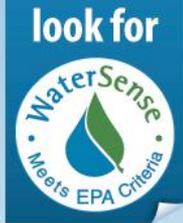


US EPA ARCHIVE DOCUMENT



WaterSense® Presents

Water Loss Control: Tools, Policies and Successful Programs



Veronica Blette - EPA

Danielle Gallet - CNT

Kate Gasner - WSO

Penny Falcon - LADWP

Chris Leuber - WWAWC

October 15, 2014



Housekeeping



- All attendees are muted to minimize background noise.
- Please type questions into the chat box on the upper right-hand side of your screen. We will have a dedicated time for Q&A.
- A recording of this presentation will be posted on the WaterSense website.



Today's Presenters



- **Veronica Blette**, US EPA WaterSense Program - Welcoming Remarks
- **Danielle Gallet**, Center for Neighborhood Technology – Improved water loss control policies and practices
- **Kate Gasner**, Water System Optimization – Water loss control management tools
- **Penny Falcon**, Los Angeles Department of Water and Power – Water loss control efforts of a large urban system in CA
- **Chris Leauber**, Water and Wastewater Authority of Wilson County - Water loss control efforts of rural system in TN





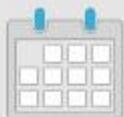
Stress on Water Supplies



- Water supplies under pressure from growing population, aging infrastructure, short- and long-term climate change, source quality
- Increasing competition for supplies amongst municipal, agricultural, energy uses – and need to protect ecological flows
- Need to look at water efficiency on the supply and demand side
 - Demand side – sustainable water rates and end use efficiency (e.g. WaterSense)
 - Supply Side – proper accounting for water and water loss control



Water Losses Big and Small are in the News



An estimated **237,600** water mains break every year in the United States,



that means nearly **700** water mains break every day...



and almost **30** break every single hour....

THE U.S. GEOLOGICAL SURVEY ESTIMATES THAT WE LOSE 1.7 TRILLION GALLONS OF TREATED DRINKING WATER EVERY YEAR.

(Sources: EPA, 2009; USGS, 2011.)



Veronica's Front Yard – August 2014

From www.slideshare.net/ValueofWater/broken-pipes-leak



Non-revenue water = No revenue



The New York Times

The Opinion Pages

Fixes

The Art of Water Recovery

By David Bornstein

July 10, 2014 8:00 pm

Fixes looks at solutions to social problems and why they work.

Imagine that you run a company that sells bottled water. You spend lots of money, and use lots of energy, pumping the water out of the ground, purifying it and transporting it for sale. Then, one day, you discover that a large number of bottles never make it to the stores. They are falling through holes in the trucks.

Wouldn't you want to know what could be done about it? Wouldn't you be crazy to allow the situation to continue?



Available EPA Guidance



WATER AUDITS AND WATER LOSS CONTROL FOR PUBLIC WATER SYSTEMS

This document provides an introduction to water loss control and information on the use of water audits in identifying and controlling water losses in public water systems. **Water audits** are the first step in a three-step process for controlling water loss. A water audit is followed by **intervention** to identify losses and implement solutions and then by an **evaluation** of intervention measures and the needs for further improvement. This document is intended for small and medium-sized water systems, as well as state programs and technical assistance providers that regulate or support these systems.

Introduction

The Water Loss Problem

Public water systems face a number of challenges including aging infrastructure, increasing regulatory requirements, water quantity and quality concerns and inadequate resources. These challenges may be magnified by changes in population and local climate. It has been estimated that:

- The United States will need to spend up to \$200 billion dollars on water systems over the next 20 years to upgrade transmission and distribution systems.¹
- Of this amount, \$97 billion (29 percent) is estimated to be needed for water loss control.²
- Average water loss in systems is 16 percent - up to 75 percent of that is recoverable.³

A water loss control program can help water systems meet these challenges. Although it requires an investment in time and financial resources, management of water loss can be cost-effective if properly implemented. The time to recover the costs of water loss control is typically measured in days, weeks, and months rather than years.⁴ A water loss control program will also help protect public health through reduction in potential entry points for disease-causing pathogens.

Understanding Water Use and Water Loss

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. The International Water Association (IWA) and the American Water Works Association (AWWA) have developed standard terminology and methods to assist water systems in tracking water losses and in performing water audits. The standard terminology includes the terms authorized consumption, real loss, apparent loss and non-revenue water that are used in this document.

- **Authorized Consumption** is water that is used by known customers of the water system. Authorized consumption is the sum of billed authorized consumption and unbilled authorized consumption and is a known quantity. It also includes water supplied to other water systems.



CONTROL AND MITIGATION OF DRINKING WATER LOSSES IN DISTRIBUTION SYSTEMS



http://water.epa.gov/type/drink/pws/smallsystems/technical_help.cfm



Today's Topics



The Big Picture - Danielle

Tools - Kate

Large Utility
Experience –
Penny

Small Utility
Experience –
Chris



Photo Credit: Shutterstock.com, Creative Commons License

IMPROVING WATER LOSS

Building Public Trust + Support

Prepared by Danielle Gallet | Center for Neighborhood Technology (CNT)

US EPA Water Loss Control Webinar | October 15, 2014





ABOUT CNT

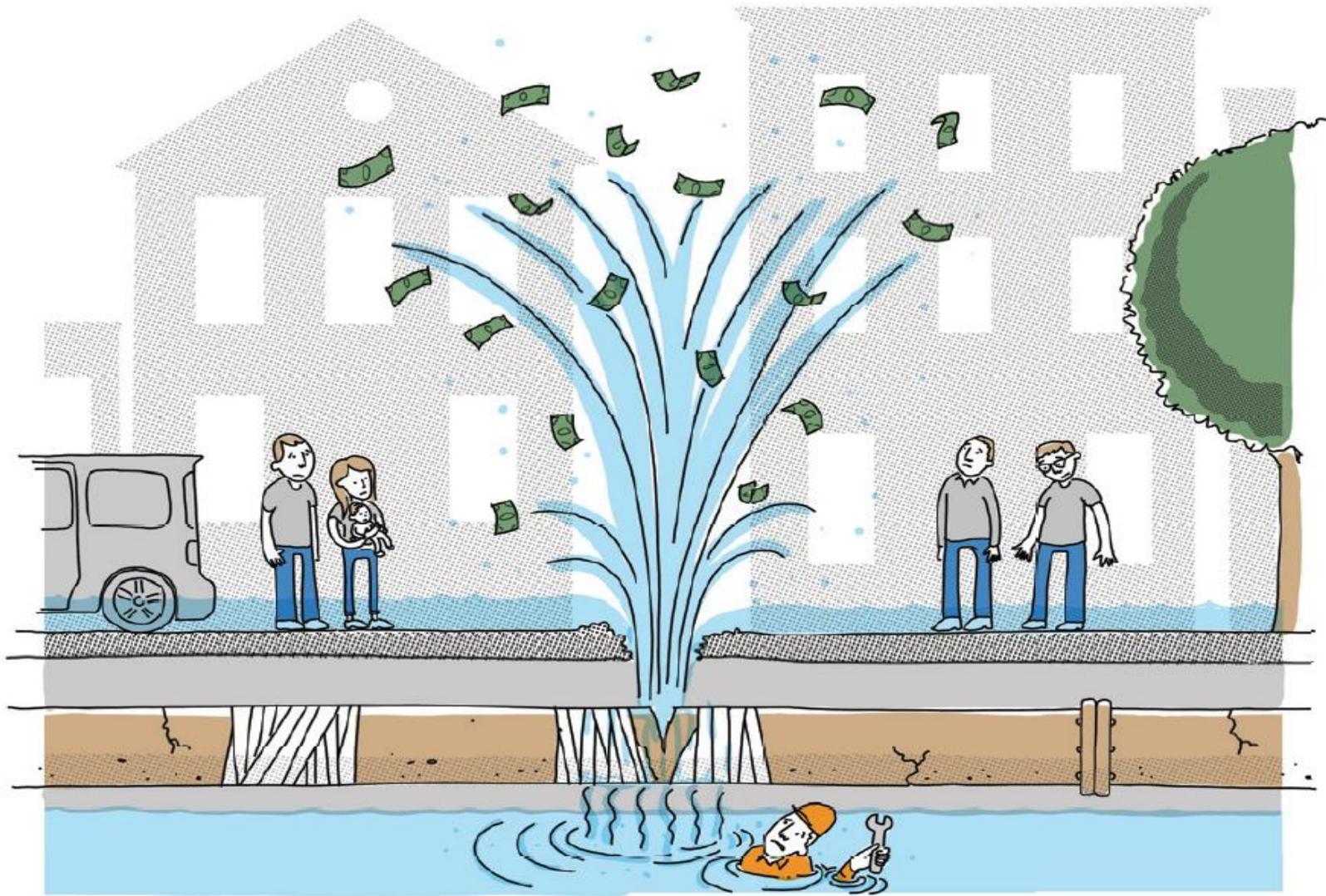
CNT is a national hub for research, strategies and solutions to help cities use resources more efficiently and equitably.

- Our main areas of focus are:
 - Transportation + community development
 - Water resource management + infrastructure
 - Sustainable prosperity

A large crowd of people holding colorful umbrellas, likely at a public event or protest. The umbrellas are in various colors including red, blue, green, yellow, and black. The people are densely packed, and the scene is set outdoors.

CNT WATER

- Original research
- Tool creation
- Collaborative solution development
- Policy advocacy
- 2 Focuses:
 - Water supply
 - Stormwater



CURRENT STATE OF AFFAIRS?

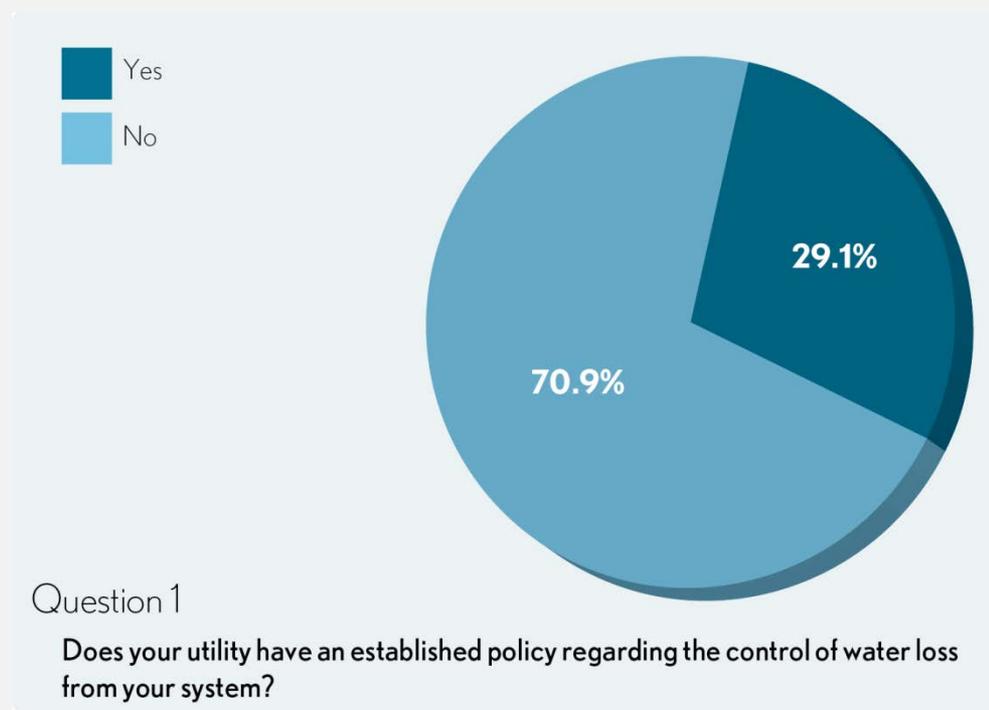
Utility Survey

- 80 water supply utilities
- 10 largest in each state
- 68% response rate
- 500 municipalities
- 9.8 million people
- Over 63,000 miles of pipe



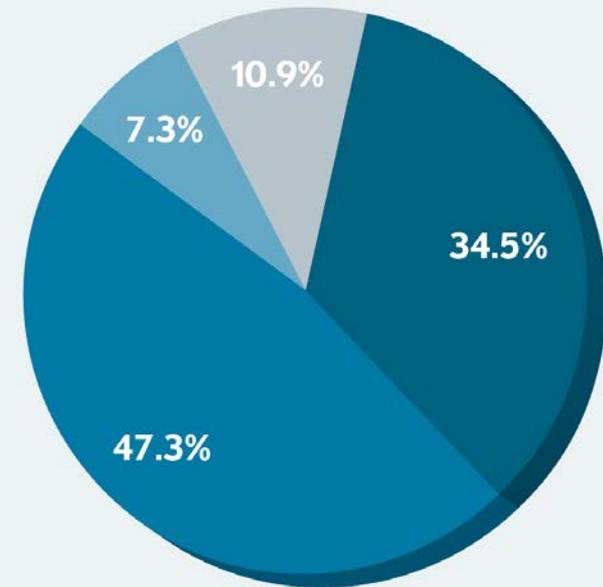
Survey Findings

- 71% have no policy
- Over 50% have no goal or benchmark
- 67% do not publicly report conditions



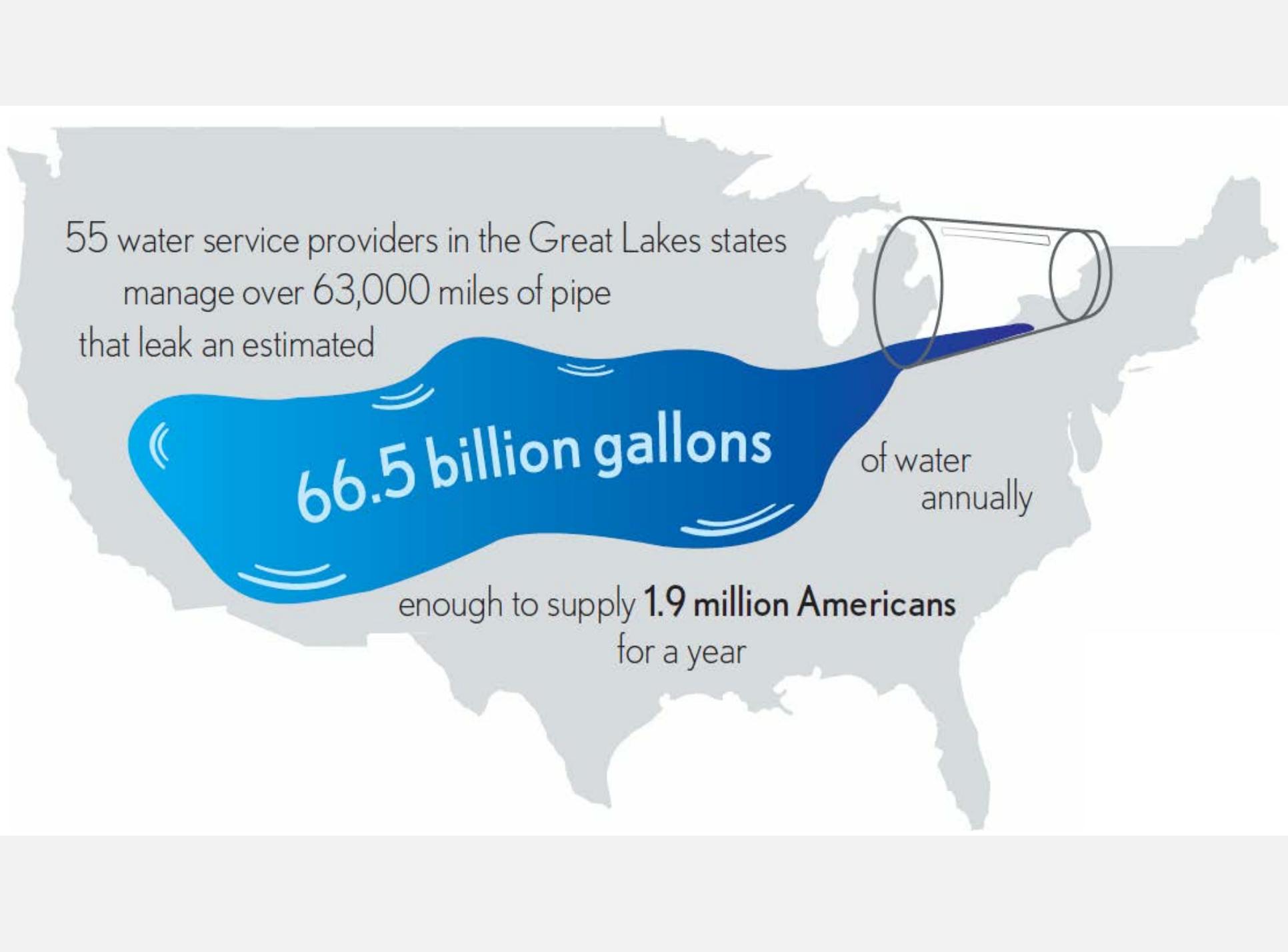
Survey Findings (cont.)

- Less than 4% receive state support
- Confusing mix of definitions
- 60% are interested in collaborating on improved practices



Question 2

Does your utility have a defined term to describe water loss from your system?

An infographic featuring a light gray silhouette of the United States. A white pipe with a blue interior is shown on the right side, tilted downwards as if pouring. A large, dark blue, wavy pool of water is depicted on the left side of the map, with the text '66.5 billion gallons' written in white inside it. Text is placed around the map to describe the water loss.

55 water service providers in the Great Lakes states
manage over 63,000 miles of pipe
that leak an estimated

66.5 billion gallons

of water
annually

enough to supply **1.9 million Americans**
for a year

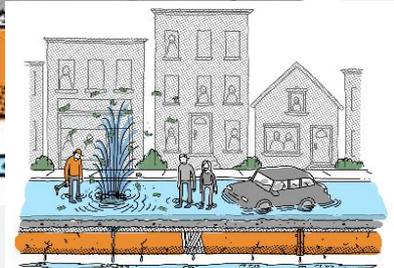
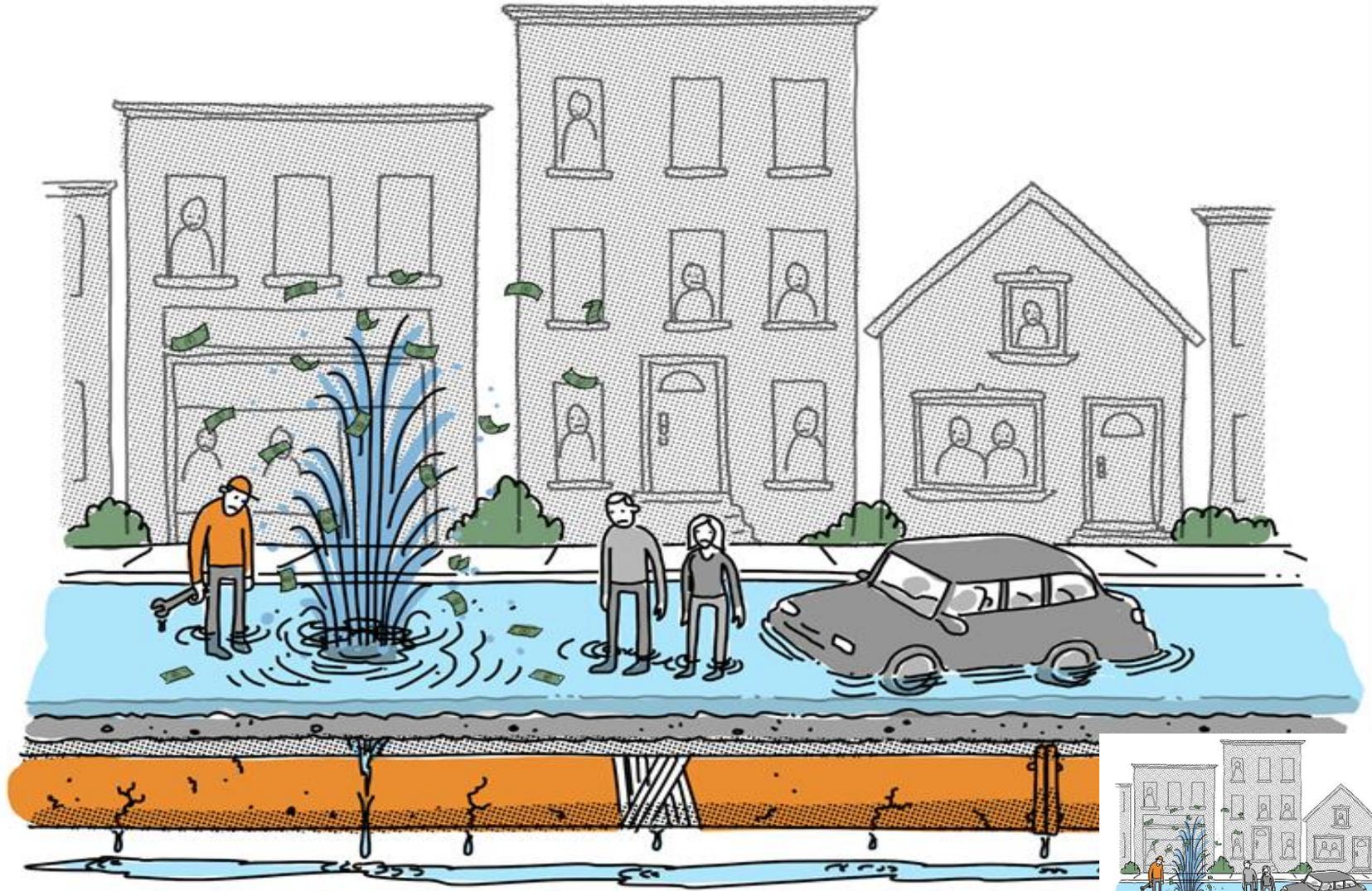


BUILD CASE FOR FIXING LEAKS

Input from the Industry

- Standardization + benchmarking would be helpful
- Training + assistance is needed
- Regulation is necessary to drive change
- Getting public support is essential





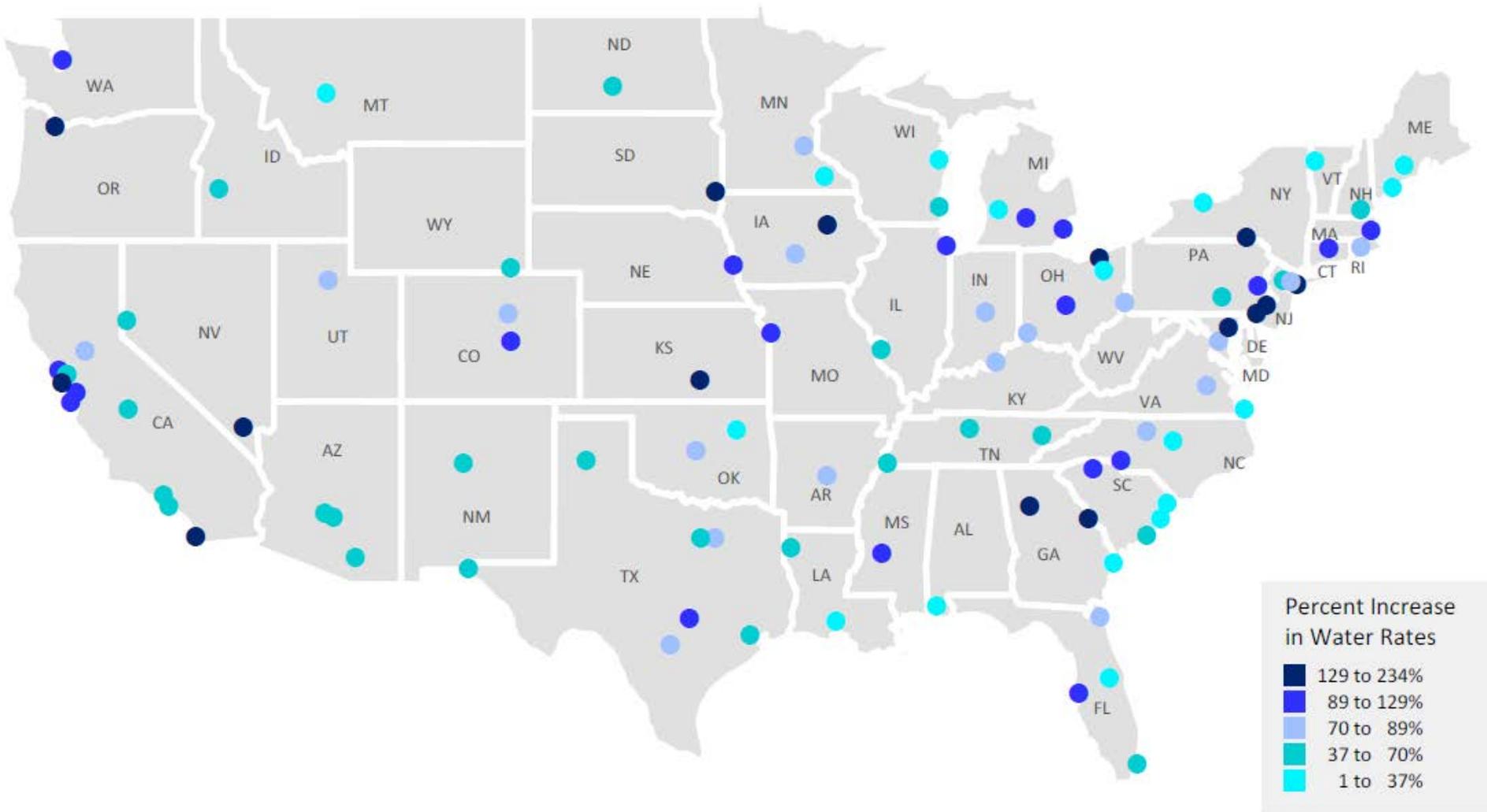
What's the public story?

The Case for Fixing the Leaks

Protecting people and saving water while supporting economic growth in the Great Lakes region



Water Rates on the Rise in the U.S.



CNT Map based on data from article: Water costs gush higher, USA TODAY
September 29, 2012

Infrastructure Report Card = D



Fixing the Leaks – A Good Idea

- Create Jobs
- Drive Economic Development
- Protect Human Health
- Reduce Energy Use
- Preserve Water Resources



“By modernizing our national water infrastructure we can improve commercial efficiency, increase U.S. competitiveness in the global economy, and create much-needed jobs in the near term.”

– Janet Kavinsky, U.S. Chamber of Commerce



Photo Credit: Chicago Metropolitan Agency for Planning (CMAP)

INCREASE OUTREACH + RESOURCES

Promote Best Practices + Training

“Water utilities that carefully audit the water that they supply are better positioned to control excessive losses and provide reliable service to their customers.”

– George Kunkel, Water Efficiency Program Manager, Philadelphia Water Department

Stepping Up Water Loss Control Utility In-Focus: Philadelphia Water Department

THE AMERICAN WATER WORKS ASSOCIATION (AWWA) AND INTERNATIONAL WATER ASSOCIATION (IWA) WATER AUDITING METHODOLOGY PRODUCT (M36) IS INTERNATIONALLY RECOGNIZED AS THE BEST METHOD FOR ACHIEVING A ROBUST AND STANDARDIZED WATER LOSS AUDIT. THE IWA/AWWA METHOD (M36) ALLOWS UTILITIES TO IDENTIFY INTERNAL UTILITY ISSUES AND RATE THEIR DATA VALIDITY. ADDITIONALLY, IT HELPS STATES AND REGIONS LOOK AT WIDER-SCALE WATER LOSS TRENDS, ENABLING THEM TO MORE EFFECTIVELY REDUCE WATER WASTE AND MAKE A STRONGER ECONOMIC CASE FOR INFRASTRUCTURE REINVESTMENT. FOLLOWING IS A CASE STUDY THAT HIGHLIGHTS THE BENEFITS OF THIS PRACTICE THROUGH THE EXPERIENCE OF A SPECIFIC UTILITY.

UTILITY PROFILE

The Philadelphia Water Department (PWD) has long been a leader in adopting innovative water supply technology. From constructing water filtration plants at the turn of the 20th century to installing the largest water utility automatic meter reading (AMR) system in the US between 1997 and 1999, the utility continues to lead in water loss and water supply accountability.¹ The utility began using M36 in 2000 and was the first American water utility to employ the method.² PWD provides water and sewer service to approximately 1 million customers. Its two primary water sources are the Delaware and Schuylkill Rivers.³

For more information on the Philadelphia Water Department, and its various initiatives, visit its website: <http://www.phila.gov/water/Pages/default.aspx>

DRIVERS FOR UTILITY WATER LOSS AND REVENUE PROTECTION

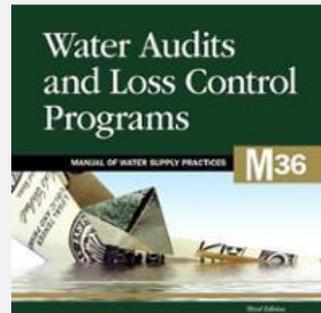
In the 1980s, the PWD realized it had 125 million gallons of treated water per day that was not being recorded on customer meters. To get a handle on water loss control and revenue protection, the PWD wanted to adopt an annual water auditing process as a standard best practice. The M36 method provided the utility an internationally recognized, standardized way of measuring leakage indices and trends.⁴



(Photo Source: Philadelphia Water Department; <http://cityofphiladelphia.gov/department/water>)

“It is possible to be accountable, but not efficient. However, it is impossible to be efficient, if you are not first accountable. Start by creating a reliable water audit and auditing process.”

– George Kunkel, PWD



It's Working: See Growing Trend Across U.S.

- Auditing + data validation
- Training opportunities
- Policies + standards for best practices
- Regulation

**New FREE Water Loss
Training Initiative in
Illinois!**

STEPPING UP WATER LOSS CONTROL LESSONS FROM THE STATE OF GEORGIA



Prepared by the Center for
Neighborhood Technology
February 2014



Stepping Up Water Loss Control Lessons from the State of Georgia

For any state or agency looking to increase adoption of M36, there are several key takeaways from Georgia's new auditing requirements:

State agencies and their partners should place emphasis on the value and usefulness of M36 for utilities. Beyond instituting any auditing requirement, states should highlight the benefits of this practice in helping utilities improve business operations.

Data validation is paramount. Water loss audits and future planning must be based on accurate and reliable audit results in order to effectively improve water systems.

Encourage strong relationships between state and local governments. It is critical for states to have a strong commitment to providing training resources and support to utilities as they adopt the M36 auditing method.

Encourage public reporting. Sharing audit results improves transparency, accountability and understanding between a utility and its customers.

Enthusiastic training sessions. The auditing process can be dull. It is important to provide engaging trainings that emphasize the benefits of adopting the M36 method.

SUMMARY

In June of 2010, the Georgia Water Stewardship Act (the Act) was signed into law in an effort to create a "culture of water conservation" throughout the state of Georgia. One of the main components of this legislation was a mandate requiring that all utilities serving populations of 3,300 and above submit annual water loss audits utilizing the American Water Works Association (AWWA) and International Water Association (IWA) water audit methodology (M36).¹ The Center for Neighborhood Technology (CNT), in its effort to support utilities in their water loss control efforts, spoke with Georgia's Environmental Protection Division (Lebone Moeti) and the Georgia Environmental Financial Authority (Jason Bodwell) to better understand the mechanisms behind the continued success of Georgia's auditing mandate.

THE AMERICAN WATER WORKS ASSOCIATION (AWWA) AND INTERNATIONAL WATER ASSOCIATION (IWA) WATER AUDITING METHODOLOGY PRODUCT (M36) IS NATIONALLY RECOGNIZED AS THE BEST METHOD FOR ACHIEVING A ROBUST AND STANDARDIZED WATER LOSS AUDIT. IT ALLOWS UTILITIES TO RATE THEIR DATA VALIDITY AND IDENTIFY INTERNAL ISSUES, WHILE HELPING STATES AND REGIONS TO LOOK AT WIDER-SCALE WATER LOSS TRENDS. THIS ENABLES THEM TO MORE EFFECTIVELY REDUCE WATER WASTE, AND MAKE A STRONGER ECONOMIC CASE FOR INFRASTRUCTURE REINVESTMENT AND OTHER WATER LOSS INITIATIVES.²



TIPS FOR MOVING FORWARD



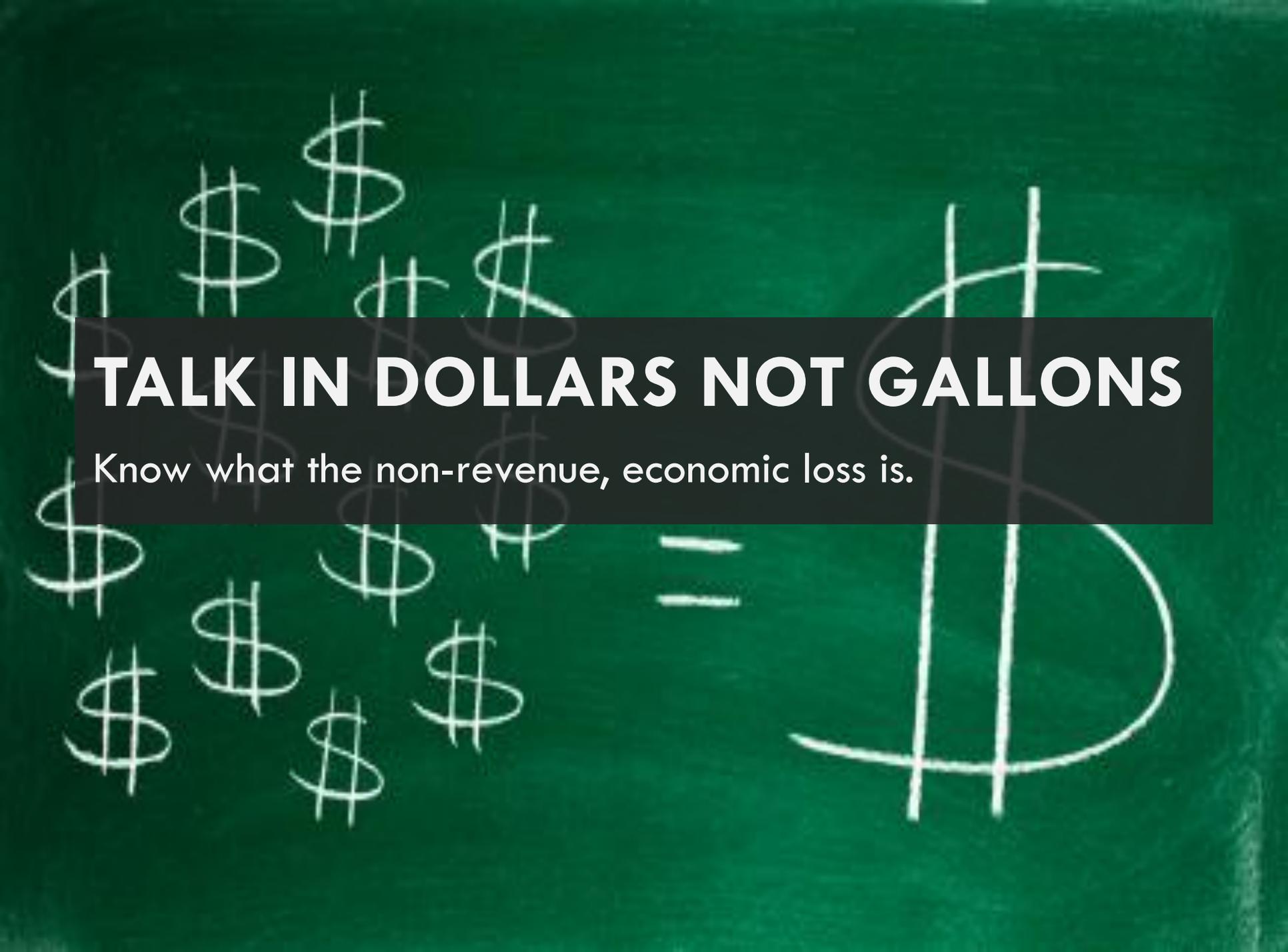
USE BEST PRACTICE TOOLS

The pathway to building a business case for reinvestment.



ENGAGE ELECTED OFFICIALS

Once a year budget meetings is not enough.



TALK IN DOLLARS NOT GALLONS

Know what the non-revenue, economic loss is.



Free
Fresh **Evanston** Tap Water

Provided by the City of Evanston Utilities Department

BUILD PUBLIC TRUST + SUPPORT

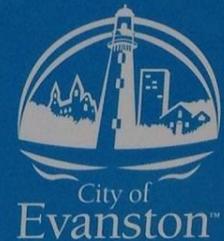
Develop a relationship with your customers – drive awareness.



Tap Water

Good for You.

Good for the Environment.





PARTNER, PARTNER, PARTNER

Crumbling infrastructure woes will not be fixed in a vacuum.



THANK YOU!

Danielle Gallet
danielleg@cnt.org
www.cnt.org/water

Water Loss Control Tools

Kate Gasner, Water Systems Optimization

10.15.14

W S O



Water Losses: Defined

APPARENT LOSSES



- ❑ Meter Under-registration
- ❑ Unauthorized Consumption
- ❑ Data Handling
- ❑ Reducing Apparent Losses increases revenue (but does not recover volume)

REAL LOSSES



- ❑ Physical Losses
- ❑ Range in flow rate & volume lost
- ❑ Reducing Real Losses recovers volume

NON-REVENUE WATER

* Also includes unbilled consumption

Benefits of NRW Management

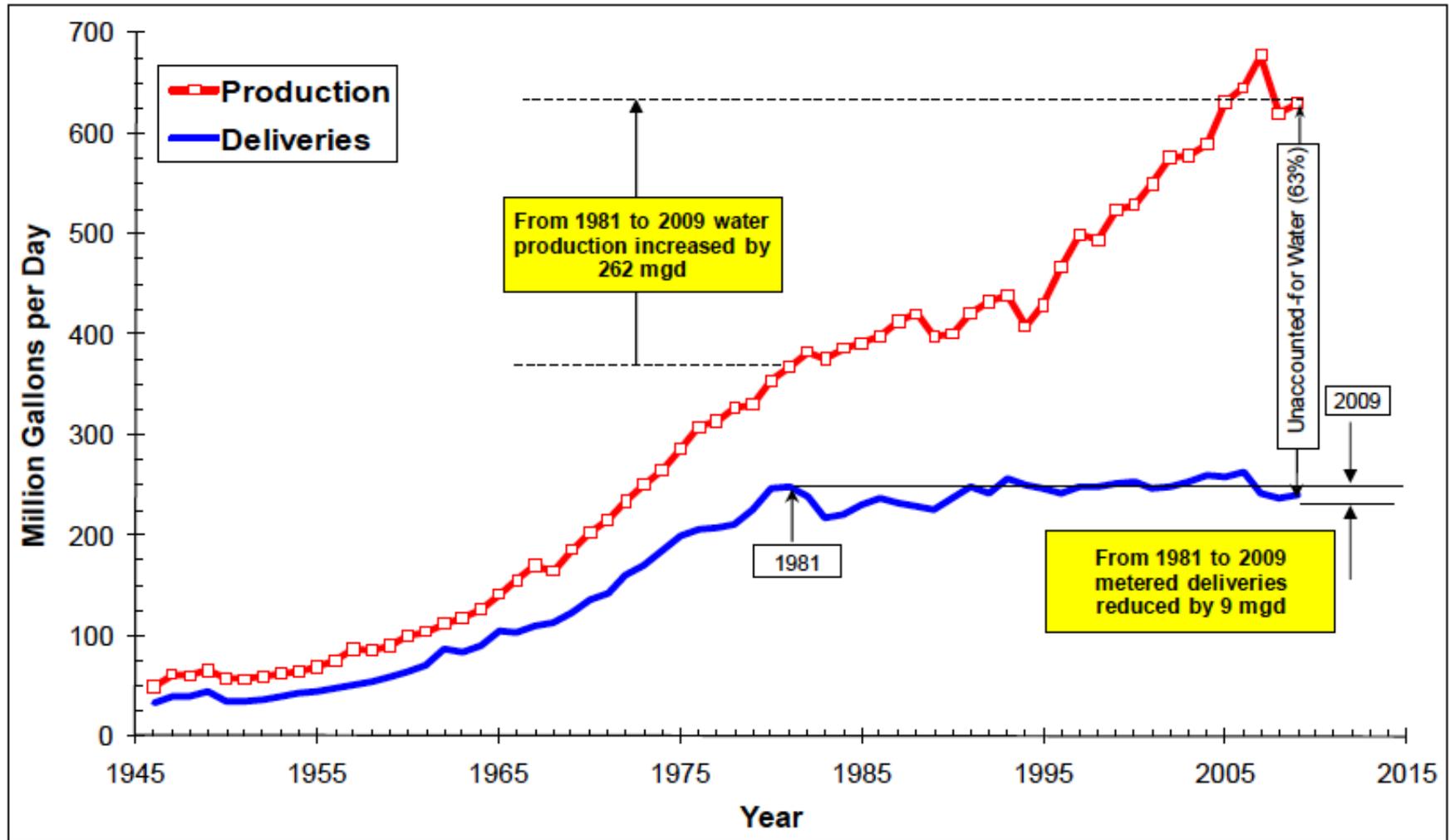
Save Water

Reduce Costs

Culture of
Accountability

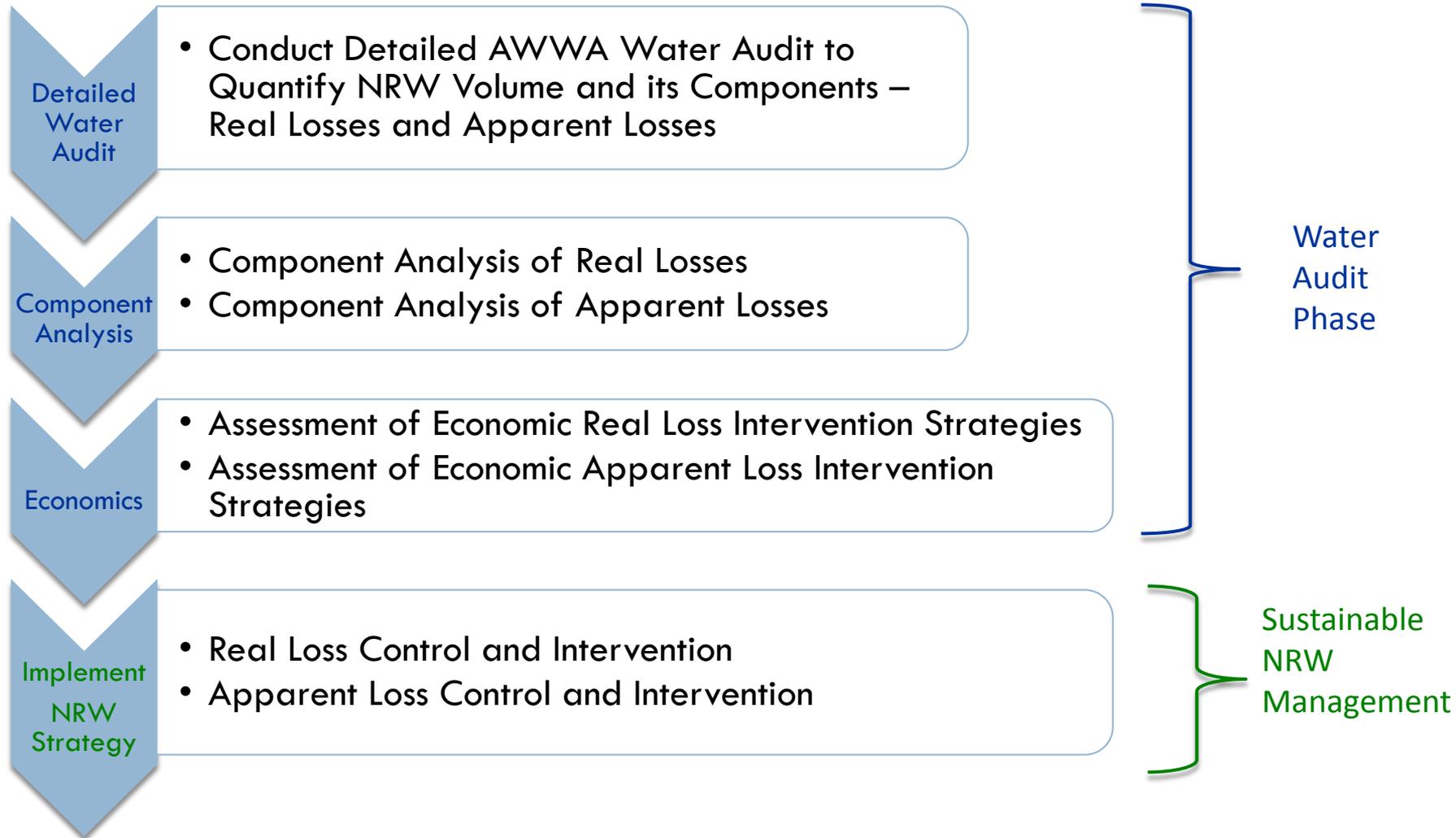
- ❑ Identify what you DON'T know
- ❑ Comprehensive understanding of your system
- ❑ Financial Benefits – Reduction in O&M & CIP costs
- ❑ Better Asset Management
- ❑ Optimized Meter Replacement/Management
- ❑ Water Conservation (Supply Side & Demand Side)
- ❑ Sustainability (Water/Energy Nexus)
- ❑ Be Ahead of Regulatory Arena
- ❑ Less Liability
- ❑ Build Credibility with Stakeholders and Regulators

What Can Happen ???



Source: PRASA.

How Can We Strategically Manage NRW??



Tools for Water Loss Control

AWWA Free Water Audit Software

- ✓ Volume of Apparent Losses
- ✓ Volume of Real Losses
- ✓ Performance Indicators
- ✓ Data Validity Score

Water Research Foundation Component Analysis Tool

- ✓ Understanding of Real Loss Breakdown (where are these losses occurring? what types of leakage?)
- ✓ Evaluation of Cost-Effective Real Loss Intervention Strategies

AWWA Free Water Audit Software

SYSTEM INPUT VOLUME	Authorized Consumption	Billed Authorized Consumption	Billed Metered Authorized Consumption
			Billed Unmetered Authorized Consumption
		Unbilled Authorized Consumption	Unbilled Metered Authorized Consumption
			Unbilled Unmetered Authorized Consumption
	Water Losses	Apparent Losses	Consumption Metering Errors
			Unauthorized Consumption
			Systematic Data Handling Errors
		Real Losses	Leakage/Overflow at Reservoirs
			Leakage from Trunk Mains
			Leakage from Distribution Mains
			Leakage from Service Connections

AWWA Free Water Audit Software



Example Audit 1a:

**AWWA Free Water Audit Software:
Reporting Worksheet**

WAS v5.0
American Water Works Association.
Copyright ©2014. All Rights Reserved.

[?](#) Click to access definition

[+](#) Click to add a comment

Water Audit Report for: City of Asheville (01-11-010)

Reporting Year: 2013 7/2012 - 6/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

←----- Enter grading in column 'E' and 'J' -----→

Volume from own sources:	+ ?	7	7,352.880	MG/Yr
Water imported:	+ ?	n/a	0.000	MG/Yr
Water exported:	+ ?	n/a	0.000	MG/Yr

WATER SUPPLIED: 7,067.430 MG/Yr

Master Meter Error Adjustments

	Pcnt:		Value:			
+ ?	3	<input type="radio"/>	285.450	<input checked="" type="radio"/>	MG/Yr	
+ ?		<input checked="" type="radio"/>	MG/Yr	<input type="radio"/>	MG/Yr	
+ ?		<input checked="" type="radio"/>	MG/Yr	<input type="radio"/>	MG/Yr	

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Billed metered:	+ ?	8	4,782.250	MG/Yr
Billed unmetered:	+ ?	n/a	0.000	MG/Yr
Unbilled metered:	+ ?	7	27.757	MG/Yr
Unbilled unmetered:	+ ?	8	157.790	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

AUTHORIZED CONSUMPTION: 4,967.797 MG/Yr

Click here: [?](#)
for help using option buttons below

	Pcnt:		Value:			
+ ?		<input type="radio"/>	157.790	<input checked="" type="radio"/>	MG/Yr	

Use buttons to select percentage of water

- AWWA M36 Publication – complete manual

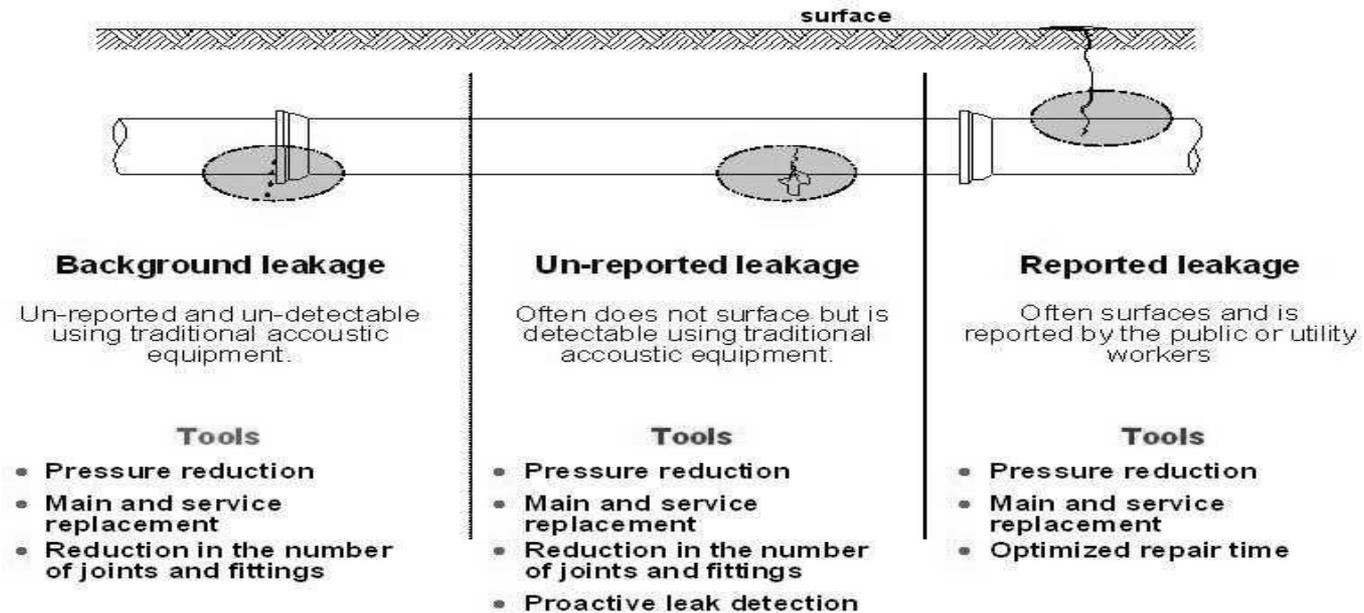
□ Reporting Worksheet

□ Performance Indicator Outputs
- Data Grading Matrix

□ Visualization of Water Balance

□ Comment Fields

Water Research Foundation Component Analysis Tool



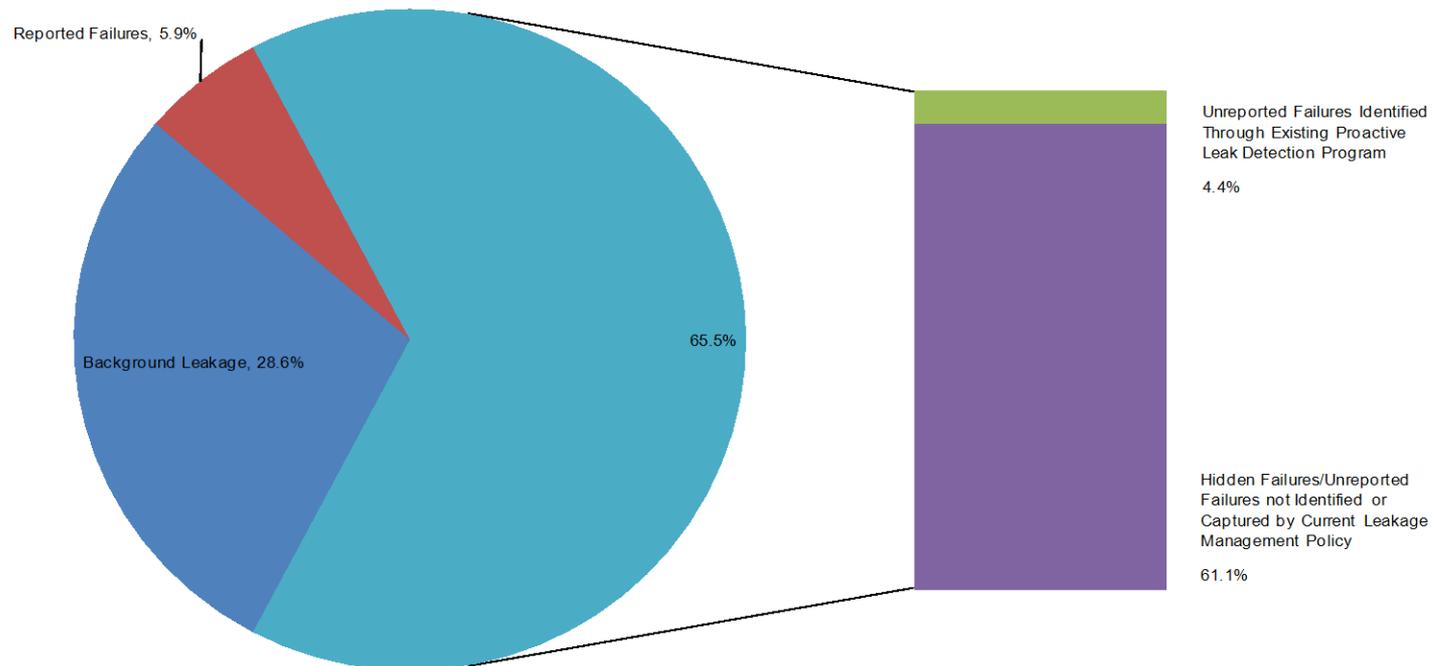
Water Research Foundation Component Analysis Tool

WaterRF 4372: Effective Organization and Component Analysis of Water Utility Leakage Data

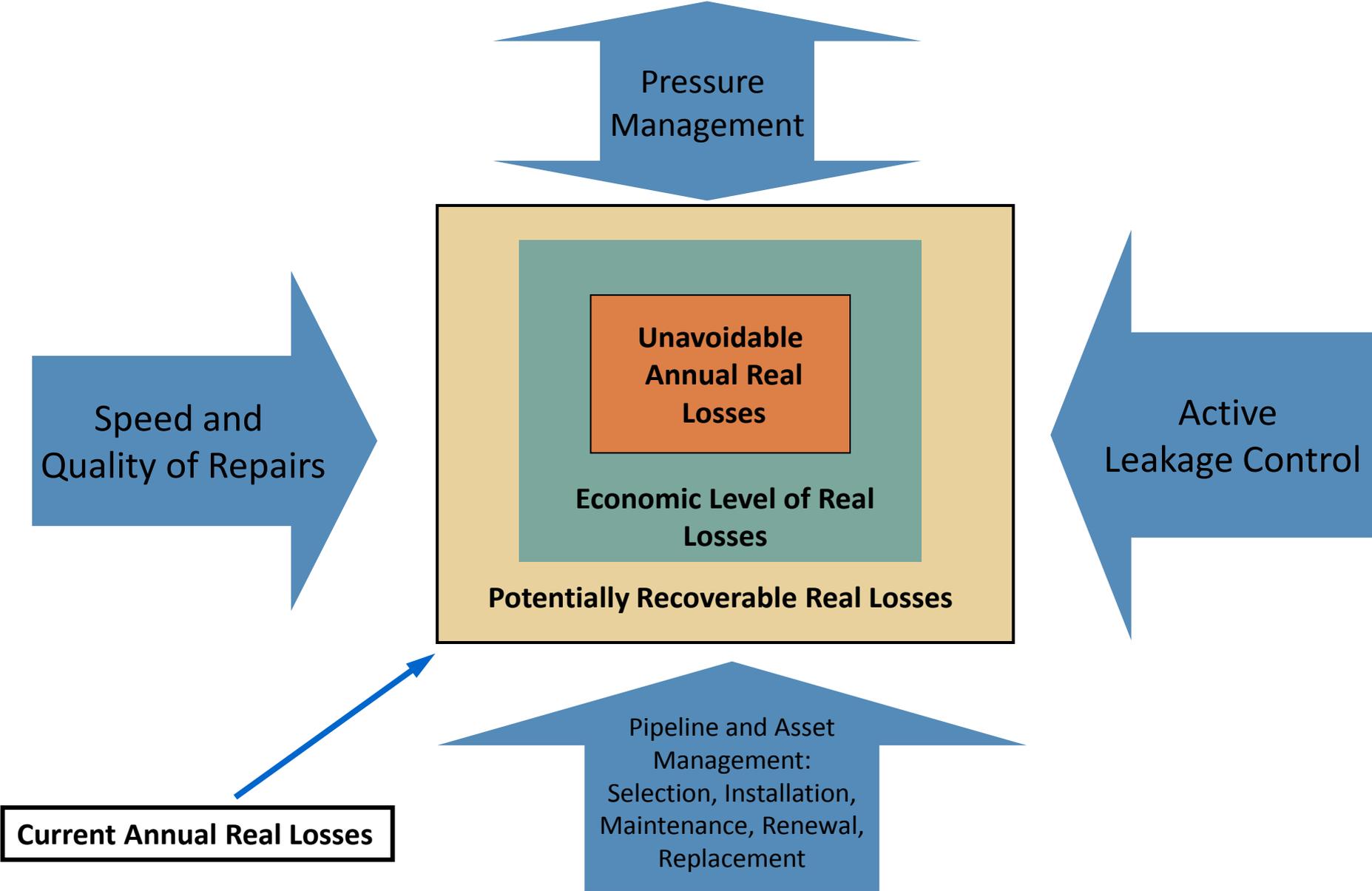
Water Audit: City of Austin, TX, USA, 2011

REAL LOSSES COMPONENTS CHART

Real Loss Components



Real Loss Intervention Strategies



Water Loss Control Tools – Free & Available Now!

AWWA Free Water Audit Software

- AWWA Water Loss Control Committee
- <http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx>
- Validated Water Audit Data
- “Water Loss Control Basics” sidebar

Water Research Foundation Component Analysis Tool

- Water Research Foundation Project Page 4372
- <http://www.waterrf.org/Pages/Projects.aspx?PID=4372>
- Full Report & Background
- Leak Repair Data Collection Guide

Thank You!

Kate Gasner

Water Systems Optimization

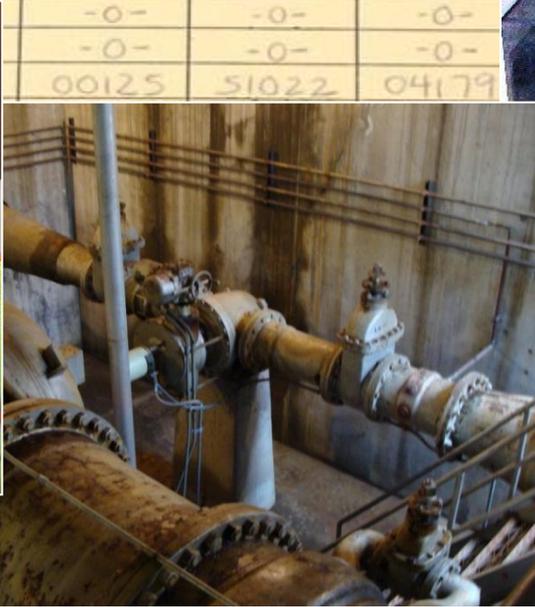
e: kate.gasner@wsoglobal.com

Upcoming WRF
workshops

Austin, TX
(Nov. 5)

Los Angeles, CA
(Nov. 6)

LADWP's Water Loss Audit and Component Analysis Project



**EPA Webinar
October 15, 2014**



The Nation's Largest Publicly Owned Utility



Bay Delta

Sierra Mountains

LA Aqueduct

State Water Project

Colorado River Aqueduct

Local Groundwater, Stormwater, Conservation & Recycling



Why did we do this Water Loss project?

- Fulfills requirements of California Urban Water Conservation Council (CUWCC) Best Management Practice (BMP) 1.2
- Assembly Bill 1420 – Water agencies must comply with CUWCC BMPs to qualify for State Grants and Loans
- ***Discovering and addressing system water losses saves water and money!***

Loss of water!!!



Project Costs

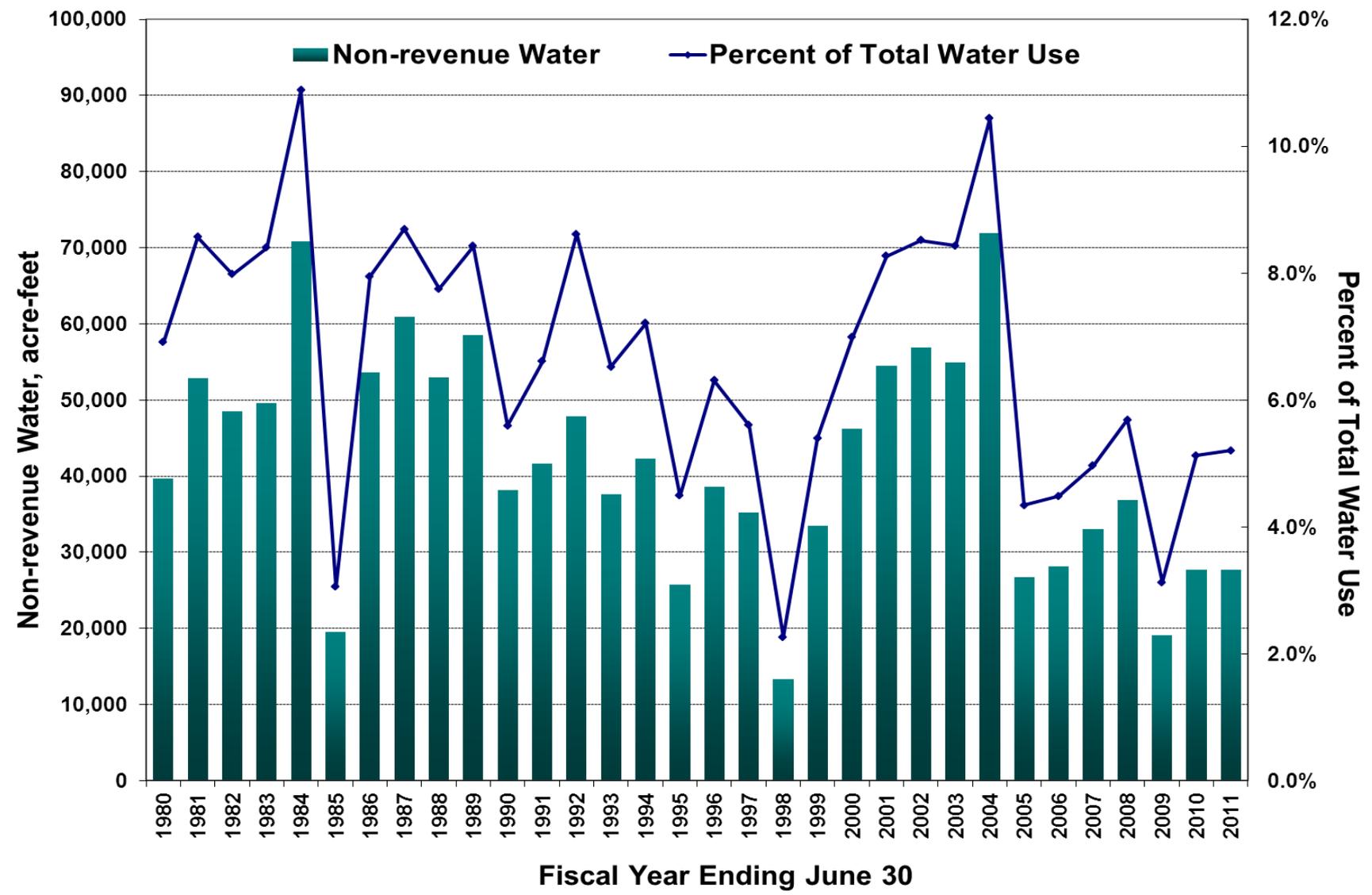
Consultant (Water Systems Optimization)	\$300,000
U.S. Bureau of Reclamation Grant	\$100,000
LADWP Staff Labor Costs	>\$1 million
Equipment and Materials	\$150,000

- 💧 Project took a little over 1 year to complete



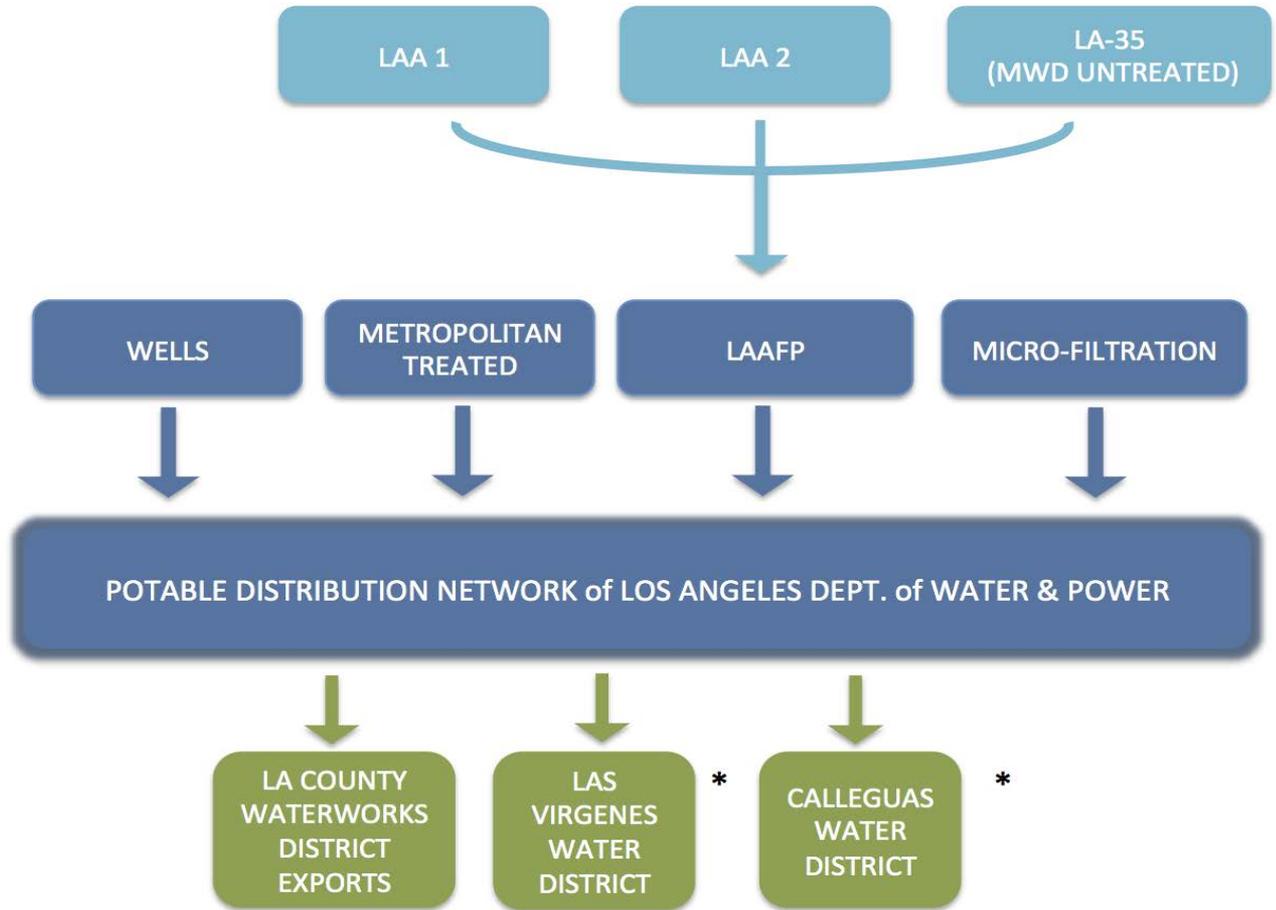


Historical Tracking of Non-Revenue Water



System Input Volume Validation

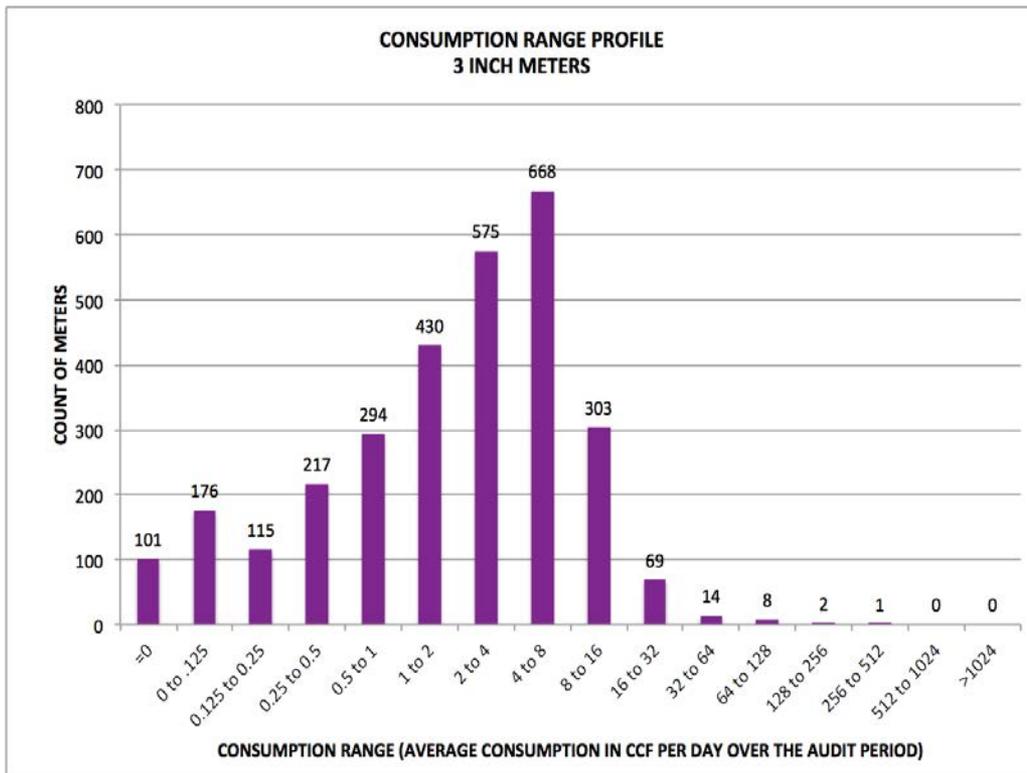
💧 Analysis of system input volume data and meter accuracies



*no exports during FY 2010-2011



Consumption Volumes: Meter Right-Sizing Analysis



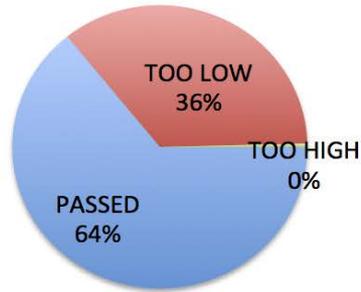
CONSUMPTION RANGE (HCF/DAY)	NUMBER OF METERS
=0	101
0 to 0.125	176
0.125 to 0.25	115
0.25 to 0.5	217
0.5 to 1	294
1 to 2	430
2 to 4	575
4 to 8	668
8 to 16	303
16 to 32	69
32 to 64	14
64 to 128	8
128 to 256	2
256 to 512	1
TOTAL	2,973

Example analysis of 3" meters in LADWP's customer base

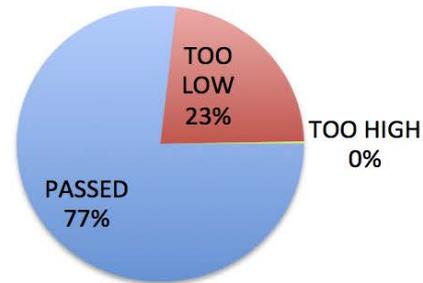
Meters highlighted in green are over-sized (too little consumption to justify a 3" meter) or under-sized (too much consumption for 3")

Apparent Losses: Small Meter Testing

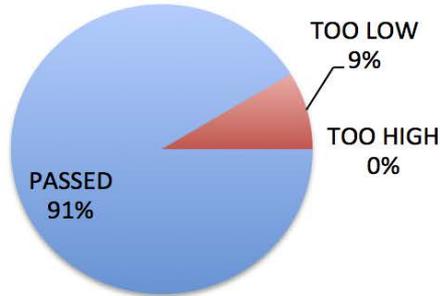
LOW FLOW



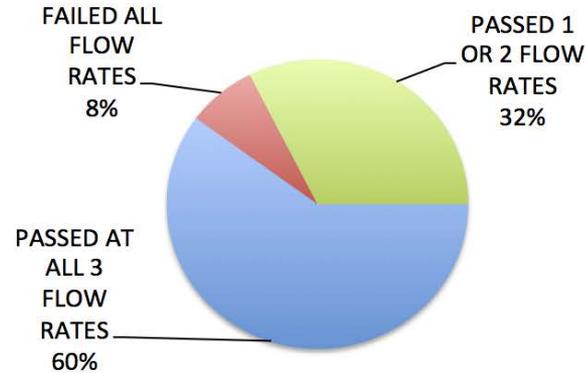
MEDIUM FLOW



HIGH FLOW



ALL FLOWS

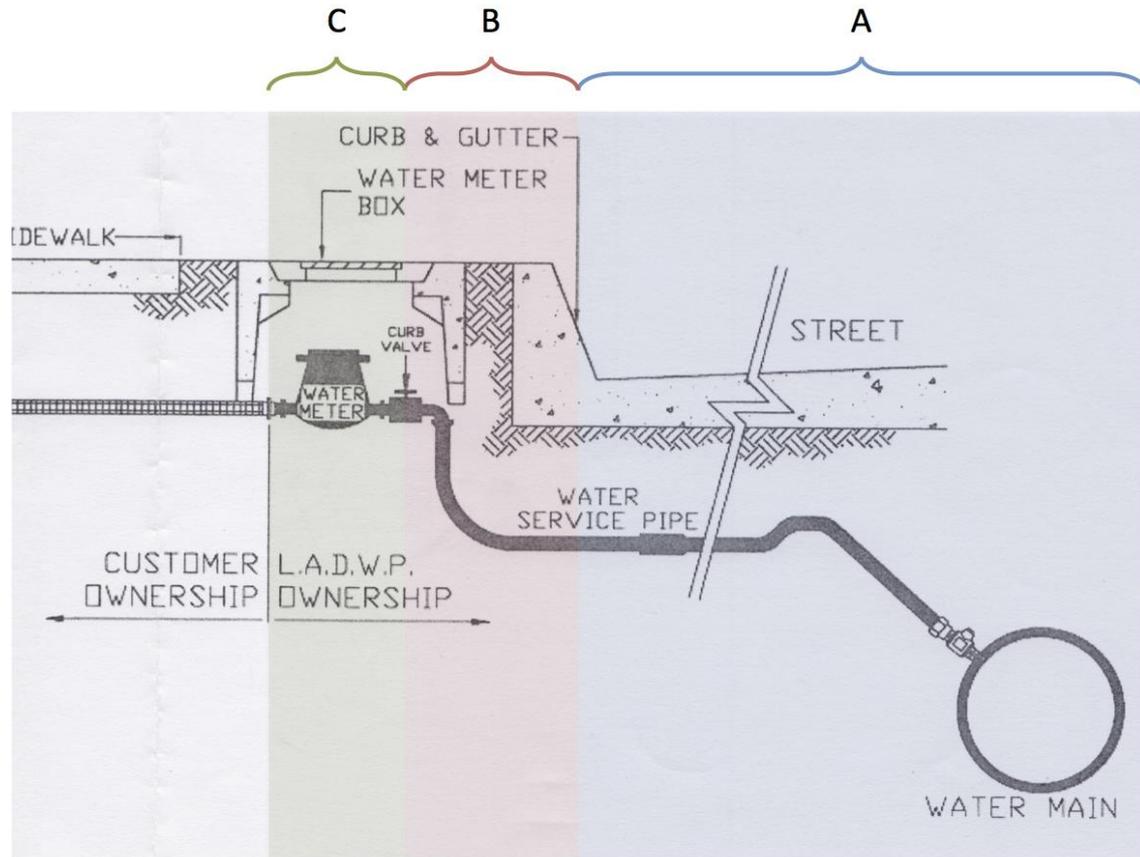




Apparent Losses: Small Meter Test Results

SIZE	TOTAL METER POPULATION (CIS)	TEST SAMPLE SIZE	VOLUME WEIGHTED AVERAGE ACCURACY (%)
5/8"	3,636	0	NA
5/8 x 3/4"	196,973	161	96.88
3/4 x 1"	289,343	322	98.72
1"	126,900	181	98.35
1 1/2"	47,953	156	97.93
2"	33,447	239	98.49
ALL SIZES	698,252	1059	98.21

Component Analysis: Reported Leaks Databases



A - Main Breaks and Service Leaks between the Curb and Main

Source: GIS and Trouble Board

B - Service Leaks between the Curb and the Meter Box

Source: CPS Reports and Trouble Board

C - Meter Leaks and Flooded Meter Boxes

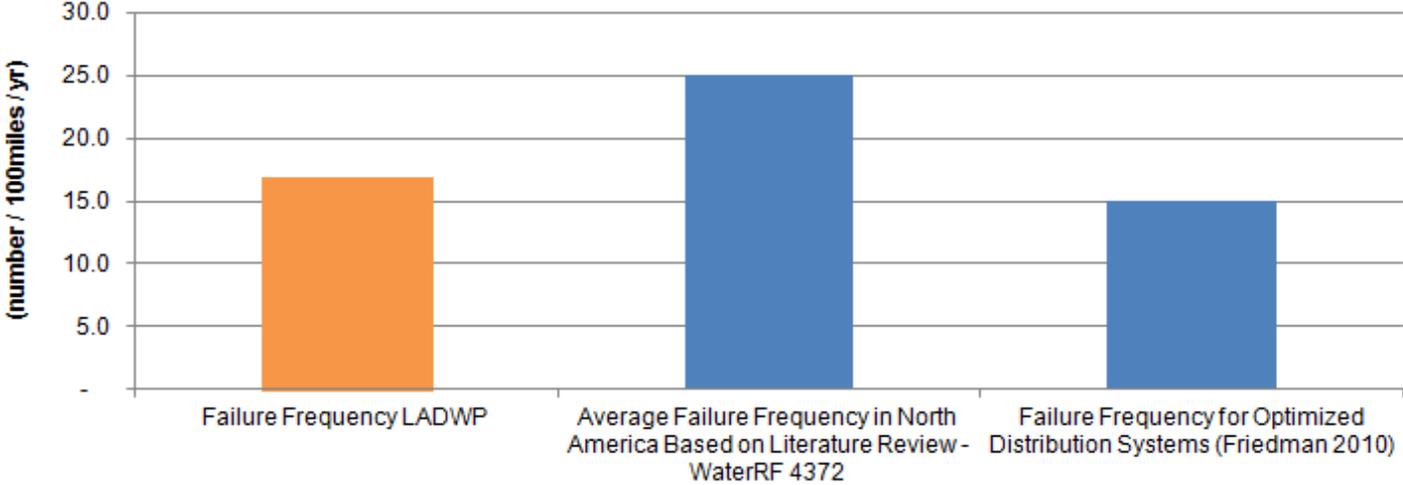
Source: Water Investigation Report (WIR) or WMIS



Component Analysis: Mains Failure Frequency

Total Number of Mains Failures Reported for Water Audit:	1,225	
Total Length of Mains	7,227.2 (miles)	
Failure Frequency LADWP	16.9 (number / 100miles / yr)	
Average Failure Frequency in North America Based on Literature Review - WaterRF 4372	25.0 (number / 100miles / yr)	
Failure Frequency for Optimized Distribution Systems (Friedman 2010)	15.0 (number / 100miles / yr)	

Mains Failure Frequency Comparison



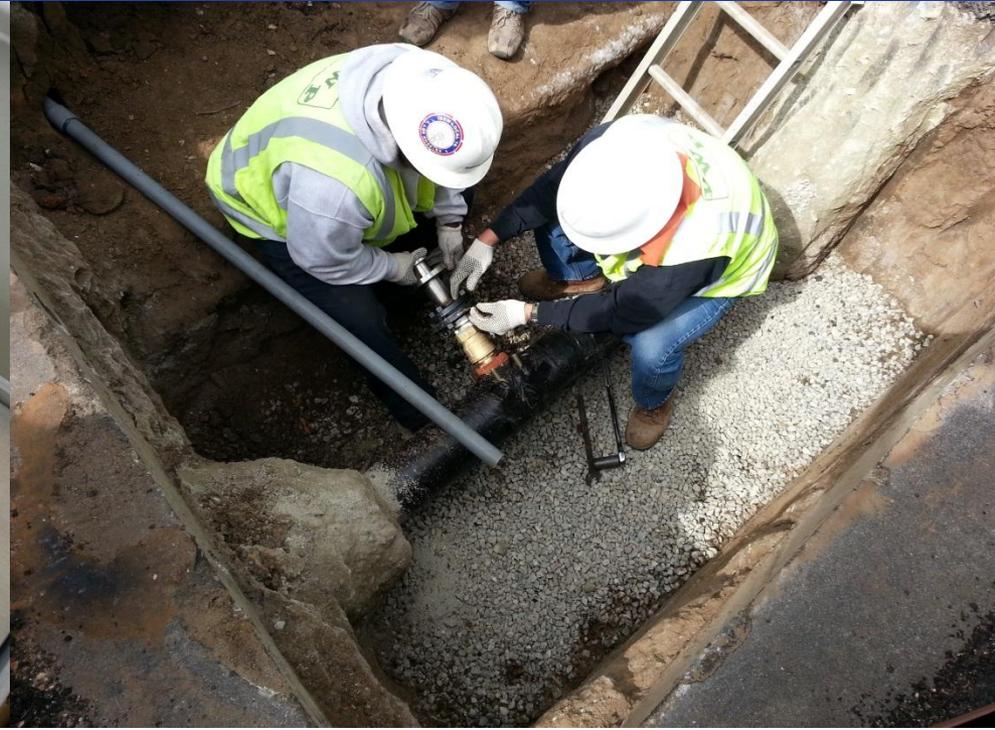


District Metered Areas: Real Loss Validation

- Identified 3 small service zones to analyze
 - Monitored the inflow and water usage in each zone
 - Performed leak detection

Zone Name	Boyle Heights	Westwood	Tujunga
Length of Distribution Network (miles)	46.91	21.48	25.98
Total Number of Service Connections	6,285	1,814	1,657
Average Pipe Diameter (inches)	6.9	7.0	6.6
Average Pipe Age (years)	73.5	65.7	41.3

Installation of the Meters and Data Loggers



- 💧 Meters were installed through hot tap (no water shut off)
- 💧 Data loggers and batteries were installed in toolboxes with locks and located above ground to protect them from water damage

Meter Reading and Data Collection

💧 Meter Reading in the 3 Zones:

- Some meters were full of dirt
- Discovered customer meter tampering and theft
- Identified potential theft on fire service meters
- Discovered unidentified, mislocated, and paved-over service meters



Leak Detection

- ◆ Identified the following leaks:
 - Boyle Heights – 11 leaks (service, hydrant, & valve leaks)
 - Westwood – 1 hydrant leak
 - Tujunga – no leaks



Results: The Good News!

For Fiscal Year 2010-2011, as a Percentage of Water Supplied:

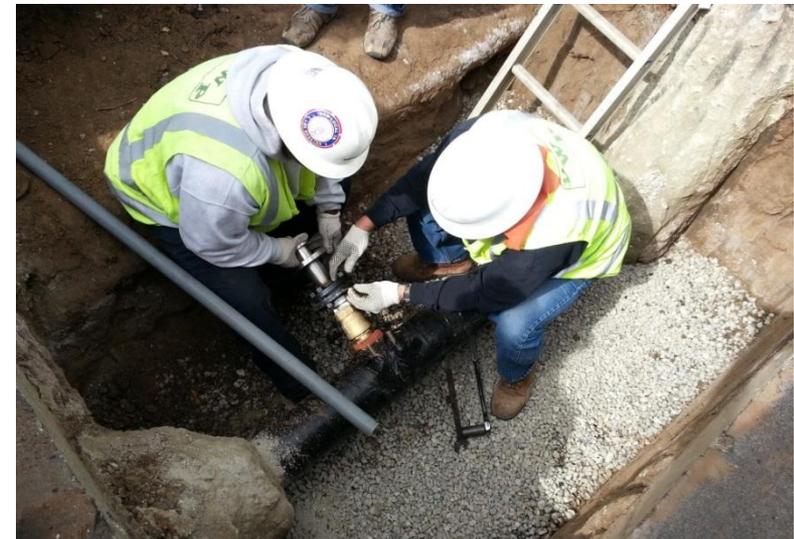
Non-Revenue Water:	5.2%
Real Losses (leakage)	3.5%
Apparent Losses (meter inaccuracies and theft)	1.6%
Unbilled Authorized Consumption (fire flows)	0.1%
Infrastructure Leakage Index (ILI)	1.26

Low overall water loss, but still some work to do



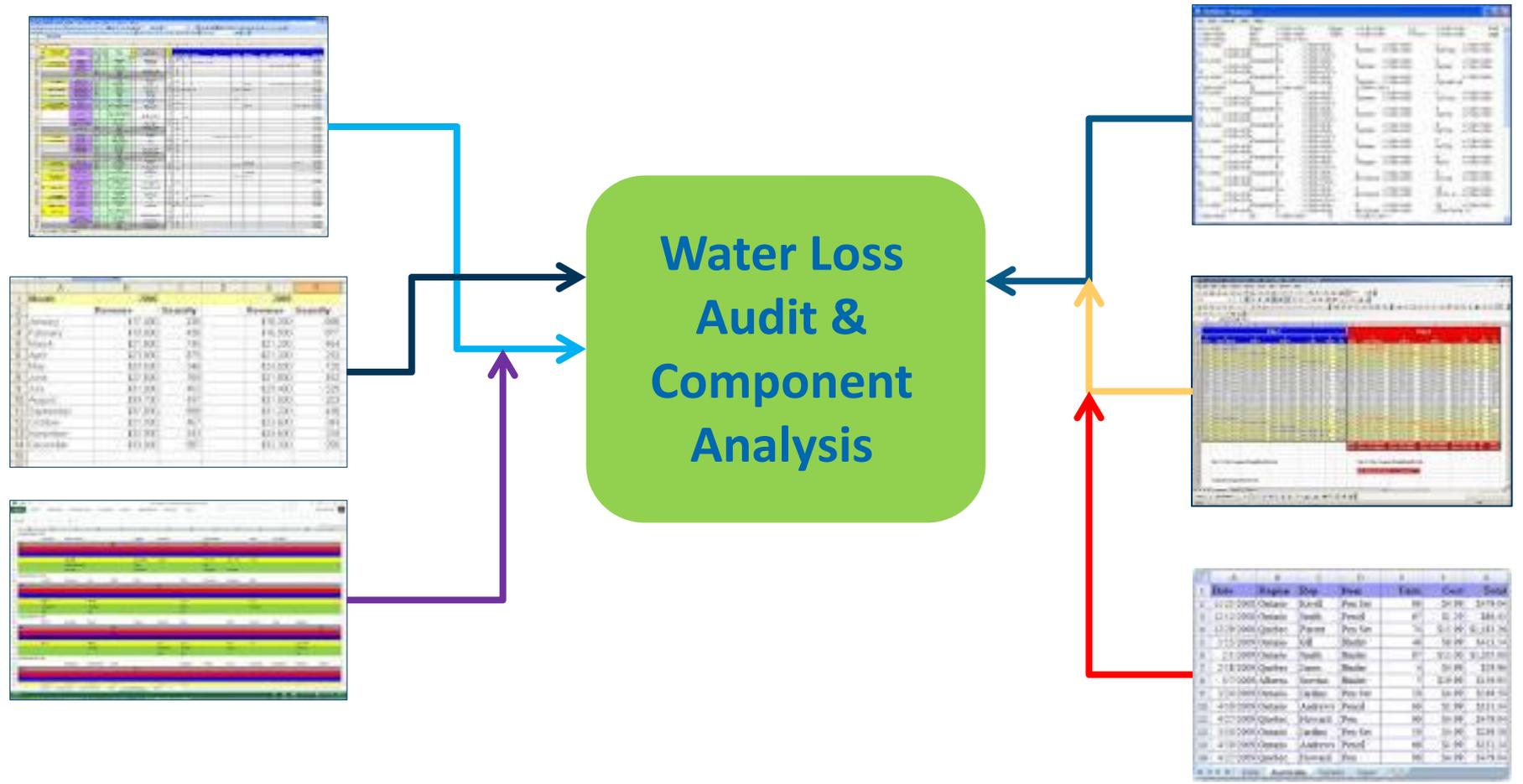
Key Findings and Recommendations

- 💧 Pressure management improvement
- 💧 Active leak detection program
- 💧 Meter sizing optimization
- 💧 Large meter overhaul schedule
- 💧 Address database inconsistencies
- 💧 Improve water supply meter accuracies



Lessons Learned

💧 Improve data retrieval methods



Lessons Learned

- Read fire service meters on a regular basis to prevent theft



Lessons Learned

- Perform District Metered Area analyses with Advanced Metering Infrastructure (AMI)



Lessons Learned

- 💧 Have all the right staff at the table

Water Loss Audit & Component Analysis Team

**Water
Distribution**

**Water
Operations**

**Water
Quality**

**Water
Engineering &
Technical
Services**

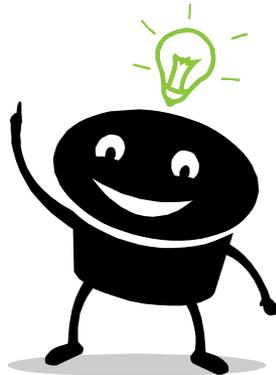
**Water
Resources**

**Customer
Service/IT**

Next Steps

💧 Water Loss Task Force formed

- All divisions involved in previous study included
- Kick-off meeting – October 2014



💧 CUWCC reporting requirements

- Water loss audit due annually
- Component analysis due every 4 years



Questions?

Los Angeles  Department of Water & Power



KEEP SAVING WATER, L.A.!!

Thank You!

Email: sofia.marcus@ladwp.com



Water Loss Control Efforts of Rural System in TN

- Chris Leauber, Executive Director, Water & Wastewater Authority of Wilson Co., TN
- 7052 Water Service Connections
- 327 Miles Distribution Main (100% PVC)
- 5 Ground Level Storage Facilities
- **16 District Metered Areas (DMA's)**
- Purchase 100% of Water Supplied, \$2.53/1000 gallons



Motivation

- Statewide Tennessee Energy & Water Conservation Program in late 80's – 90's
 - Energy Division funded water audits, meter testing & leak surveys; nearly 400 systems
 - Payback within 1 year in energy savings alone
 - Majority of the leaks were not surfacing
- Purchase 100% of supply & 1/3 lost
- 2013 TN regs required annual reporting AWWA Free Water Audit Software
 - Non-compliance: validity score 65 or less, or NRW by cost of operating system of 30% or greater. Stricter every 2 years; validity score of 80 or less in 2019.

On-going Process

- 90's In-house sonic leak surveys
- Early 2000's
 - Small meter change-outs @ 500,000 usage
 - Upgrade SCADA from telephone to radio
 - Implemented GIS
- 2006 -2010
 - MNF analysis via tank levels, temporary DMA flows, Step Testing, & pressure logging
 - Test 10% of replaced meters (system 98.3%)
 - Use AWWA Free Water Audit Software
 - Real Losses benchmarking

Case Study Published: EPA 816-R-10-019 water.epa.gov/drink November 2010 Indicators used for Real Loss Target Setting

AWWA WLCC Free Water Audit Software: Reporting Worksheet
 Copyright © 2010, American Water Works Association. All Rights Reserved. WAS v4.2

Water Audit Report for: **Water & Wastewater Authority of Wilson County, TN**
 Reporting Year: **FY08/09** 7/2008 - 6/2009

Annual cost of Real Losses: **\$159,559**

Operational Efficiency Indicators

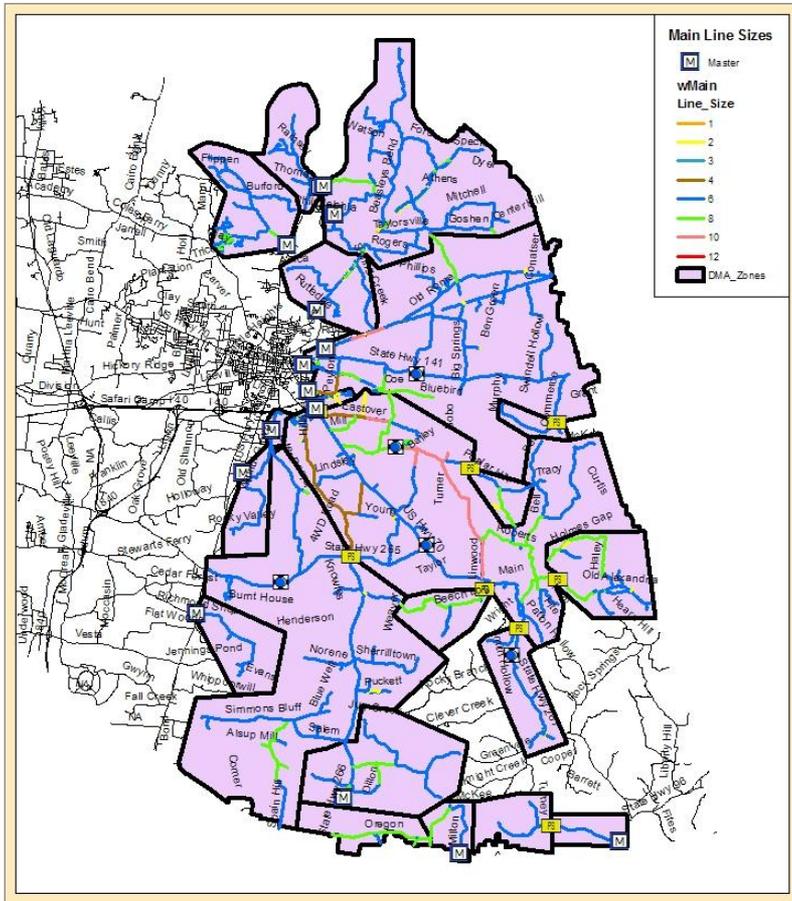
Apparent Losses per service connection per day:	2.60	gallons/connection/day
Real Losses per service connection per day*:	N/A	gallons/connection/day
Real Losses per length of main per day*:	645.42	gallons/mile/day
Real Losses per service connection per day per psi pressure:		gallons/connection/day/psi
Unavoidable Annual Real Losses (UARL):	60.78	million gallons/year
From Above, Real Losses = Current Annual Real Losses (CARL):	75.62	million gallons/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.24	

* only the most applicable of these two indicators will be calculated

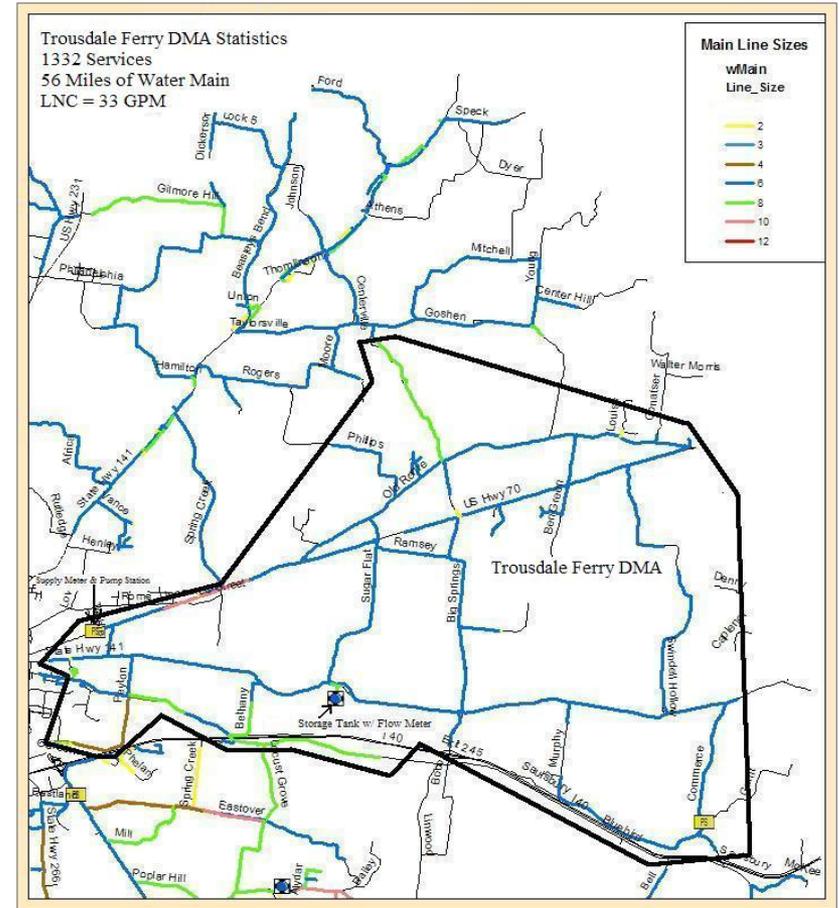
WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 85 out of 100 *****

Navigation: Instructions | Reporting Worksheet | Water Balance | Grading Matrix | Service Connection Diagram | Definitions | Loss Control Planning | Ex. Audit 1 (M ...)



Water & Wastewater Authority of Wilson Co.
Infrastructure Inventory 2010

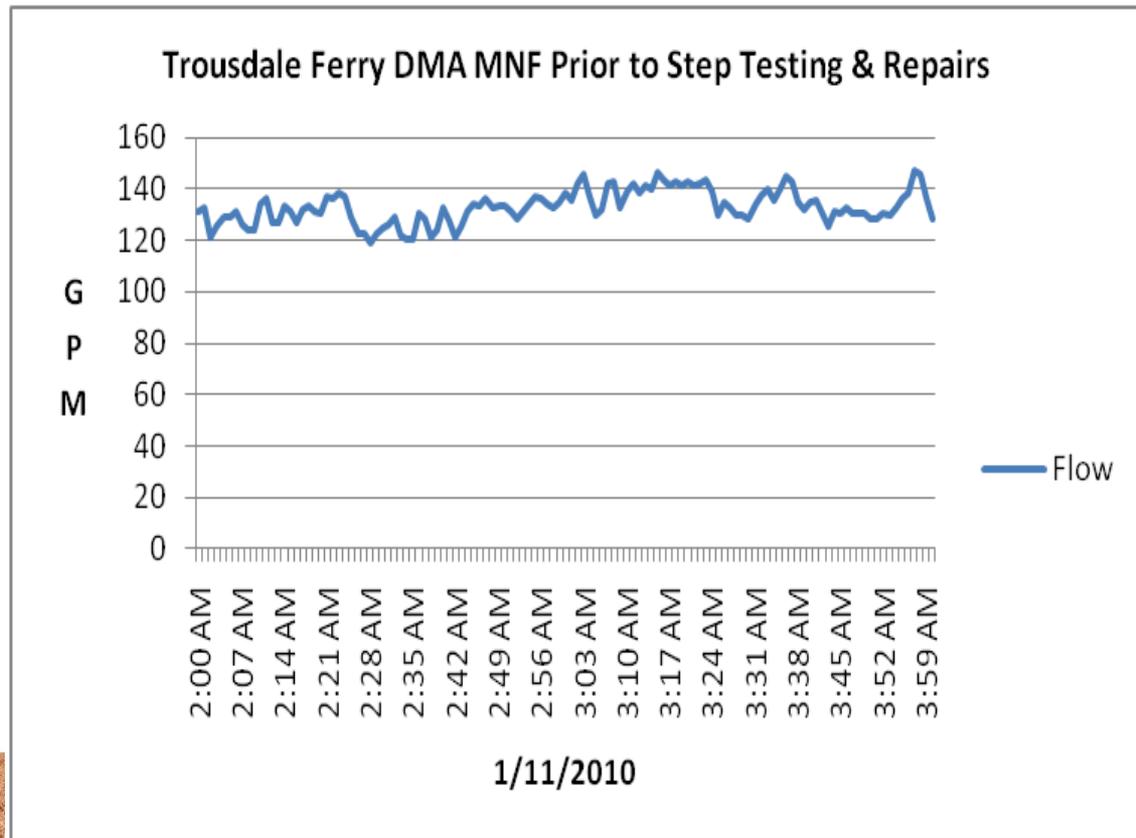


Water & Wastewater Authority of Wilson Co.
Infrastructure Inventory 2010

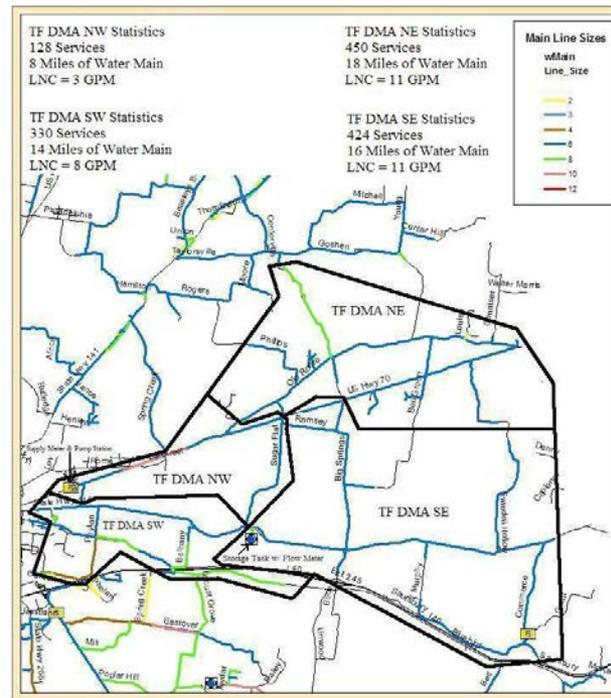
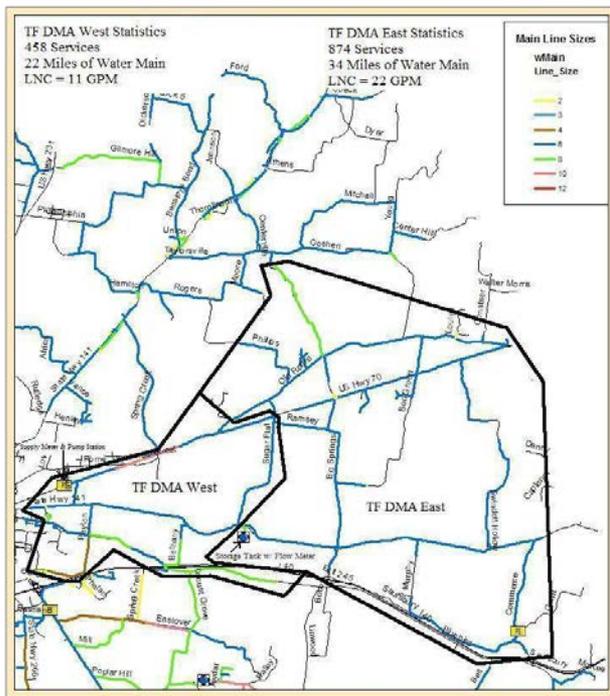


System-wide UARL 60.78 million gallons/year (0.36 gpm/mile)
TF DMA = 56 Miles of main
Real Losses should be maintained at a level of 20 gpm (0.36 gpm per mile)
The MNF should be maintained at 53 gpm (LNC of 33 gpm + Real Losses of 20 gpm)

If MNF > 53 gpm consider intervening



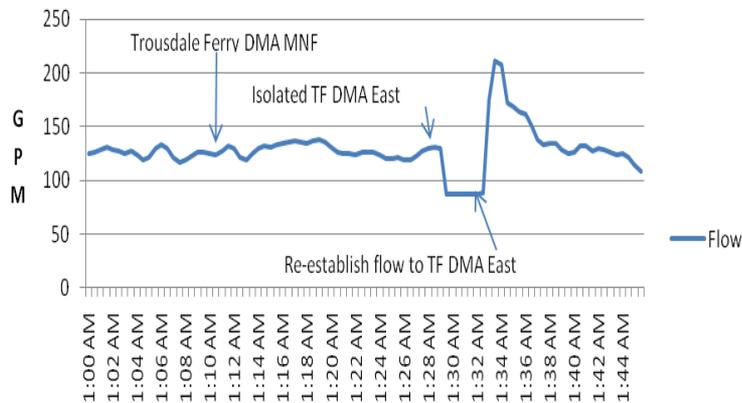
Trousdale Ferry DMA MNF = 120 gpm
Trousdale Ferry DMA LNC = 33 gpm
Trousdale Ferry DMA Real Losses (Leakage) = 120 gpm - 33 gpm = 87 gpm
Trousdale Ferry DMA = 56 miles main
87 gpm/56 miles = **1.6 gpm/mile**



Water & Wastewater Authority of Wilson Co.
 Infrastructure Inventory 2010

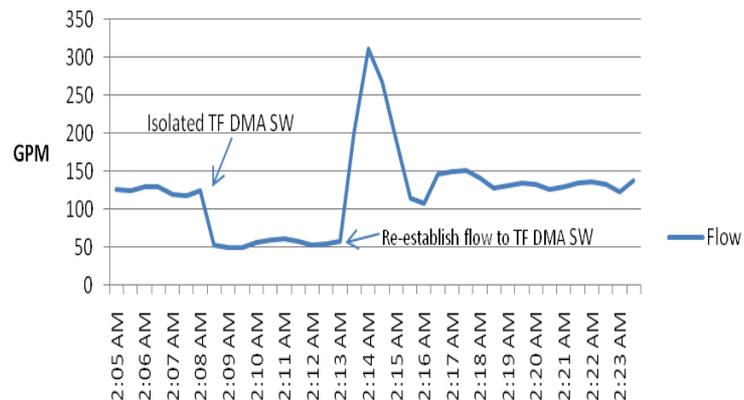
Water & Wastewater Authority of Wilson Co.
 Infrastructure Inventory 2010

TF DMA East Step Test



1/12/2010

TF DMA SW Step Test



1/12/2010

Additional Step Testing within TF DMA SW

- Leakage isolated 3:15 AM to 1,700' area
- Step tested 56 miles in 2 hours
- No water surfacing
- 6" PVC main located under soil conditions, 20' off road , 90 psi
- No low pressures complaints
- Not detectable by direct contact sounding

Leak Sounding

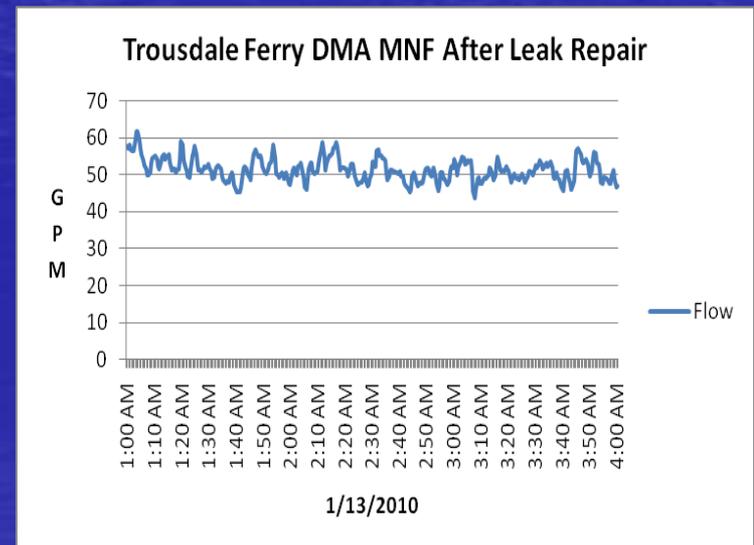
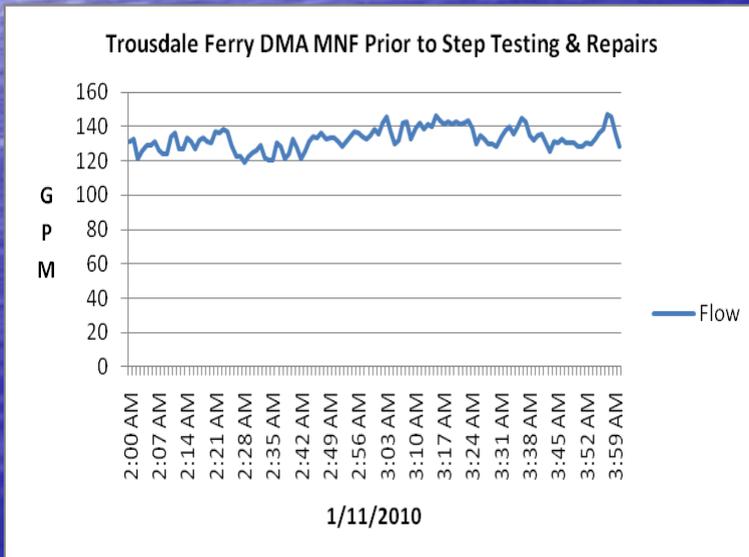
No Leak Noise on nearby Water Service



Only Audible in 2' Radius over Leak



65 gpm, 94,000 gallons per day, 34,000,000 gallons per year, @ \$2/1000 gal = \$68,000/Yr.

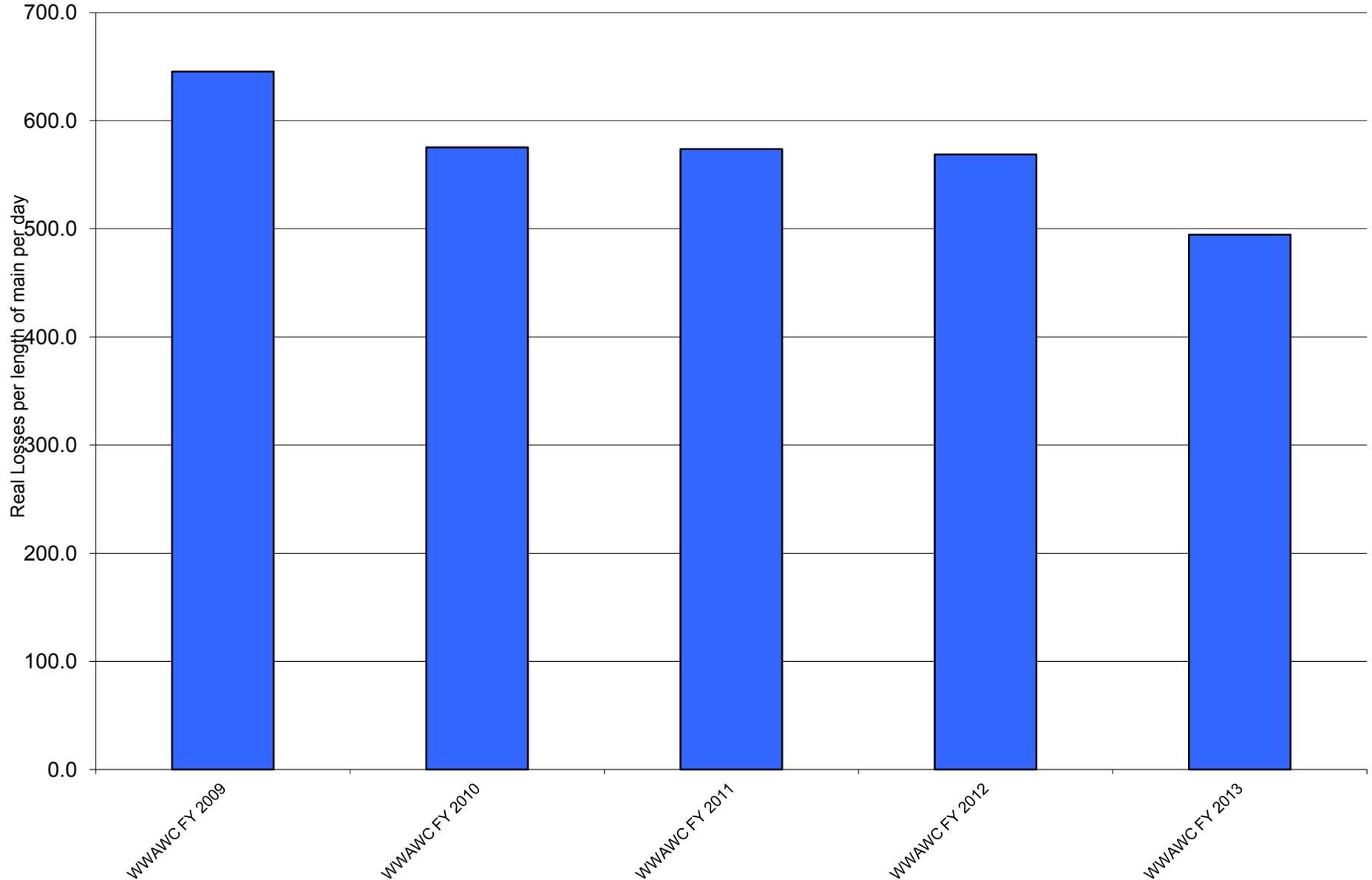


Today

- MNF benchmarking based on Real Losses per length of main per day & UARL from Water Audit Software & LNC
- SCADA tank level resolution increased & provides MNF data daily for 64% of distribution system
- Near real-time Telemetry installed on 2 of 15 system input meter via text messaging, 1 minute flow & pressure data
 - Eliminates daily site visits for required reads
 - One-man Step Testing

Results (also ILI @ Technical Min <1.0)

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How much water was lost?



- 35,000,000 gallons

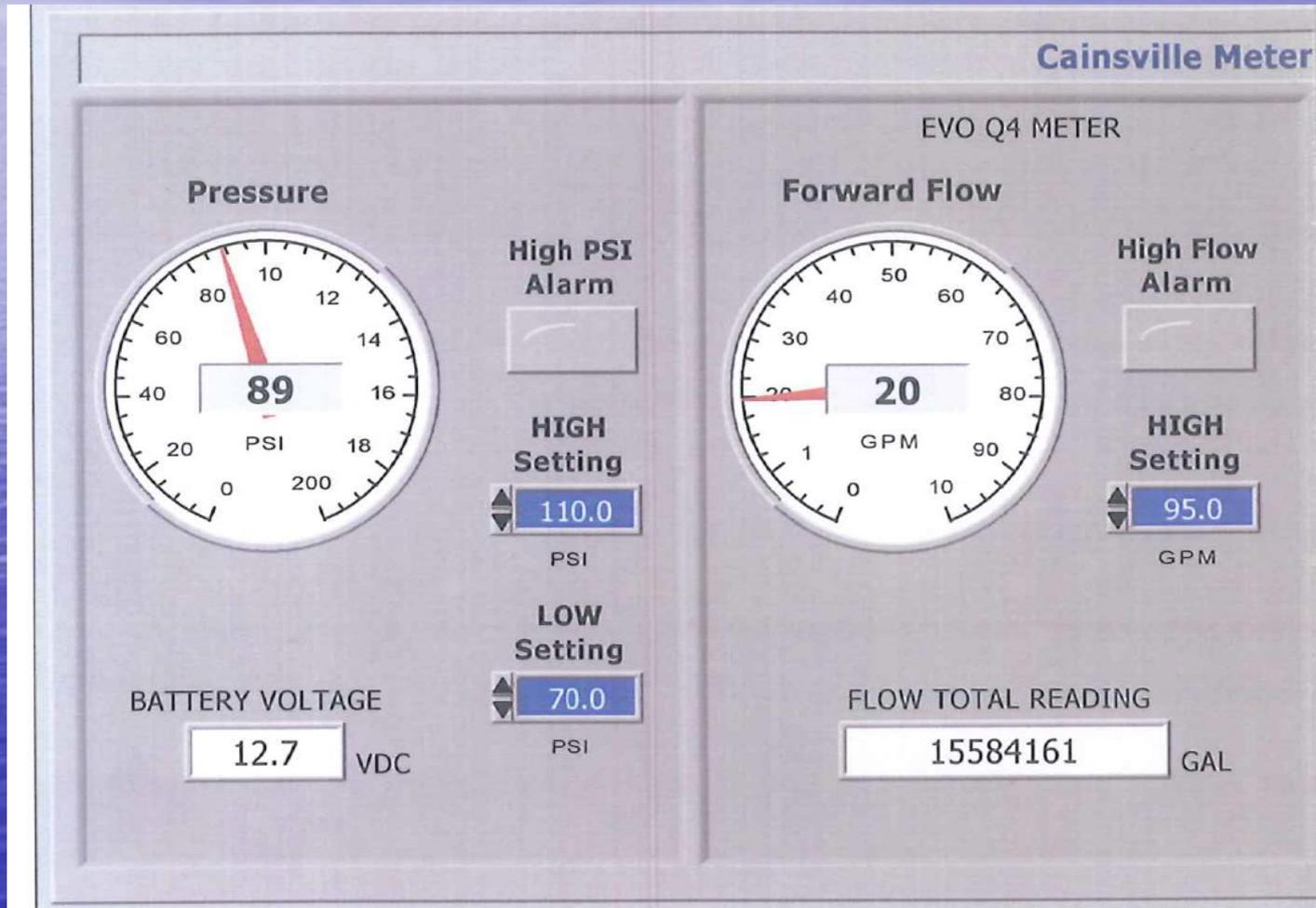
- Last time 24-hour DMA Input Meter flow was as low as now was March, 2002

- 7 gpm running for almost 10 years

- @ \$2.00/1000 gal = \$70,000



One-man Step Testing via Smart Phone

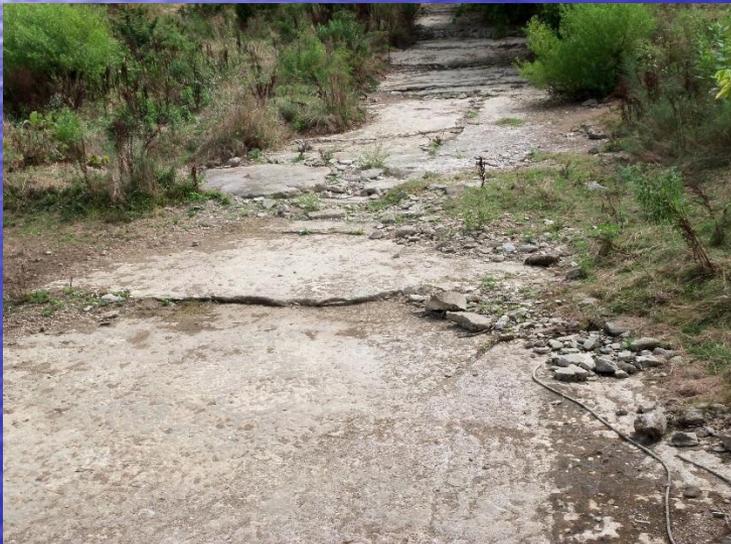


Proactive vs. Reactive



- Repaired under pressure
- No HTH or Bac-T sample required
- No interruption of service to customers
- Scored perfect 100 on last 3 Sanitary Surveys

Recoverable Leakage: Serves New H.S., Drought Demands, & Unserved Areas



2 Year Goal

- All system input meters to be electromagnetic, 1 pulse/1 gallon, on Telemetry w/ 1 minute flow & pressure data to SCADA & One-man Step Testing
- Pilot AMI – Align DMA MNF consumption to MNF input for daily loss analysis
- Automate daily loss analytical process
- Pressure Management: (waterrf.org) Real Loss Component Analysis: A Tool for Economic Water Loss Control 4372a

Contact Information

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Questions?



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- Partners help promote WaterSense labeled products and campaigns (e.g., Fix a Leak Week)
- Wide range of tools available for partners
 - Infographics, Bill Stuffers, Messaging & Tips, Sample web text, Sample press release/newsletter text
- Best of all - partnership is free!
 - www.epa.gov/watersense/partners



¿Cómo sentirse bien de sí mismo cada vez que ve su recibo de agua?

Alcanzar agua, energía y dinero es tan fácil como 1-2-3

1. Verifique si existen fugas en el baño.
2. Enrosque un aspirador de grifo.
3. Reemplace una ducha antigua con una que tenga la etiqueta de WaterSense.

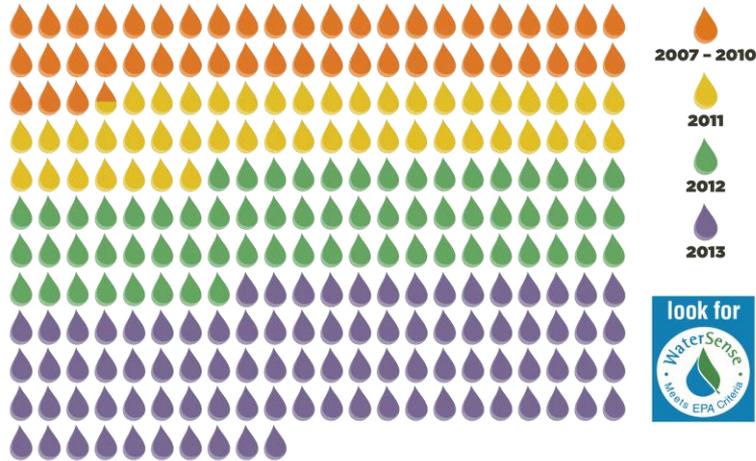
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For More Information



757 billion gallons of water saved since 2006!



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