



# To Control Water Loss May Mean It's Time to Conduct a Water Loss Survey

**A**ccording to the US Environmental Protection Agency (EPA), “Much of the drinking water infrastructure in the United States has been in service for decades and can be a significant source of water loss through leaks. In addition to leaks, water can be ‘lost’ through unauthorized consumption (theft), administrative errors, data handling errors, and metering inaccuracies or failure.”<sup>1</sup> Another important term is non-revenue water (NRW), which includes real and apparent losses, along with unbilled, authorized consumption such as fire-fighting.

Kansas Rural Water Association (KRWA) staff provide a lot of assistance to cities and rural water districts in the attempt to determine the cause of unaccounted for water. Too many people just assume that when the amount of water sold is less than the amount produced or purchased by the system, then there’s probably a bunch of leaks that need to be located. That may or may not be the case.

The first step that I do in performing a water loss survey is to prove the master meter is accurate. This goes for cities and rural water districts. This is a simple process that involves connecting the master meter to a KRWA test meter

and performing three tests for accuracy. If the system’s master meter is not set up with a test port, it may first be necessary to install a new test port. Installing a test port allows the meter to be tested at any time in the future. I always suggest that every meter have a test port. It seems so basic to include it in the system design. Usually installing a new port only involves installing a saddle clamp with a shut-off valve and a coupler. This is relatively inexpensive for the system to do to ensure the meter can be tested. But sometimes the test port needs to be installed on cast-iron pipeline and not every water district or small city can accomplish that.

Another aspect of controlling unaccounted for water is that it may be necessary to test several customer meters throughout the water system. This is especially true if the meters are very old or have high use. This will indicate possible water loss caused by the customer meters.

So, in my hypothetical review case here, we’ve tested the master meter and we also tested a sampling of the customer meters. They have been proven to be accurate. We will also assume that the utility billing and meter reading processes have been verified. So, with a continuing water loss, it may now be time to actually begin to conduct leak detection. The point is that possible causes of chronic water loss need to be investigated before launching out on leak detection work.

When beginning a water loss survey in a rural water district, I start by studying the system’s maps to get an idea of where all the valves are located. I usually start with the straight runs of pipeline that usually dead-end. These seem to be easier to do than listening on looped lines. I start at the end of the lines and close the valves for a minimum of 10 to 15 minutes. Then slowly open the upstream valve and listen to see if it takes the waterline a considerable time to charge up. If it charges right up it proves there is not a major leak on that line. If it takes a while to charge, it could indicate there’s a leak on the line. It may be necessary to check customer meters to ensure no customers are using water that

## Types of Water Loss

There are two types of water losses. They are:

- **Real Losses** – actual losses of water from a system, including leaks from transmission and distribution mains, service connections up to and including the meter and overflows from storage tanks.
- **Apparent Losses** – occur in utility operations due to customer meter inaccuracies, data handling errors in customer billing systems and unauthorized consumption; that is, treated water that is consumed but is not properly measured, accounted or paid for.

<sup>1</sup> EPA. 2013. Water Audits and Water Loss Control for Public Water Systems. EPA 816-F-13-002.



**This photo shows a meter test being conducted by KRWA in a rural water district in late January 2022. The test meter is an ultrasonic, non-intrusive unit by Fuji Electric. A critical factor in using the non-intrusive units is to have certainty of the inside diameter of the pipe being tested. While this meter is rated for testing up into the thousands of gallons per minute, KRWA has found them to be very helpful in measuring flow on distribution pipelines that have been exposed during leak detection surveys.**

could show a false leak. From there I just keep making the way back into the district using the same steps of closing and opening valves and listening to them with sonic detection equipment. It's pretty amazing how the sonic equipment will pronounce the sound of water going through a valve.

A person can check pipelines that are looped in the same manner. You just have to make sure all the valves are closed on the loops. In a few cases, it may be necessary to leave the valves on the looped lines closed for several days to see if any customers complain of low flow or low pressure.

Leak location is similar for cities. First, always ensure the master meter is accurate. Cities seem to be easier to locate leaks because of the meters, valves, and fire hydrants. All these appurtenances are in close proximity vs. miles apart as in a rural system.

**In some instances using the sonic equipment, I have heard leaks up to three blocks away.**

I use a sub-surface, sonic leak detector to listen to the meters and fire hydrants. I usually just begin in one end of the town and make my way up and down each street listening for possible leaks. If a meter makes a noise indicating a leak close by, it is necessary to make sure the customer is not using water. In some instances using the sonic equipment, I have heard leaks up to three blocks away.

Once a leak is indicated, I begin doing what I refer to as "ground-mic'ing". A highly sensitive microphone is mounted in a pad that rests on the street or sidewalk. In either location, it works well. I have had relatively no luck pinpointing a leak on grass or bare dirt using a ground mic. The sound of a leaking pipe just does not resonate very well in soil.

Over the past 12 years of working for KRWA, I have found many fire hydrants that have been leaking. Frequently, this was because the hydrant was not fully shut off and was allowing water to emit out the weep holes. This may be due to an operator flushing and not getting the hydrant shut all the way off. The fire department also could have used the hydrant and failed to fully close the hydrant. Either way, I am sure it was not intentional. Some of the older hydrants are very difficult to get seated down all the way.

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