This presentation premiered at WaterSmart Innovations

watersmartinnovations.com
As The River Flows:
Catawba-Wateree’s Innovative Model for Building Water Loss Control

Relevant Roles:
Chair, AWWA Water Loss Outreach Subcommittee
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The Big Picture: Economic Intervention

Annual Water Balance
- Annual M36 water audit
- Apparent & Real Loss volumes
- Level 1 validation

Loss Profiling & Uncertainty
- Advanced Validation
  - Level 2 Analytics
  - Level 3 Field Study
  - Margins of Error
- Apparent Loss Profile
  - Theft
  - Meter Inaccuracy
  - Data Handling
- Real Loss Profile
  - Reported Leakage
  - Unreported Leakage
  - Background Leakage

Cost-Benefit & Targets
- Costs of losses
  - by subcomponent
  - in aggregate
  - wholesale & retail
- Costs of intervention strategies
- Program design
- System-specific

Intervention
- Leakage Management:
  - Active Leak Detection
  - Pressure Optimization
  - Repair Time Reduction
  - Network Renewal
- Revenue Protection:
  - Theft Mitigation
  - Meter Optimization & Renewal
  - Billing Data System Integrity
  - Revenue Recovery

Stage 1: baseline
Stage 2: technical analysis
Stage 3: economic analysis
Stage 4: cost-effectiveness
IWA/AWWA Standard Water Balance

Water Audit Report for: [Northern San Leandro Combined Water Sewer Storm Utility District  (0007900)]

- Reporting Year: 2013
- From: 01/2013 to 12/2013

**Water Supplied**

- Volume from own sources: 1,000.000 MG/Yr
- Water imported: 9 MG/Yr
- Water exported: 100.000 MG/Yr

**Water Exported**

- Water supplied: 825.000 MG/Yr

**Authorized Consumption**

- Billed metered: 8700.000 MG/Yr
- Billed unmetered: 950.000 MG/Yr

**Authorized Consumption:** 760.313 MG/Yr

**WATER LOSSES**

- Water supplied - Authorized consumption: 64.688 MG/Yr

**Unbilled Authorized Consumption**

- Unbilled metered: 10.313 MG/Yr
- Unbilled unmetered: 50.000 MG/Yr

**Billed Water Exported**

- Billed metered consumption: 825.000 MG/Yr
- Billed unmetered consumption: 9 MG/Yr

**Non-Revenue Water**

- Water losses: 64.688 MG/Yr
- Real losses: 50.000 MG/Yr

**Water Losses**

- Apparent losses: 15.071 MG/Yr
- Unauthorized consumption: 3.000 MG/Yr
- Customer metering inaccuracies: 7.071 MG/Yr
- Systematic data handling errors: 5.000 MG/Yr

**WATER LOSSES:** 64.688 MG/Yr

**NON-REVENUE WATER**

- Non-revenue water: 75.000 MG/Yr

**COST DATA**

- Total annual cost of operating water system: $1,000,000/year
- Customer retail unit cost (applied to apparent losses): $3.50
- Variable production cost (applied to real losses): $3,000.00/MG

**SYSTEM DATA**

- Length of mains: 100.0 miles
- Number of active and inactive service connections: 1,000
- Service connection density: 1 conn./mile main
- Average length of customer service line: 60.0 ft
- Average operating pressure: 60.0 psi

For more information, please visit the AWWA Free Water Audit Software: Reporting Worksheet.

Visit us at www.awwa.org/wateraudit for more information.
Non-Revenue Water

- Total System Input
- Water Supplied (allow for known errors)
- Water Exported
- Authorized Consumption
- Billed Authorized Consumption
- Unbilled Authorized Consumption
- Water Losses
  - Apparent Losses
  - Real Losses
- Non-Revenue Water
  - Unauthorized Consumption
  - Customer Metering Inaccuracies
  - Systematic Data Handling Errors
  - Leakage on Mains
  - Leakage on Service Lines
  - Leakage & Overflows at Storage
3-V’s

Volume

Value

Validity
Aggressive Intervention is **Over-Spending**
Example: replacement of pipes and meters before their optimal useful life

**Economic Optimum**
Loss & Intervention
Economic target from benefit-cost design (M36)

Reactive Intervention is **Over-Spending**
Example: fixing only leaks that surface, replacing meters only when they stop

- **Total Cost**
- **New Supply**
- **The GAP**
- **Cost of Water & Revenue Loss**
- **Cost of Intervention**
WELCOME TO THE CATAWBA WATER LOSS SITE

This site has been developed for members of the Catawba-Wateree Water Management Group.

Enter

Not a participant in this program, but want to learn more? Contact us here.
Phase 2-4 quantifies this
Phase 5 quantifies this
Phases 6-8 = implementation to get there

Aggressive Intervention is Over-Spending
Example: replacement of pipes and meters before their optimal useful life

Economic Optimum NRW & Intervention
Economic target from benefit-cost design (M36)

Reactive Intervention is Over-Spending
Example: fixing only leaks that surface, replacing meters only when they stop
Total Non-Revenue Water Volume (MG) in 2016

$16 Million/year

Margin of Error +/-15%
## Catawba Water Loss Program Outcomes

### NRW Components - Volumes & Values

<table>
<thead>
<tr>
<th>Volume (MG)</th>
<th>Real Loss $</th>
<th>Apparent Loss $</th>
<th>Unbilled Consumption $</th>
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<td>$4,000,000</td>
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</tr>
</tbody>
</table>

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The chart illustrates the breakdown of NRW components into Real Loss, Apparent Loss, and Unbilled Consumption. The values are represented in both volume (MG) and dollar ($) terms.
Statistics for Individual Utilities

NRW Volume
(kgal/conn/year)

NRW Value
$/conn/year
Statistics for Individual Utilities

Unbilled Consumption (gal/conn/day)

Apparent Loss (gal/conn/day)

Real Loss (gal/conn/day)
Statistics for Individual Utilities

Infrastructure Leakage Index

[Box plot diagram]
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Baseline
- Value
- Volume
- Technical analysis
- Economic analysis
- Cost-effectiveness

Stage 1
- Stage 2
- Stage 3
- Stage 4
Catawba Water Loss Program Outcomes

Real Loss Components - By Volume

- Unreported Leakage: 67%
- Background Leakage: 28%
- Reported Leakage: 5%

Annualized Cost of Real Losses - $5M
Types of Leakage

Background Leakage
Unreported and un-detectable using traditional acoustic equipment.

Unreported Leakage
Often does not surface but is detectable using traditional acoustic equipment.

Reported Leakage
Often surfaces and is reported by public or utility workers.
Selecting the Right Tool

**Background Leakage**
Unreported and un-detectable using traditional acoustic equipment.
- **Tools**
  - Pressure Management
  - Main & service replacement
  - Reduction in number of joints/fittings

**Unreported Leakage**
Often does not surface but is detectable using traditional acoustic equipment.
- **Tools**
  - Pressure Management
  - Main & service replacement
  - Reduction in number of joints/fittings
  - Proactive Leak Detection

**Reported Leakage**
Often surfaces and is reported by public or utility workers.
- **Tools**
  - Pressure Management
  - Main & service replacement
  - Optimized repair time
Catawba Water Loss Program Outcomes

Annualized Cost of Apparent Losses - $11M
Catawba Water Loss Program Outcomes

NRW Subcomponents - Volumes & Values (Annualized)

- Free Water Accounts
- Reported Leakage
- Operational Use
- Data Handling
- Unauthorized Use
- Background Leakage
- Unreported Leakage
- Customer Meter Inaccuracy

Volume (MG):
- 9,337
- 3,823
- 1,425
- 746
- 1,118

Value ($):
- $8,382,019
- $3,288,201
- $1,526,982
- $1,465,201
- $1,139,936
- $604,440
- $18,000,000

Data Sources:
- NRW Data Collection
- Economic Analysis
- Revenue Impact Assessment
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Stage 4: Intervention
Statistics for Basinwide Aggregate

CWWMG Cumulative NRW Cost Impacts for 5-Year Horizon

- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
Advantages of a Basinwide Water Loss Program

Source Water

Collaboration

Perspective
Water Loss Control Programs - United States

- **Washington**
  - Pilot, 10 Systems, 9 Months
- **Colorado**
  - Full Scale, 165 Systems, 2 Years
  - Utah
    - 2 Pilots, 12 Systems, 6 Months
- **Wisconsin**
  - Pilot, 6 Systems, 6 Months
- **Utah**
  - 2 Pilots, 12 Systems, 6 Months
- **Massachusetts**
  - 60 Systems, 2 Years
- **Wisconsin**
  - Pilot, 6 Systems, 6 Months
- **Utah**
  - 2 Pilots, 12 Systems, 6 Months
- **Massachusetts**
  - 60 Systems, 2 Years
- **California**
  - Full Scale, 460 Systems, 2 Years
- **Arizona**
  - Pilot, 6 Systems, 6 Months
- **New Mexico**
  - Full Scale, 134 Systems, 12 Months
- **North Carolina + South Carolina**
  - Regional Basin, 19 Systems, Multi-year
- **Georgia**
  - Full Scale, 230 Systems, 5 Years
- **Florida**
  - Pilot, 10 Systems, 12 Months
Registration is Open!

www.awwa.org/waterloss

With Support From:

Alliance for Water Efficiency

EPA WaterSense

IWA

the international water association

Local Host:

American Water Works Association
Kentucky/Tennessee Section
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