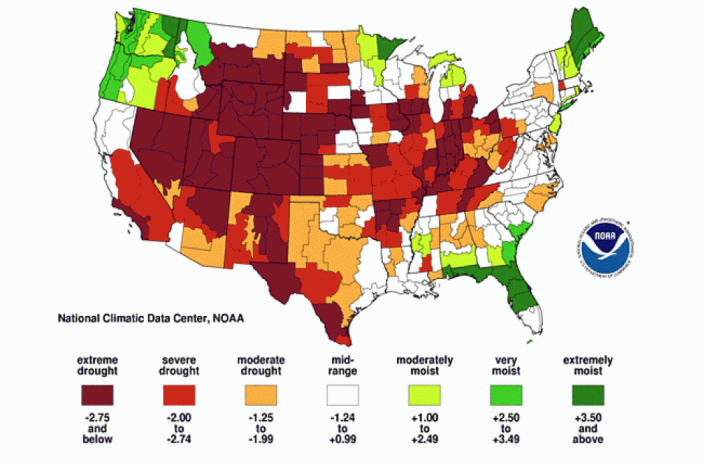
Non-Revenue Water
The Big Picture

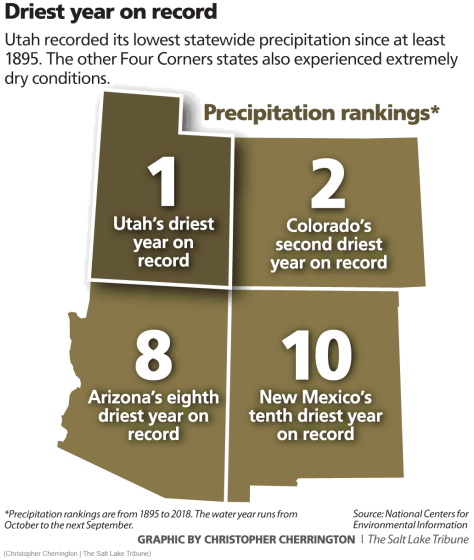
CATAWBA WATEREE
WATER MANAGEMENT GROUP

Presenter:
Steve Cavanaugh, P.E.
Chief Innovation Officer

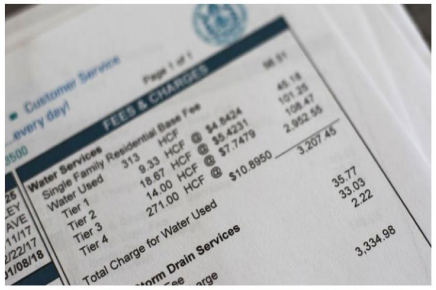
CAVANAUGH
Stewardship Through Innovation

Drivers for Water Loss Control





Editorial | Don't just blame the meter readers for San Diego's water billing scandal



San Carlos resident Kelli Sandman-Hurly got a water bill of $3,334.98 -- an overcharge of more than $3,000. (K.C. Alfred / U-T)

By The San Diego Union-Tribune Editorial Board

JULY 27, 2018, 5:15 PM

A new report from City Auditor Eduardo Luna about erroneous water bills serves as a clear indictment of the city's Public Utilities Department. It detailed how 2,750 water bills sent to residents in 2017 were incorrect, often by hundreds of dollars, and that

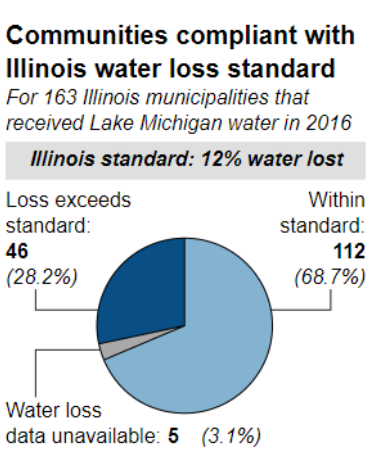
ADVERTISEMENT

SAWS reveals 9 billion gallons of water wasted last year

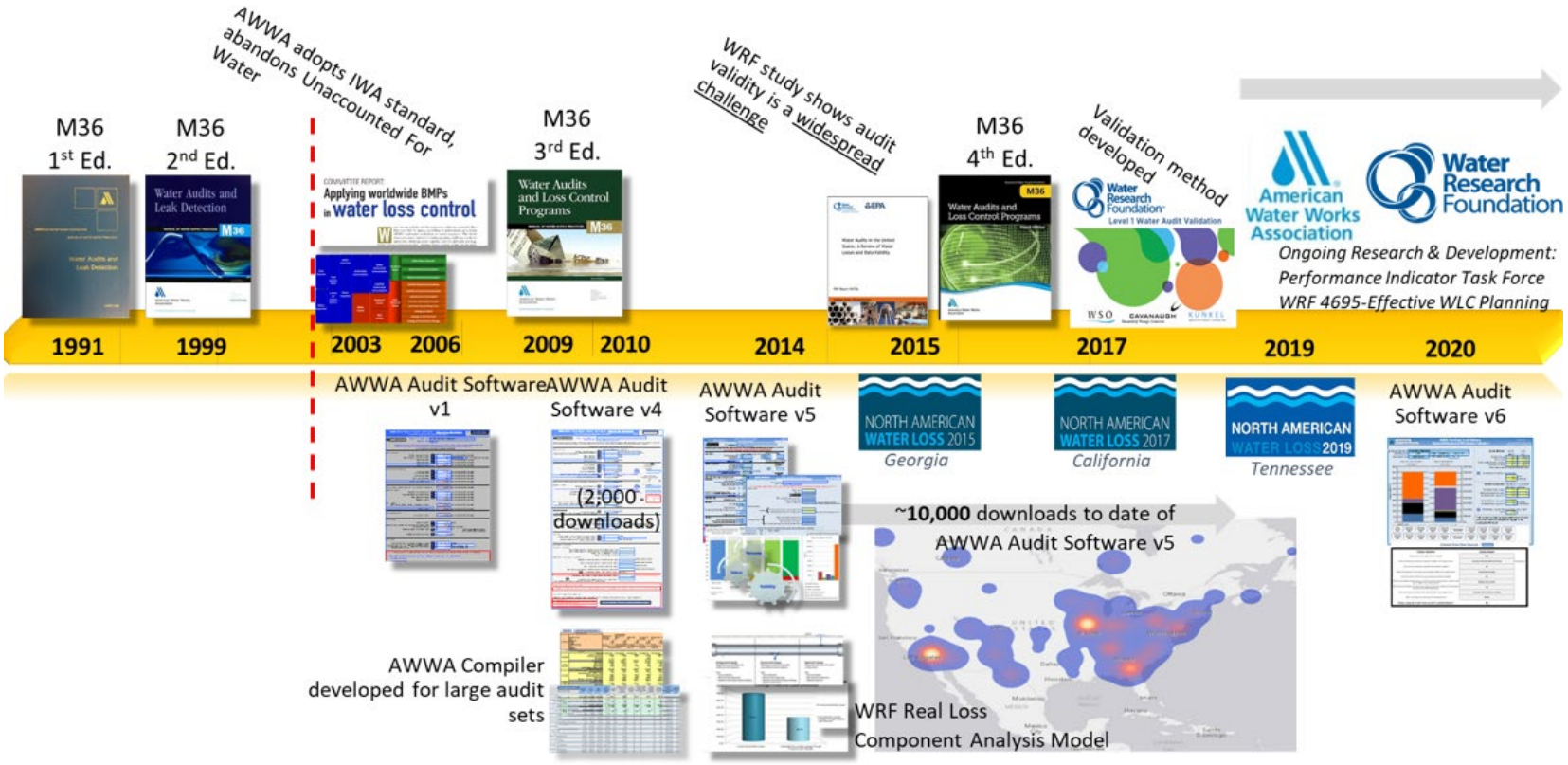
by APRIL MOLINA | Wednesday, November 1st 2017

SBG Photo

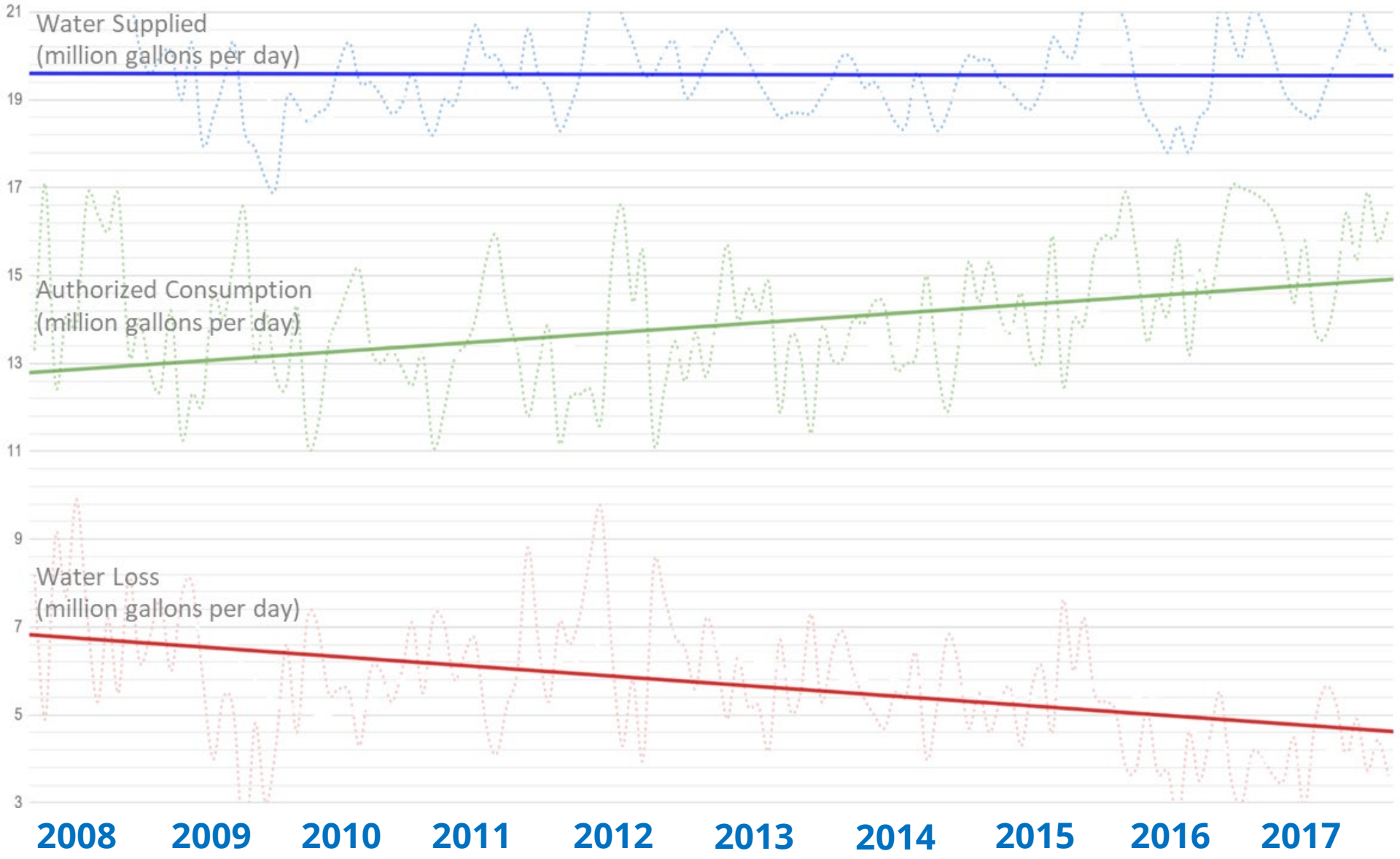
VIEW PHOTO GALLERY
5 photos



IWA/AWWA M36 Methodology – State of the Art Water Auditing & Loss Control



Increased Supply



05 SEPT 2018

Rating Action: Moody's upgrades to Aa1 Asheville, NC's outstanding $43.4M Water Revenue Enterprise bonds; Outlook stable

New York, September 05, 2018 -- Moody's Investors Service has upgraded the rating to Aa1 from Aa2 on the City of Asheville, NC's $43.4 million Water System Revenue Refunding Bonds, Series 2015. The outlook is stable.

RATINGS RATIONALE

The upgrade to the high quality Aa1 rating reflects the growing size and diversity of the service area's economic base, strong management practices including comprehensive fiscal policies, an active pay-go capital improvement program, regular rate reviews and long term planning. The rating also incorporates ample debt service coverage (4.3 times) and liquidity levels (1,229 days cash on hand). Legal provisions are satisfactory (1.2x rate covenant) with no debt service reserve requirement which is offset by maintenance of healthy reserves.

RATING OUTLOOK

The stable outlook reflects our expectation of continued sound financial operations and stability within the service area.

FACTORS THAT COULD LEAD TO AN UPGRADE

-Maintenance of high debt service coverage levels

-Reduction of water leakage rate

-Reduction of water leakage rate

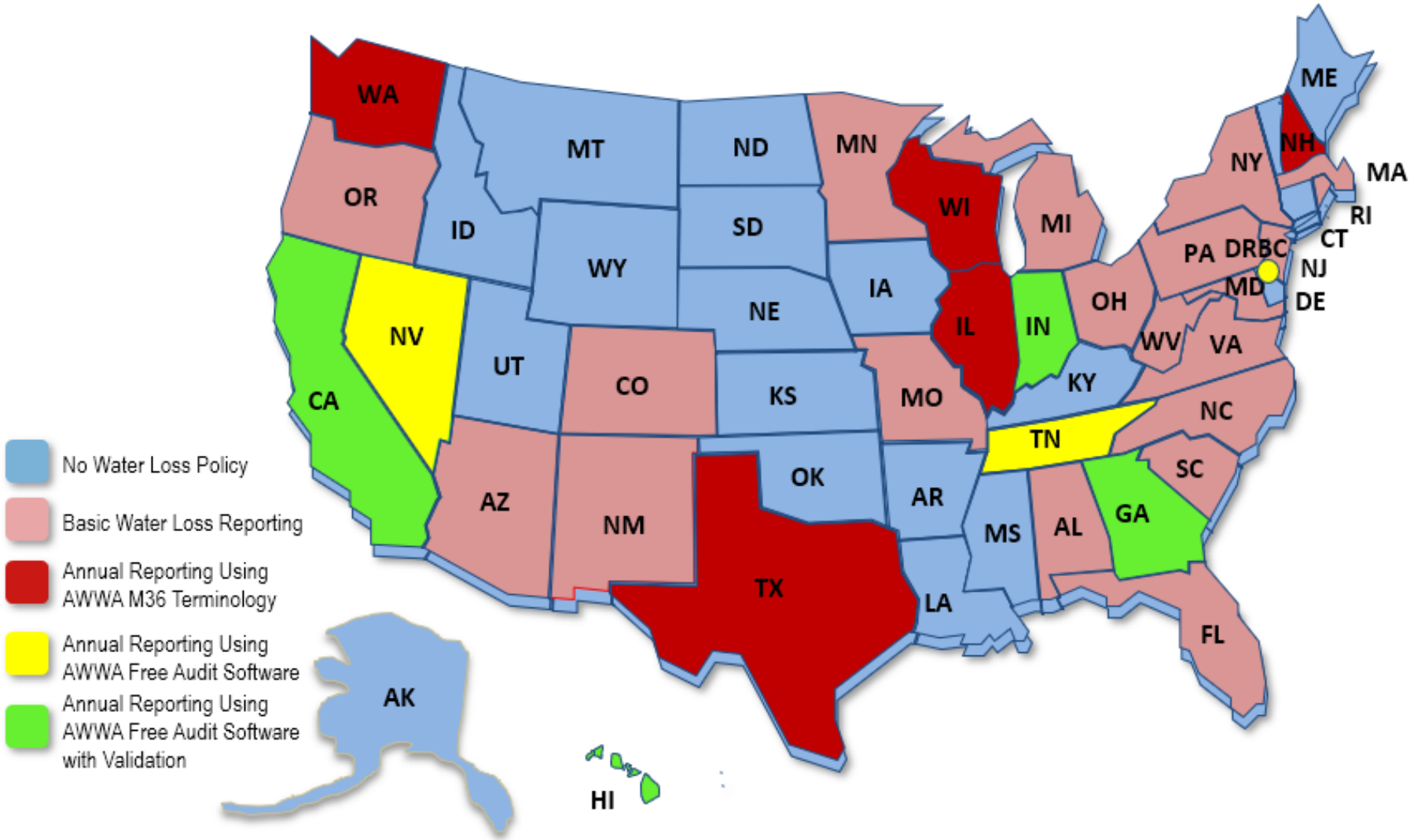
FACTORS THAT COULD LEAD TO A DOWNGRADE

-Debt service coverage falling below current projections

-Significant increase in debt ratio

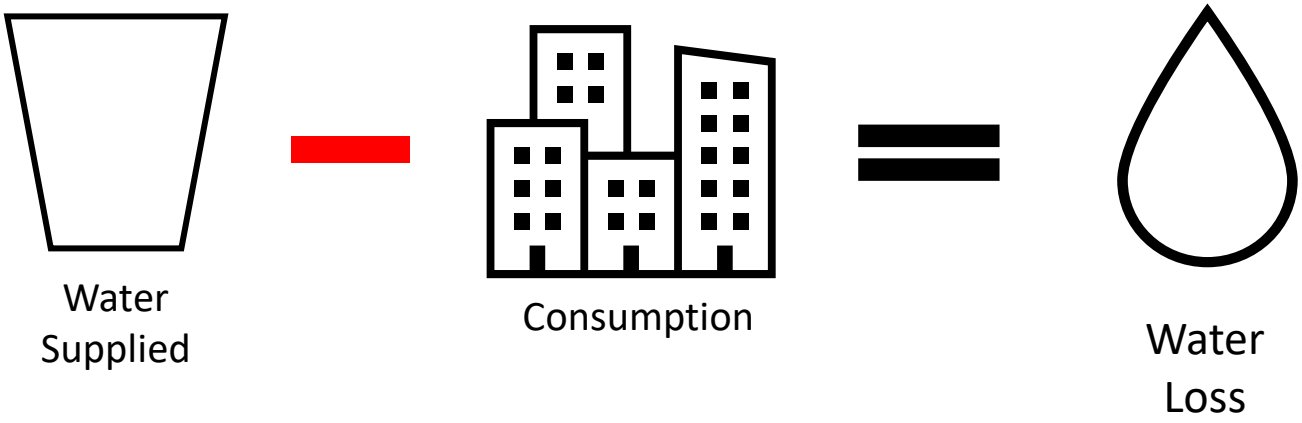
-Material deterioration of the customer base and economic profile

AWWA M36
Regulatory Landscape



What is Water Loss?

Water Loss

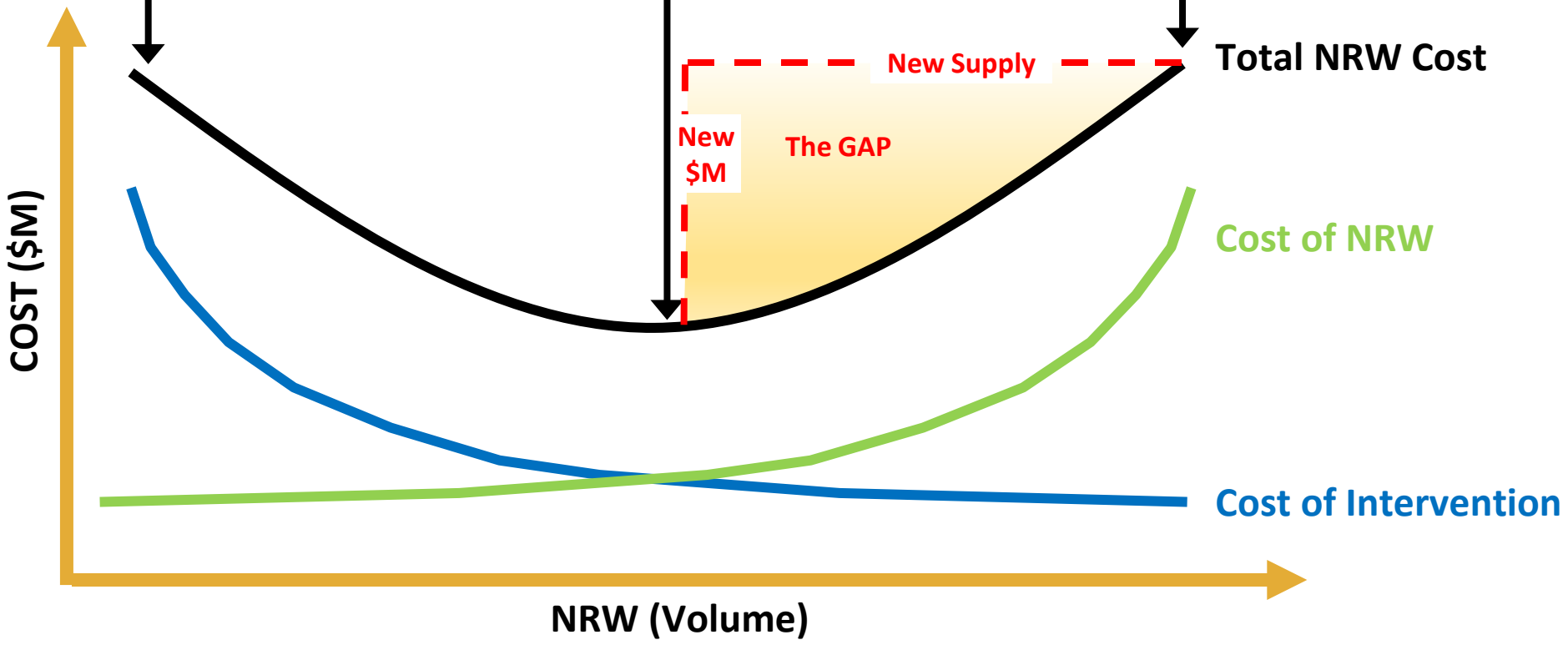


Economic Optimum Level of Intervention

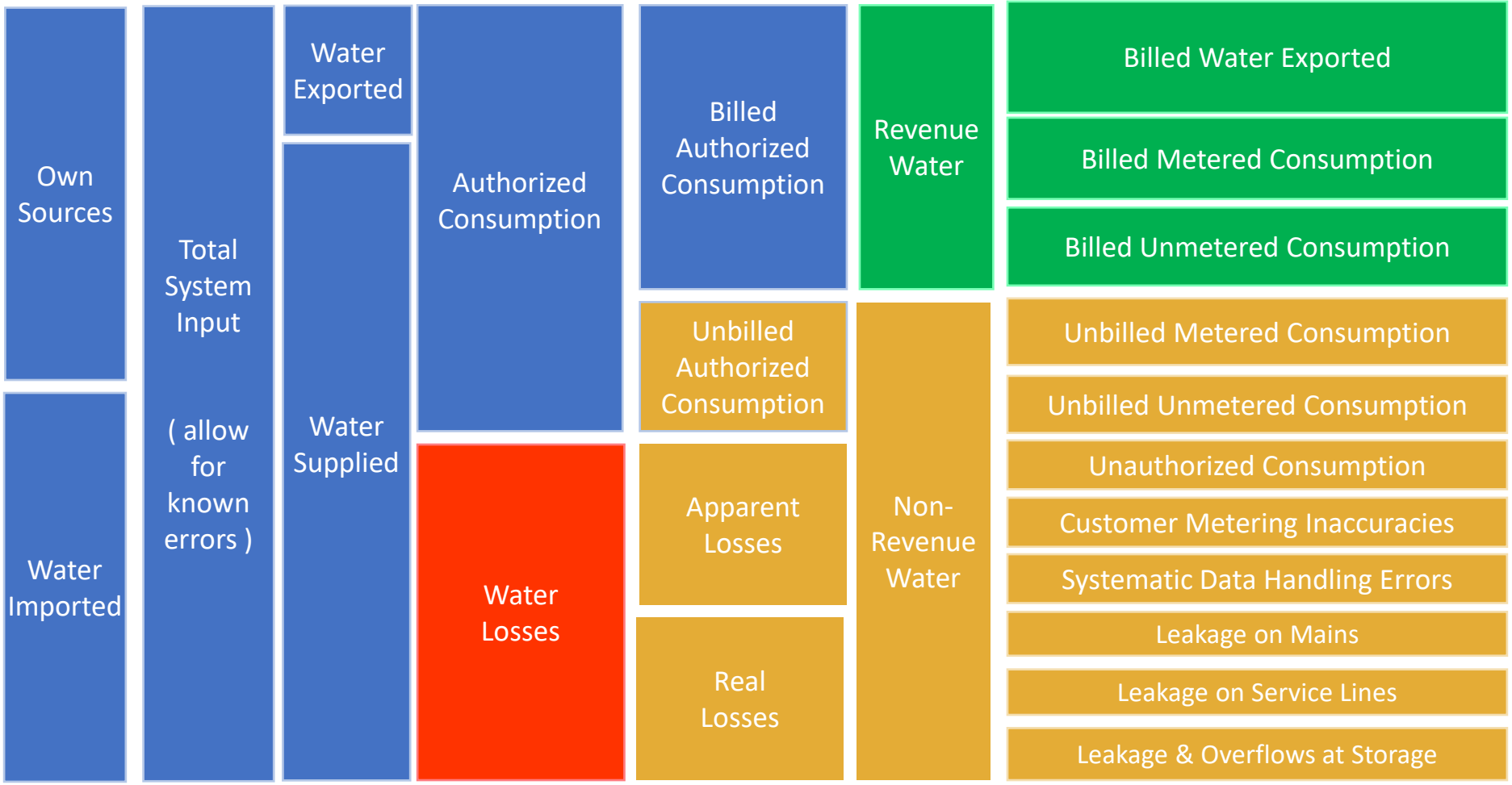
Aggressive Intervention is **Over-Spending**
Example: replacement of pipes and meters before their optimal useful life

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

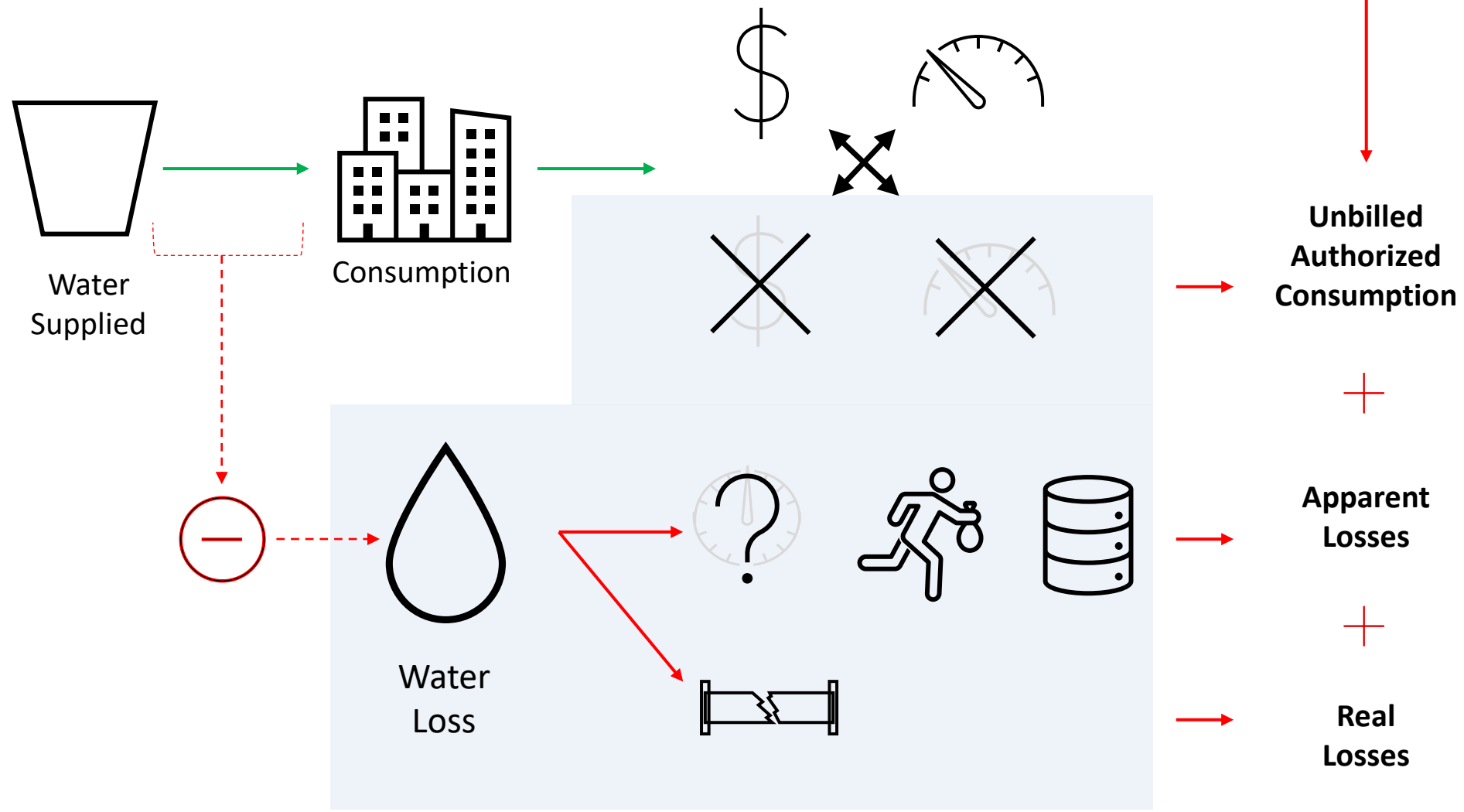
Reactive Intervention is **Over-Spending**
Example: fixing only leaks that surface, replacing meters only when they stop

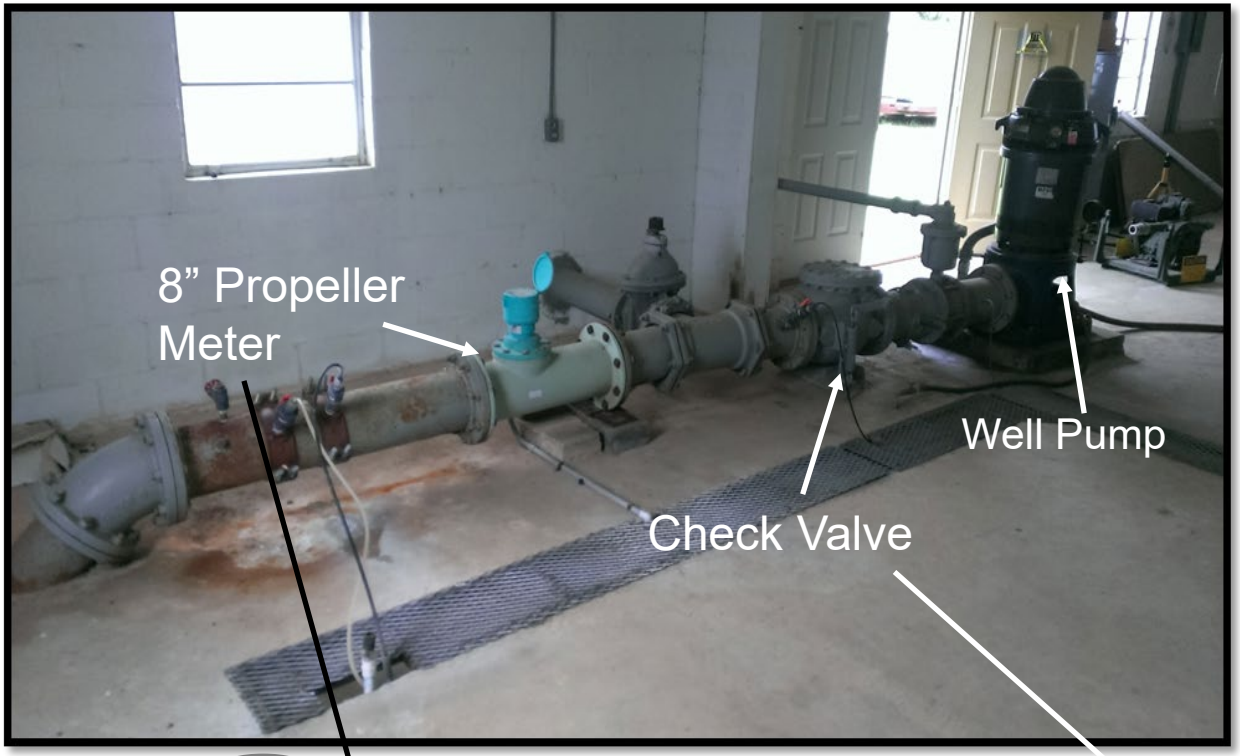


The Water Balance & Water Auditing



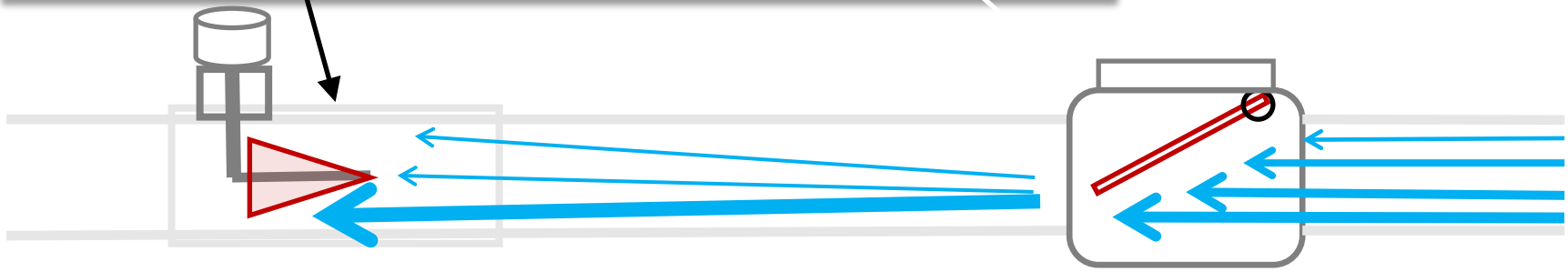
What is Non-Revenue Water?





Accuracy results from MFR test bench: 99.5%

Accuracy results from in-situ test: 142.2%



Courtesy MESCO

Different Types of Leaks

Figure 1: Sub-Components of Real Loss (graphic credit WRF)

AWWA M36 Program Approach

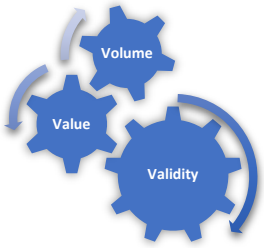
Annual Water Balance

Annual M36 water audit

Apparent & Real Loss volumes

Level 1 validation

baseline



Stage 1

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

technical analysis

Stage 2

Cost-Benefit & Targets

Costs of losses
- by subcomponent
- in aggregate
- wholesale & retail

Costs of intervention strategies

Program design

System-specific

economic analysis

Stage 3

Intervention

Leakage Management:
- Active Leak Detection
- Pressure Optimization
- Repair Time Reduction
- Network Renewal

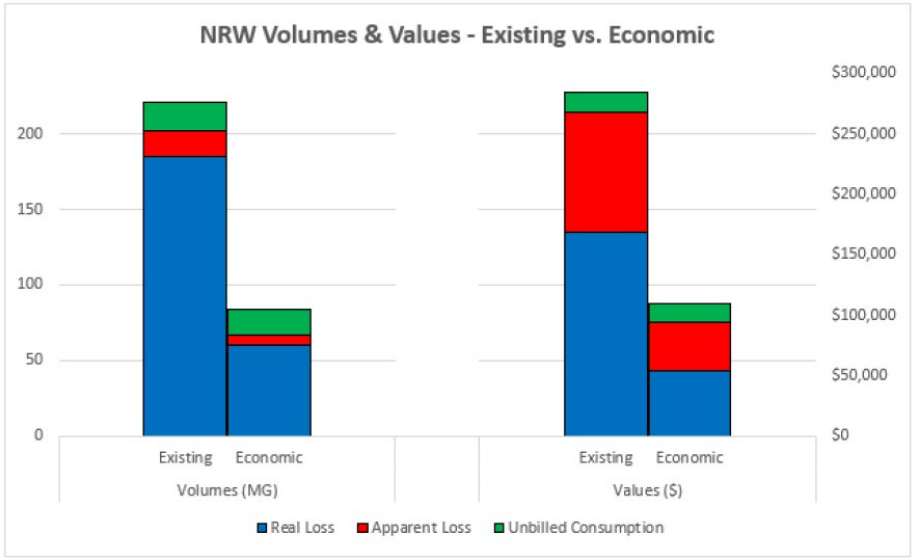
Revenue Protection:
- Theft Mitigation
- Meter Optimization & Renewal
- Billing Data System Integrity
- Revenue Recovery

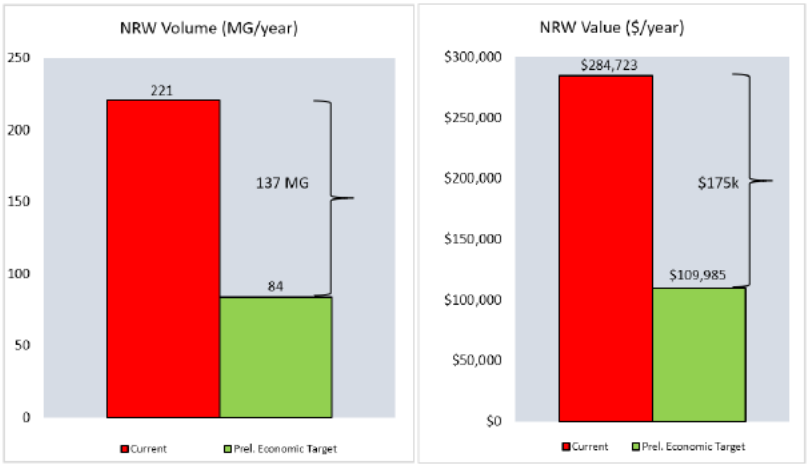
cost-effectiveness

Stage 4

Economic Analysis - Example

Fiscal Year 2017/2018					
			95% Confidence Limits (+/-)		
Economic Metrics	**Volume**		**Low**	**High**	**%**
Non-Revenue Water (Existing)	221	MG/yr	181	261	18.2%
Non-Revenue Water (Economic)	84	MG/yr	67	100	19.7%
Target NRW Recovery ("Gap")	137	MG/yr	110	164	19.7%
	Value (Primary + Secondary)				
Non-Revenue Water $ (Existing)	$284,723	$/yr	$245,580	$323,865	13.7%
Non-Revenue Water $ (Economic)	$109,985	$/yr	$88,345	$131,626	19.7%
Target NRW Recovery $ ("Gap")	$174,737	$/yr	$140,357	$209,118	19.7%
NRW Economic Index	**2.6**	ratio of current vs optimum NRW cost			
Technical Metrics					
Unbilled Consumption	9.3	gal/conn/day	8.2	10.4	11.6%
Apparent Loss	8.5	gal/conn/day	7.3	9.7	14.0%
Real Loss	92.7	gal/conn/day	73.4	112.1	20.8%
Infrastructure Leakage Index	4.8		3.7	5.8	21.6%
Data Validity Band (Level)	Band III (51-70)				





Volumes (MG)	Existing	Economic
Unbilled Consumption	18.6	17.1
Apparent Loss	17.1	6.9
Real Loss	185.3	59.8

Values ($)	Existing	Economic
Unbilled Consumption	$16,932	$15,538
Apparent Loss	$99,331	$40,069
Real Loss	$168,460	$54,379

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