# This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



# M-36 or Bust

A Story of Conducting Nearly 50 System Wide Water Audits on Small Water Providers

Presented by:

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# **Sustainable Practices**

Resource Sustainability, Policy and Management





"Your investment in water



# Overview

- Regional Water Conservation Planning by Southeastern Colorado Water Conservancy District
  - Required as Part of Project Permitting
  - Funded By Reclamation and State of Colorado
  - Project Participants Requested Efficiency Support with Infrastructure and Water Rates (versus Customer Demand Management)



# Audits

- AWWA M-36 Used As Framework/Guide "It's a Process"
- No Mandate This is Not Georgia
- https://www.secwcd.org/BMPToolbox



# Audits

- Not Intended to Create Report Card on Water Loss
- Data Collection and Assessment
  - Collective Snapshot of "Conditions"
    - What Kinds of Data and How Managed
  - Educational
  - Policy Support
    - Regional Reporting Related to Project
    - Informing Regional and Statewide Planning



# AWWA M-36 Water Accounts



Sold



# AWWA M-36 Water Accounts



Non-Revenue Water – Water that has a cost to produce (e.g., energy, treatment, distribution) which does not generate revenue.



# AWWA M-36 Water Accounts



# Produced

Water

Water

Sold

# AWWA M-36 Water Accounts



**GREAT WESTERN INSTITUTE** 







map shamelessly borrowed from http://www.washingtonstatesearch.com/United\_States\_maps/Colorado/maps/Colorado\_State\_map.jpg



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# Water Provider Characteristics

- 47 Audits Performed (2 phases of audits)
- Private and Public Organizations
- Number of Connections
  - 24 to 10,000 plus (median~250) (13 >1,000)
- Rural to Suburban
  - Including Small Towns and Cities





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- ~1 Billion Gallons Per Month (collectively)
  - 36,400 AF annually
  - From 7,000 to 4,500,000 gallons per day

# "Data! Data! Data! I cannot make bricks without clay." Sherlock Holmes

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			3/11	1267	20193	0345	2524	88
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			5/1	5652	20859	F 02.5	5367	97
			6/11	9631	21248	0551	6953	027
			7/11	2800	21537	4440	8640	OT
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# Stories about material failures



# Stories about replacing the old with the new





# Stories about superb accuracy in measurements



# **Data Requested**



- Produced Water (or Water Treatment Plant (WTP) Influent)
- Water into Distribution (WTP Effluent)
- Master Metering (where, calibration history, etc.)
- Water Sold (bonus if by customer type)
- Listing of Unbilled Uses
- Estimates of Unbilled Uses
- Meter Types, Numbers, Sizes, Ages
- Billing and Meter Reading Schedules
- Meter Testing and Replacement Practices
- Distribution Piping Diameters, Materials, Lengths
- Distribution Line Leak Detection and Repair Practices
- Recent History of Leaks
- CIP Budgets and Past Operating Budgets
- Stories of Best Management Practices/Lessons Learned

# **Initial Findings**

- Nearly All Organizations Maintain Much of These Data in Accessible Formats;
  - or they found benefit in gathering it
- Just Organizing the Data Helps Find Gaps
  - Lack of meters/meter testing
  - Inconsistency in data collection
  - Need for improved record keeping
  - Differentiates "estimates" from "measurements"
  - Better understanding of data use in water loss management
  - Breaking silos (Cross-organization communications)
- Embarrassment Factor

# **Initial Findings**

- None of the Audited Organizations:
  - Has All the Data Needed to Perform the Audit Completely (as prescribed in M-36)
    - Documented "estimation techniques" for Authorized Unbilled Consumption
    - Documented meter accuracy data (for either master meters or customer meters)
    - Formal water loss management programs
- Few had:
  - Documented water loss reporting
- All had annual budgets for:
  - Leak and distribution line repair
  - Meter replacement (not all had meter testing)
  - CIP for water line replacement







- Non-Revenue Water
- Estimated Authorized Unbilled Consumption
- Estimated Apparent Losses (as % of Sold)
  - Meter Inaccuracy
  - Unauthorized Use
  - Systematic Errors
- Estimated Real Losses
  CARL
- Developed Performance Indicators





Average Non-Revenue Water – 16.7% Value of Non-Revenue Water - \$ 500K/month

# Estimated Non-Revenue Water (as % of Water Produced)<sup>a</sup>



<sup>a</sup> does not include RO reject, but does include small system filter backwash





Non-Revenue Water can vary from positive to negative variations come from changing periods of data collection, changing system conditions













Authorized Unbilled Consumption - \$44K/Month\* Apparent Losses - \$106K/month Real Losses - \$350K/month

•7 entities with Authorized Unbilled Consumption greater than 25% of Non-Revenue Water

•6 entities claim zero Authorized Unbilled Consumption



# A Word About Performance Indicators

"All Models are Wrong, Some Models are Useful"

George E.P. Box Science and Statistics

# A Word About Performance Indicators

- Real Losses
  - All other uncertainties impact accuracy of this calculation
  - M-36 Characteristic Parameters Valuable but,...
    - CARL Current Annual Real Losses
    - UARL Unavoidable Annual Real Losses (includes Reported and Unreported Leakage plus UBL) (may not be applicable to entities with < 3,000 connections)</li>
      - About ½ of Audited Entities Have CARL< estimated UARL</li>
    - UBL Unavoidable Background Leakage
    - ILI Infrastructure Leakage Index

# **Major Recommendations**

- Move Toward Consistent Temporal Data Collection
- Conduct Meter Inspections/Testing
  - Production Meters
  - Prioritized Customer Meters (size, age, etc.)
- Meter Unmetered, Unbilled Uses (for those with these ~25% of audited entities)
  - City Parks
  - Cemeteries
- Implement BMPs

# **Recommended BMPs**

- Maintain Leak Repair Records
- Tracking of Authorized Unmetered Uses
  - What are they?
  - How quantified?
- Coordinate Data Management with Engineering with Finance
  - Monthly Tracking of Non-Revenue Water, etc.
- Develop Storage Tank Level Monitoring Program
- District Metered Areas (DMAs)
- Conduct <u>Regular</u> Third Party System Wide Audits



# Thank You

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