

# Data Validation Methodologies for Water Audits in Florida



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# Why focus on water audits in Florida?

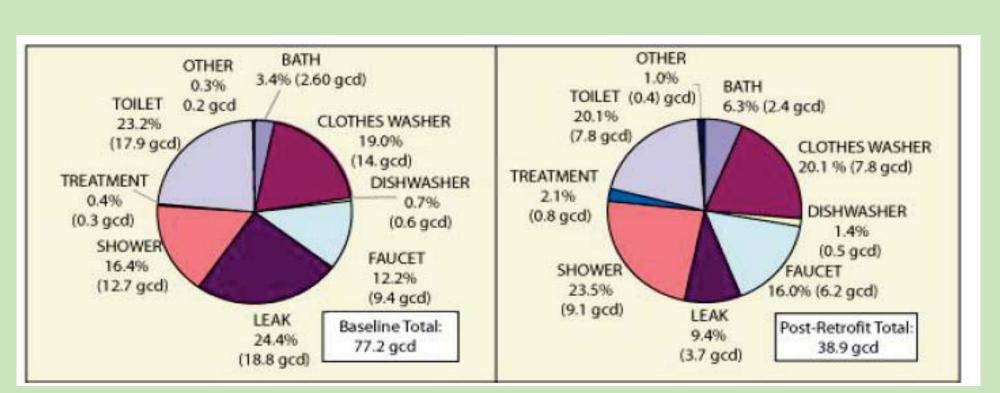
•Several water stressed areas in Florida are considering alternative water supplies, including reuse water, and water conservation to ensure that ample future water is provided.

- •Water loss could account for 15-20% of water supplies.
- •System water loss is typically analyzed separately from water conservation analysis addressing post customer meter demand management.
- However, system loss can be evaluated in conjunction with typical conservation analysis since both involve an end use accounting of water uses.
- •Figure 1 shows how end use analysis can be used to evaluate single family residential usage.
- •In this example, all end uses are directly measured and residual usage is considered leakage or water loss.
- System losses can be evaluated similarly by measuring all uses within a distribution system where any residual usage is leakage or water loss.
- •Several water audit methodologies exist in Florida to evaluate system water

•However, the audits are inconsistent both in how water loss is defined and how loss is calculated.

- •Furthermore, the validity of data input into water audits is handled differently in each audit.
- •Water audits in Florida need to be consistent and accurate in order to evaluate water loss control as a demand management option.
- •A water conservation tool (EZ Guide 2.0) has been developed to evaluate water conservation potential including water loss for utilities.

## Figure 1. Pre- and post-retrofit indoor per capita water use percentage including leakage for Tampa (Mayer et al. 2004).



## Comparison of water audits in Florida

- St. Johns River Water Management District (SJRWMD)
- Includes treatment losses
- % loss by volume including treatment losses
- South West Florida Water Management District (SWFWMD)
- Required for water use cautionary areas • 12% loss by volume rule requiring meter testing
- Florida Rural Water Association (FRWA)
- Asks for monthly data, but uses annual data
- Detailed unmetered use section
- Online Water Conservation Guide
- Simple, does not incorporate unbilled uses
- •None of these methodologies analyze data validity.

# **IWA/AWWA Audit**

- •The IWA/AWWA audit was developed by international water loss experts. •Most extensive audit available.
- •Free download of spreadsheet-Version 4.0 (Figure 2) released in May 2009
- (AWWA 2009b) •Associated 2009 AWWA technical manual (M36) contains detailed procedures (AWWA 2009a).
- •Based on one year of historical data (AWWA 2009a).
  •Simple to use. About 18 inputs with manual input of reliability score for each input (1-10) (Figure 2 and 3).
- •High validity scores for metered data, low for estimates/guesses.
  •Calculates various performance indicators (not %).
- ·Aggregate data reliability score based on pre-defined weighting of input importance.

Figure 2. AWWA version 4.0 water audit spreadsheet

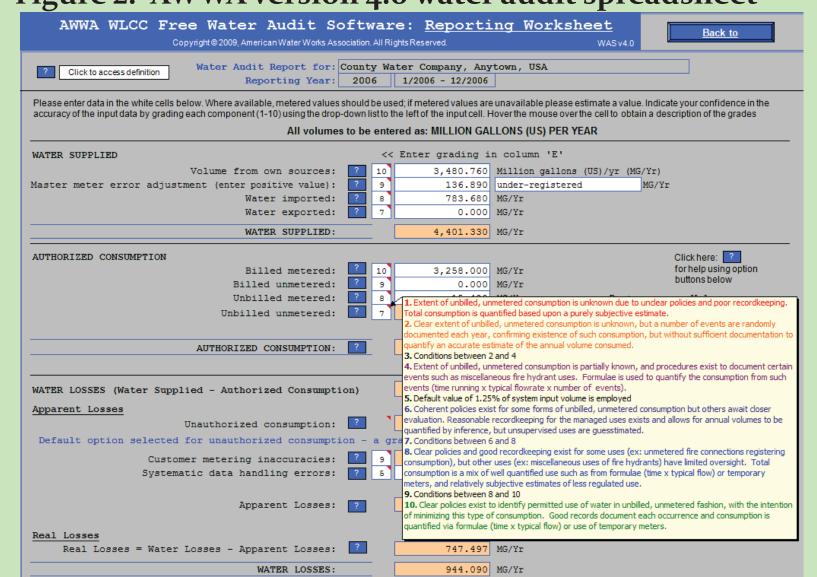


Figure 3. Inputs for 2009 AWWA version 4.0 audit

Number	Category	Item
1	Water Supplied	Volume from own sources
2	Water Supplied	Master meter error adjustment
3	Water Supplied	Water imported
4	Water Supplied	Water exported
5	Authorized	Billed metered
	Consumption	
6	Authorized	Billed unmetered
	Consumption	
7	Authorized	Unbilled metered
	Consumption	
8	Authorized	Unbilled unmetered
	Consumption	
9	Apparent Losses	Unauthorized consumption
10	Apparent Losses	Customer metering inaccuracies
11	Apparent Losses	Systematic data handling errors
12	System Data	Length of mains
13	System Data	Number of active and inactive service
		connections
14	System Data	Average length of customer service line
15	System Data	Average operating pressure
16	Cost Data	Total annual cost of operating water system
17	Cost Data	Customer retail unit cost (Applied to
		Apparent Losses)
18	Cost Data	Variable production cost

# What is the best option for Florida?

- •The current water audits in Florida including the IWA/AWWA audit were reviewed for their applicability toward water conservation evaluations in Friedman and Heaney 2009b.
- •Florida (EZ Guide 2.0) should use M36 audit procedures complemented by free software.
- •Express water loss as gpcd and % by volume for conservation analysis (Figure 4). •Errors in metered supply and billing data needed.
- •Quantitative meter testing according to accepted procedures.
- •The validity scoring system in the IWA/AWWA audit was reviewed for its applicability toward water conservation evaluations in Friedman and Heaney 2009a.
- •Only 7 of the 18 inputs were necessary for conservation analysis.
- •Composite score of weighted average of manual scores and weights can be utilized.
- •However, a flow weighted average in which all unmeasured usage is considered loss was suggested as an appropriate validity score (Figure 4)
- •Current EZ Guide 2.0 uses manual entry of percent water loss from any audit chosen (Figure 5).
- •Feedback needed on proposed audit methodology for Florida.

Figure 4. Comparison of water audit validity methods

		Population =		15,000				
Number	Item	Score	Assumed Weight	Score* Weight	Mil. Gal./ year	Gpcd	Gpcd Weight	
	WATER SUPPLIED							
1	Volume from own sources	10	20	200	800	146.1	87.9%	
2	Master meter error adjustment	3	8	24	50	9.1	5.5%	
3	Water imported	10	8	80	60	11.0	6.6%	
4	Water exported							
	Sub-total, Water Supplied	23	36	304	910	166.2	100.0%	
	WATER DELIVERED							
5	Billed metered	8	15	120	650	118.7	71.4%	
7	Unbilled metered	8	4	32	50	9.1	5.5%	
10	Customer metering inaccuracies	5	8	40	50	9.1	5.5%	
	Sub-total, Water Delivered	21	27	192	750	137.0	82.4%	
	Totals	44	63	496			16.0	
	Maximum Value	60		630			18.2	
	Relative Score	73.3%		78.7%			88.0%	
	% Metered Water				82.4%			
	Unmetered gpcd					29.2		

A flow based validity weighting results in a score of 88 as opposed to a score of 78.7 based on assumed predefined weights

igure 2.1 Water Audits		
	Water Audit	
distribution system. UAW is calculated from verified sup	se of a water audit is to accurately determine the amount oply and consumption records, factoring in various estimate from the most recent 12-month period. Any period less	ted usage figures. Due to potential short-
	nly if the figures used to calculate the level of UAW are ac a, which is dependent upon meter accuracy. Because of th	
Licers of the E7 Guide should select the water audit m	ethodology required by their Water Management Distric	t In all other cases the E7 Guide audit ha
on the AWWA M36 (Water Audits and Leak Detection) n	method can be used. The four buttons in Figure 2.1 link to the udit found in chapter 2 of the M36 manual. The other three bu	respective water audit procedures commo
Detailed guidance for conducting a water audit can be	found in the American Water Works Association's (AWWA)	٦
Manual #36; Water Audits and Leak Detection. The for documenting the M36 water audit. This audit has been Labeled Main Audit, Source Water Data, Authorized Co	M36 Audit	
worksheets were developed to assist utilities as they for a result the worksheets are pre-populated with the Mil	ollowed the procedures laid out in detail in the M36 Manual. As 36 County Water utility Company data.	:
AWWA Water Loss Control Committee (WLCC) Free V		
Detailed guidance for conducting a water audit can be Manual #36; Water Audits and Leak Detection.	found in the American Water Works Association's (AWWA)	AWWA 4.0
Southwest Florida Water Management District Water and Worksheets document. To access the spreadshee	Audit instructions are available in the <u>Water Audit Guidelines</u> et click the SWFWMD button.	SWFWMD
St. Johns River Water Management District Water Au <u>Water Audit Form</u> document. To access the form dick	dit instructions are available in the <u>Instructions to Complete the</u> the SJRWMD button.	SJRWMD
Florida Rural Water Association Water Audit . To acce	ss the spreadsheet click the FRWA button.	FRWA
to use rigorous methods to estimate this important numb		ig to Beecher (2002) regulatory agencies value. Based on the study performed by
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Type in the water audit method used. The links to for	ur common water audit procedures in Florida are provided to the audit specified.	in Figure 2.1
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Update and proceed to Water Budget CFWC

What is your water loss percentage (%), or ccept default water loss percentage

## **Conclusions**

- •Water audits in Florida need to be consistent and accurate in order to evaluate water loss control as a
- demand management option.
- •The IWA/AWWA audit should be utilized in Florida.
- •For conservation analysis, water loss should be expressed as gpcd and % by volume.
- •A flow weighted average can be used to determine water audit validity.
- •With this methodology, water loss can be compared to usage in other sectors for conservation analysis (Figure 6).

#### Figure 6. Comparison of water loss with other usage sectors in EZ Guide 2.0

Sector	% of Total Water Use	Breakdown of Gross good	
Single Family	41.0%	58	
Single Family Indoor	25.9%	36	
Single Family Outdoor	15.2%	21	
Multi-Family	20.8%	29	
Commercial	13.3%	19	
Industrial	0.8%	1	
Institutional	9.1%	13	
Water Loss	15.0%	21	
TOTAL	100.0%	141	

## References

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# **More Information**

Conserve Florida Water Clearinghouse: http://conservefloridawater.org

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