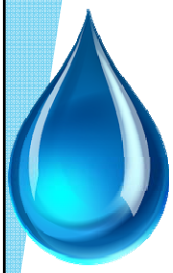


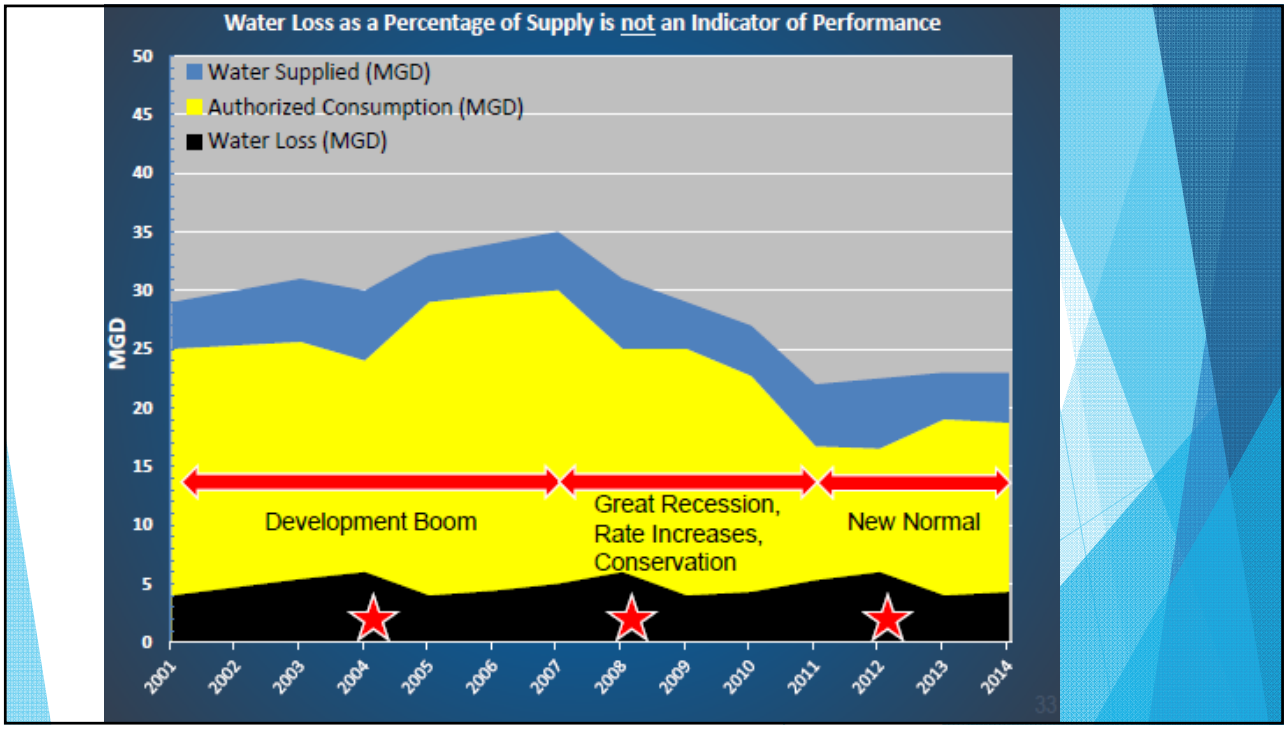
2016 Water Loss Audit Results

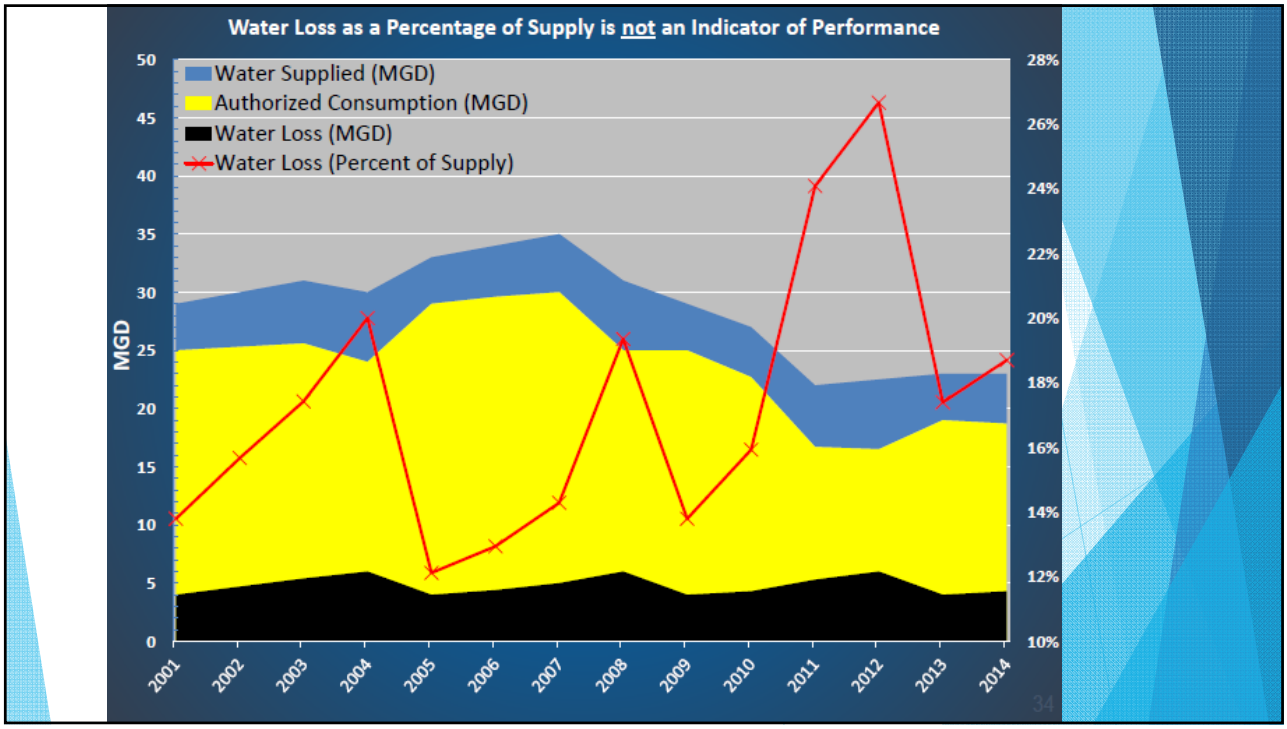
Michelle Erickson, Technical Specialist

February 15, 2017 LUC

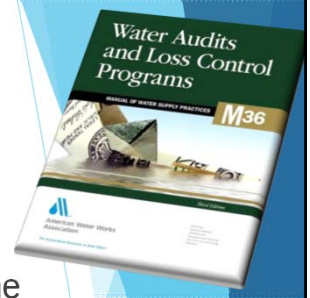
New Goals Based on New Understanding

- **Percentages:**
  - Unaccounted for Water (Yearly report from 2000-2015)
  - Non-Revenue Water Loss Goal (2013 Water Conservation Plan)
    - Goal to reduce to 10-11% of total treated water by 2020
- **Change in Focus from Percentages to Gallons:**
  - **Total Water Produced:** Can vary dramatically based on factors such as weather, water conservation or economic conditions
  - **Background Leakage:** Tends to not dramatically from year to year
  - **Percentages:** Reporting water losses as a percent of water produced is not a good performance indicator
  - **Gallons:** Reporting water losses in gallons or gallons per service connection provides a better performance indicator


Water Loss as a Percentage of Supply is not an Indicator of Performance
Water Supplied (MGD)
Authorized Consumption (MGD)
Water Loss (MGD)
MGD
Development Boom
Great Recession, Rate Increases, Conservation
New Normal
33

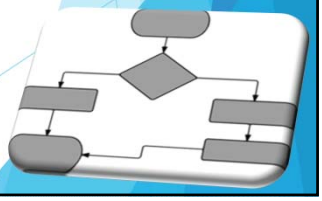

Water Loss as a Percentage of Supply is not an Indicator of Performance
Water Supplied (MGD)
Authorized Consumption (MGD)
Water Loss (MGD)
Water Loss (Percent of Supply)
MGD
34

What is an M36 Water Loss Audit

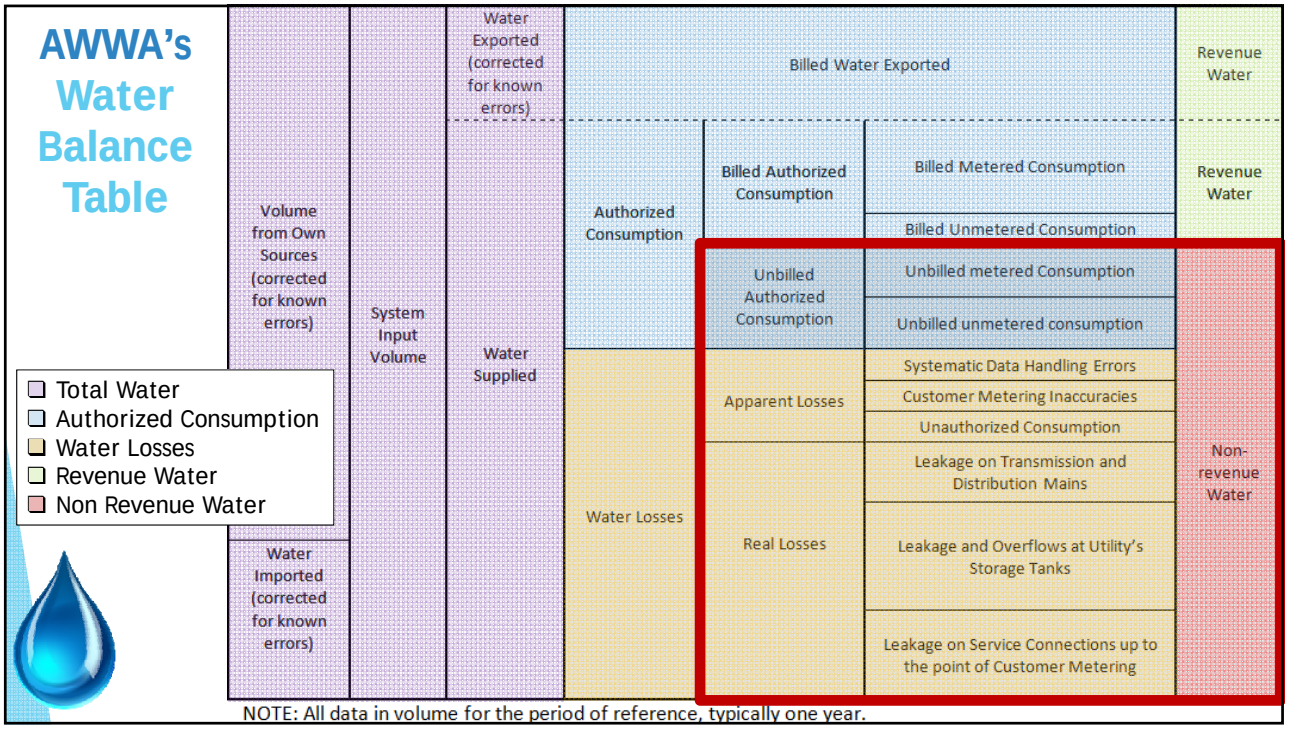


- **Water Audit:** Traces the flow of water from water treatment through the water distribution system and into customer properties
- **Water Balance Table:** Based on the theory that all water placed into a distribution system would equal all the water taken out of a distribution system
  - Summarizes water audit findings
  - The sum of each column are equal and therefore "balance"
  - *Note: Because all water is quantified (by measurement or estimate) as either authorized consumption or losses, we no longer use the term "Unaccounted for Water". The focus is now on reducing and managing "Non-revenue Water".*

3 Levels of Water Auditing Process



- **Top-down Approach:** Desktop process of gathering information from existing records, procedures, data and other information systems.
- **Component Analysis:** Technique that models leakage volumes based on the nature of leak occurrences and duration and is used to model various occurrences of apparent losses.
- **Bottom-up Approach:** Validates the top-down results with actual field measurements, physical inspections, and process flowcharting of customer billing systems.



Water Balance Table • Loveland Water & Power • 2015 Calendar Year • (Million Gallons)

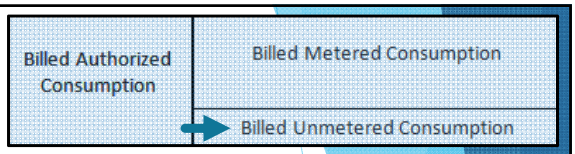
Volume from Own Sources 4,463.039	System Input Volume 4,467.389	Water Exported 87.113			Billed Water Exported 87.113	Revenue Water 87.113
		Water Supplied 4,380.276	Authorized Consumption 3,631.120	Billed Authorized Consumption 3,564.193	Billed Metered Consumption 3,564.000	Revenue Water 3,564.193
					Billed Unmetered Consumption 0.193	
				Unbilled Authorized Consumption 66.927	Unbilled Metered Consumption 12.173	Non-Revenue Water (NRW) 816.083
					Unbilled Unmetered Consumption 54.753	
			Water Losses 749.157	Apparent Losses 168.868	Unauthorized Consumption 10.951	
					Customer Metering Inaccuracies 149.007	
					Systematic Data Handling Errors 8.910	
Water Imported 4.350				Real Losses 580.289	Leakage on the following is not broken down: • Transmission and Distribution Mains • Overflows of Utility's Storage Tanks • Customer Metering	
					Real Losses 580.289	

Water Supplied

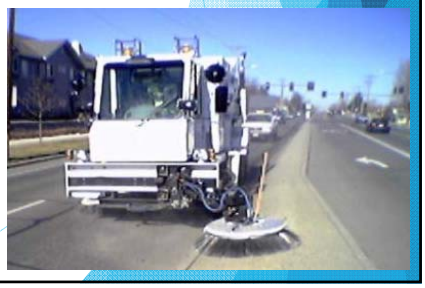
Volume from Own Sources	4,463.039 MG	• Water Produces at the Loveland Water Treatment Plant
+ Water Imported	4.350 MG	• Water Bought from Neighboring Water Districts
- Water Exported	87.113 MG	• Water Sold to Neighboring Water Districts
= Water Supplied	4,380.276 MG	

- **Improvements Made:**
  - Fixed computer software calculation error on source water meter
  - Scheduled to read interconnect meters near end of calendar years
- **Improvement Goals:**
  - Work with neighboring water districts to read their interconnect meters near end of calendar years
  - Calibrate electronic components of source water meters more regularly - preferably annually

Billed Unmetered Consumption



- **Improvements Made:**
  - Installed 2 meters on trucks with water tanks in 2016
  - Only 4 vehicles remaining with unmetered water tanks that we estimate and bill based on load counts



Unbilled Metered Consumption

Unbilled Authorized Consumption	Unbilled metered Consumption
	Unbilled unmetered consumption

- **Improvements Made:**
  - Began billing:
    - **Parks Department:** watering downtown beds
    - **Wastewater Utility:** 3 existing meters at wastewater treatment plant
    - **HOA:** irrigation of landscape around a neighborhood lift station
- **Improvement Goals:**
  - Working to bill the following:
    - Irrigation of two grassy detention ponds
    - Irrigation of landscaping at a water ditch syphon



Unbilled Unmetered Consumption

Unbilled Authorized Consumption	Unbilled metered Consumption
	Unbilled unmetered consumption

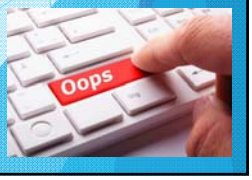
- **Improvements Made:**
  - **Wastewater Utility:** Installed 2 meters at Wastewater Treatment Plant and began billing in 2016
  - **Water Utility:** Reviewed and updated as needed the calculations and tracking methods for water used to flush transmission lines, clean water storage tanks, flush fire hydrants, perform fire hydrant flow tests, disinfect pipes, and de-watering of lines.
- **Improvement Goals:**
  - **Parks Department:** Install meter at concession stand sink at North Lake Park and bill Parks for water usage
  - **Fire Authority:** Ensure staff follows through on improved logs of water usage (fire training grounds, off-site training, fighting fires and possibly fire sprinkler systems)
  - **Water Utility:** Ensure staff continues with detailed logs of water used to maintain the water distribution system and for disinfection of new lines and for construction projects.



Apparent Losses:
System Data Handling Errors

Apparent Losses	→ Systematic Data Handling Errors
	Customer Metering Inaccuracies
	Unauthorized Consumption

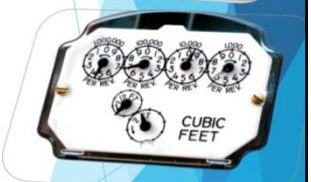
- **Improvements Made:**
  - Signed contract with Water Company of America to do a thorough review of unbilled or misbilled utilities.
- **Improvement Goals:**
  - Correct any errors discovered by Water Company of America
  - Flowchart the customer billing system to determine the potential for data handling errors



Apparent Losses:
Customer Metering Inaccuracies

Apparent Losses	Systematic Data Handling Errors
	→ Customer Metering Inaccuracies
	Unauthorized Consumption

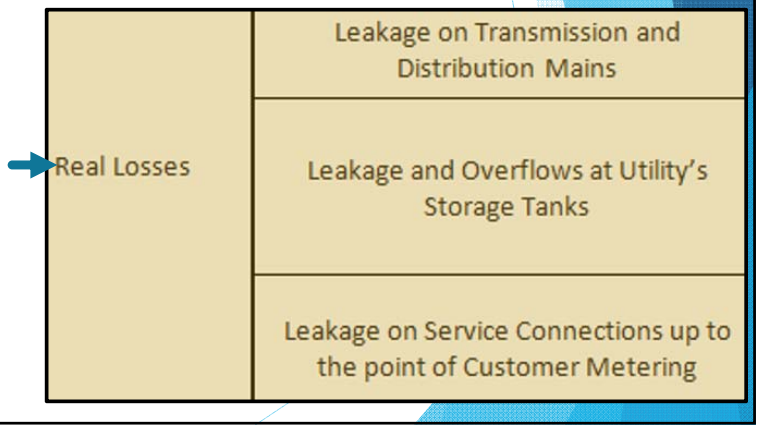
- **Actions Already In Place:**
  - **Account Anomaly Meter Testing:** Test when flagged for large change in consumption or a possible meter problem
  - **Large Meter Testing:** 1-1/2" in diameter or larger every 5 years
  - **Meter Replacements:** Replace when needed (less costly, discontinued parts, lead component restrictions, AMI incompatibility, etc.)
- **Improvement Goals:** Audit the Water Flows to Ensure:
  - **Right Sizing:** Meters sized correctly for the normal flow range not just for peak flows
  - **Appropriate Type:** Audit meters to ensure the proper type of meter is employed
    - **Turbine Meter:** For continuous moderate and high flows (periodic low flows result in apparent losses)
    - **Compound Meters:** For variable flows

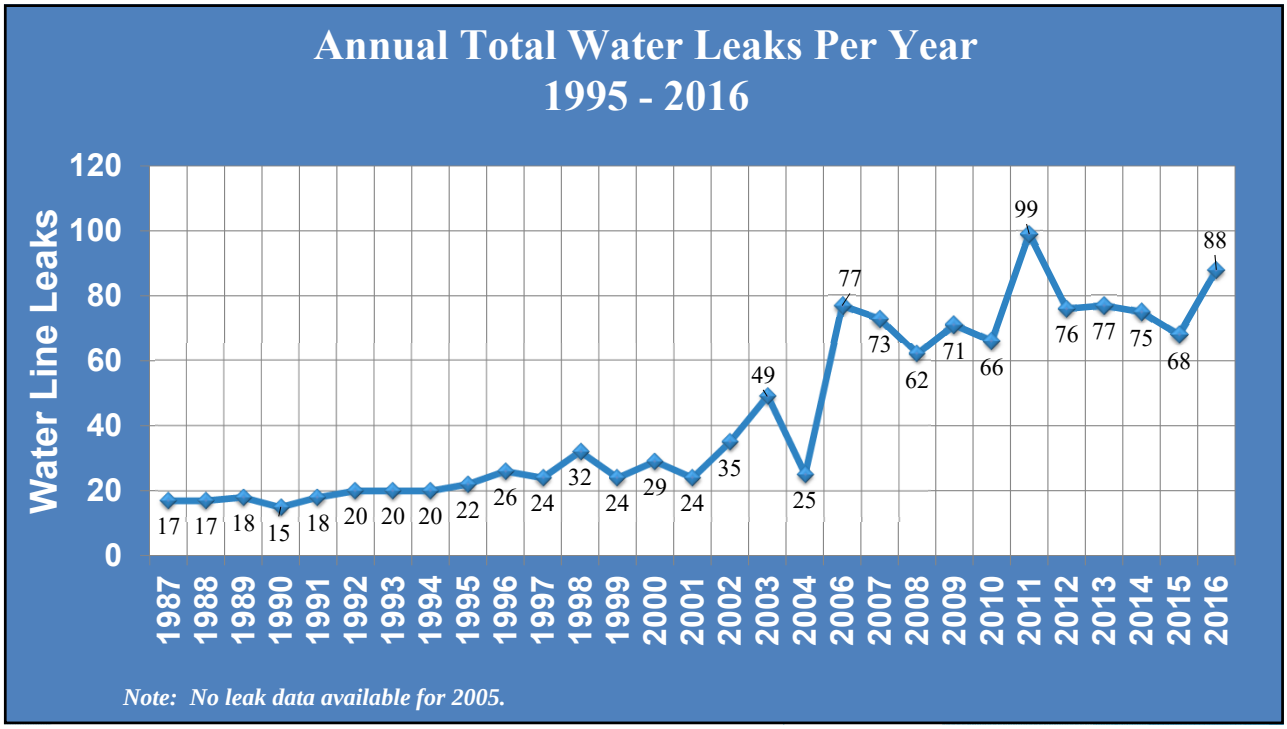


Real Losses:

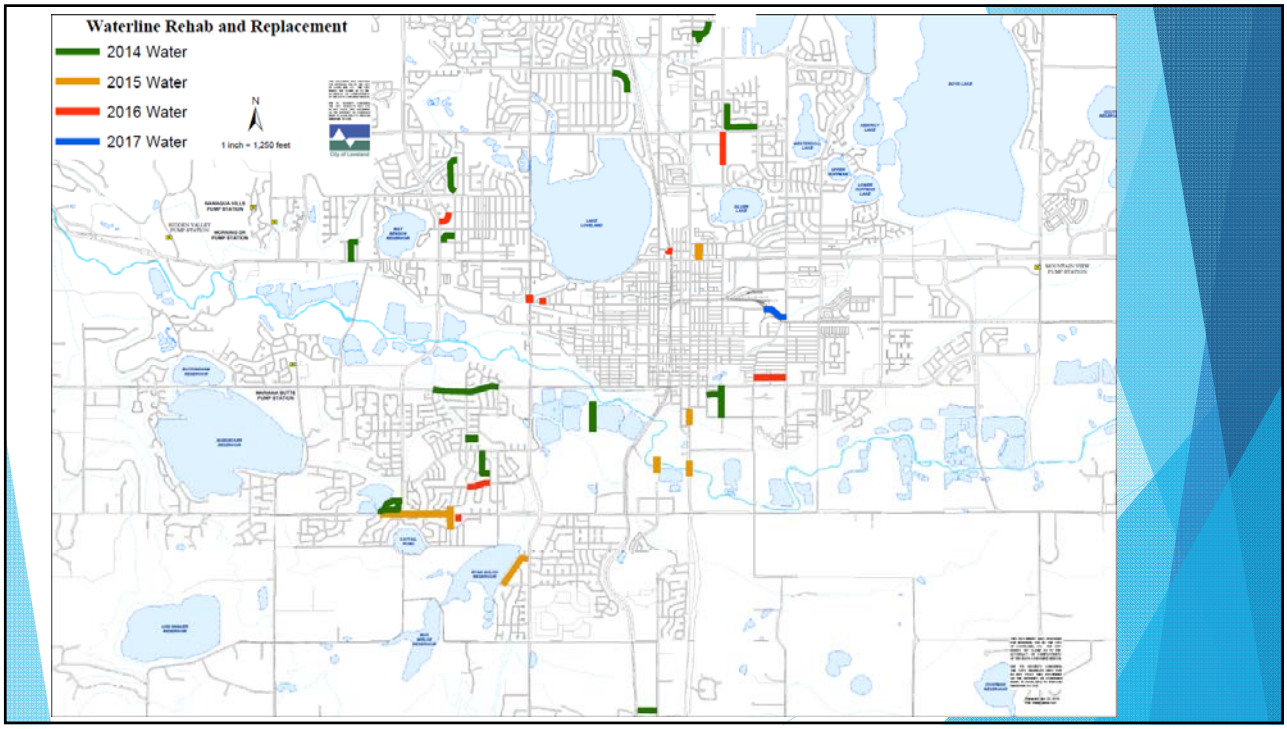
Leakages & Overflows

- **Real Losses** are physical losses of treated, energized water from the distributions system
- **Volume of Loss Affected By**
  - Number of leaks
  - Magnitude of leaks
  - Operating pressures
  - Total time leaks are permitted to run





Signs of Failing Infrastructure

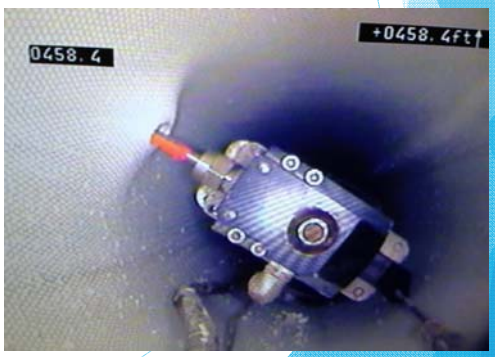


Waterline Rehabilitate/Replacement Method:
Open Cut



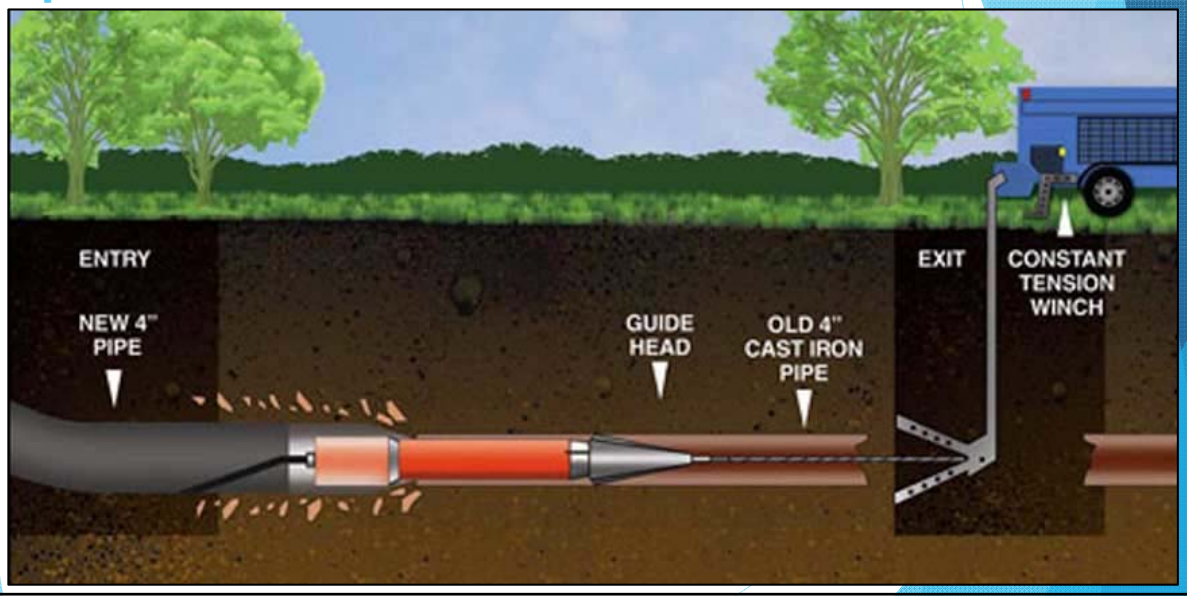
Waterline Rehabilitate/Replacement Method:
Cured in Place Pipe (CIPP)

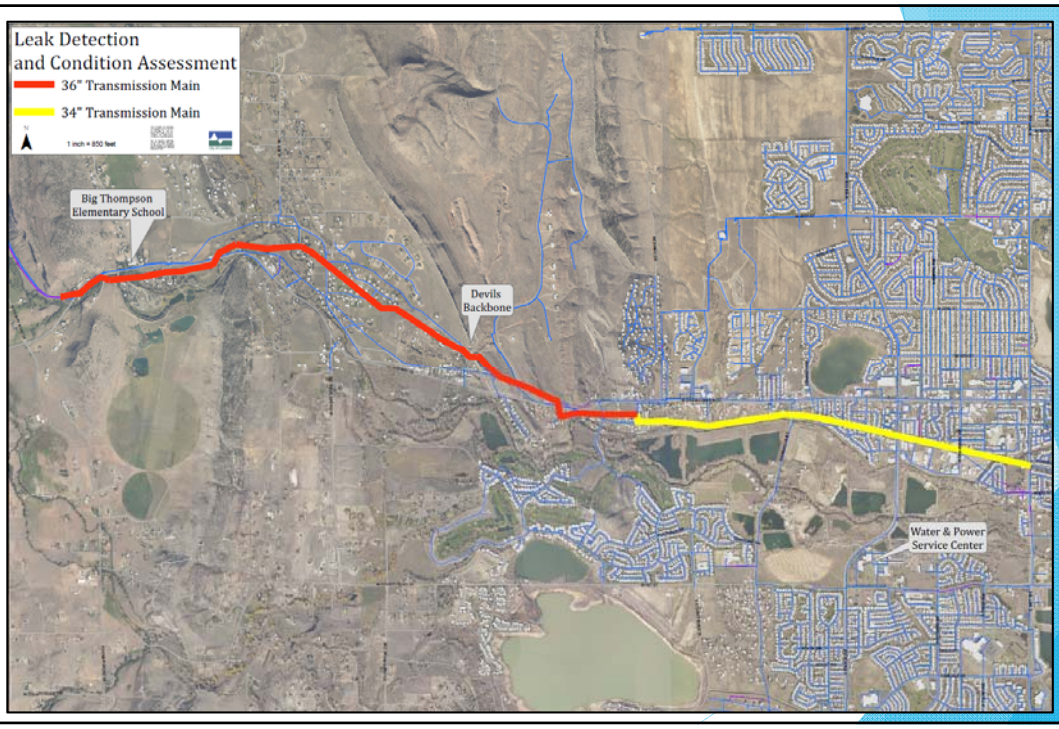




Waterline Rehabilitate/Replacement Method:

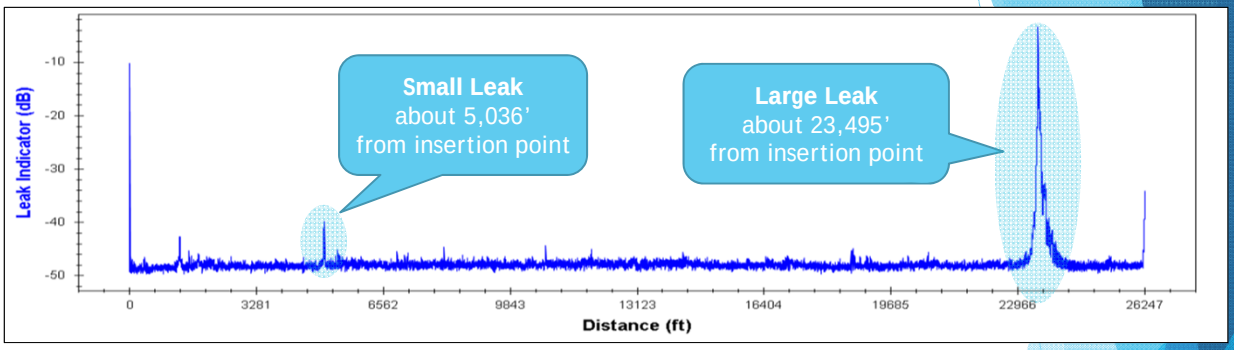
Pipe Burst:





Leak Detection & Condition Assessment Method:
Smart Ball

Leaks Found Using Smart Ball



Description	Distance from Insertion (feet)	Time Since Launch (hh:mm:ss)
Leak (Small)	5,036	01:17:33
Leak (Large)	23,495	06:03:50

Going forward…

- **Annually perform water loss audits** to make improvements to:
  - Address issues that are found
  - Improve the tracking of water throughout the distribution system
  - Reduce non-revenue water where practical
- **Continue Proactive Approaches:**
  - Meter testing program
  - Line rehabilitation and replacements
  - Condition assessments
- **Improvement Goals:**
  - Set specific targets and track progress to reducing non-revenue water
  - Incorporate bottom-up and component analysis audit approaches
  - Dedicate more resources toward addressing water losses (time, budget, employees, etc.)

Questions?