement projects," Jason says. "One of our key performance metrics is cost per mile, so it's important to focus on very specific sections of pipe. I think using this tool will go a long way to saving us money in the long run."

What advice does Jason give other utilities?

"It's inevitable that water utilities will incorporate AI and machine learning into their processes – it's just a matter of time. At WaterOne, we've focused on getting our data in order, making sure that we record all the key events, locations, and attributes over several years because that's what drives the risk model," explains Jason.

"There are several vendors offering a variety of solutions, some include AI analytics, some combine satellite data, and some are software-driven models that compare your data to an industry benchmark. For us, it is important to work with a partner who is collaborative, prepared to truly understand our data, and who will work with us to develop the best model and the best outputs."

"We have a big mission. At the end of the day, we need to have trust and believe that AI will work. It's a huge step for us and we've now proved it's a step worth taking," Jason concludes.

Jason Beyer is GIS Lead, Distribution Engineering at WaterOne. With 16 years' experience, 10 of those at WaterOne, Jason is responsible for producing data and analysis to support the prioritization of distribution main replacement and transmission main condition assessment. Leading a team of GIS and technical professionals, he is also in charge of GIS support for hydraulic modelling and web app development for the Distribution Engineering team.

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