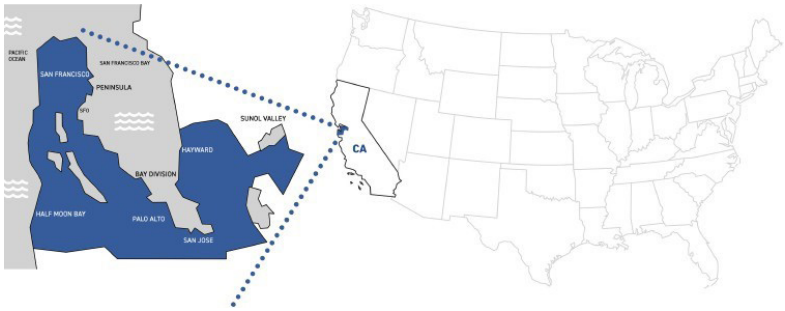
FRACTA

KURITA

FRACTA CASE STUDY

Supplementing drinking water pipe replacement decisions with artificial intelligence.

San Francisco Water Power Sewer
Services of the San Francisco Public Utilities Commission



THE UTILITY

SAN FRANCISCO PUBLIC UTILITIES COMMISSION (SFPUC)

SFPUC is the third largest municipal utility in California, serving 2.7 million residential, commercial andindustrial customers in four Bay Area counties. Approximately 1,240 miles of distribution pipe deliverwater to the residents within the City of San Francisco.These pipes are comprised of buried cast iron (61%), ductile iron (29%) and steel (10%), with 184 miles of cast iron pipe being 100+ years old and another 386 miles of cast iron pipe being 75-100 years old.

THE CHALLENGE

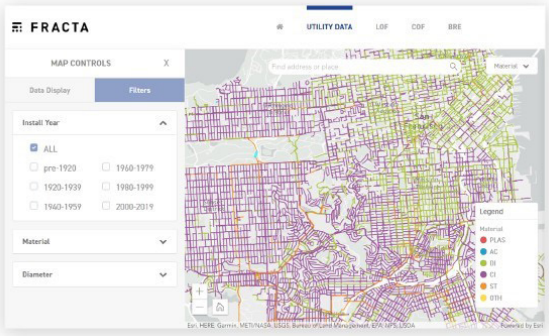
HOW TO DECIDE WHICH DRINKING WATER PIPES TO REPLACE

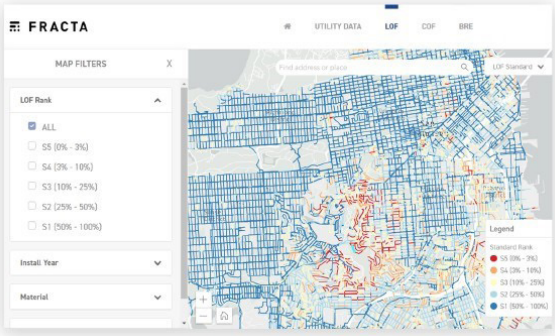
In 2011, the SFPUC evaluated the risks of in-City water distributon lines as part of a larger effort to prioritize main replacements before breaks happen. As part of this effort, they developed total risk scores for all of SFPUC's San Francisco distribution pipes; this resulted in approximately 25% of the system (approximately 310 miles) being identified for priority replacement, with a replacement goal of 15 miles/year. The key assessment criteria for this model are “priority” pipelines, hydraulic improvements, operational improvements, recent main breaks, seismic backbone and other replacement projects in the area.In 2016, Fracta began developing a cloud-based solution using Machine Learning to assess the condition of drinking water distribution pipes. The Fracta solution calculates and visualizes the Likelihood of Failure (LOF) for every water pipe segment. The LOF score represents the mathematical probability of a pipe failure. SFPUC supported the work by allowing Fracta to use its distribution data, and collaborated with engineers and scientists from Fracta in developing a large data-driven method to further support pipe replacement decisions.

THE CHALLENGE CONT.

USE A MACHINE LEARNING MODEL TO SUPPLEMENT THE EXISTING PIPE REPLACEMENT METHODOLOGY

Starting in 2017, Fracta modeled SFPUC's 1,240 miles of drinking water pipes in San Francisco, and subsequently commercialized its Pipeline Condition Assessment model in 2017. In 2018, SFPUC incorporated Fracta's LOF output as an additional assessment criteria and is now using Fracta as a supplemental tool for selecting which pipes to replace – particularly in the case of "borderline" pipes where SFPUC's existing risk score does not provide clear direction on a pipe's need for immediate replacement.





THE FUTURE

OPTIMIZING PIPE REPLACEMENT DECISIONS TO REDUCE WATER MAIN BREAKS

In an effort to select and prioritize projects, SFPUC continues to supplement its current methodology with Artificial Intelligence and Machine Learning to better assess and predict a pipeline's LOF, Fracta's tool will be valuable in future applications for system improvements. With this process, SFPUC planners will be able to prioritize replacement of vulnerable pipes before theybreak. This increases the reliability of the San Francisco distribution system, saves ratepayer resources from having to respond to avoidable main breaks, and ensures customers continue to receive reliable, high quality water from their taps.

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BRINGING ARTIFICIAL INTELLIGENCE TO INFRASTRUCTURE

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