This presentation premiered at WaterSmart Innovations

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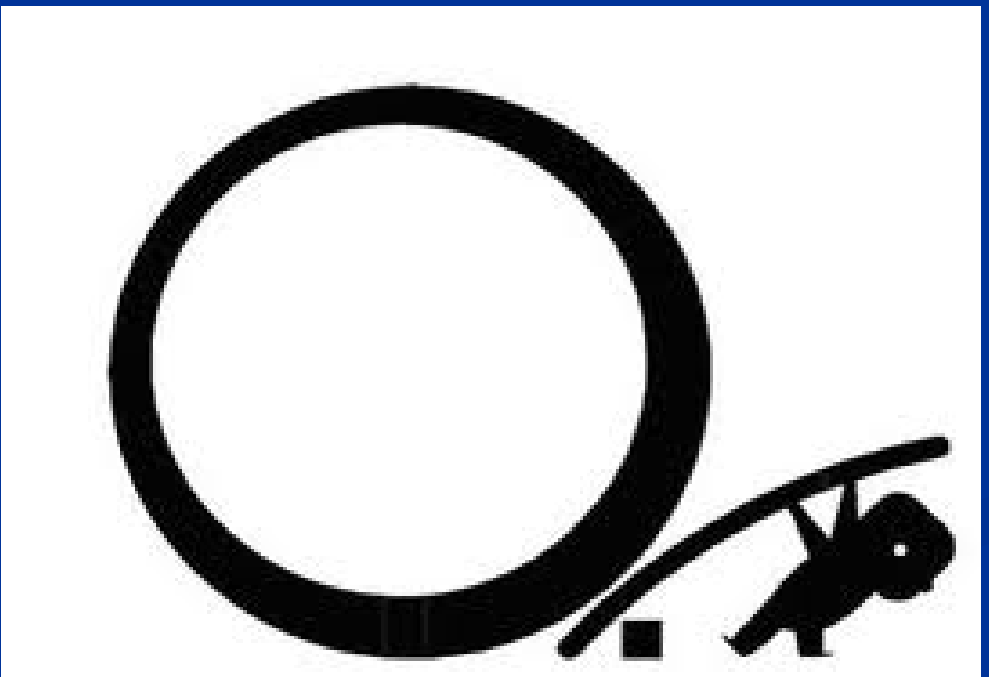
Just Add Water:

Leveraging Existing Water System Data to Launch Pilot District Metered Areas for Advanced Leakage Management

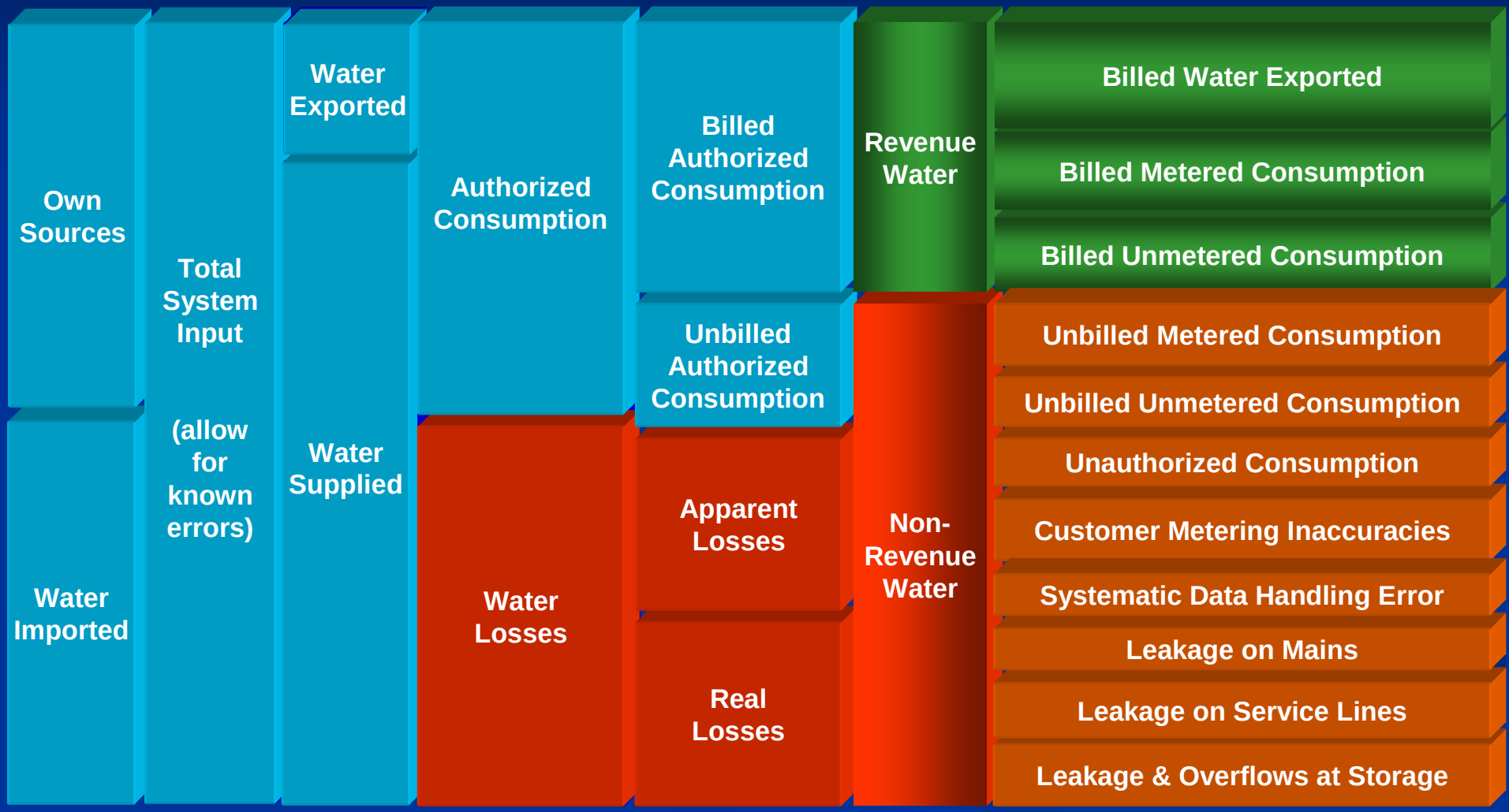
By: Will J. Jernigan, P.E., LEED® AP



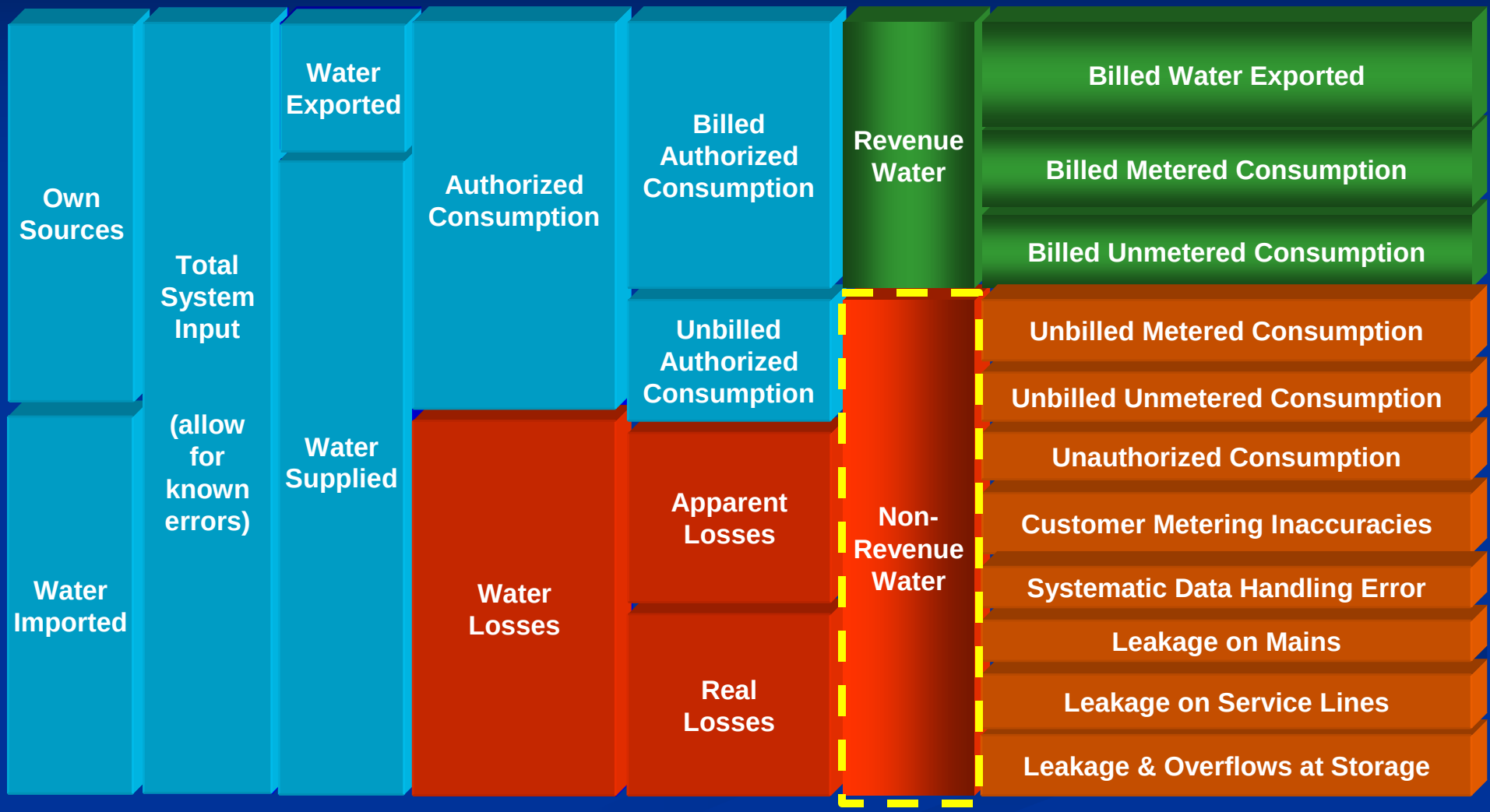
CAVANAUGH

Stewardship Through Innovation

Water Balance: Categorizing Use and Loss



Water Balance: Categorizing Use and Loss



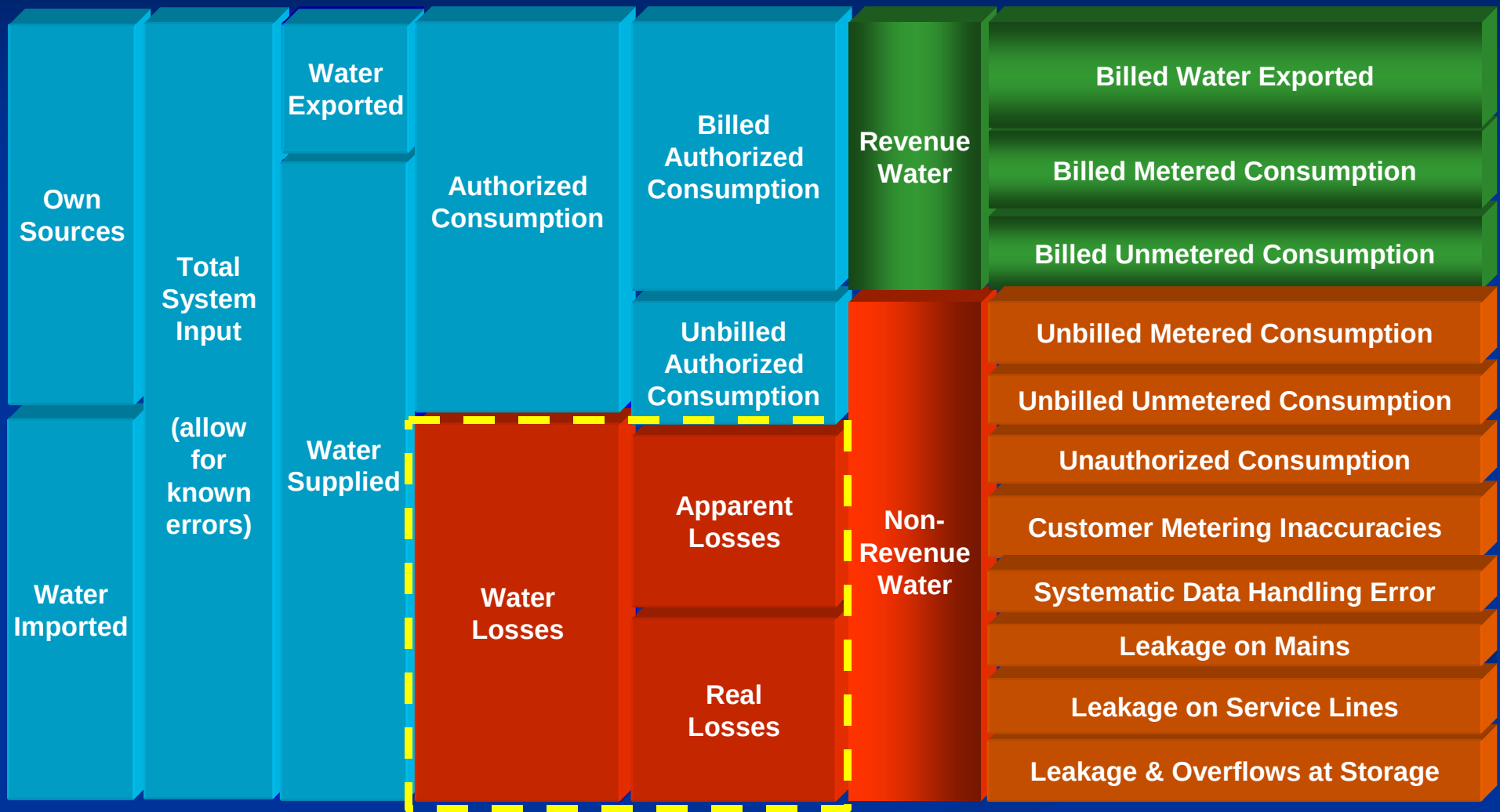
Non-Revenue Water

1. Water put into the system that does NOT return revenue to the Utility.

2. All Water Loss plus Unbilled Consumption.

3. “Unaccounted-for water” has been abandoned forever.

Water Balance: Categorizing Use and Loss



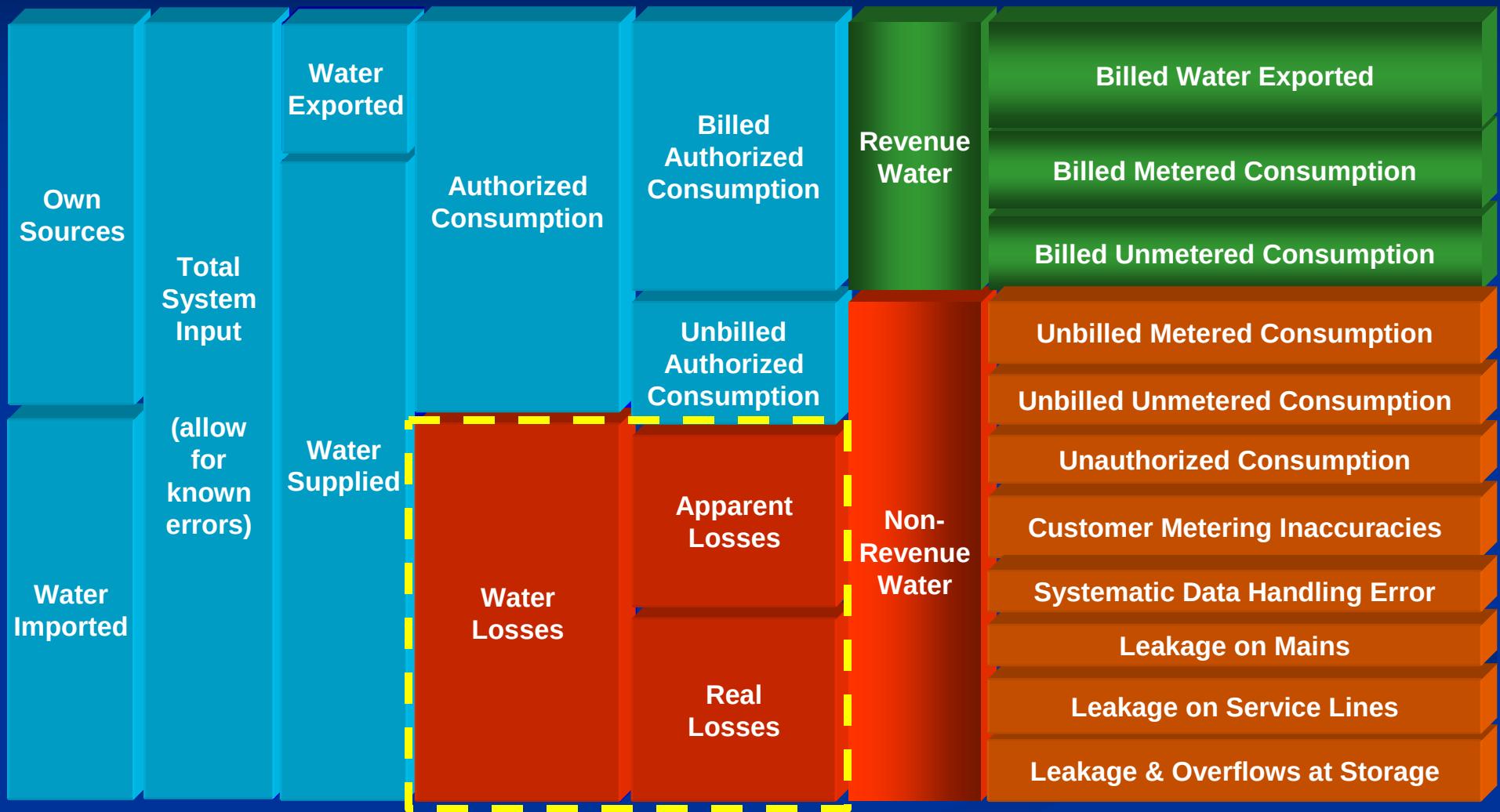
Real vs Apparent Loss

1. Water Loss comes in 2 forms: Real and Apparent.

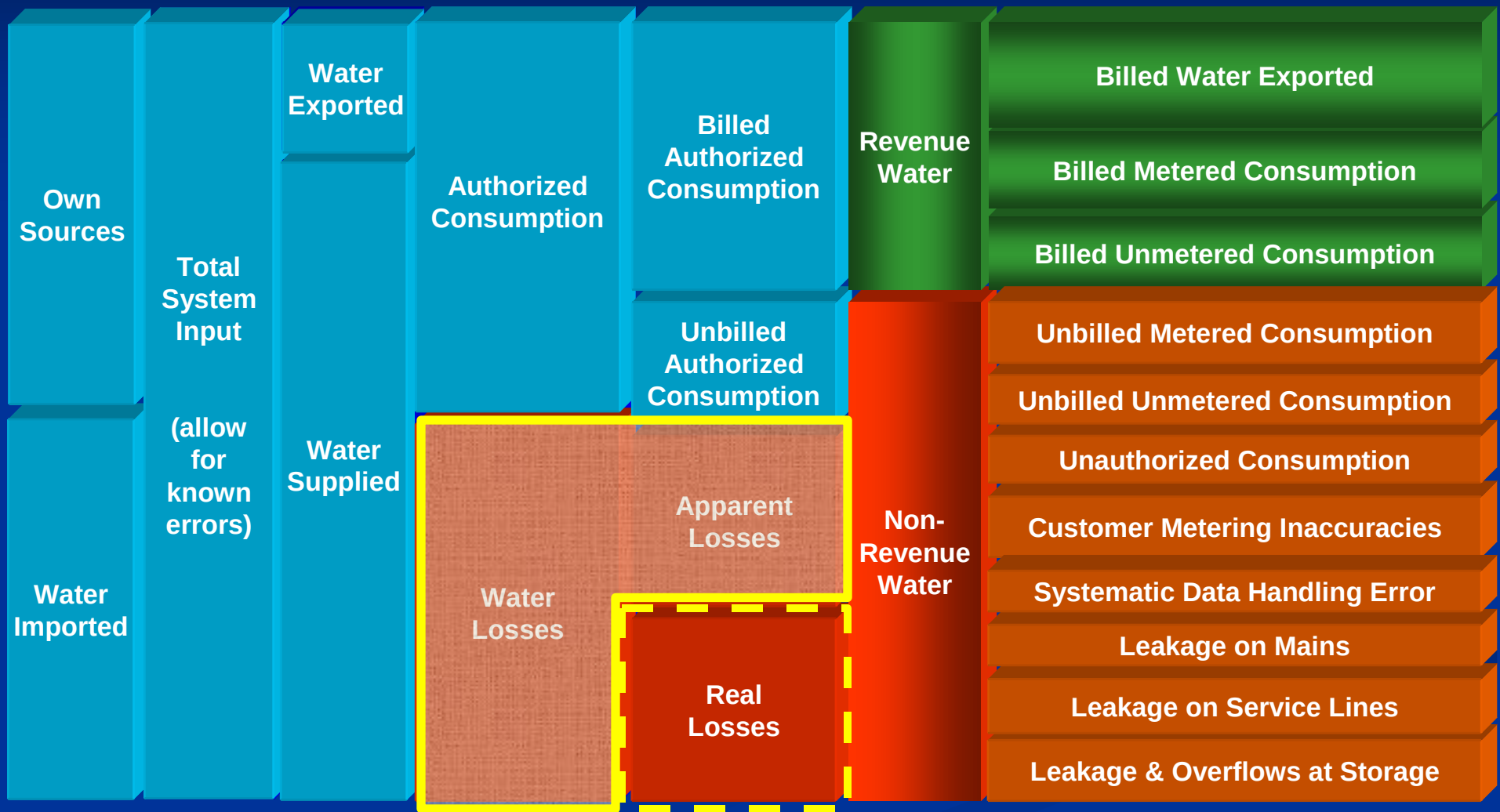
2. Real Loss = Leakage. Cost is calculated as 'wholesale' rate.

3. Apparent Loss = Slow meters, billing issues and theft. Cost is calculated at 'retail' rate.

Water Balance: Categorizing Use and Loss



Water Balance: Categorizing Use and Loss



Objective

- Develop a proactive leakage management approach
- Utilize existing data that is already in place and being monitored through SCADA
- Launch Pilot District Metered Areas to prioritize and focus Leak Detection resources

Case Study Overview: Macon Water Authority (GA)

- 5 hydraulically independent pressure zones
- No zones are master metered
- 1,600 miles of distribution system
- 65,000 connections
- 10 BG produced/year

Project Approach

Phase 1: Top-Down Water Audit

Gather available financial and operational data and develop a Water Balance for the audit year

Phase 2: Bottom-Up Validation

In-depth analysis and staff interviews pertaining to billing accounts and methods, customer metering database ad methods, distribution system management and SCADA system capabilities, with recommendations.

Phase 3: Program Dev & Implementation

Implementation of the Water Efficiency Program, manifested through a series of monthly Water Efficiency Team Meetings, at which time we prioritize, execute and evaluate the improvement measures identified in Phase two, document and communicate results to the leadership, and recommend improvements.

Water Audit – Establish Baseline Volumes of Real Loss

Macon Water Authority

WATER SYSTEM KEY PERFORMANCE INDICATORS

Audit Year (AY 11)

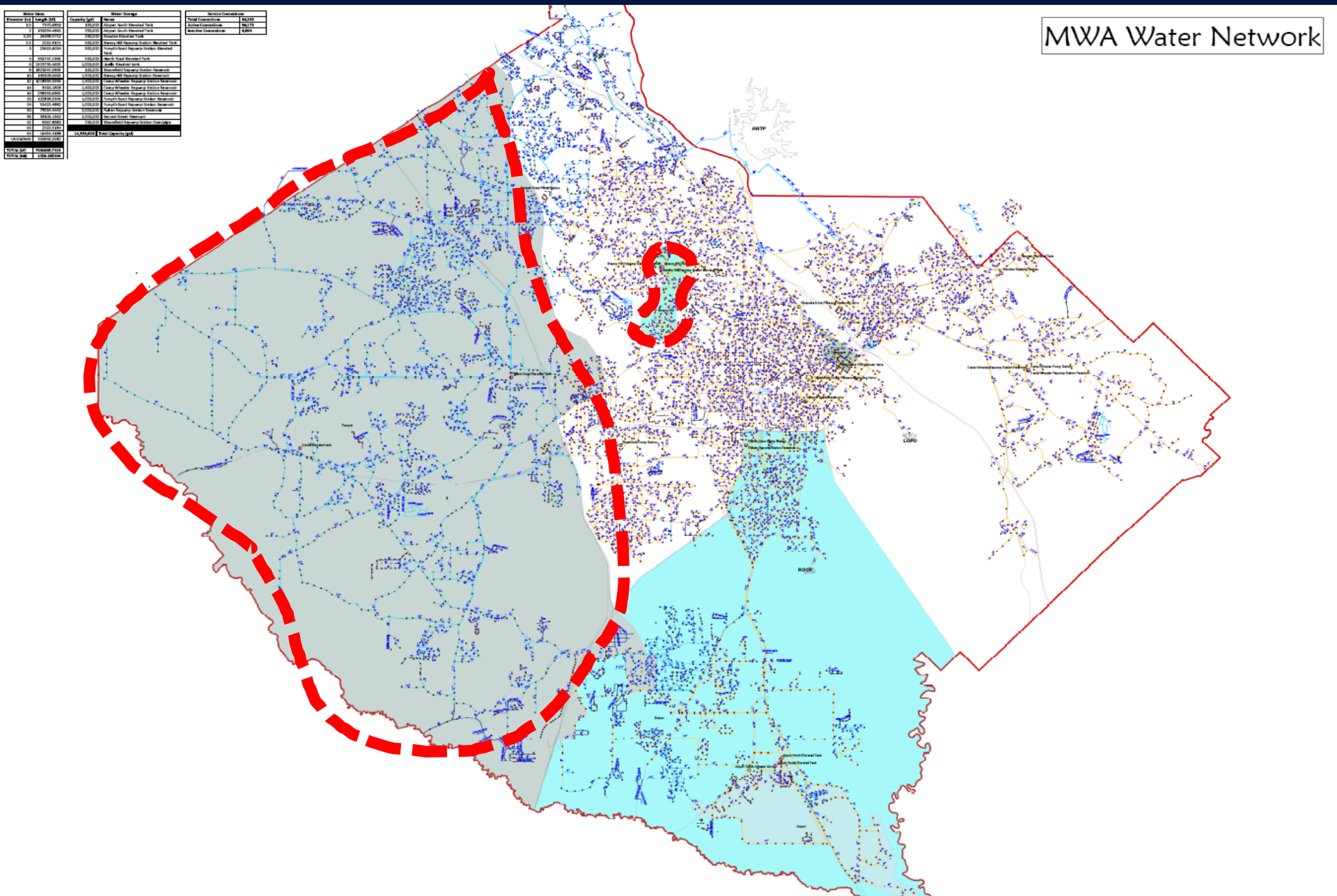
Jul-10_Jun-11

System Input Volume	9,567	MG / year	Data Validity:	68
Annual Operating Cost (Water Only)	12,016,745	$ / year	(out of 100)	

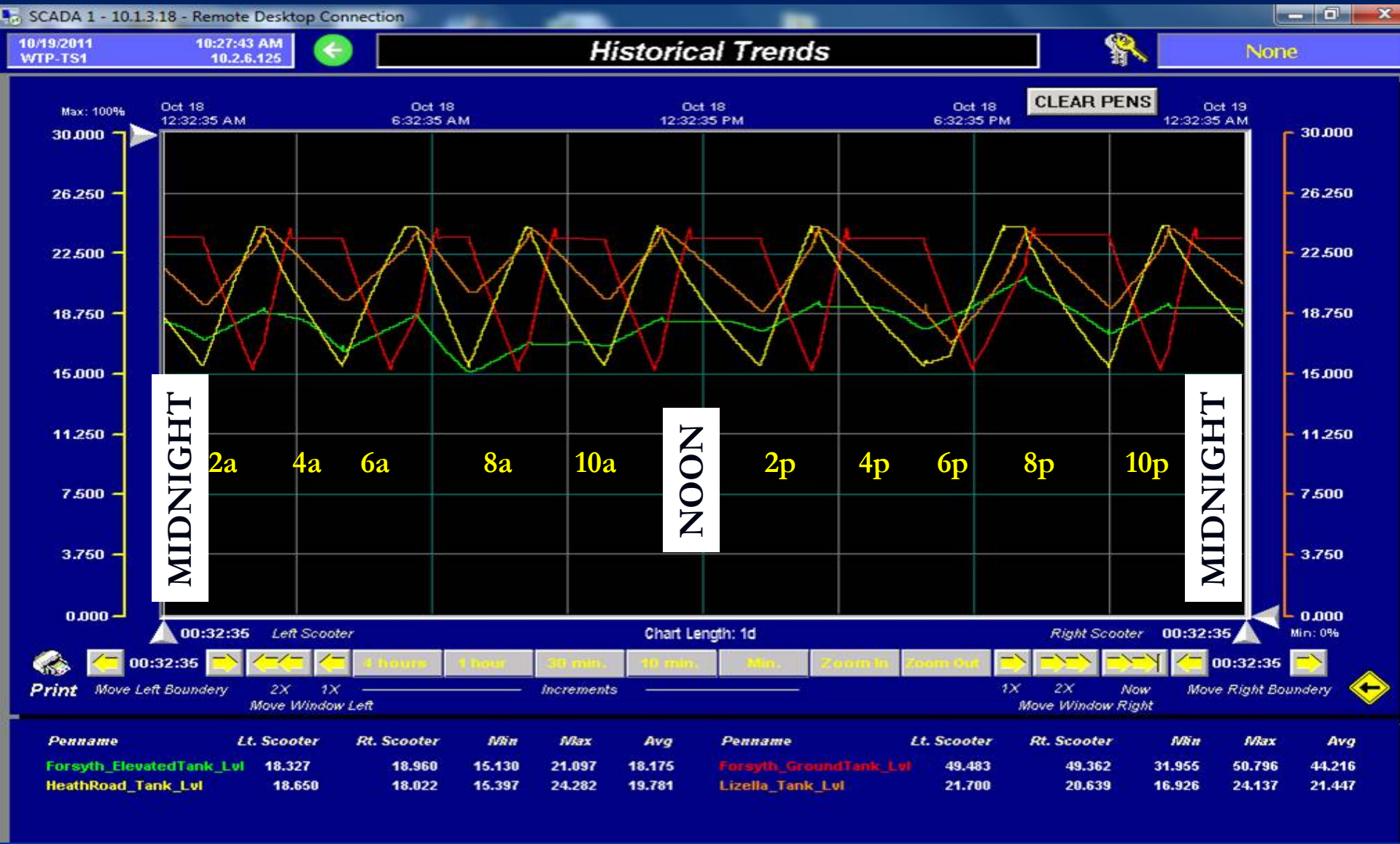
Operational Indicators

Non-Revenue Water	1,755	MG / year		18.3%
Water Loss	1,585	MG / year		16.6%
Current Annual Apparent Loss (CAAL)	321	MG / year	3.4%	
Current Annual Real Loss (CARL)	1,264	MG / year	13.2%	
Apparent Losses per service connection per day	14	gal/conn/day		
Real Losses per service connection per day	54	gal/conn/day		
Real Losses per service connection per day per psi	1	gal/conn/day/psi		
Unbilled Consumption	171	MG / year		1.8%
Unavoidable Annual Real Loss (UARL)	570	MG / year		6.0%
Infrastructure Leakage Index (ILI) :	2.22	[CARL / UARL]		

Identify Pilot District Metered Areas



Analysis of Min-Hour Demand within Pilot DMAs



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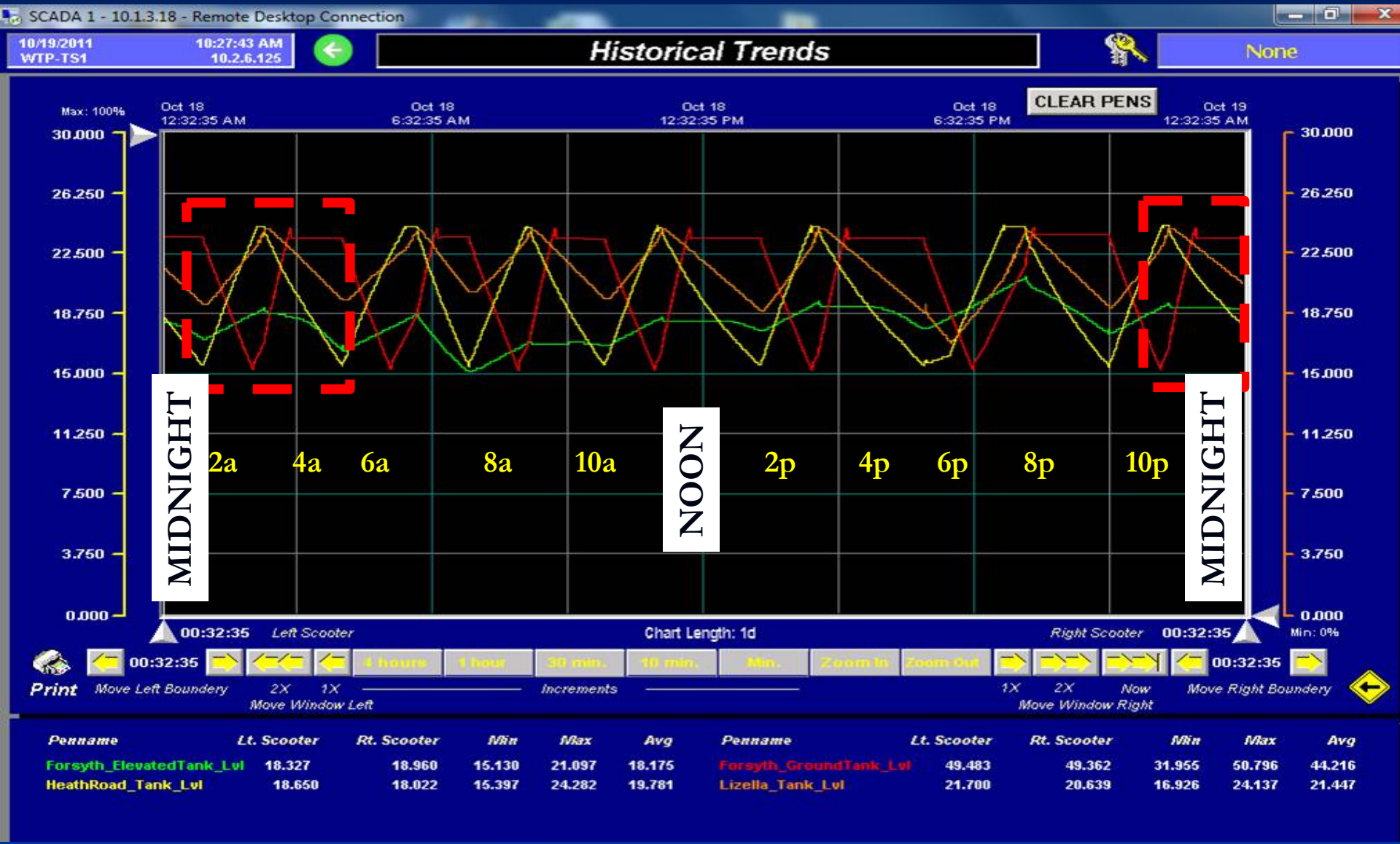

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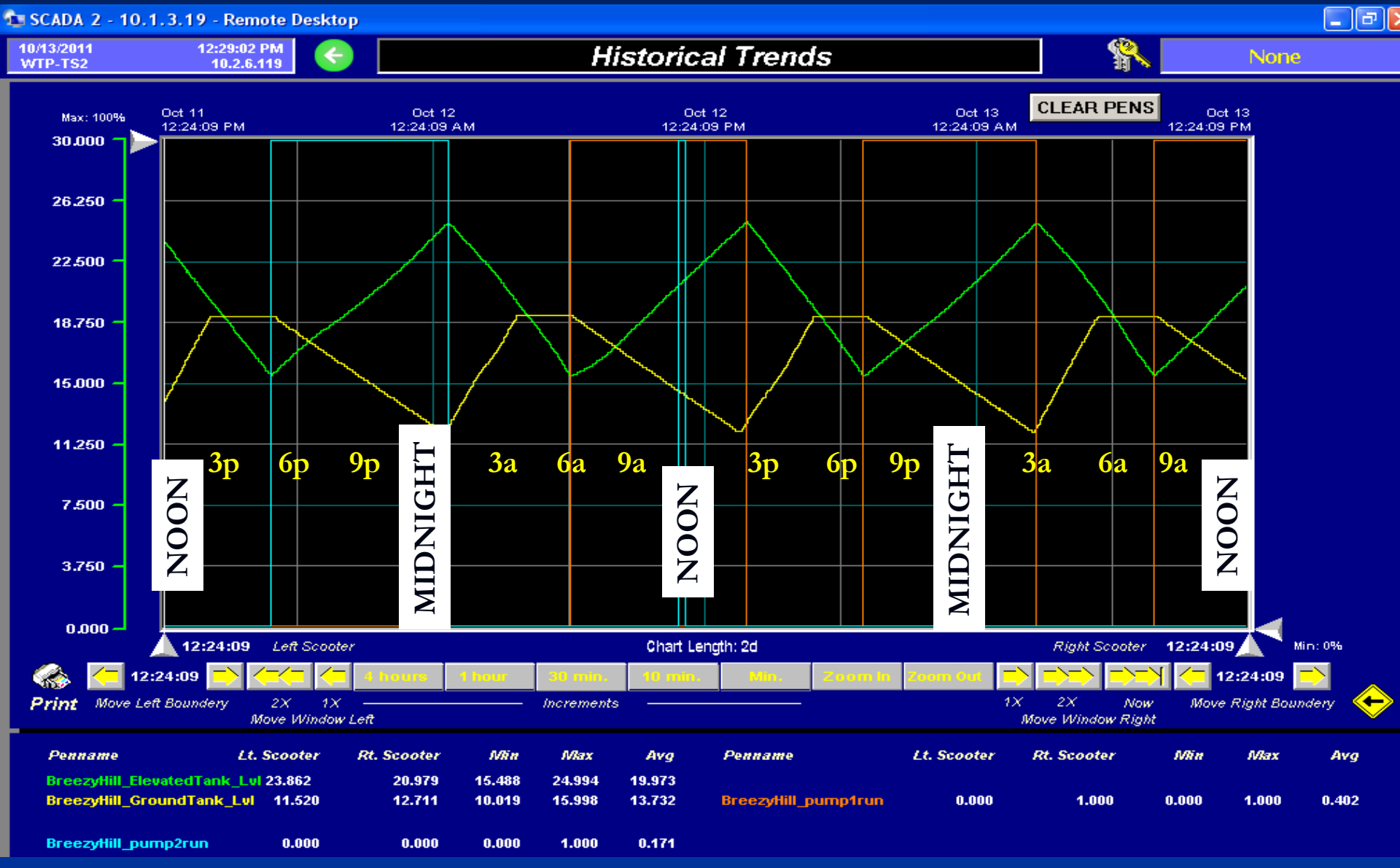

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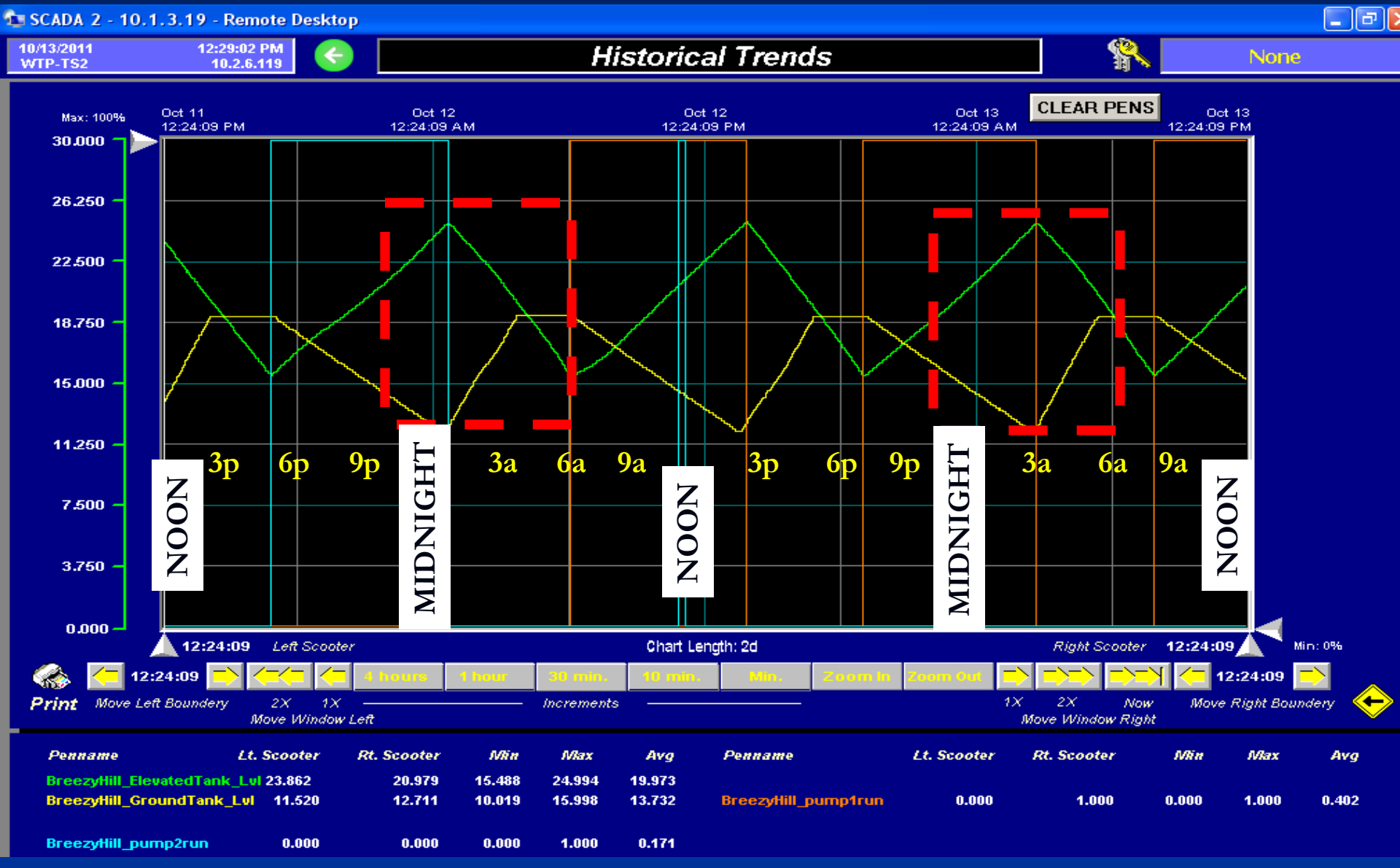

Analysis of Min-Hour Demand within Pilot DMAs

Zone	length/mains (per GIS) (mi)	#/connections (per GIS) (ea)	average pressure (per model) (psi)	UARL (MG/yr)
Forsyth	333	10,495	112	138
Downtown	4	864	91	5
Breezy Hill	14	1,365	85	9
Airport	19	441	83	5
Amerson / Ruben	957	50,405	93	432
total	1,328	63,570	93	567

Analysis of Min-Hour Demand within Pilot DMA Forsyth Zone

tank	t hr	nighttime drop ft	tank vol gal	est tank diameter ft	est gal/ft gal/ft	est rate of outflow gpm	est rate of outflow MG/year
forsyth	1	1.0	300,000	41.26	8,000	133	70
lizella	1	2.0	1,000,000	75.33	26,667	889	467
heath rd	1	2.5	500,000	53.26	13,333	556	292
					total estimated min-hour tank outflow	**1,578**	**829**
						gpm	MG/year
					estimated demand: Prison	50	26
					estimated demand: Monroe County	150	79
					estimated demand: Barrington Golf Course	30	16
					estimated demand: Harrison Rd Hotels	100	53
					estimated demand: Macon State U	100	53
					estimated demand: Miscellaneous	100	53
					total estimated min-hour demand	**530**	**279**
					total estimated leakage - Forsyth Zone	**1,048**	**551**
					UARL - Forsyth Zone	138	11%
					Recoverable Real Loss- Forsyth Zone	**413**	**33%**

est % of total system leakage	cost/year
44%	$ 572,190
11%	$ 143,313
33%	**$ 428,877**

Analysis of Min-Hour Demand within Pilot DMA Breezy Hill Zone

	t	nighttime drop	tank vol	est tank diameter	est gal/ft	est rate of outflow	est rate of outflow	% of total system leakage	
tank	hr	ft	gal	ft	gal/ft	gpm	MG/year		
breezy hill	3	5.0	500,000	53.26	16,667	463	243		
					total estimated min-hour tank outflow	463	243		
					estimated demand: Miscellaneous	50	26		
					total estimated min-hour demand	50	26		cost/year
					total estimated leakage - Breezy Hill Zone	**413**	**217**	**17%**	**$ 225,518**
					UARL - Breezy Hill Zone	9	1%	$ 9,125	
					Recoverable Real Loss - Breezy Hill Zone	**208**	**16%**	**$ 216,393**	

Key Points

- **Pilot DMAs identified**
- **Top-Down leakage and recovery potential quantified**
- **No Capital Costs**
- **Discovery and analysis of total leakage relationship to zone leakage**

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