



Water Loss Management and Leak Detection

Big Flats Water Dept
May 8, 2019



What is Water Loss?

- Water loss is water that never reaches the customer. Water loss has impact on profitability and water quality.
- Water loss greatly affects operational cost and treatment.
- Non-revenue water is the water that is lost before it reaches the customer.
- Losses can be real or apparent.



Identifying Water Loss

Physical Loss (Real Loss)	Commercial Loss (Apparent Loss)
<ul style="list-style-type: none">• Pipe breaks and leaks	<ul style="list-style-type: none">• Metering errors
<ul style="list-style-type: none">• Storage tank overflows• Hydrants cracked open	<ul style="list-style-type: none">• Water theft
<ul style="list-style-type: none">• Unmetered Fire flow test• House connection leaks	<ul style="list-style-type: none">• Billing anomalies

- Real losses are physical, such as leakage and storage overflows
- Apparent losses are non-physical losses in operation due to meter inaccuracies, data handling errors in billing and unauthorized consumption.



Identifying Water Loss

The High Cost of NON-REVENUE WATER

Leaks
Leaks are the largest component of real losses, with 75% of drinking water investment needs being repair and replacement of leaky pipes.

REAL LOSSES
Real losses are the physical losses of water from the distribution system.

Main Breaks
There are 650-700 main breaks per day in the U.S., or roughly 240,000 per year.

Tank Overflows

Meter Errors

Thft

Billing Errors

APPARENT LOSSES
Apparent losses are non-physical losses that consist of water successfully delivered but not measured or recorded accurately.

What is NRW?
Non-revenue water (NRW) is clean, treated drinking water delivered to the distribution system but not billed to customers.

Water Loss in the U.S.

- We lose about seven billion gallons of water per day
- The amount of water lost in one year is enough to supply the ten largest cities in the U.S.
- Lost water accounts for billions of dollars in lost revenue
- The amount of NRW for utilities is 10-30%

Slow the Flow
AWWA's *Water Audits and Loss Control Programs M36* methodology helps utilities find and control water loss:

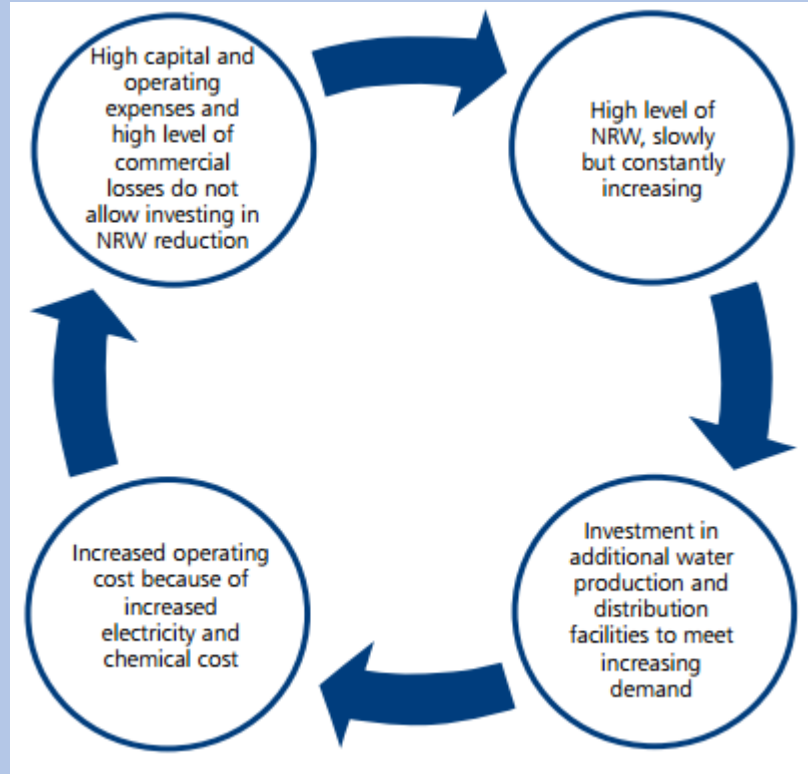
- Lowers operation and maintenance costs
- Increases water availability
- Reduces the need for new sources and treatment plants
- Diminishes impacts from drought and climate change

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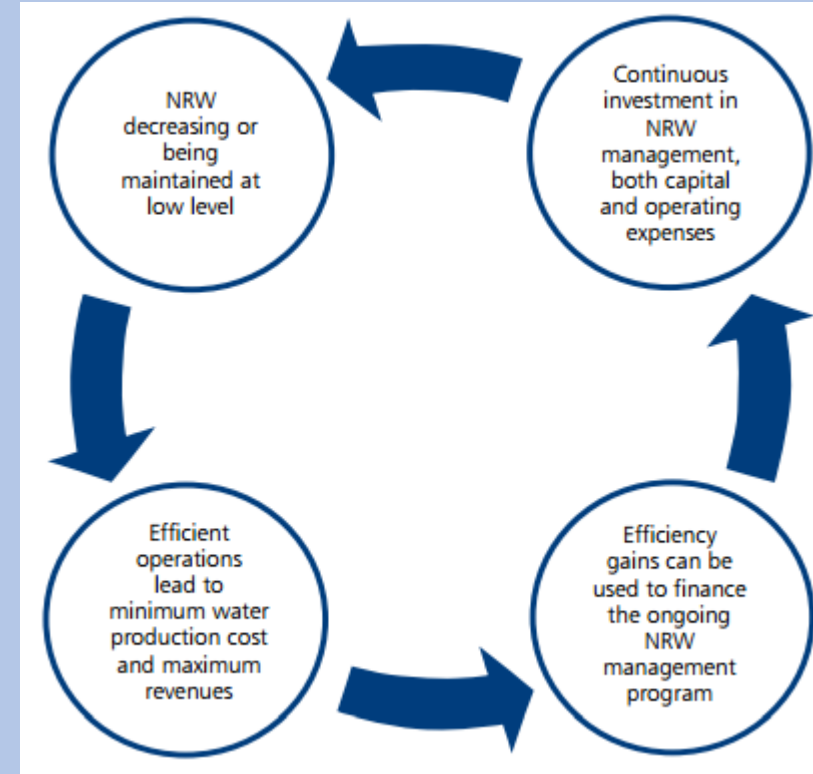
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Non- Revenue Water (NRW) Cycle



Vicious NRW circle



Virtuous NRW circle



A Simple Calculation

- Do you know where your water is going?
- Simple ratio analysis tells you a lot
 - What's an acceptable loss?
 - Things getting better or worse?

$$\text{Unaccounted-for water (\%)} = \left[\frac{\text{Production} - \text{metered use}}{\text{Production}} \right] \times 100\%$$

- You can't fix a problem until you know it's there!

Know where your water is going – are there unaccounted losses?



Benefits of Leak Detection and Repair

- Improved operational efficiency
- Lowered water system operational costs
- Reduced potential for contamination
- Extended life of facilities
- Reduced potential property damage and water system liability
- Reduced water outage events
- Improved public relations

Be proactive, not reactive, dealing with leaks!



Passive vs. Active Leak Detection

- Passive leak detection means waiting for visible signs of leakage to appear
 - Surfacing water or sinkholes in a road or other damage due to settlement and erosion from leaking water
- Active leak detection goes beyond the readily visible signs of leakage to actively searching for leaks that might not otherwise appear until damage occurs or, in many cases, may never show visible signs.
- If a municipality repairs leaks only as their visual evidence appears, system demand would gradually increase as the system ages and unseen leakage gradually increases
- With an active leak detection and repair program, leakage control activities are initiated immediately to find and repair them.
- The benefit of active leak detection is that leaks are usually found much sooner and less water is lost than when waiting for visible evidence



Leak Risk Factors

- Old or poorly constructed pipelines
- Inadequate corrosion protection
- Frost heaves, heavy vehicle traffic
- Poorly maintained valves and mechanical damage
- Unauthorized digging

Not all leaks rise to the surface and are easily detected



Signs of visual leaks (surface)

- Water bubbling out of the ground.
 - Water coming out from inside of a building.
 - Frozen or broken hydrants or fixtures.
-
- These are the most obvious leaks to locate.



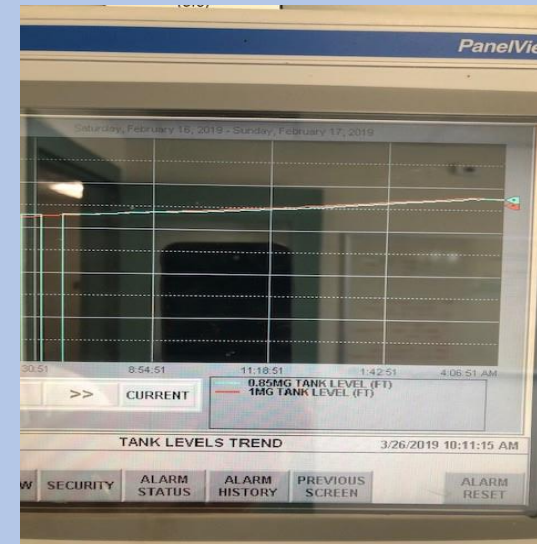
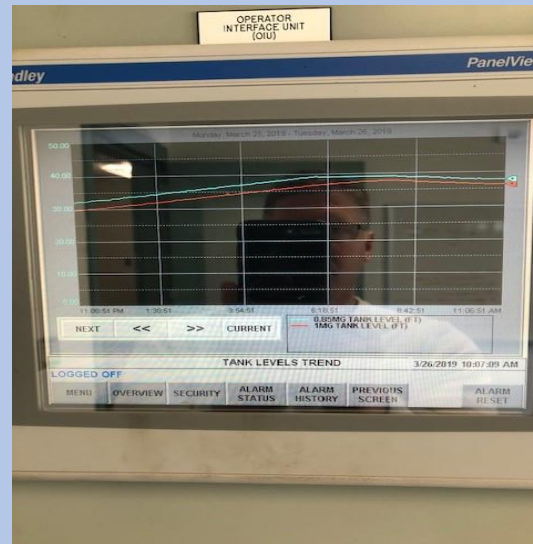
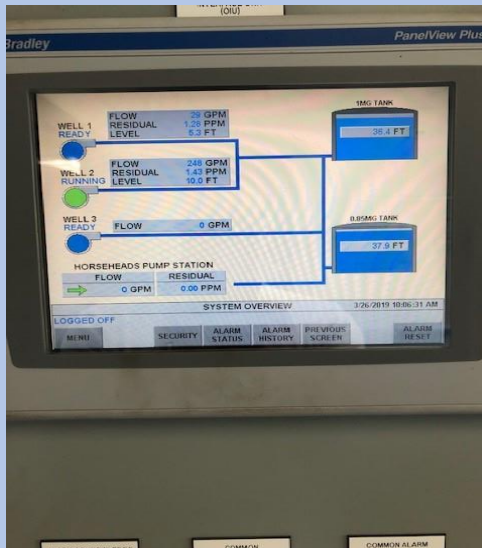
Signs of Underground Leaks

- Unusually wet spots in landscaped areas and/or water pooling on the ground surface.
- An area that is green, moldy, soft, or mossy surrounded by drier conditions
- A notable drop in water pressure/flow volume
- A sudden problem with rusty water or dirt or air in the water supply (there are other causes for this besides a leak)
- Heaving or cracking of paved areas
- Sink holes or potholes
- Uneven floor grade or leaning of a structure
- **Unexplained sudden increase in water use**, consistently high water use, or water use that has been climbing at a fairly steady rate for several billing cycles



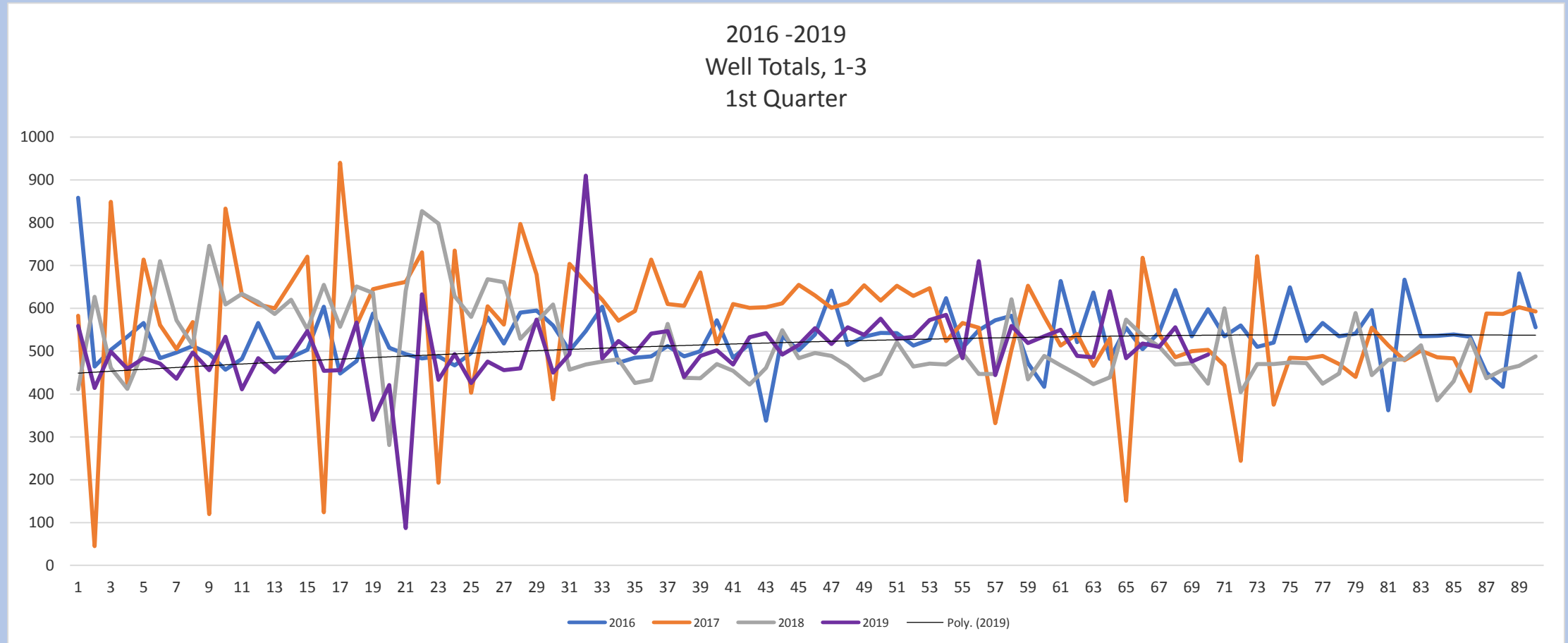
Leak detection begins

- Leak detection starts within the source of supply.
- Paying attention to your daily usage.
- SCADA systems (Supervisory Control And Data Acquisition)





Weekly well charts

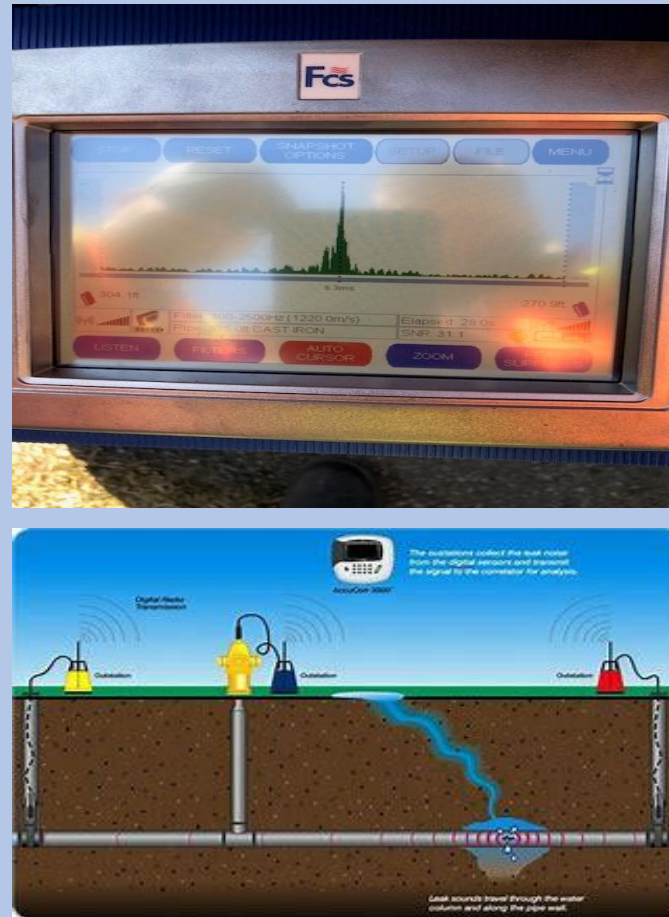




Detection Techniques



Water operator listens on a hydrant to find a
Underground leak



Correlation of water main



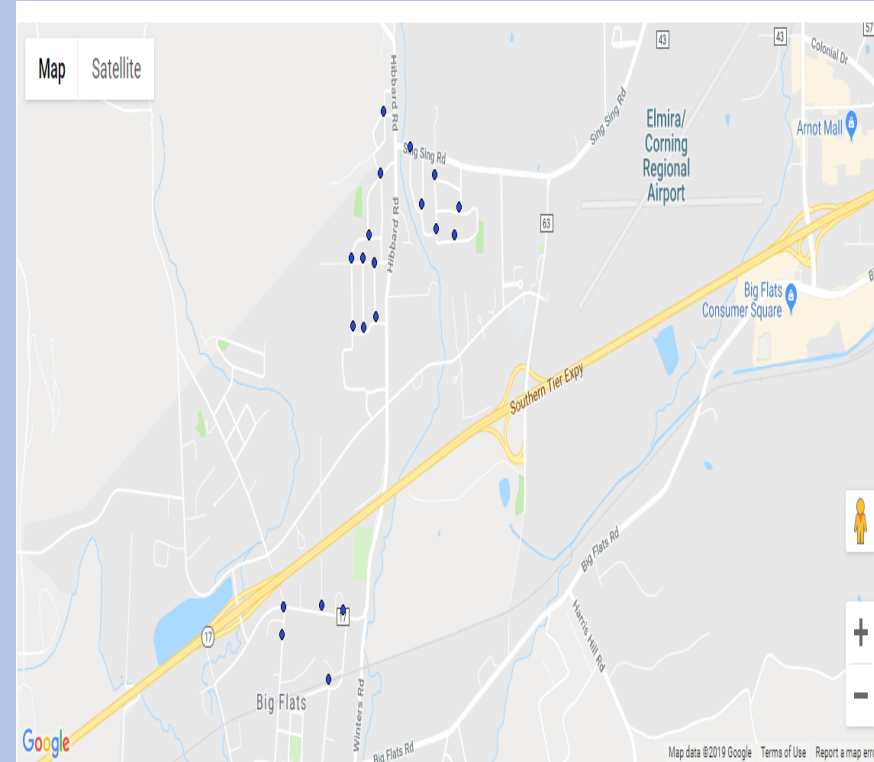
Water operator listens to the ground mic to pin
point the underground leak



Permanent Leak detection



Perma net loggers



Data Gate



Legal Minefield for Inaction?

- Prompt action can help avoid litigation
- Might win case but lose in the court of “public opinion”
- Need to stay current with standards that have become accepted and customary

Water, Water Everywhere: Is a Municipality Liable for Damages Caused by a Leak in Its Water Supply System?

By Karen M. Richards

In many communities, water supply systems are provided by a municipality. Leaking water supply systems can cause various types of property damages. This article explores a municipality's liability for such damages.



Governmental/Proprietary Functions

In determining a municipality's liability for damages, courts have examined “the specific act or omission out of which the injury is claimed to have arisen and the capacity in which that act or failure to act occurred.”¹ In other words, was the municipality acting in a governmental or proprietary capacity when it engaged in the allegedly negligent activity?

A proprietary function “is undertaken when governmental activities essentially substitute for or supplement traditionally private enterprises.”² When acting in a proprietary capacity, a municipality is held to the same duty of care as private individuals and institutions engaging in the same activity.³ A municipality is not entitled to the defense of governmental immunity when it is engaging in a proprietary function, and accordingly, a plaintiff does not have to establish a “special relationship” with it in order to successfully commence an action against the municipality.⁴

In claims for damages caused by a municipality's water supply system, courts generally have found that the “maintenance and repair of water mains is traditionally performed by private businesses, such as water companies, and thus, where a municipality maintains a water system to provide water to private customers, it constitutes a proprietary function.”⁵ This is illustrated in *D & D of Delhi, Inc. v. Village of Delhi*, where a village employee turned a shutoff valve believing it would stop the flow of water through the main line and help isolate the water break.⁶ Instead, the water flowed into the plaintiff's store causing substantial property damage. The court rejected the village's contention that the complaint should be dismissed on the basis of governmental immunity because it found that the village's maintenance and repair of water mains constituted a proprietary function.

The same finding of a proprietary function occurred in *K & S Realty Co. v. City of New York*, where a city crew had inspected the main for leaks months before a 48-inch water main broke and flooded nearby properties.⁷ The inspection for leaks “was prompted principally by the desire to avoid waste of a commodity, i.e. water.”⁸ The court found the plaintiff's claim was actionable, even in the absence of a special duty running from the City to the plaintiffs, since the decision made by the City to inspect for leaks “was conducted by the City acting proprietarily as a water vendor rather than in its governmental capacity as a protector of the public health and safety.”⁹

On the other hand, the protection and safety of the general public pursuant to the general police powers is a governmental rather than a proprietary function.¹⁰ When a municipality acts in a governmental capacity, it will only be held liable for injuries resulting from its negligent performance when a “special relationship” exists between it and the injured party.¹¹

A municipality's construction, installation, and extension of a water system have been found to be governmental actions because these functions are necessary for the preservation of public health and safety.¹² Therefore, where it is alleged that negligence occurred during the construction, installation, or extension of a water system, liability can only attach if the plaintiff can establish a special relationship with the municipality.¹³

Continuing to utilize the governmental/proprietary distinction in claims involving a municipal water supply system has come under criticism. While supplying water may have historically been undertaken by private agencies,

[i]n this day and age, municipal water corporations have flourished to the relative exclusion of private utilities. Moreover, in our modern, complex urban civilization, it is readily apparent that the supplying of water by a municipality is as immediately and directly related to the health, safety and welfare of its inhabitants as is the construction of sewers which are all but universally regarded as governmental.¹⁴

Despite this criticism, New York courts have yet to



Summary

- Leaks are a “fact of life” in the municipal water business
 - Not a question of “if” but rather “when”
- Detecting and dealing with problems early is smartest approach
 - Newest technology is a powerful tool
- If you don’t have an aggressive leak detection program yet, it’s probably time to get one started
 - Learn from others who have programs up and running