The Return on Investment (ROI) of Reducing Water Loss

DIGITAL WATER SOLUTIONS

In today's world, water is an invaluable resource, yet millions of gallons are lost daily due to inefficiencies in municipal water distribution systems.

"The ROI of Reducing Water Loss" explores the significant benefits of addressing water loss. By implementing advanced technologies and strategies, municipalities can not only conserve water but also achieve substantial financial savings and environmental benefits. This document delves into the various methods for detecting and minimizing water loss, the role of smart water management systems, and the impressive return on investment that can be realized through proactive water loss management. Join us as we explore how reducing water loss can lead to a more sustainable and cost-effective future for water utilities.

What is Water Loss?

Water loss in a municipal water distribution system refers to the water that is produced and subsequently lost before it reaches the end consumer. This can occur through leaks, breaks, overflows, and other inefficiencies within the water distribution system. Managing and minimizing water loss is crucial for ensuring sustainable water supply, reducing costs, and maintaining infrastructure integrity.

Calculating Water Loss in Municipal Water Systems

Calculating water loss in municipal water systems is a critical aspect of water management that involves the assessment of non-revenue water, which includes both:

- **apparent losses** due to meter inaccuracies or unauthorized consumption, and
- **real losses** resulting from leaks, bursts, and overflows.

This process typically begins with a systematic analysis of water supply and consumption data. Advanced methodologies like the Infrastructure Leakage Index (ILI) and performance indicators such as the Non-Revenue Water (NRW) percentage are utilized to quantify water loss levels and set performance targets.

The challenges associated with estimating the NRW percentage will vary from one municipal water system to the next. For example, municipalities that have implemented District Metered Areas (DMAs) will have an easier time tracking real losses within those areas compared to municipalities without DMAs. The type of flow meter or metering technology can also result in a "delayed" estimate of water loss. For example, municipalities that rely on manual reading of water meters will only be able to obtain an updated consumption value every 1-4 months, whereas municipalities with smart meters can receive consumption data effectively in real-time. Ultimately, obtaining an accurate measure of NRW is oftentimes a complex challenge in and of itself, and any abilities of new or existing technologies to help in this endeavour should be taken into careful consideration.

Strategies for Minimizing Water Loss

Minimizing water loss in a municipal water distribution system involves several strategies:

- **Regular Maintenance and Monitoring**
  Regular maintenance and monitoring can detect leaks early.
- **Infrastructure Upgrades**
  Upgrading infrastructure with modern materials and technology can prevent breaks.
- **Smart Water Management Systems**
  Implementing smart water management systems can optimize distribution networks and reduce water loss.
- **Public Education on Water Conservation**
  Public education on water conservation also plays a role in minimizing overall water usage.

How to Detect Municipal Water Distribution Leaks Early

Early detection of leaks in a municipal water distribution system can be achieved through various methods. Acoustic sensors can listen for the sound of escaping water within the system. Pressure gauges can monitor for sudden drops which may indicate a leak. Visual inspections and the use of smart water meters also contribute to identifying leaks before they become major issues.

Additionally, pressure management, active leakage control, and pipeline management are integral components of a comprehensive strategy to reduce water loss and enhance the efficiency of the municipal water supply system. Any of these methods can be further coupled with signal processing techniques, machine learning or artificial intelligence to further maximize their ability to detect leaks in the early stages.

Most Effective Method for Leak Detection

The most effective method for detecting leaks within a water system is a comprehensive approach that includes regular monitoring, the use of advanced acoustic sensors, and pressure testing. Regular monitoring involves visual inspections and checking for unexplained fluctuations in water usage, which can often indicate the presence of a leak. Acoustic sensors are highly sensitive devices that can detect the sound of water escaping from pipes, even when leaks are not visible. These sensors can be strategically placed throughout the system to provide real-time alerts. Pressure testing is another critical component, where water pressure within the pipes is measured and monitored over time; a drop in pressure can signify a breach in the system. Additionally, implementing smart water technologies that provide data analytics can help identify patterns that suggest leaks and allow for prompt repairs. It's essential to combine these methods with a proactive maintenance schedule to ensure the integrity of the water system.

The value proposition of hydrant.AI centers on its ability to provide advanced, real-time data analytics and insights for water systems. By leveraging cutting-edge artificial intelligence and machine learning algorithms, hydrant.AI offers a suite of tools that enable municipalities and water utility companies to optimize their operations, reduce costs, and improve service delivery. hydrant.AI utilizes intelligent monitoring to detect anomalies in water usage patterns, aiding in the early detection of leaks or unauthorized access to the water supply. Overall, the value of hydrant.AI lies in its contribution to the sustainability and efficiency of water resources management.

Return on Investment of Reducing Water Loss

The return on investment (ROI) of reducing water loss in municipal systems can be substantial. When municipalities proactively address water loss, they not only conserve a vital resource but also reduce the costs associated with treating and distributing water as well as costs associated with unexpected repairs. This can lead to significant financial savings over time. Moreover, by minimizing water loss, municipalities can defer the need for costly infrastructure expansions to meet demand, further enhancing the ROI. Additionally, there are environmental benefits that, while not directly quantifiable in monetary terms, contribute to the overall value gained from reducing water loss. These include preserving natural ecosystems and reducing energy consumption related to water treatment and distribution processes. Ultimately, investing in technologies and strategies to reduce water loss is both fiscally responsible and environmentally sustainable.

Estimating the Return on Investment of a New Technology

Whenever a municipality is considering investment in a new technology, the expected ROI associated with that technology is a vital piece of information for the decision-making process. When it comes to water loss or NRW, the accuracy of the ROI estimate for a municipality is highly dependent on the accuracy of the NRW data available. Several other key factors can also drastically influence the potential ROI of a technology, such as:

- **Geographic Factors:** variations in the availability or cost to treat and supply water depending on location.
- **Population Density:** the average number of metered connections per mile of pipe
- **Pipe Material:** different materials have different probabilities of leak likelihood.
- **Pipe Age:** leak likelihood is positively correlated with pipe age.

As providers of our own leak detection and pressure monitoring solution (hydrant.AI), we understand the importance of being able to estimate the ROI of our technology before making an investment. To aid in the decision-making process, the team at DWS have developed an ROI calculator for hydrant.AI which takes into consideration these key factors, enabling municipalities to obtain an estimate of ROI specific to their water system. To remain as unbiased and as transparent as possible, the ROI calculator is constructed from statistics and data found in openly available sources wherever possible. Any data specific to the performance of hydrant.AI was also sourced solely from real-world deployments of the technology in municipal water systems.

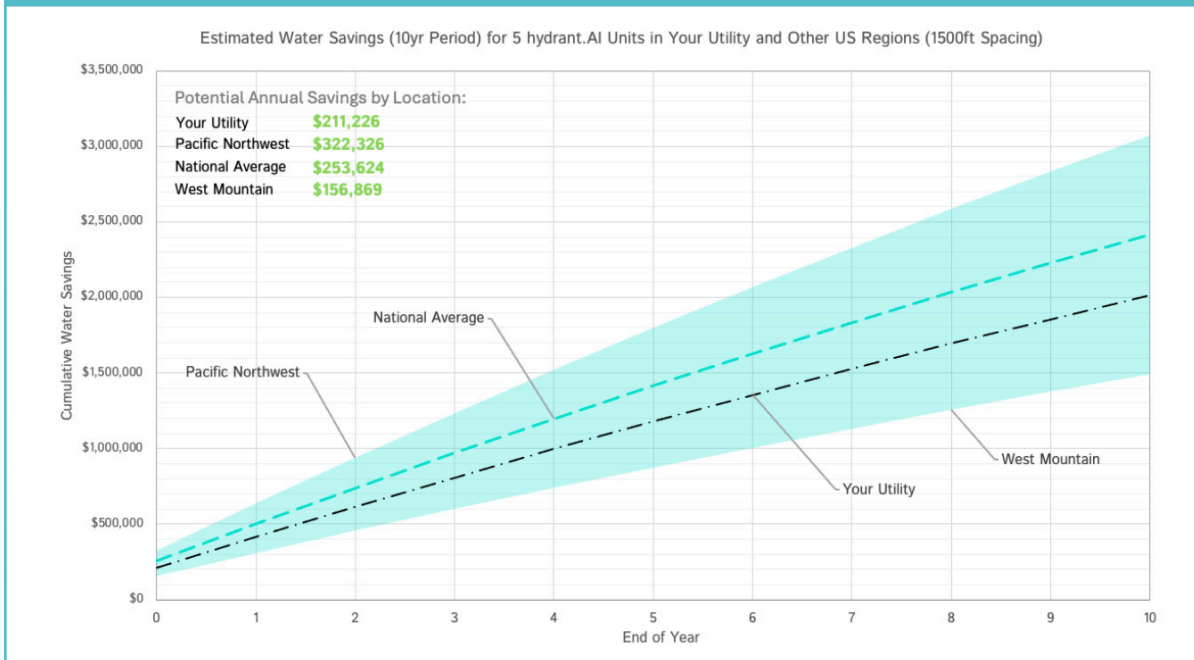## Estimated Annual Savings: $250,000 | 5 hydrant.AI Units | 1,500ft Spacing

Estimated Water Savings (10yr Period) for 5 hydrant.AI Units in Your Utility and Other US Regions (1500ft Spacing)

Potential Annual Savings by Location:
Your Utility $211,226
Pacific Northwest $322,326
National Average $253,624
West Mountain $156,869

Figure 1 - Example of 10-year ROI for 5 hydrant.AI Units for various regions across the US

Estimated ROI Forecast by Population | 11.1% NRW | 5 hydrant.AI Units | 1,000ft Spacing

hydrant.AI ROI Forecast for DWS Waterworks - 11.1 % NRW & 1000 ft Unit Spacing
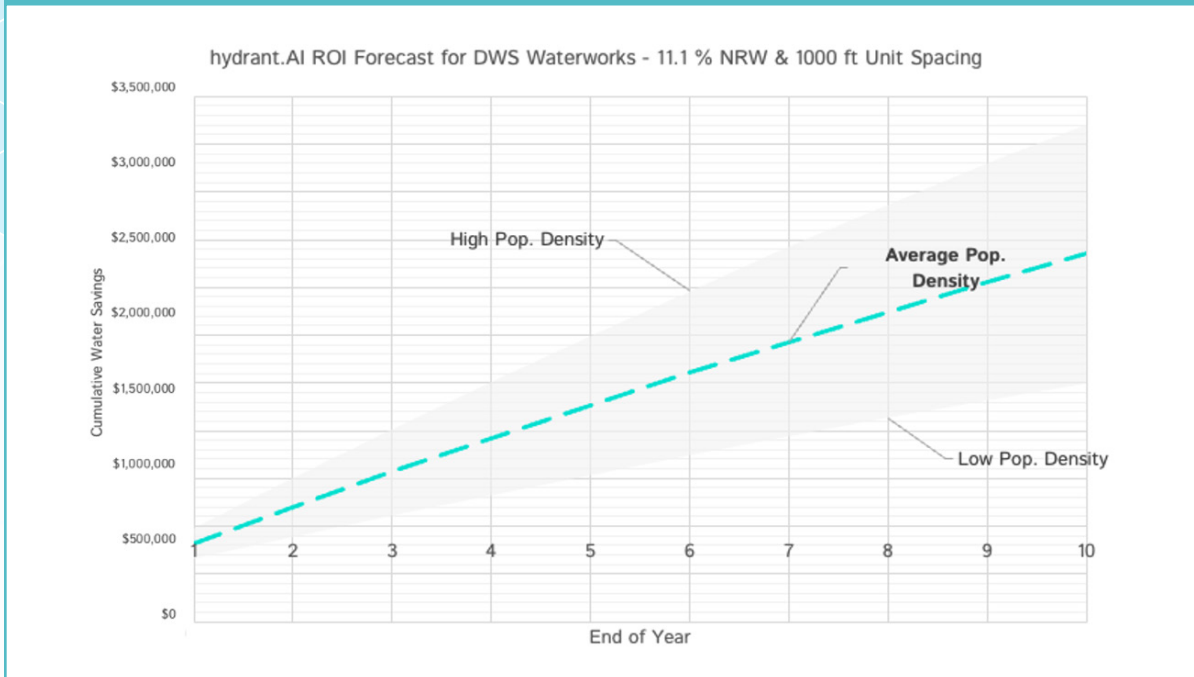
*Figure 2 - Example of 10-year ROI for 5 hydrant.AI units for the same
size distribution network with different population densities*

Beyond the decision-making process, the ROI calculator can also be a useful tool for municipalities that have already adopted hydrant.AI. The example below shows the ROI calculator being used to estimate the ROI of a pre-existing leak in King County WD90 that was detected by hydrant.AI and promptly repaired by the municipality shortly after deployment. For more information, please refer to the full case study on KCWD90 which can be found <u>here</u>.
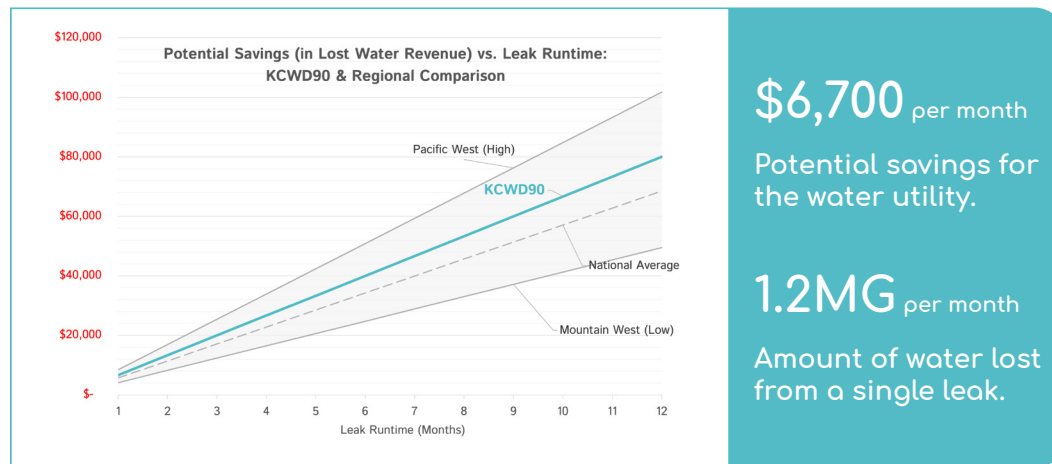

Figure 3 - ROI Estimate for King County WD90 (KCWD90) Pre-Existing Leak

AWWA's Efforts to Advance Water Loss Control & Sustainability

The American Water Works Association (AWWA) advocates for water utilities to implement water loss controls as a means of providing accountability in their operations. This involves reliably auditing their water supplies and implementing controls to minimize system losses, which include real losses from pipeline leakage and apparent losses from unmeasured or unbilled customer water consumption.

The AWWA endorses the IWA/AWWA Water Audit Method, which offers best management practice tools and guidance for efficiently managing water supplies. The AWWA Free Water Audit Software is the industry standard tool for conducting annual water audits and using the results to guide a program for cost-effective water loss control and revenue recovery. This software, now in its sixth version, includes over 1,000 improvements from user feedback, featuring an Interactive Data Grading feature, a Performance Indicator Dashboard, and a streamlined user experience. Additionally, the AWWA Water Audit Reference Dataset (WARD) assists utilities in comparing their attributes and key performance indicators with other utilities to benchmark and improve their water loss control measures.

Reducing Carbon Emissions Through the Leakage Emissions Initiative (LEI)

The Leakage Emissions Initiative (LEI) is a concerted effort to address the carbon emissions resulting from water loss in utility systems. It was established with the goal of incentivizing utilities to aggressively identify and reduce leakage, thereby generating carbon credits that can be sold to organizations striving for carbon neutrality. The initiative underscores the importance of reducing carbon emissions to combat climate change, aligning with the objectives set forth by the Paris Accords.

The LEI emphasizes the need for utilities to adopt the Standard IWA/AWWA Water Balance and the newly added Carbon Balance methodology. By doing so, utilities can quantify the carbon cost associated with every unit of water distributed and subsequently lost due to leakage. This approach not only highlights the environmental impact of unmanaged leakage but also presents an economic incentive for utilities to minimize water loss and its associated carbon footprint.

The LEI represents a significant step towards a more sustainable and responsible management of water resources, contributing to the broader efforts of achieving a carbon-neutral future.

Further Reading on Water Loss

Additional water loss resources can be found here:

Water Loss Control | American Water Works Association

M36 Water Audits and Loss Control Programs, Fifth Edition

AWWA Water Loss Control Pressure Management Factsheet November 2020

Key Performance Indicators for Non-Revenue Water - AWWA Water Loss Control Committee Report November 2019

IWA: Leakage Emissions Initiative: Establishing a Standard Carbon Balance for Drinking Water Utilities - April 2023

ISO 24528:2021 - Guideline for a Water Loss Investigation of Drinking Water Distribution Networks

Greenhouse Gas Equivalencies Calculator | US EPA

SWAN - Smart Water Network Forum

Digital Water Solutions

At Digital Water Solutions we are here to help you and
your team find leaks, save water, and save money.

Why wait. Reach out to us today to discuss what your ROI would be for an initial
problem area, or your entire distribution network. Our team is ready to work through
the specifics of your network to help you both prioritize the early investment, and plan
for a longer-term deployment of a permanent leak detection solution.

Contact us now to start your journey towards
finding leaks, saving water, and saving money.

Digital Water Solutions Inc.
(647) 951-8628
get@digitalwater.solutions