

There are six stars scattered across the upper half of the slide. Five are white and one is yellow. They are positioned at various angles, with some pointing upwards and others downwards. The yellow star is located in the upper right quadrant, while the others are more centrally located.

Using AMI to Reduce Non-Revenue Water

Non-Revenue Water



Water is a FINITE resource
20% Water Loss on average in USA
Sustainability of Clean Water
Conserve Energy
Reduce Production Costs

Presented by:
Travis Smith
Sr. Product Manager



Today's Discussion

- Breakdown of Non-Revenue Water (NRW)
- NRW Sources
- Monitoring NRW
- Reducing NRW
- Top 3 Ways to Reduce NRW

Water Balance

Sensus Water Balance										
Source	Surface Water Plants				Ground Water				Purchased Water	
Total Water	Total System Water Input									
Consumption/Losses	Authorized Consumption					Water Losses				
Consumption/ Losses with Billing and Loss Type	Billed Authorized Consumption			Un-Billed Authorized Consumption		Apparent Losses		Real Losses		
Use Type	Billed and Collected Metered Use	Billed and Collected Un-Metered Use	Billed Not Collected Metered Use	Unbilled Metered Use	Unbilled Un-Metered	Unauthorized Use	Metering Inaccuracies	Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows
Revenue/ Non Revenue	Revenue Water		Non-Revenue Water							
Examples	Municipal Transfer, Residential Use Commercial and Industrial Use, Including Customer Leaks	Flat Fee Structures for Accounts	Residential Use Commercial and Industrial Use, but Payment not Collected, Leaks	Billing Errors, City Use, Other Authorized Non Payment Applications, Flushing	City Use, Other Authorized Non Payment Applications, Flushing	Theft, Illegal Taps, Tamper	Residential, Commerical Meters, Tamper	Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows

Based upon the IWA/AWWA methodology

Water Balance Inputs

Sensus Water Balance									
Source	Surface Water Plants				Ground Water			Purchased Water	
Total Water	Total System Water Input								
Consumption/Losses	Authorized Consumption				Un-Authorized Consumption			Water Losses	
Consumption/Losses with Billing and Use Type	Billed Authorized Consumption				Un-Billed Authorized Consumption			Approved Losses	
Use Type	Water and Collection Metered Use	Water and Collection Un-Metered Use	Water and Collection Metered Use	Un-Billed Metered Use	Un-Billed Un-Metered Use	Unauthorized Use	Unauthorized Use	Unauthorized Use	Unauthorized Use
Residential Use Revenue	Residential Use Revenue				Residential Use Revenue			Residential Use Revenue	
Examples	Manager Turnover Residential Use Revenue Collection Use Revenue Collection Use Revenue Collection Use Revenue	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use	Water and Collection Metered Use Water and Collection Metered Use Water and Collection Metered Use

Sensus Water Balance			
Source	Surface Water Plants	Ground Water	Purchased Water
Total Water	Total System Water Input		
Consumption/ Losses	Authorized Consumption		Water Losses

Water Balance Revenue Water

Sensus Water Balance									
Source	Surface Water Plants				Ground Water		Treated Water		
Total Water	Total Surface Water Input				Total Ground Water Input		Total Treated Water Input		
Consumption/Losses	Authorized Consumption				Unauthorized Consumption		Other Losses		
Consumption/Losses with Billing and Loss Type	Billed Authorized Consumption				Un-Billed Authorized Consumption		Approved Losses		
Use Type	Billed and Collected Metered Use				Billed and Collected Un-Metered Use		Unauthorized Use		
Revenue/ Non Revenue	Revenue Water				Non-Revenue Water		Non-Revenue Water		
Examples	Municipal Transfer, Residential Use, Commercial and Industrial Use, Including Customer Leaks				Flat Fee Structures for Accounts		Municipal Transfer, Residential Use, Commercial and Industrial Use, Including Customer Leaks		

Sensus Water Balance		
Consumption/Losses	Authorized Consumption	
Consumption/ Losses with Billing and Loss Type	Billed Authorized Consumption	
Use Type	Billed and Collected Metered Use	Billed and Collected Un-Metered Use
Revenue/ Non Revenue	Revenue Water	
Examples	Municipal Transfer, Residential Use, Commercial and Industrial Use, Including Customer Leaks	Flat Fee Structures for Accounts



Leaks



Metered Use

Water Balance Authorized Non Revenue

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Total Water	Total Surface Water			Total Ground Water			Total Purchased Water		
Consumption/Losses	Authorized Consumption			Un-Billed Authorized Consumption			Other Losses		
Consumption/Losses with Billing and Loss Type	Billed Authorized Consumption			Un-Billed Authorized Consumption			Other Losses		
Use Type	Billed and Collected Metered Use	Billed Not Collected Metered Use	Un-Billed Metered Use	Un-Billed Un-Metered Use	Un-Billed Metered Use	Un-Billed Un-Metered Use	Leaks On Transmission System	Leaks On Distribution System	Manager/Staff Losses and Other Losses
Revenue/ Non Revenue	Revenue Water			Non-Revenue Water			Non-Revenue Water		
Examples	Manager/Staff Losses and Other Losses	Un-Billed Metered Use	Un-Billed Un-Metered Use	Un-Billed Metered Use	Un-Billed Un-Metered Use	Un-Billed Metered Use	Leaks On Transmission System	Leaks On Distribution System	Manager/Staff Losses and Other Losses

Sensus Water Balance			
Consumption/Losses	Authorized Consumption		
Consumption/ Losses with Billing and Loss Type	Billed Authorized Consumption	Un-Billed Authorized Consumption	
Use Type	Billed Not Collected Metered Use	Unbilled Metered Use	Unbilled Un-Metered
Revenue/ Non Revenue	Non-Revenue Water		
Examples	Residential Use Commercial and Industrial Use, but Payment not Collected, Leaks	Billing Errors, City Use, Other Authorized Non Payment Applications, Flushing	City Use, Other Authorized Non Payment Applications, Flushing



Flushing



Unmetered Use

Water Balance Apparent Losses

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Source	Surface Water Plants			Ground Water			Treated Water		
Total Water	Total Surface Water			Total Ground Water			Total Treated Water		
Consumption/Losses	Authorized Consumption			Unauthorized Consumption			Apparent Losses		
Consumption/Losses with Billing and Loss Type	Billed Authorized Consumption			Un-Billed Authorized Consumption			Unauthorized Consumption		
Use Type	Water and Collection Metered Use	Water and Collection Unmetered Use	Water and Collection Metered Use	Water and Collection Unmetered Use	Water and Collection Metered Use	Water and Collection Unmetered Use	Unauthorized Use	Metering Inaccuracies	Water Use Without Metering
Revenue/ Non Revenue	Revenue Water			Non-Revenue Water			Non-Revenue Water		
Examples	Residential Use	Commercial Use	Industrial Use	Water and Collection Metered Use	Water and Collection Unmetered Use	Water and Collection Metered Use	Unauthorized Use	Metering Inaccuracies	Water Use Without Metering

Sensus Water Balance		
Consumption/Losses	Water Losses	
Consumption/ Losses with Billing and Loss Type	Apparent Losses	
Use Type	Unauthorized Use	Metering Inaccuracies
Revenue/ Non Revenue	Non-Revenue Water	
Examples	Theft, Illegal Taps, Tamper	Residential, Commercial Meters, Tamper



Theft/Tamper



Temporary Use/
Theft

Water Balance Real Losses

Sensus Water Balance									
Source	Surface Water Plants				Ground Water		Reclaimed Water		
Total Inflow	Total Surface Water Inflow				Total Ground Water Inflow		Total Reclaimed Water Inflow		
Consumption/Losses	Authorized Consumption				Unauthorized Consumption		Real Losses		
Consumption/Losses with Billing and Loss Type	Billed Authorized Consumption				Un-Billed Authorized Consumption		Real Losses		
Use Type	Billed and Collected Metered Use				Un-Billed Metered Use		Real Losses		
Revenue/ Non Revenue	Revenue Water				Non-Revenue Water		Real Losses		
Examples	Meterage Taps, Residential Use, Commercial Use, Industrial Use, Public Works, City, County, State, Federal, Military, etc.				Leaks On Transmission and/or Distribution Mains, Leaks On Service Connections Up To Customer Meters, Storage Tank Leaks And Overflows		Leaks On Transmission and/or Distribution Mains, Leaks On Service Connections Up To Customer Meters, Storage Tank Leaks And Overflows		

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Revenue/ Non Revenue	Non-Revenue Water		
Examples	Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows



Main Breaks



Overflow

Water Balance

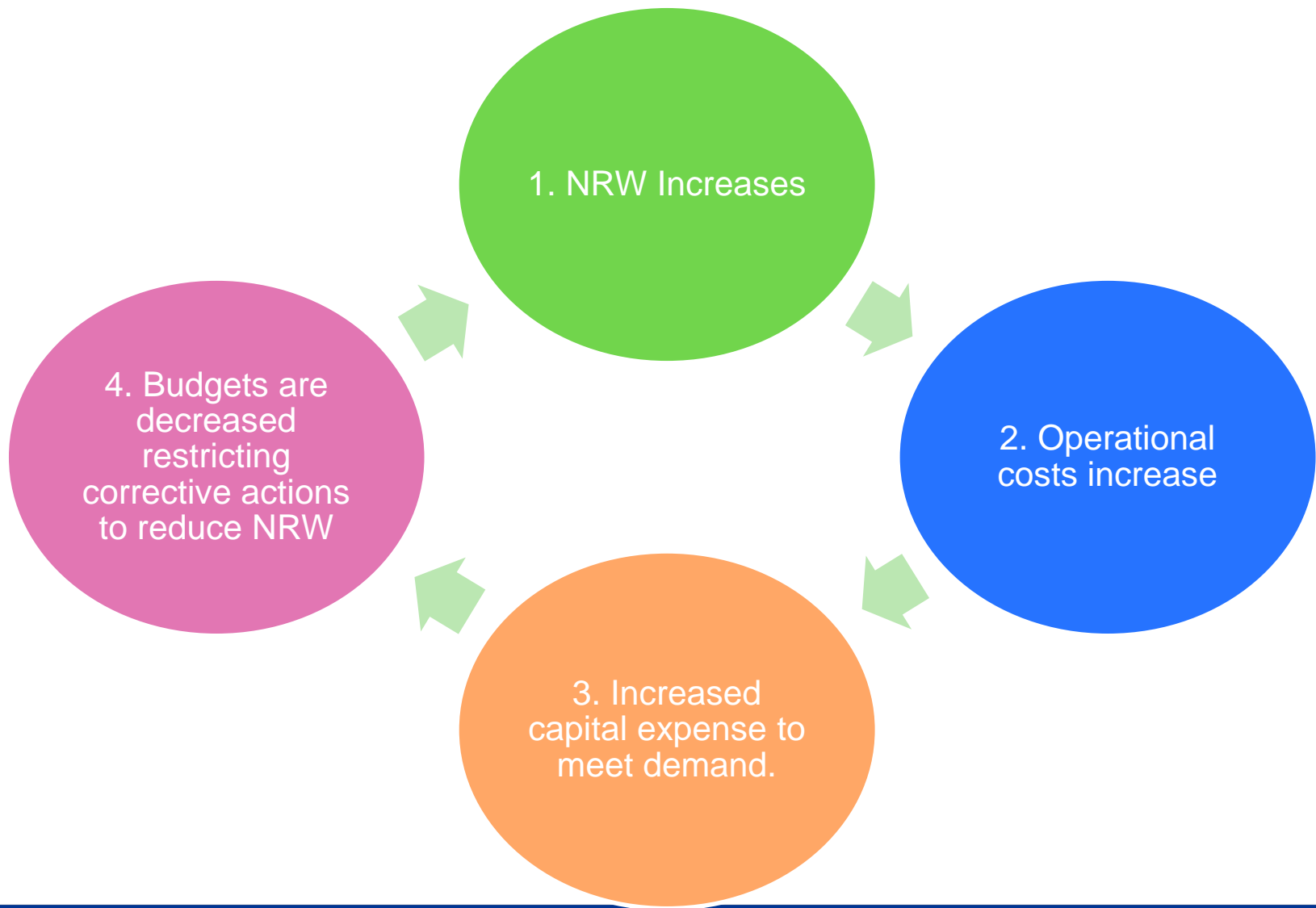
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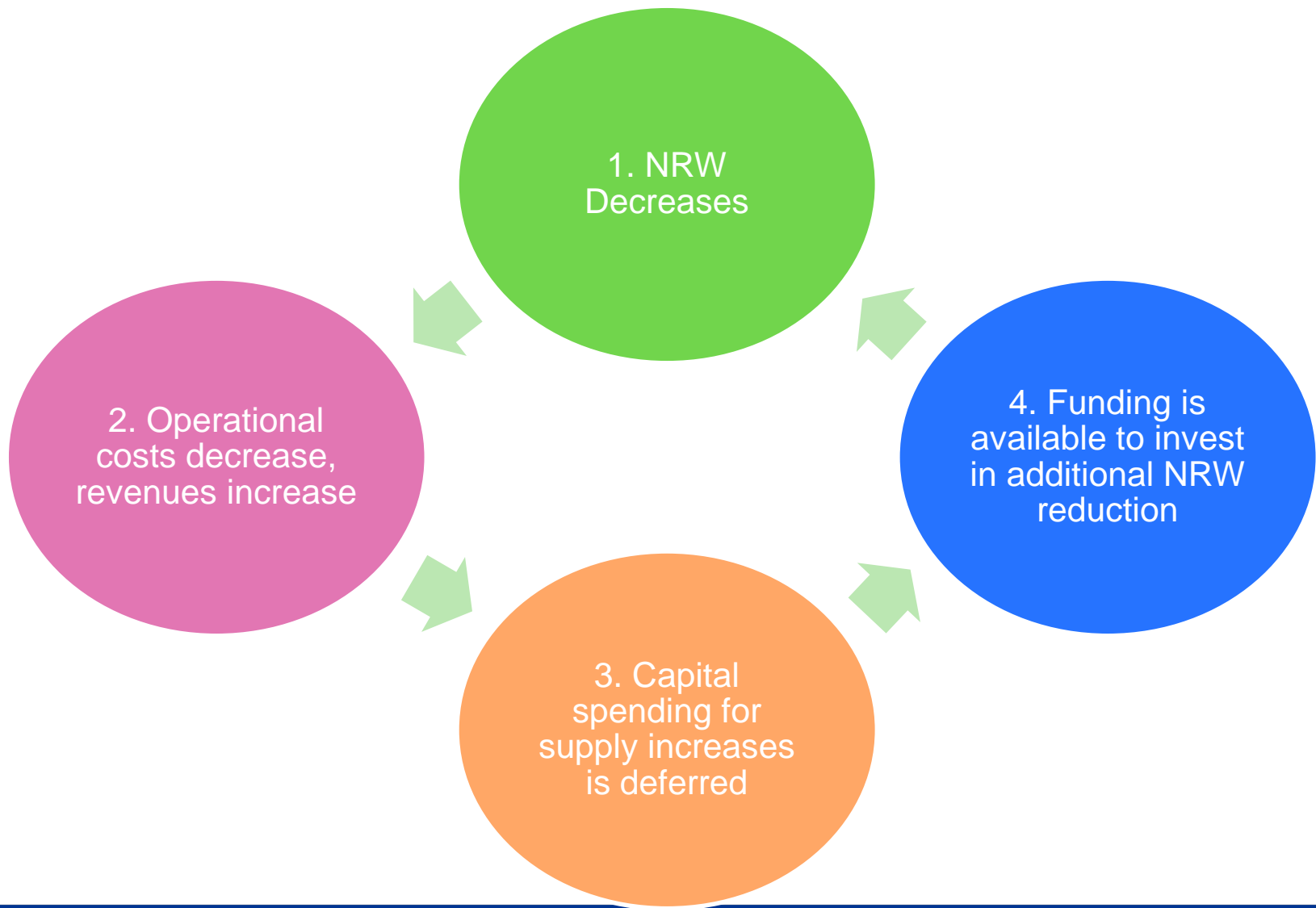
Monitoring Non-Revenue Water

- How do you monitor today?
 - Produced vs. Sold?
- Can you break down further?
 - Apparent Losses vs. Real Losses?
- How accurate is the information?
- What procedures are in place to correct?

Vicious NRW Cycle



Virtuous NRW Cycle



Monitoring NRW

Sewer Water Balance												
Source	Surface Water Plants				Ground Water				Treated Water Plants			
Total Supply	Total Supply (Mileage)											
Consumption/Production	Authorized Consumption						Other Losses					
Consumption/Production with Billing and Loss/Leak	Billed Authorized Consumption						Unbilled Authorized Consumption		Approved Losses		Unauthorized Losses	
Use Type	Industrial and Commercial Metered Use	Industrial and Commercial Unmetered Use	Public Metered Use	Public Unmetered Use	Government Metered Use	Government Unmetered Use	Healthcare Metered Use	Healthcare Unmetered Use	Leisure Metered Use	Leisure Unmetered Use	Other Metered Use	Other Unmetered Use
Non-Revenue Water	Non-Revenue Water						Non-Revenue Water					
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Billed Not Collected Metered Use	Unbilled Metered Use	Unbilled Un-Metered	Unauthorized Use	Metering Inaccuracies	Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows
Non-Revenue Water							

Non-Payment

- An issue we all face – some utilities over \$100K per year.
- Costly truck rolls – Can we use the labor to find higher value leaks or repair leaks?
- Remote Shut-Off will save time and money
- Smart Meters and AMI systems find leaks faster and reduce leak adjustment losses.
- Improved data logs for dispute resolution



Authorized NRW

Unbilled Metered Use	Unbilled Un- Metered
-------------------------	-------------------------

- City Buildings
- Flushing
- City Park
- Need to capture consumption



- Something we deal with daily
- Smart meters can detect tamper, empty pipe, reverse flow.
- AMI helps create awareness faster.
- Fire Hydrant Monitor
- Detect Illegal Use



Unauthorized
Use

Theft

- Analytics on your side

SENSUSANALYTICS

DemoWaterB@sensus.com | [logout](#)



[+ Add Alert](#) [+ Add Group](#) [View Groups](#)

Summary

Alerts Configured	1
Groups	1
People	1
Categories	1

Alerts

Name	Category	Type	Groups
Tamper Alerts	Ami Alarms	Tamper	1

< 1 > 1 alerts

- A 10% drift in accuracy is substantial loss
- Invest in long lasting meters
- Solid State meters provide long life accuracy
- Testing Programs help find lost revenue





Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows
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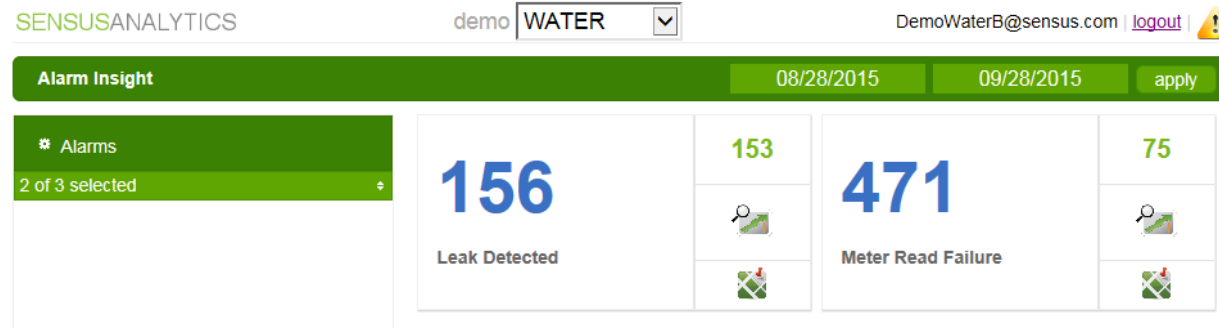
Real Losses

- More Data helps find the leaks
 - Overflows
 - Pressure
 - Smart Meters
- Acoustical monitoring
- Four Stages of Leak
 - Awareness
 - Location
 - Repair
 - Verification

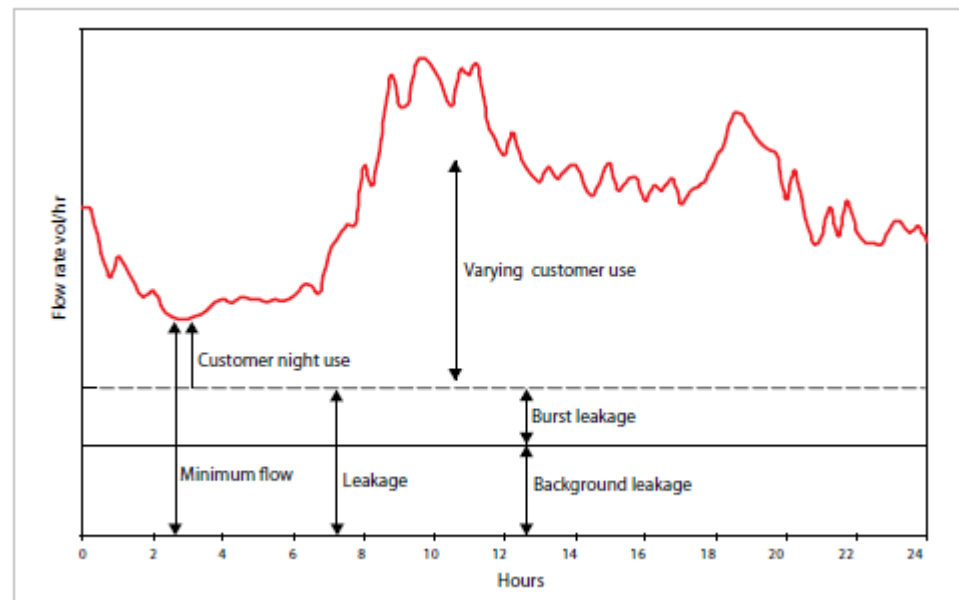


Real Losses

Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows
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- Analytics tracks leak data

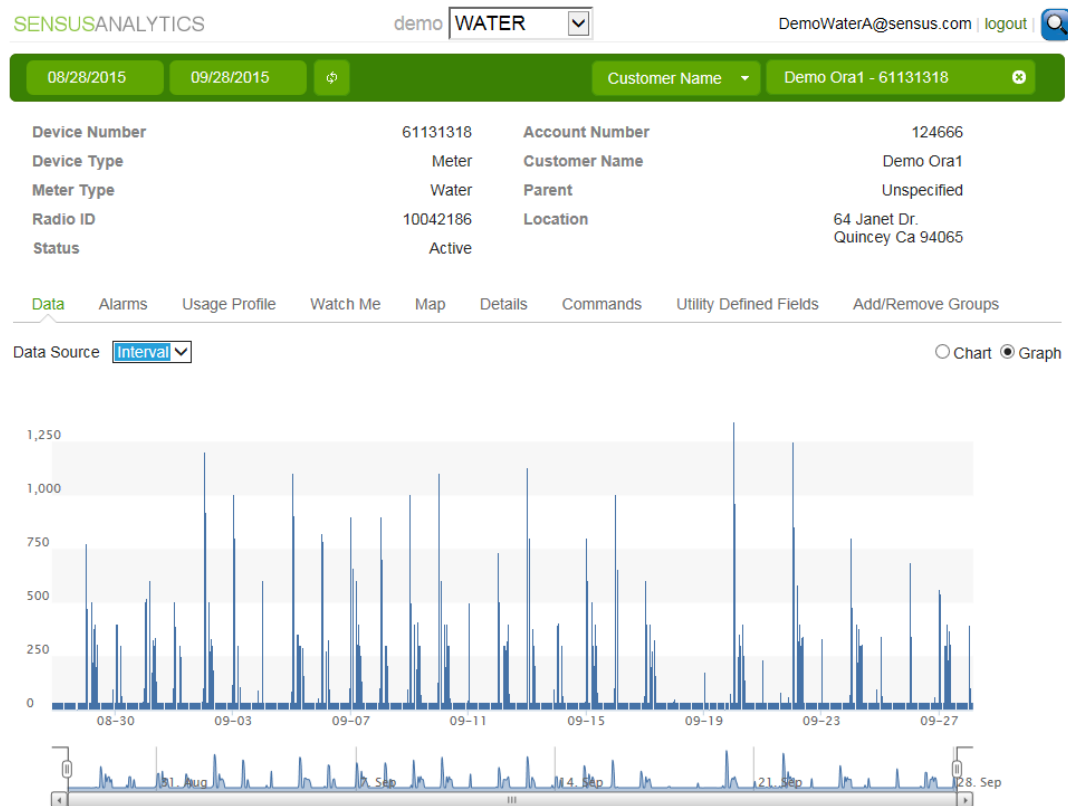


The Manager's Non-Revenue Water Handbook, Malcolm Farley, Gary Wyeth, Zainuddin Bin Md. Ghazali, Arie Istandar, Sher Singh



Real Losses

- See the raw data from the account

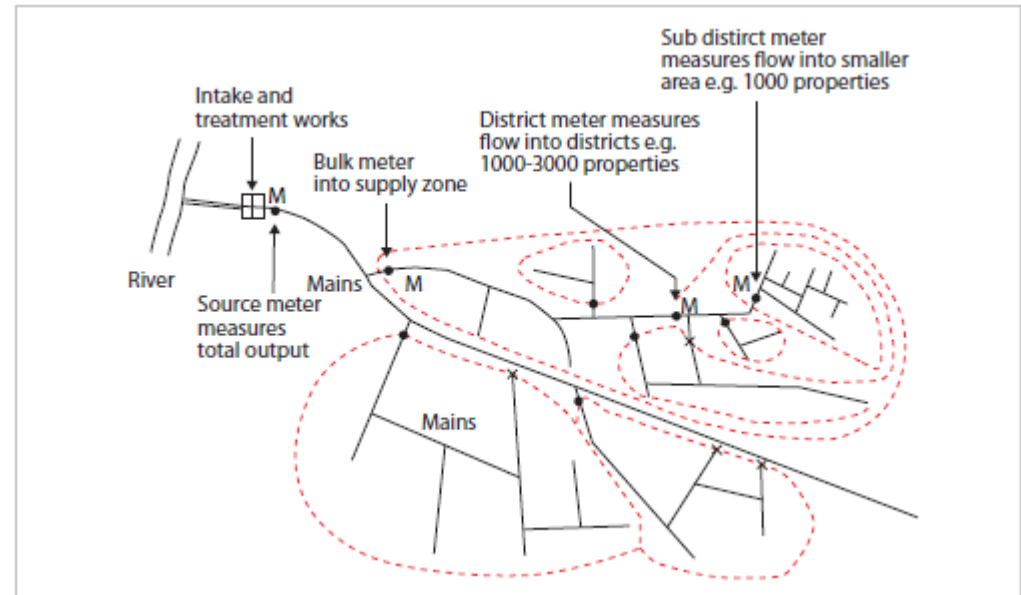




Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows
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Real Losses

- District Metered Area (DMA)
- Breakdown your service area to smaller, more easily tracked areas.
- Utilize a master meter entering the zone



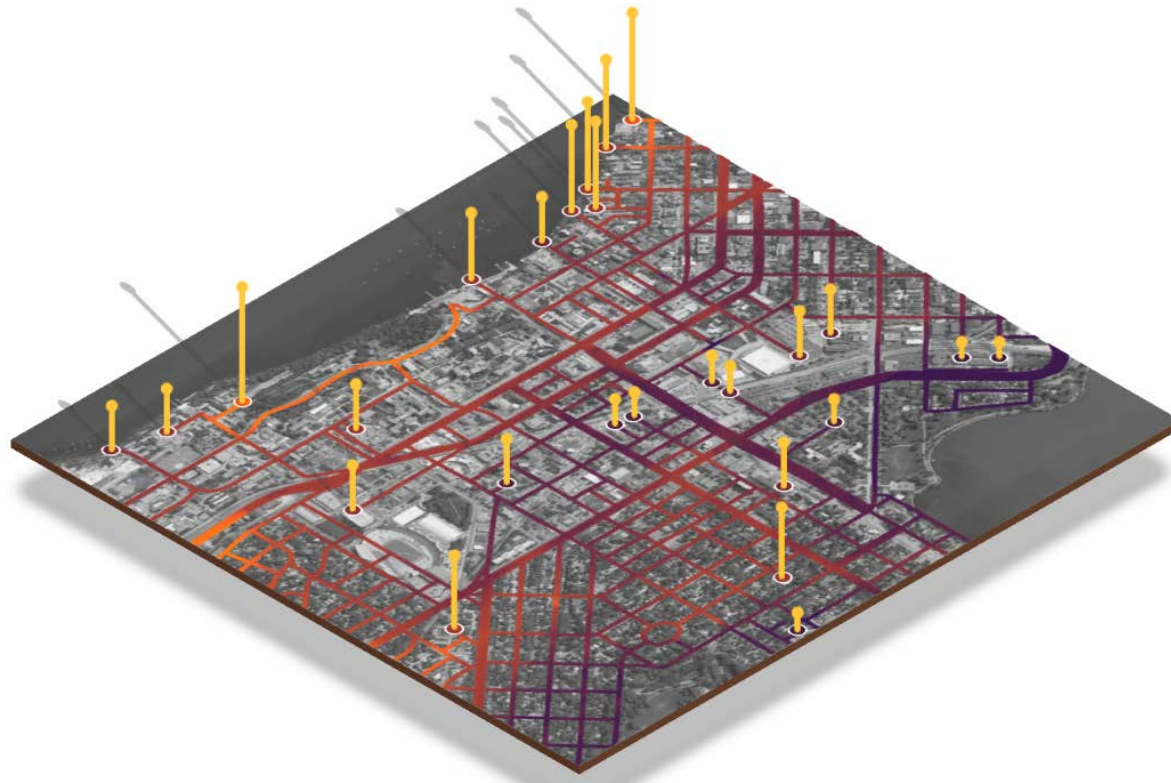
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Real Losses

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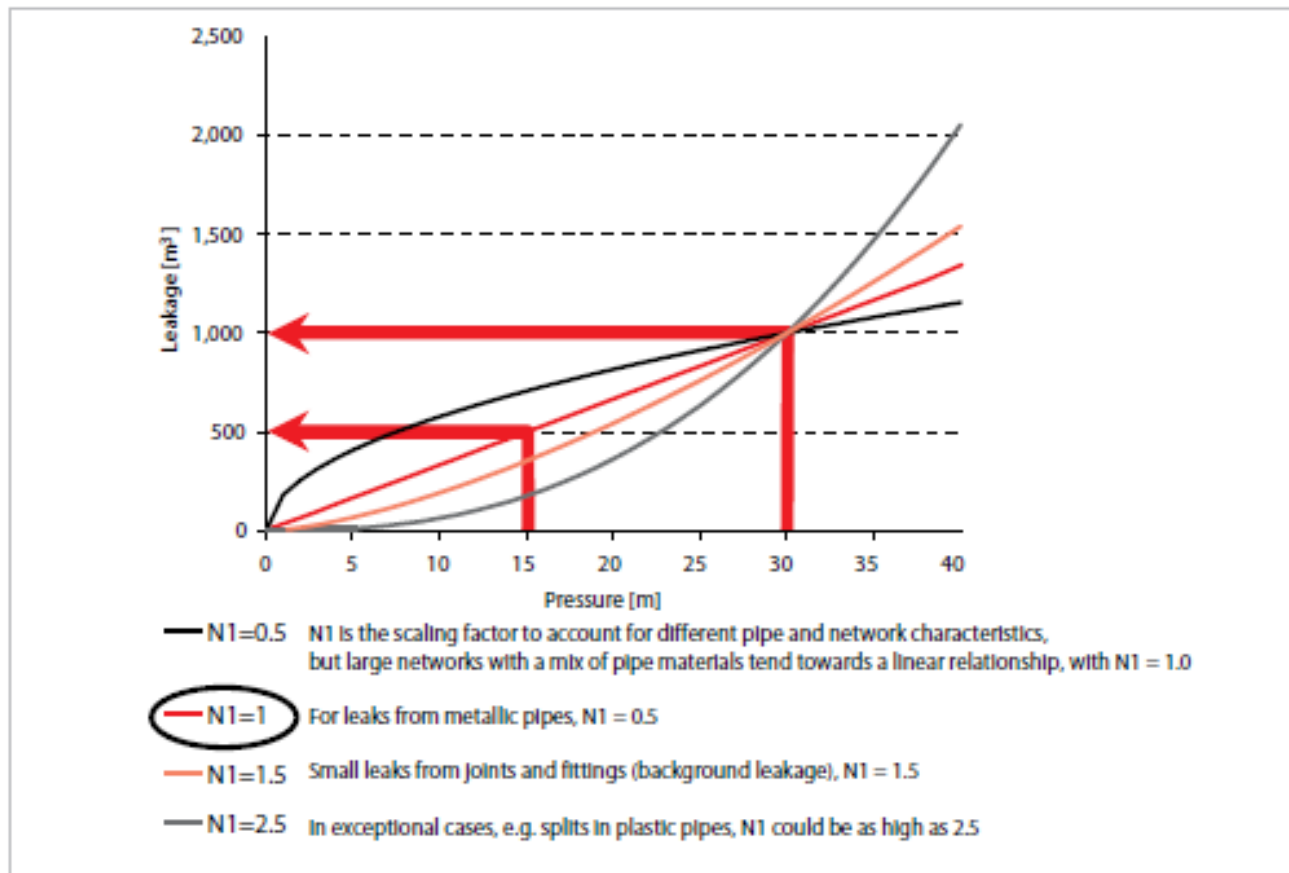
- Enhanced Pressure Profile





Leaks On Transmission and/or Distribution Mains	Leaks On Service Connections Up To Customer Meters	Storage Tank Leaks And Overflows
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Real Losses



Source: World Bank Institute

Top 3 Ways to Capture More Non-Revenue Water



1. Ensure meter accuracy
 - Create a testing program
2. Capture more data
 - Account for all areas of the water balance
 - Acoustical monitoring
 - Measure pressure and consumption
3. Analyze Frequently
 - Baseline the data
 - Review on hourly basis
 - Use the AWWA Free Water Audit Software

Water Balance

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CITY OF UNIVERSAL CITY, TX

**PRESENTED BY:
AVERY LUNSFORD, CONSERVATION MANAGER**

Universal City – Deployment & Results

- Water conservation is a priority for Universal City.
- With the AMR system coming online the City saw an opportunity to incorporate a system wide leak detection program.
- City received grant funding from the Edwards Aquifer Authority (EAA) to implement a leak detection program employing the Permalog advanced leak loggers.





Universal City – Deployment & Results

- EAA was eager to explore this new technology as they are always looking for innovative conservation techniques.
- 375 Loggers were installed in three phases over a period of three years, which allowed us monitor the majority of the wa distribution system.



Universal City – Deployment & Results

- Implemented advanced leak detection systems & program
 - Replacing over 4,000 meters
 - iPERL, SRII, OMNI
 - Permalog cover every square mile of wired network
 - FlexNet communication Network



Universal City – Results

- AMI successful for Universal City
- Allowed the City to locate leaks that had been trouble spots for numerous years and located leaks that would have never manifested under normal conditions.
- The difference between water production and total metered use is now around 4-5%, down from 8-10%.



Universal City – Results

- Early leak detection conserves water and saves our customers money
- FlexNet communication network provides competitive edge.

