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# Georgia's Approach to Developing Performance Measures After 2 Years of More Than 200 Validated Water Audits



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# Outline

- Background and Regulatory Drivers
- Current Requirements for Water Suppliers
- Water Audit Validation
- Benchmarks Development
- Summary

# History of Lake Lanier Rulings

- 2009: Fed Court Ruling
  - Water supply was not originally authorized purpose of Lanier
  - Current supply use exceeds Army Corps authority
  - Restricts future water use (2012 deadline)
- June 2011: Court of Appeals
  - Reversed 2009 Ruling
  - Vacated the 2012 deadline
  - Dismissed requirement for Congressional approval
- June/July 2012
  - US Supreme Court declines to hear appeal.
  - Army Corps must determine how it will operate Lanier to meet water supply and the other authorized purposes.

# Water Stewardship Act of 2010

- WSA was enacted by 2010 General Assembly
- Recognizes imminent needs:
  - to create a culture of water conservation in the State of Georgia
  - to plan for water supply enhancement during future extreme drought conditions and water emergencies
- Six key provisions ...
- 1) Requires state agencies to review and enhance conservation programs
- 2) Revises standards for plumbing fixtures and devices
  - High efficiency plumbing fixtures (toilets, showerheads and urinals)
  - Sub-metering for multi-unit buildings (after July '12)
  - High efficiency cooling towers for commercial and industrial (after July '12)

# WSA - Key Provisions

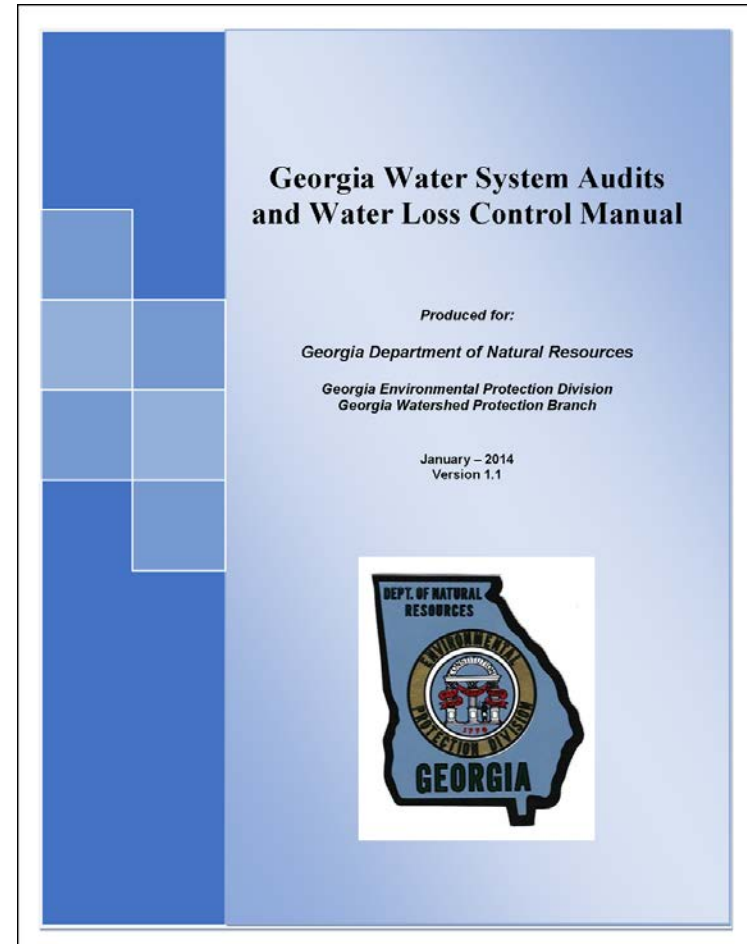
- 3) Mandates public water systems to conduct annual water audits and follow leak abatement best practices
- 4) Modifies authorities to restrict outdoor water use and establishes a schedule for outdoor irrigation
- 5) Calls for amendments to permitting system for farm water use
- 6) Created a Water Supply Study Commission to study and analyze the state's reservoir system and strategic needs for additional water supply

# Water Audit Background and Regulatory Drivers

- GA WSA requires annual water system audits (calendar year)
- Phased-in approach based on size of service area:
  - Water systems serving >10,000 individuals initial audit by 2012
  - Water systems serving 3,300 to 10,000 individuals audits by 2013
  - Infrastructure leakage index (ILI)
  - In accordance with the International Water Association (IWA) method/standard
- Submitted 2011 large system audits posted on EPD website
  - [http://gaepd.org/Files\\_PDF/whats\\_news/2011\\_GeorgiaPWS\\_WaterAuditResults.pdf](http://gaepd.org/Files_PDF/whats_news/2011_GeorgiaPWS_WaterAuditResults.pdf)

# Specific Requirements for Water Suppliers – GA Water Loss Control Manual

- Utilized existing resources
  - AWWA M36 Manual and Software
  - Metropolitan North Georgia Water Planning District
  - 2013: Addition of sample calculations addendum
  - Manual to be revised in 2014 – include systems serving below 3,300

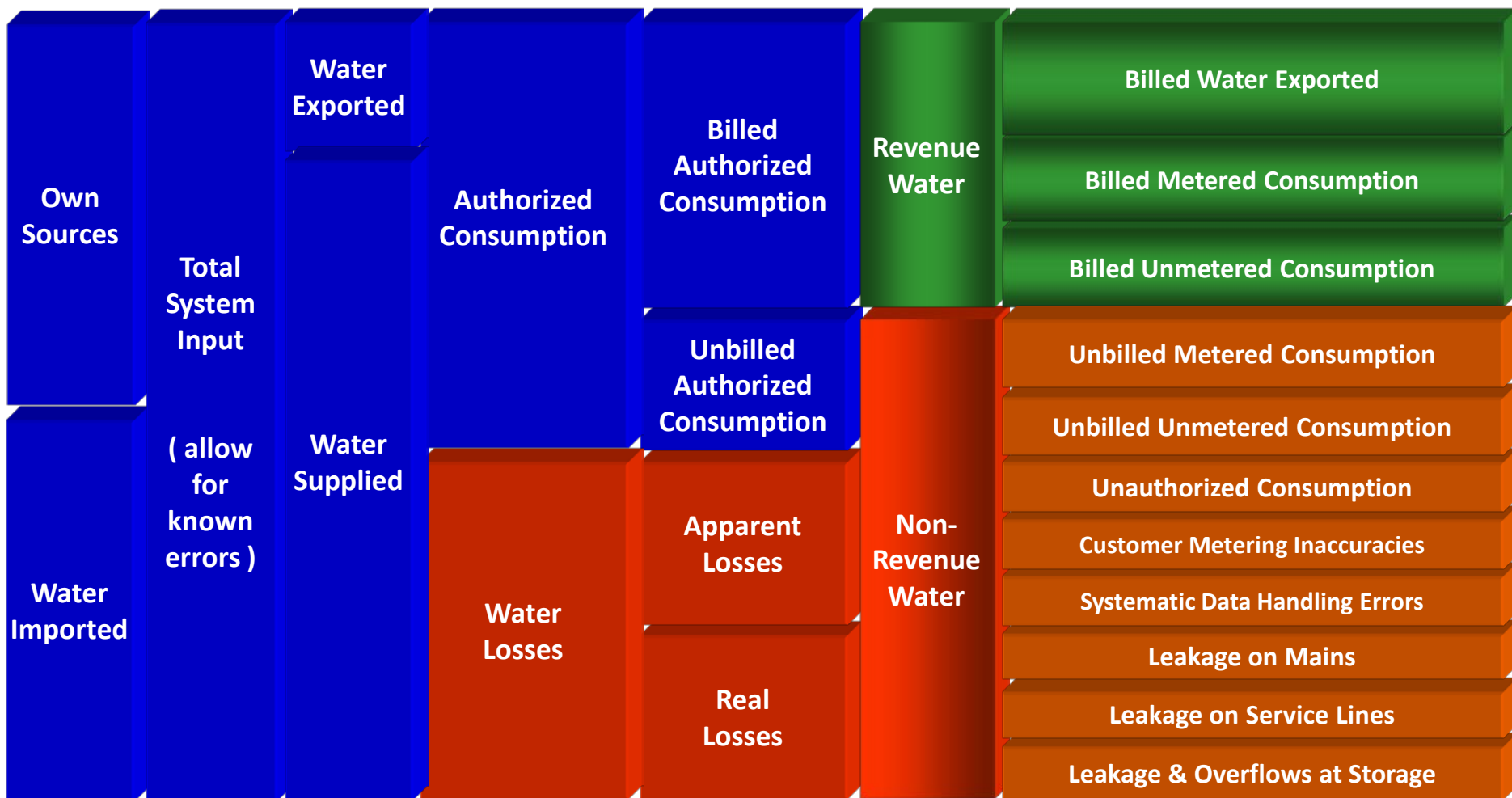


# Non-Revenue Water (NRW)

- Is the difference between the volume of water produced and the volume of water billed to customers
- It consists of three elements with different values in \$/gallon:
  - Real Losses
  - Apparent Losses
  - Unbilled authorized consumption
- Calculate the \$ value of each NRW component



# IWA/AWWA Standard Water Balance



# Transition away from “Unaccounted-for Water Percentage”

- No consistent definitions for the components
- Percentage indicators have been found to be suspect in measuring technical performance
- Percentage indicators translate nothing about water volumes and costs
- Water systems now translating UAW components into IWA/AWWA standard water balance about water volumes and costs
  - EPD is in the process of changing reporting forms to not use UAW

# Real Losses

- Also called *Physical* Losses – water that enters the distribution system, but never reaches a user
- Includes:
  - Leakage on transmission and distribution mains
  - Storage tank overflows
  - Service Line leakage up to customer meter
- Reducing real losses creates an additional resource which reduces operating costs and can be used to defer capital expenditure

# Apparent Losses

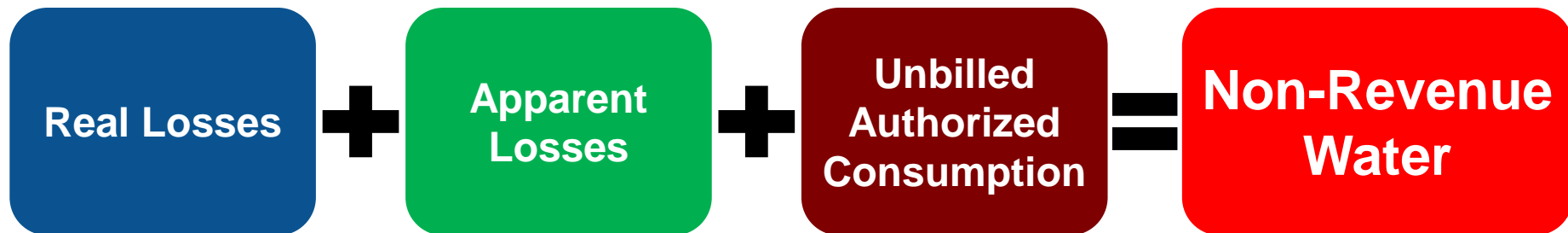
- Also called *Paper* or *Economic* Losses – water that reaches a user, but is not properly measured or paid for
- Includes:
  - Theft
  - Customer metering inaccuracies
  - Data handling errors
- Reducing Apparent losses increases revenue but creates no *new* water

# Unbilled Authorized Consumption

- Could be metered or unmetered
- Does NOT include leaks and breaks
- System operations and maintenance (unbilled unmetered)
  - Fire fighting, pressure/flow testing, water quality or complaint flushing, sewer jet trucks, street sweeper trucks, line flushing after repair, tank draining for maintenance, etc.
- City/County use (unbilled metered)
  - Water plant, wastewater plant, city hall, fire station, police station, etc.

# Non-Revenue Water (NRW)

- Is the difference between the volume of water supplied and the volume of water billed to customers
- It consists of three elements with different values in \$/gallon:
  - Real Losses
  - Apparent Losses
  - Unbilled Authorized Consumption
- Use this term instead of “unaccounted-for-water”



# % Water Loss is Not a Reliable Metric

- Volume of Real and Apparent Water Loss divided by your Water Supplied
- Percentages can vary widely from year-to-year as production and consumption vary

The diagram illustrates the formula for calculating % Water Loss. It features three main components: a numerator and a denominator. The numerator is represented by two green rounded rectangular boxes, 'Real Losses' and 'Apparent Losses', connected by a black plus sign. These are positioned above a thick black horizontal line. Below this line is a blue rounded rectangular box labeled 'Water Supplied'. To the right of the horizontal line is a black equals sign. Further to the right is a black rounded rectangular box containing the text '% Water Loss'.

$$\frac{\text{Real Losses} + \text{Apparent Losses}}{\text{Water Supplied}} = \% \text{ Water Loss}$$

# Water Loss Metrics

- Consider the volume of Real and Apparent Losses
- Metrics to consider for goal setting:
  - Real Loss volume per connection (or mile of main)
  - Apparent Losses per connection
  - Infrastructure Leakage Index (ILI)



# Need for Validation was Evident from the Start on Large and Small Systems

- Need for validation – based on initial review of 2011 large system audits
- GEFA technical assistance for small systems implemented as result of observations of audit results from large systems (2012 audits)
- Teaching circuit across the State for small systems, starting in June 2012 through February 2013
  - 3 sub-regional teaching workshops
  - In-progress validation step
  - Application phase
  - Reinforcement and continuous improvement
  - Final validation step

# AWWA WLCC Water Audit Validation Process

- Standard set of questions
- Individual water system discussions about input and grading
- Uniform adherence to grading matrix definitions
- Consistent definitions and calculations
- Consistent Validation Team

Form Source: AWWA Water Loss Control Committee EPD Large Systems 2011 Water Audit Validation 2011 Audit Validation Call Document					
Telephone Interview Date:	EPD Team Member(s) Brian Skeens				
Water Utility Name:	Water Utility Interviewees	Water Audit Data Validity Score (from submitted data):	Infrastructure Leakage Index (from submitted data):		
Evaluation of Water Audit Components – entered quantities & data gradings					
Component	Submitted Quantity	Submitted Grading	Evaluation Comments	Final Quantity	Final Grading
Volume from Own Sources					
Master meter error adjustment					
Water Imported					
Water Exported					
Billed Metered					
Billed unmetered					
Unbilled metered					
Unbilled unmetered					
Unauthorized consumption					
Meter inaccuracy					
Handling errors					

# Observations from Validated Audit Results

- Volume from own sources was the top area for improving audit results for both large and small validated systems
- For large validated systems, second top priority is master meter error adjustment, for small systems it is billed metered
- Validity scores decreased due to validation for both large and small systems; ILI scores increased
- Large system average validation score (63) was higher than average small system validation score (54)
- Trending for all metrics for unvalidated 2012 large systems show mixed results – need for ongoing validation

# Validated Audit Results from the Large and Small Systems

- Resulted in 100 validated audits for 2012 - small systems
- 107 large system audits for 2011 also validated in Fall 2012/Spring 2013
  - Combined 207 validated audits!!!
- 107 validated large system and 100 validated small system water audits (207)
  - Largest set of validated audits in North America, perhaps even in the world!!
- More water audit validation in progress!
- \*GAWP/GAWWA Water Loss Control Committee
  - Formed in Summer 2012 to assist in promoting water audits and leak detection and abatement programs state wide
  - Provides assistance to EPD with updating and revising the Georgia Water Loss Control Manual

# Validated Audits May Still Need Improvement Before Target/Goal Setting

- Validated just means it is an accurate reflection of current data and activities
- Improving data scores on inputs
- Improve the quality/reliability data and practices
- Confidence in the results of the audit
- Low confidence in water audit can result in bad financial decisions

ANWA WLCC Free Water Audit Software: Grading Matrix									
Copyright © 2010 American Water Works Association. All Rights Reserved. <span>Water 4.2</span> <a href="#">Back to Instructions</a>									
In the Report, grades were assigned to each component of the audit to describe the confidence and accuracy of the input data. The grading assigned to each audit component responding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items that are highlighted.									
Grading									
	1	2	3	4	5	6	7	8	9
Billed meters:	Less than 50% of customers with volume-based billing from meter readings, flat or fixed rate billed for the majority of the customer population.	At least 50% of customers with volume-based billing from meter readings, flat or fixed rate billed for the remainder. Manual meter reading used, at least 50% meter reading success rate, remainder estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based billing from meter readings, flat or fixed rate billed for remainder. Manual meter reading used, at least 50% meter reading success rate, remainder estimated. Purchase records only rely on customer meters, only very limited meter accuracy testing is conducted. Customer meters replaced only upon complaint to a third party. Comprehensive billing records, but only limited manual testing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter readings, flat or fixed rate billed for remainder. Manual customer meter reading given at least 90% customer meter reading success rate, remainder estimated. Good customer meter records. Regular meter accuracy testing given replacement of statistically significant number of meters each year. Possible addition of comprehensive billing records for global and detailed statistics, verified periodically by third party.	Conditions between 6 and 8	At least 95% of customers with volume-based billing from meter readings, flat or fixed rate billed for remainder. Manual customer meter reading given at least 95% customer meter reading success rate, remainder estimated. Good customer meter records. Regular meter accuracy testing given replacement of statistically significant number of meters each year. Possible addition of comprehensive billing records for global and detailed statistics, verified periodically by third party.	Conditions between 8 and 10
Improvements to attain higher data grading for "Billed-Metered" component:	to quality for 2 Conduct investigations on basis of customer meter model. Budget funding for meter test stations. Investigate volume-based water rate structures.	to quality for 6 Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify unmetered or existing meters. Test a minimal number of meters for accuracy. Install comprehensive billing system.	to quality for 6 Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable process in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Conduct routine audit of global statistics.	to quality for 6 Purchase and install meters on unmetered accounts. Assess cost effectiveness of Automatic Meter Reading (AMR) system for portion or entire system, or achieve ongoing improvement in manual meter reading success rate. Perform meter accuracy testing program. For meter replacement goal based upon accuracy test results. Perform routine auditing procedures based upon field party policies.	to quality for 6 Purchase and install meters on unmetered accounts. Assess cost effectiveness of Automatic Meter Reading (AMR) system for portion or entire system, or achieve ongoing improvement in manual meter reading success rate. Perform meter accuracy testing program. For meter replacement goal based upon accuracy test results. Perform routine auditing procedures based upon field party policies.	to quality for 6 Purchase and install meters on unmetered accounts. Assess cost effectiveness of Automatic Meter Reading (AMR) system for portion or entire system, or achieve ongoing improvement in manual meter reading success rate. Perform meter accuracy testing program. For meter replacement goal based upon accuracy test results. Perform routine auditing procedures based upon field party policies.	to quality for 6 Purchase and install meters on unmetered accounts. Assess cost effectiveness of Automatic Meter Reading (AMR) system for portion or entire system, or achieve ongoing improvement in manual meter reading success rate. Perform meter accuracy testing program. For meter replacement goal based upon accuracy test results. Perform routine auditing procedures based upon field party policies.	to quality for 6 Purchase and install meters on unmetered accounts. Assess cost effectiveness of Automatic Meter Reading (AMR) system for portion or entire system, or achieve ongoing improvement in manual meter reading success rate. Perform meter accuracy testing program. For meter replacement goal based upon accuracy test results. Perform routine auditing procedures based upon field party policies.	to quality for 6 Purchase and install meters on unmetered accounts. Assess cost effectiveness of Automatic Meter Reading (AMR) system for portion or entire system, or achieve ongoing improvement in manual meter reading success rate. Perform meter accuracy testing program. For meter replacement goal based upon accuracy test results. Perform routine auditing procedures based upon field party policies.
Billed unmetered:	Water utility policy does not require customer metering flat or fixed fee billed. No data collected on customer consumption. Only estimates available are derived from data estimation methods using average rates and consumption by number of connections, or similar approach.	Water utility policy does not require customer metering flat or fixed fee billed. Some estimated accounts exist in parts of the system (e.g., area or District Metered Area) with consumption recorded on portable dataloggers. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water users.	Conditions between 2 and 4	Water utility policy does require metering and volume-based billing but lacks written procedures and employs casual oversight, resulting in up to 20% of billed accounts are unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume-based billing but exemption exist for a portion of accounts such as municipal buildings. As many as 50% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a rough estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy requires metering and volume-based billing for all customer accounts. However, less than 50% of billed accounts remain unmetered because because installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.	Conditions between 8 and 10

# Bottom-up Data Validation

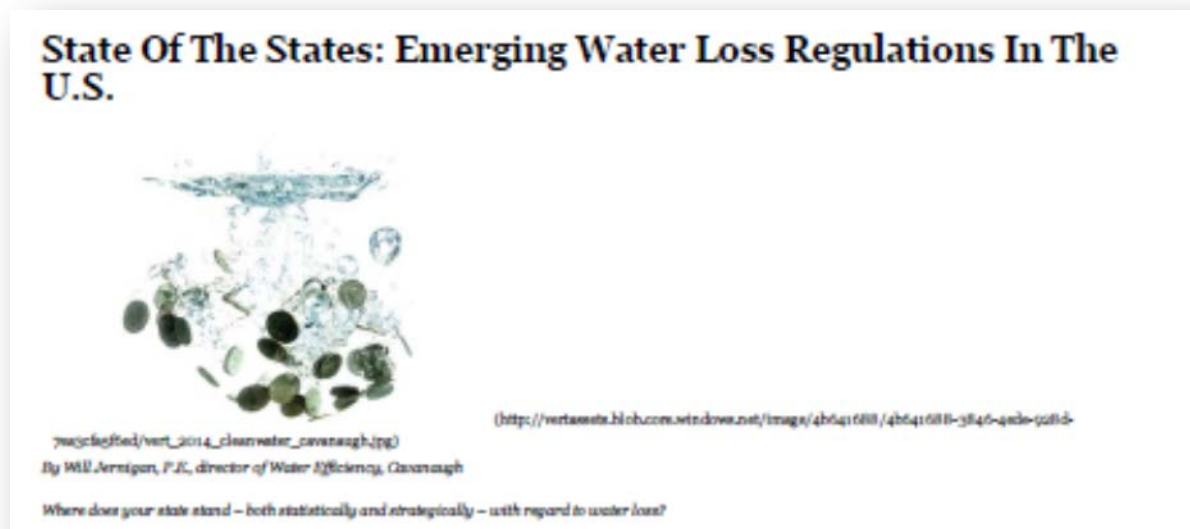
- Improve the data going into the audit
  - Production meter testing
  - Customer meter testing
  - Meter reading system evaluation
  - Billing system evaluation
  - Business process evaluation

# Drivers for Benchmarks Development

- The Board of Natural Resources shall by January 1, 2011, adopt rules for the minimum standards and best practices for monitoring and improving the efficiency and effectiveness of water use by public water systems to improve water conservation. The best practices program shall include without limitation:
  1. The establishment of an infrastructure leakage index;
  4. A phased-in approach requiring public water systems to implement water loss detection programs

# What are Others Doing?

- Tennessee – Increasing validity scores and % NRW by Cost
- Texas – proposed water loss thresholds for financial assistance
- Ohio – 15% UFW, ILI targets for Water Utilities
- California – processes, validity score, specific improvement
- Other states: WaterOnline Article, Jernigan



# Planned Use of Water Audit Results by EPD

- Establish benchmarks for water loss based on process and performance measures – ILIs, validity scores, Op23, Op24, Economic Level of Leakage (ELL), and other factors
- Audit results will inform decisions on:
  - water withdrawal permit applications
  - drinking water plant expansions
  - needs assessments for reservoir projects
  - GEFA funding for water projects
  - Regional Water Planning

# GWLCC Draft Benchmarks Framework

- Group started in November 2013 with goal of advising EPD
- Provide water systems with a framework to set goals and monitor system-specific water loss improvement over time.
- Improvement is measured in terms of performance (metrics) and process (business practices), with an emphasis on process.
- Incorporation of Validation/Certification of water audit
- Not built on universal targets, or comparison between utilities, but system-specific improvement.
- Recognizes that data validity will improve over time to a limit.
- Include a suite of performance and process measures, recognizing there is not 1 measure that is applicable and appropriate for every utility.
- Overall framework should be applicable to all utilities 3,300 population and greater.
- Improvements should be focused on cost-effective conservation, and empower utilities to make business decisions that are appropriate to their specific situation.
- In keeping with best practices recognized by AWWA and IWA.

# Georgia EPD Stakeholder Draft Rule

- Stakeholder Draft Rule was released on October 6, 2014
- Public meeting on October 22, 2014
- Components are similar to GWLCC framework
  - Codify audit submission
  - Require validation
  - Individualized goals
  - Reporting
  - Demonstrable progress

## Stakeholder Draft Only – Not An Official Draft

### **RULES OF THE GEORGIA DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL PROTECTION DIVISION**

#### **Chapter 391-3-33**

#### **Georgia Rules for Water Use Efficiency**

##### **391-3-33-.01 Purpose.**

The purpose of these Rules is to establish policies, procedures, requirements and standards to implement the Georgia Water Stewardship Act of 2010 to carry out the purposes of adopting standards for public water systems to develop and improve the efficiency and effectiveness of water use. Georgia's Water Loss Audit Program started with public water systems serving at least 10,000 individuals conducting a water loss audit covering calendar year 2012, followed by public water systems serving at least 3,300 individuals conducting a water loss audit covering calendar year 2013.

##### **391-3-33-.02 Definitions.**

When used in this Chapter:

[Additional Definitions TBD]

(1) "Certified Water Loss Auditor" means an individual with the demonstrated knowledge, skills and ability to conduct a validation assessment of a water loss audit.

(2) "Public water system" means a system for the provision to the public of piped water for human consumption.

##### **391-3-33-.03 Water Loss Audit Program.**

(1) **Water Loss Audit.** Public water systems shall conduct an annual water loss audit in accordance with the International Water Association (IWA) and American Water Works Association (AWWA) methodology for water loss auditing as provided by the Division in the Georgia Water System Audit and Water Loss Control Manual and AWWA Water Audit Software.

(2) **Reporting.** By March 1 of each calendar year, annual water loss audit results for the previous calendar year shall be submitted to the Division in a form and manner prescribed by the Division.

(3) **Validation.** By March 1 of each calendar year, public water systems shall validate the annual water loss audit results for the previous calendar year prior to submission to the Division. The validation shall be performed in conformance with the Georgia Water System Audit and Water Loss Control Manual by a Certified Water Loss Auditor.

(a) For audits due on March 1, 2015, the validation shall be due on October 1, 2015.

(b) For audits due on March 1, 2016 and thereafter, the validation shall be performed prior to submission of the annual water loss audit to the Division.

##### **391-3-33-.04 Water Use Efficiency and Effectiveness Improvement.**

(1) **Water Loss Control Program.** Public water systems shall develop and conduct a water loss control program to investigate, assess, and implement efforts to improve water use efficiency. Water loss control programs may include, but are not limited to, the following:

(a) Leakage Management, including distribution system water leakage detection and repairs;

(b) Finished Water Meter Flow Verification;

# SUMMARY

- Water Loss Benchmarking should be based on system specific improvements and goal setting
- Industry best practice methodology should be followed, IWA AWWA Methodology, M36 Manual, AWWA Water Audit Software
- GAWP/GAWWA Water Loss Control Committee was formed to support water system education on water auditing, water loss and technical assistance
- Georgia EPD rulemaking process has been informed by this process and will benefit from advance stakeholder involvement

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## Questions