Communicating Complicated Analyses to Utility Leaders and the Public

Glenn Barnes

October 16, 2025

WATER FINANCE ASSISTANCE

A Little About Me

Glenn Barnes

Director

Water Finance Assistance

WATER FINANCE ASSISTANCE

We Conduct Analyses

- Rate studies
- Asset management plans
- Water audits
- Risk-resiliency assessments
- Emergency response plans

Hopefully, boards **act** on these analyses…

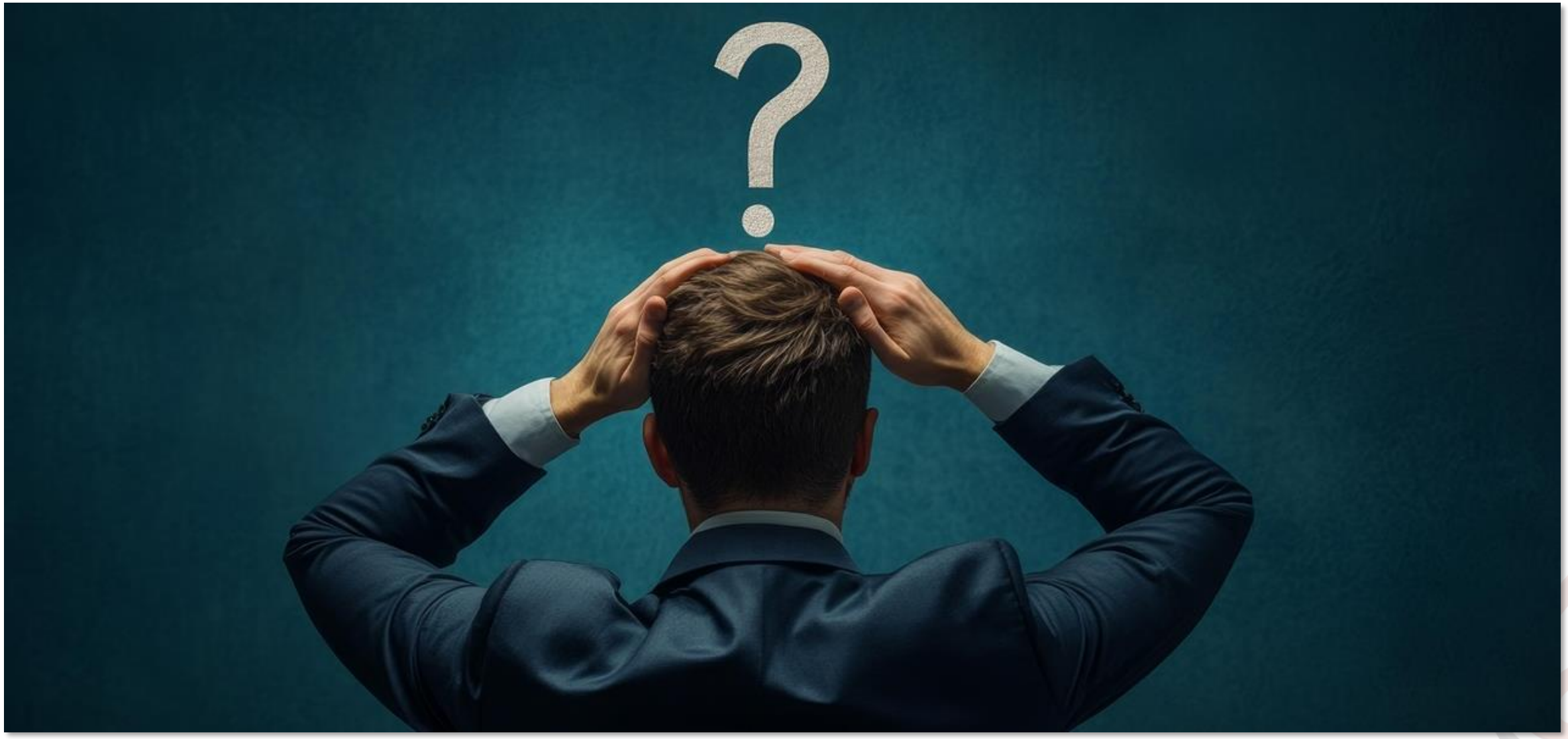
But sometimes they **don’t**

Why?

Money Issue?

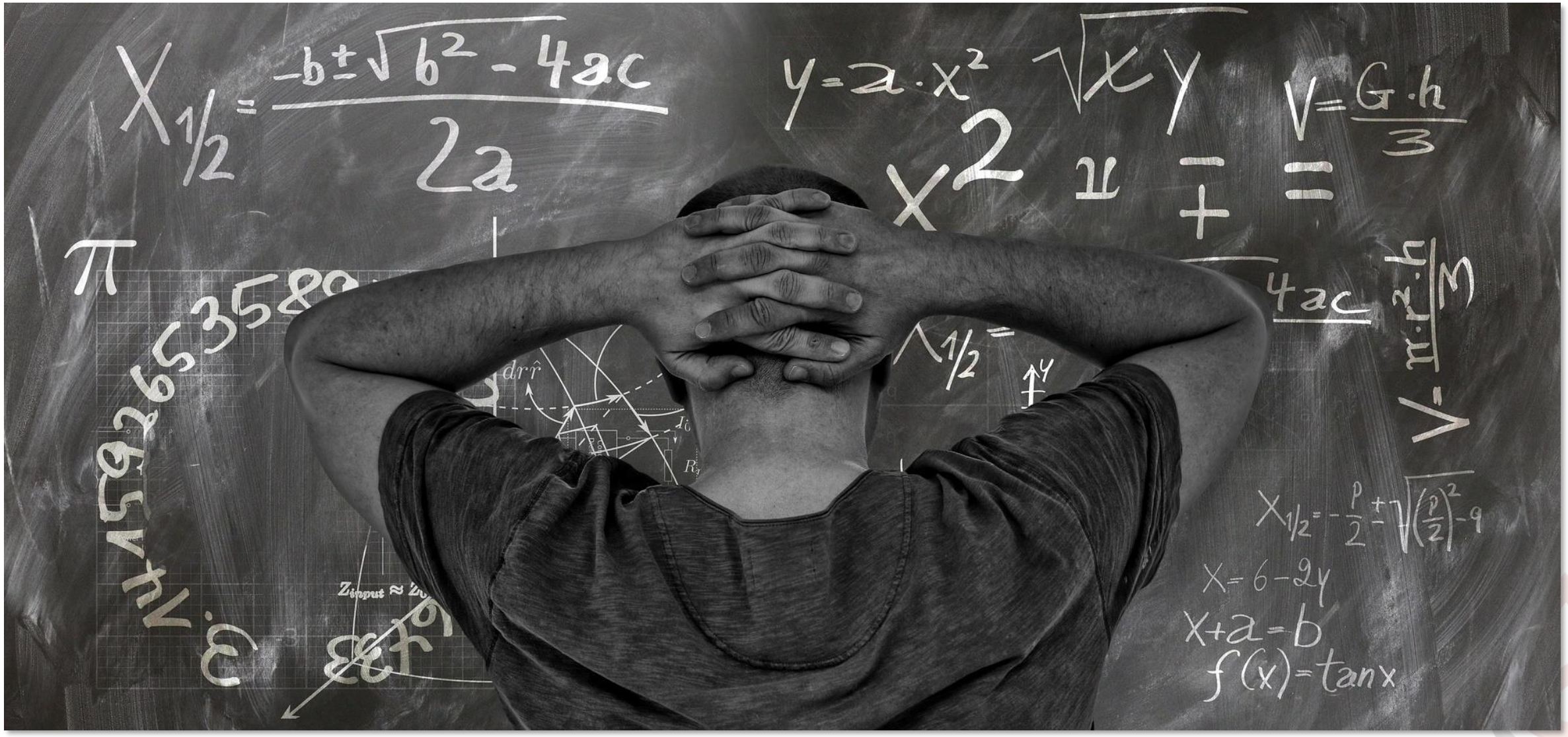
Politically Unpopular?

But what if they were just **confused**?



All these analyses generate **helpful** information...

…But They Are **Complicated**



We should assume the general public **doesn’t understand** what we do

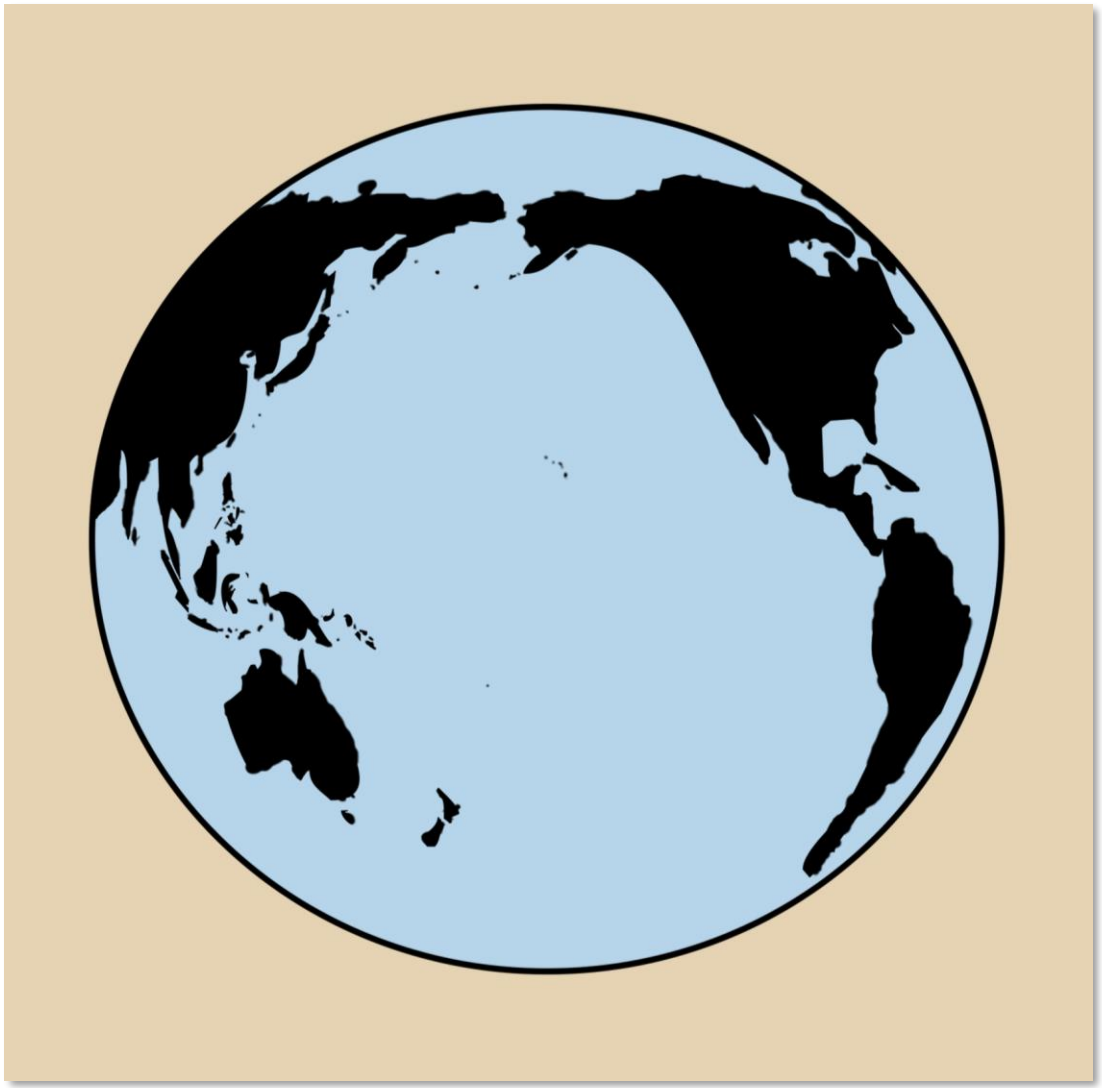

TRANSLATE

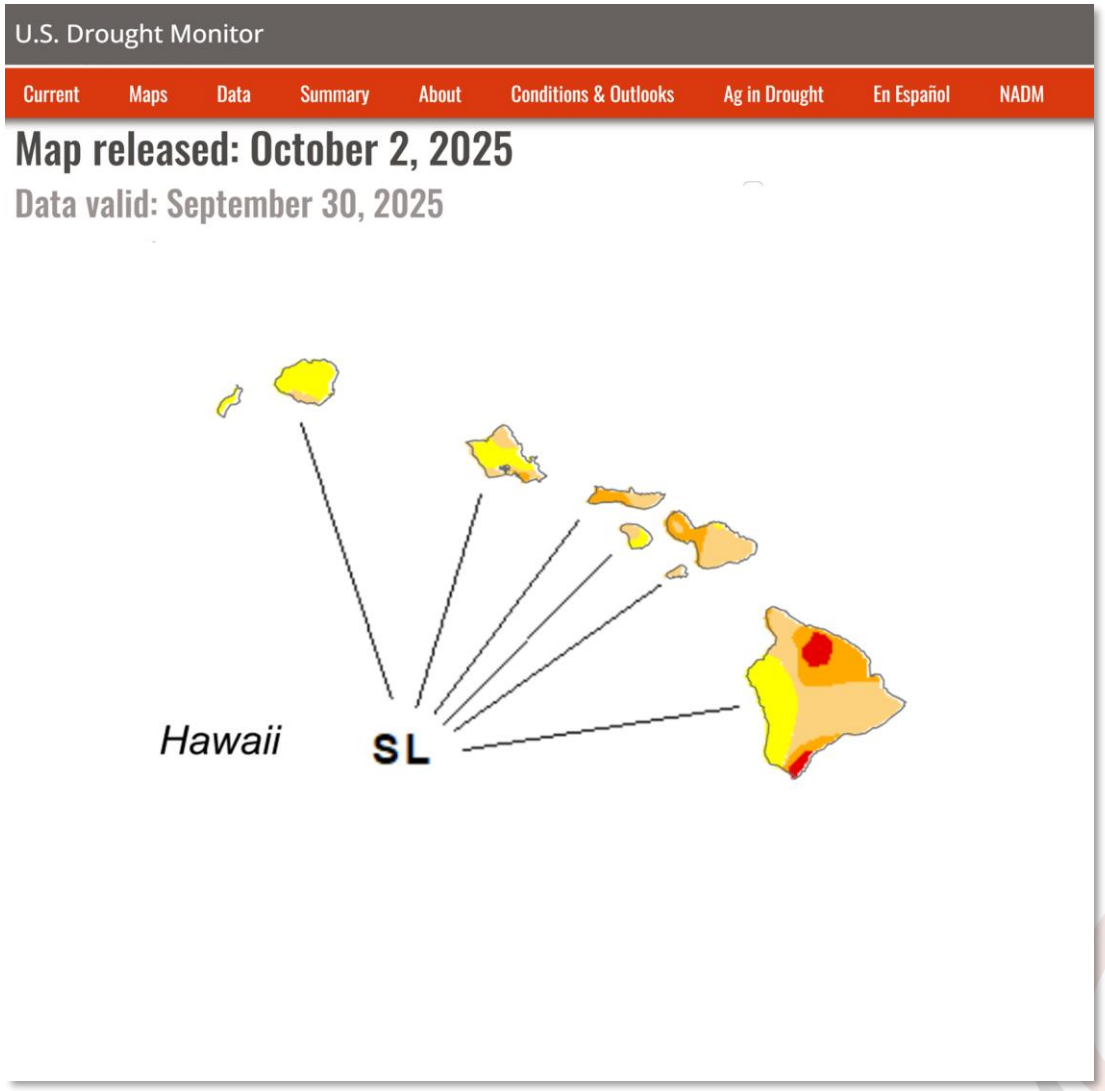
1

Address their top priorities

Money, Always

Water Waste, Always





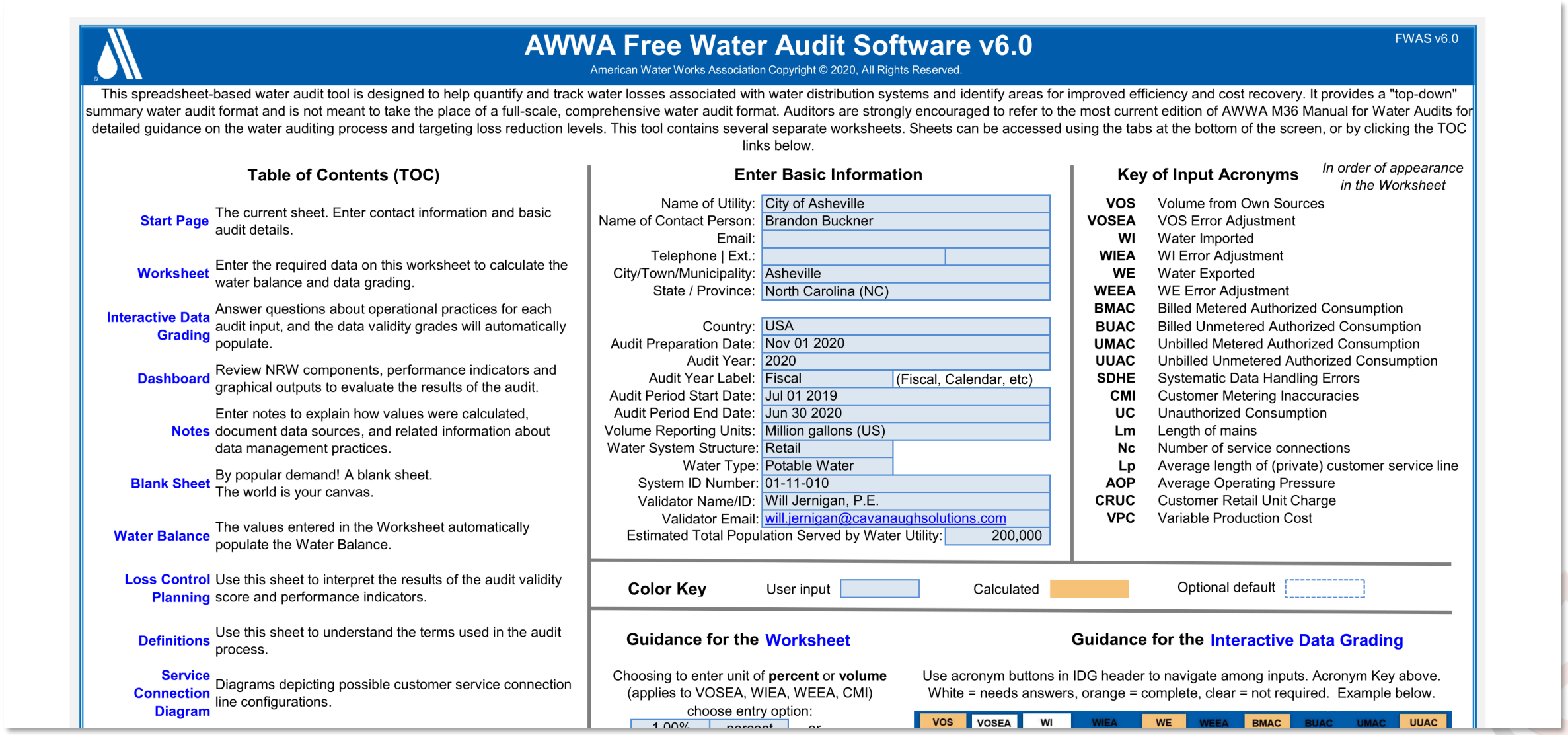
Their Top Priorities

- Water comes out of the faucet when we turn it on
- It doesn’t kill us or make us sick
- No bad press
- We aren’t in trouble with our regulators

2

No jargon or acronyms

Water Audits



AWWA Free Water Audit Software v6.0

FWAS v6.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format and is not meant to take the place of a full-scale, comprehensive water audit format. Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targeting loss reduction levels. This tool contains several separate worksheets. Sheets can be accessed using the tabs at the bottom of the screen, or by clicking the TOC links below.

Table of Contents (TOC)

Start Page	The current sheet. Enter contact information and basic audit details.
Worksheet	Enter the required data on this worksheet to calculate the water balance and data grading.
Interactive Data Grading	Answer questions about operational practices for each audit input, and the data validity grades will automatically populate.
Dashboard	Review NRW components, performance indicators and graphical outputs to evaluate the results of the audit.
Notes	Enter notes to explain how values were calculated, document data sources, and related information about data management practices.
Blank Sheet	By popular demand! A blank sheet. The world is your canvas.
Water Balance	The values entered in the Worksheet automatically populate the Water Balance.
Loss Control Planning	Use this sheet to interpret the results of the audit validity score and performance indicators.
Definitions	Use this sheet to understand the terms used in the audit process.
Service Connection Diagram	Diagrams depicting possible customer service connection line configurations.

Enter Basic Information

Name of Utility:	City of Asheville
Name of Contact Person:	Brandon Buckner
Email:	
Telephone | Ext.:	
City/Town/Municipality:	Asheville
State / Province:	North Carolina (NC)
Country:	USA
Audit Preparation Date:	Nov 01 2020
Audit Year:	2020
Audit Year Label:	Fiscal (Fiscal, Calendar, etc)
Audit Period Start Date:	Jul 01 2019
Audit Period End Date:	Jun 30 2020
Volume Reporting Units:	Million gallons (US)
Water System Structure:	Retail
Water Type:	Potable Water
System ID Number:	01-11-010
Validator Name/ID:	Will Jernigan, P.E.
Validator Email:	will.jernigan@cavanaughsolutions.com
Estimated Total Population Served by Water Utility:	200,000

Key of Input Acronyms

In order of appearance in the Worksheet

VOS	Volume from Own Sources
VOSEA	VOS Error Adjustment
WI	Water Imported
WIEA	WI Error Adjustment
WE	Water Exported
WEEA	WE Error Adjustment
BMAC	Billed Metered Authorized Consumption
BUAC	Billed Unmetered Authorized Consumption
UMAC	Unbilled Metered Authorized Consumption
UUAC	Unbilled Unmetered Authorized Consumption
SDHE	Systematic Data Handling Errors
CMI	Customer Metering Inaccuracies
UC	Unauthorized Consumption
Lm	Length of mains
Nc	Number of service connections
Lp	Average length of (private) customer service line
AOP	Average Operating Pressure
CRUC	Customer Retail Unit Charge
VPC	Variable Production Cost

Color Key User input | Calculated | Optional default

Guidance for the Worksheet

Choosing to enter unit of **percent** or **volume** (applies to VOSEA, WIEA, WEEA, CMI) choose entry option:

1.00% percent or

Guidance for the Interactive Data Grading

Use acronym buttons in IDG header to navigate among inputs. Acronym Key above. White = needs answers, orange = complete, clear = not required. Example below.

VOS | VOSEA | WI | WIEA | WE | WEEA | BMAC | BUAC | UMAC | UUAC

Water Audits

VOS	UUAC	AOP	WEEA
WI	SDHE	CRUC	WIEA
WE	CMI	ILI	UMAC
BMAC	UC	Lm	Lp
BUAC	NRW	Nc	VPC

We need plain language

Water Audits

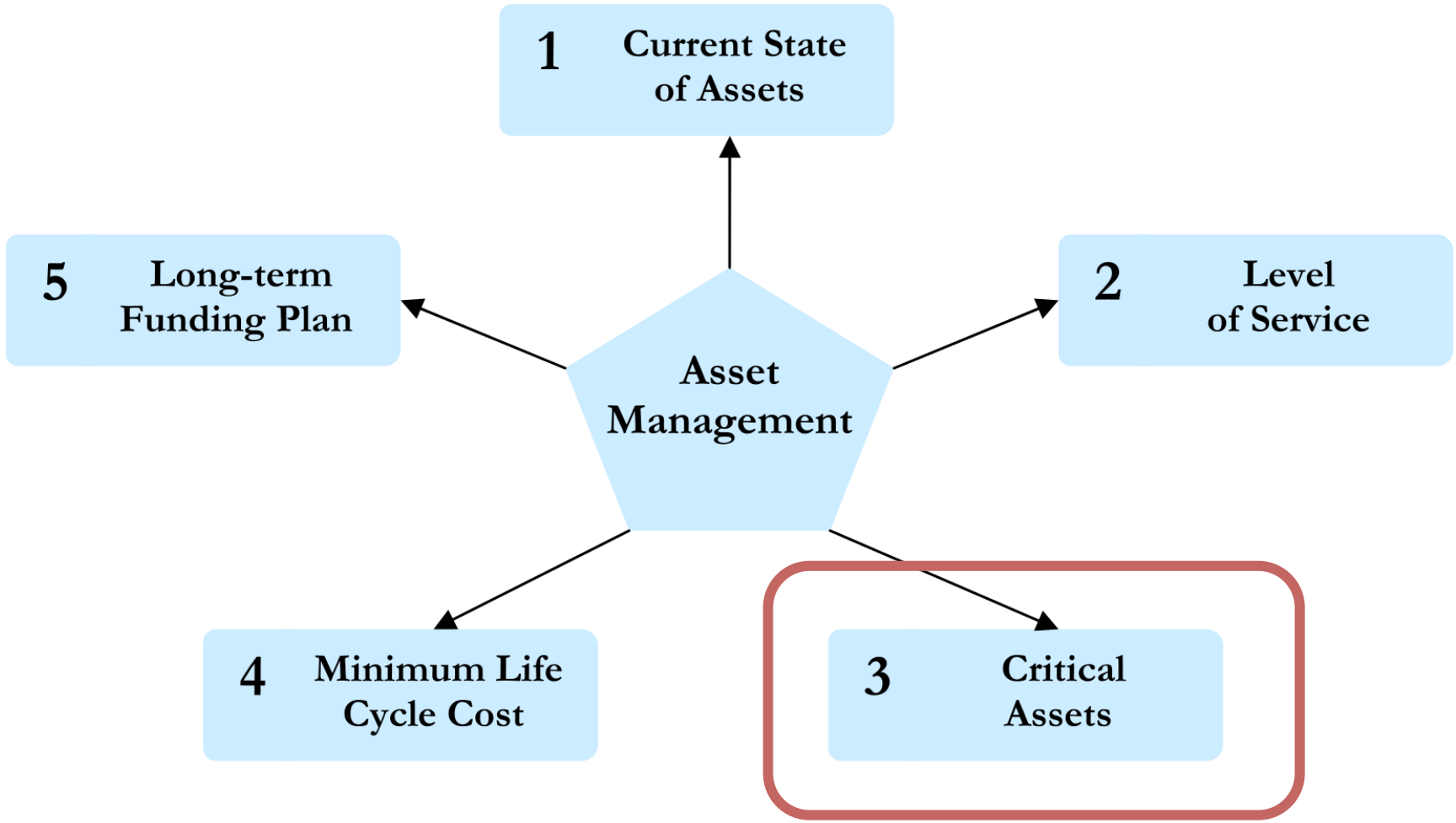
- “System input volume”
- “Revenue water”
- “Non-revenue water”
- “Real losses”
- “Apparent losses”
- “Authorized consumption”

Water Audits

- “System input volume” “What we produce”
- “Revenue water” “What we are paid for”
- “Non-revenue water” “What we are NOT paid for”
- “Real losses” “What leaks out of the system”
- “Apparent losses” “What should be billed but isn’t”
- “Authorized consumption” “What we allow to be used for free”

The way we talk about asset management might be **worse**

Flow Chart: The Five Core Questions of Asset Management Framework



Source: EPA's *Asset Management: A Best Practices Guide*

Critical Assets

Probability of Failure

$$PoF \times CoF \times Redundancy\ Factor$$

Consequence of Failure

Instead of PoF...

Old ≠ Failing

Anne Garrett
Age 80
2:13:23

Glenn Barnes
Age 40
2:42:29

Instead of CoF...

"How many customers will **lose access** to safe and reliable water or wastewater service if this asset **fails**?"

Make a List of the Most Important Assets

At Least 50% of Customers Rely on These Assets

- Well #1
- Well #2
- Treatment Plant
- High Service Pump
- Tank #3
- Well Line #1
- Well Line #2
- Main Distribution Line
- Line to Tank #3
- Main After Tank #3

Vital Customers Rely on These Assets

- Line to Tank #4
- Tank #4
- Main After Tank #4
- School Service Line
- Hospital Service Line

3

Show data effectively

Quick Rules of Data Visualization

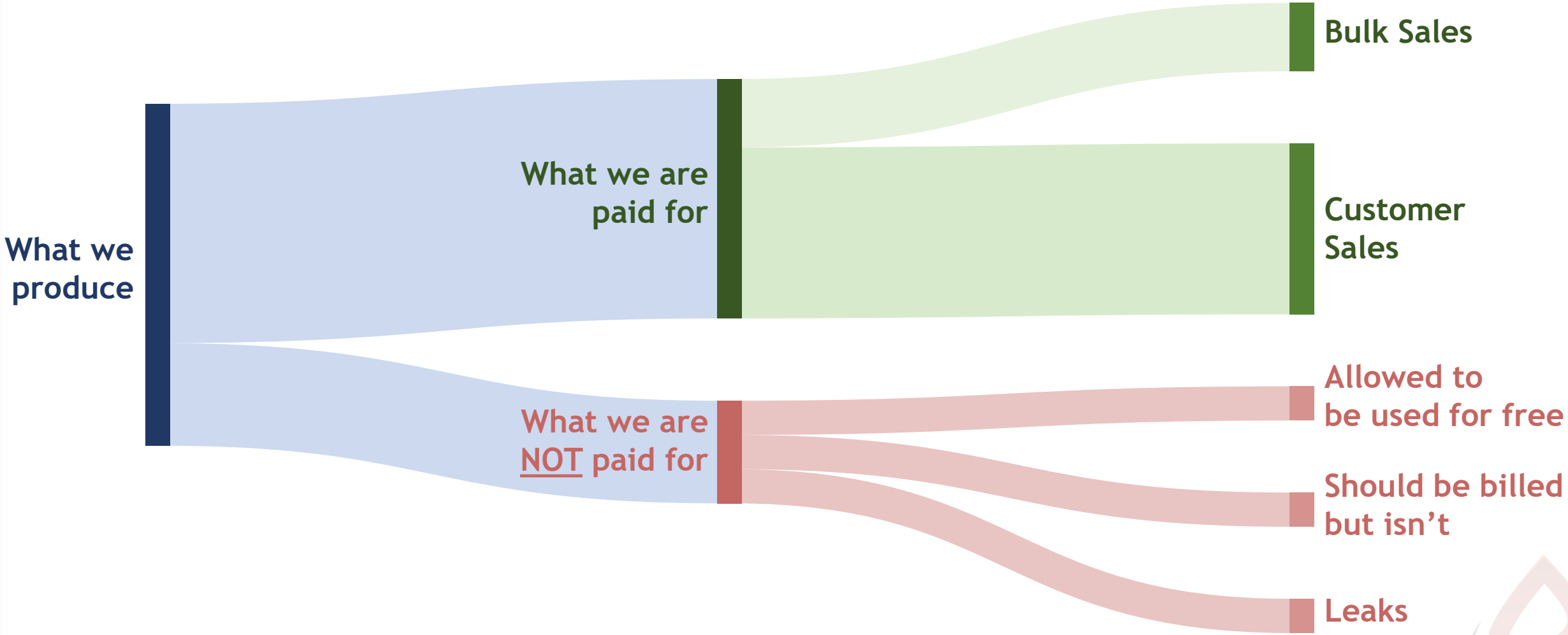
- Graphs, not tables
- Choose the right graph type
- One point per graph
- Emphasized by the title
- Free of clutter

AWWA Free Water Audit Software
Water Balance

Water Audit Report for: Tylerville
Audit Year: 2022 Jan 01 2022 - Dec 31 2022
Data Validity Tier: Tier II (26-50)

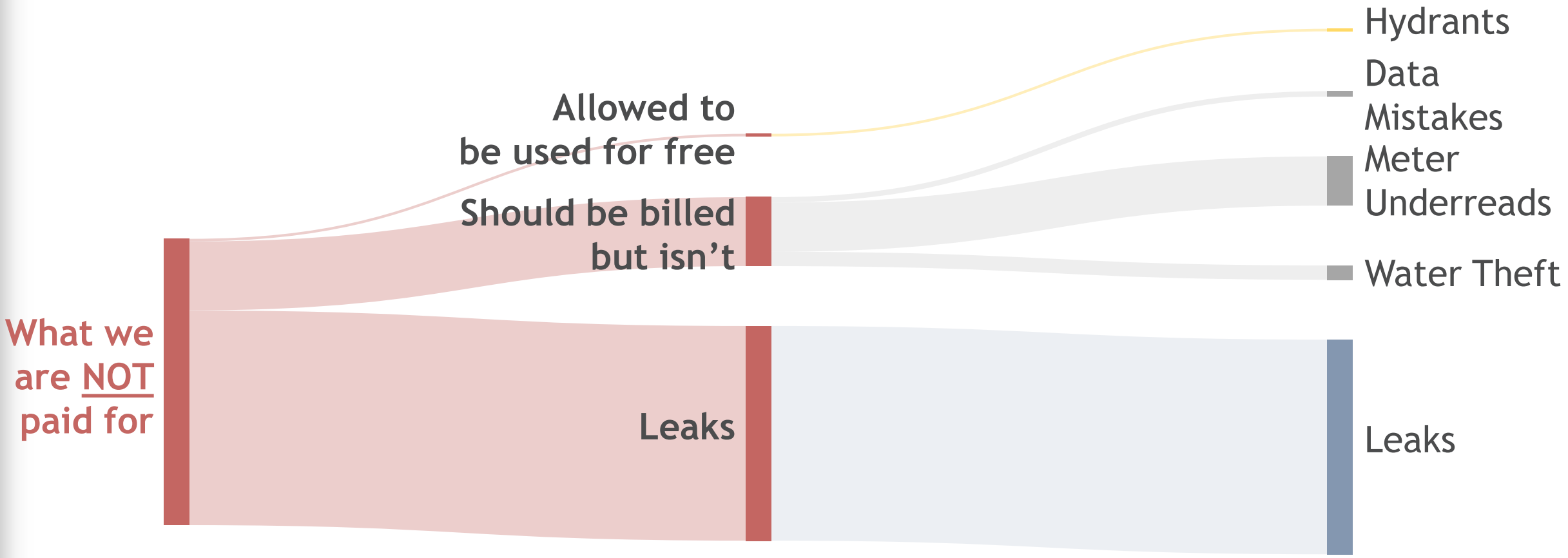
Volume from Own Sources (VOS) (corrected for known errors) 101.355	System Input Volume 101.355	Water Exported (WE) (corrected for known errors) 0.000	Billed Water Exported		
		Water Supplied 101.355	Authorized Consumption 32.182	Billed Authorized Consumption 32.102	Billed Metered Consumption (BMAC) (water exported is removed) 32.102
					Billed Unmetered Consumption (BUAC) 0.000
				Unbilled Authorized Consumption 0.080	Unbilled Metered Consumption (UMAC) 0.000
					Unbilled Unmetered Consumption (UUAC) 0.080
			Water Losses 69.173	Apparent Losses 8.694	Systematic Data Handling Errors (SDHE) 0.080
					Customer Metering Inaccuracies (CMI) 8.533
					Unauthorized Consumption (UC) 0.080
Water Imported (WI) (corrected for known errors) 0.000				Real Losses 60.479	Leakage on Transmission and/or Distribution Mains Not broken down
					Leakage and Overflows at Utility's Storage

Do This Instead



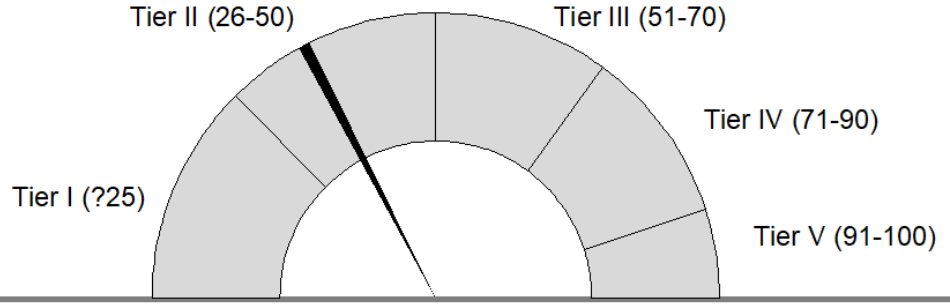
Graph generated with SankeyMATIC

Really Easy to See The Problems



Graph generated with SankeyMATIC

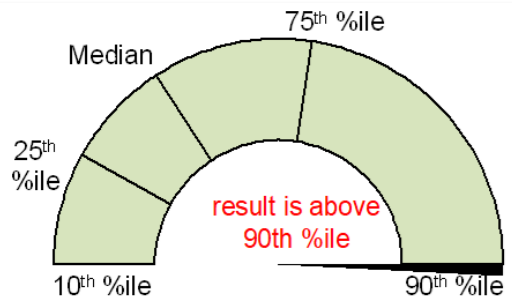
See Loss Control Planning for Tier Details



NRW Components Summary

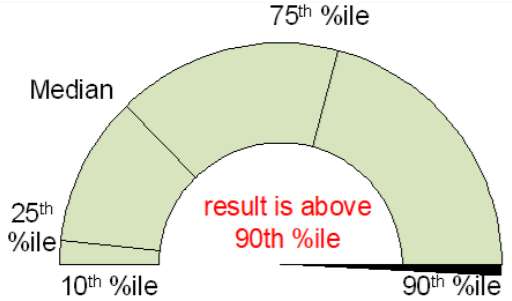
Total Volume of NRW = 69 MG/Yr

Total Cost of NRW = $83,135/Yr



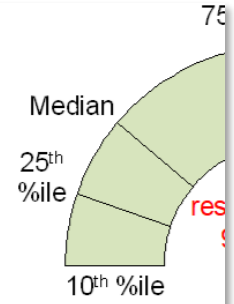
Total Loss Cost Rate

195.49 $/conn/year



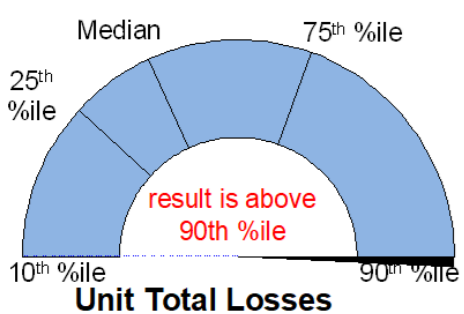
Apparent Loss Cost Rate

102.28 $/conn/year



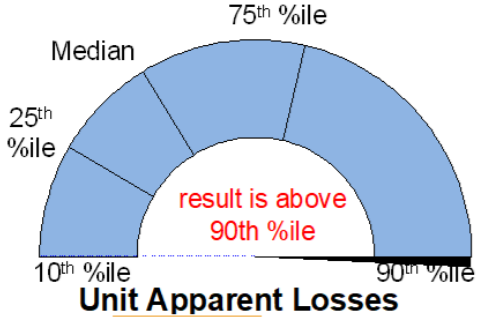
Real Los

93.



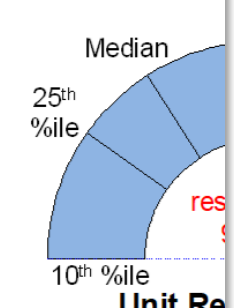
Unit Total Losses

445.9 gal/conn/day



Unit Apparent Losses

56.0 gal/conn/day

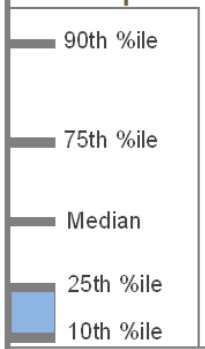


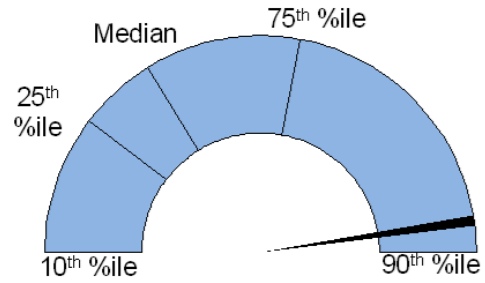
Unit Re

38

Average Operating Pressure

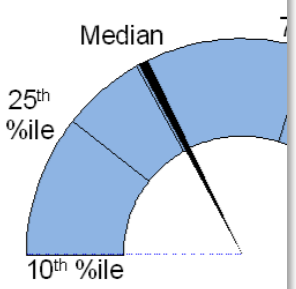
60 psi





Infrastructure Leakage Index (ILI)

5.4 dimensionless



Unit Real Loss

2,071 gal/

See UARL definition for additional guidance on the ILI

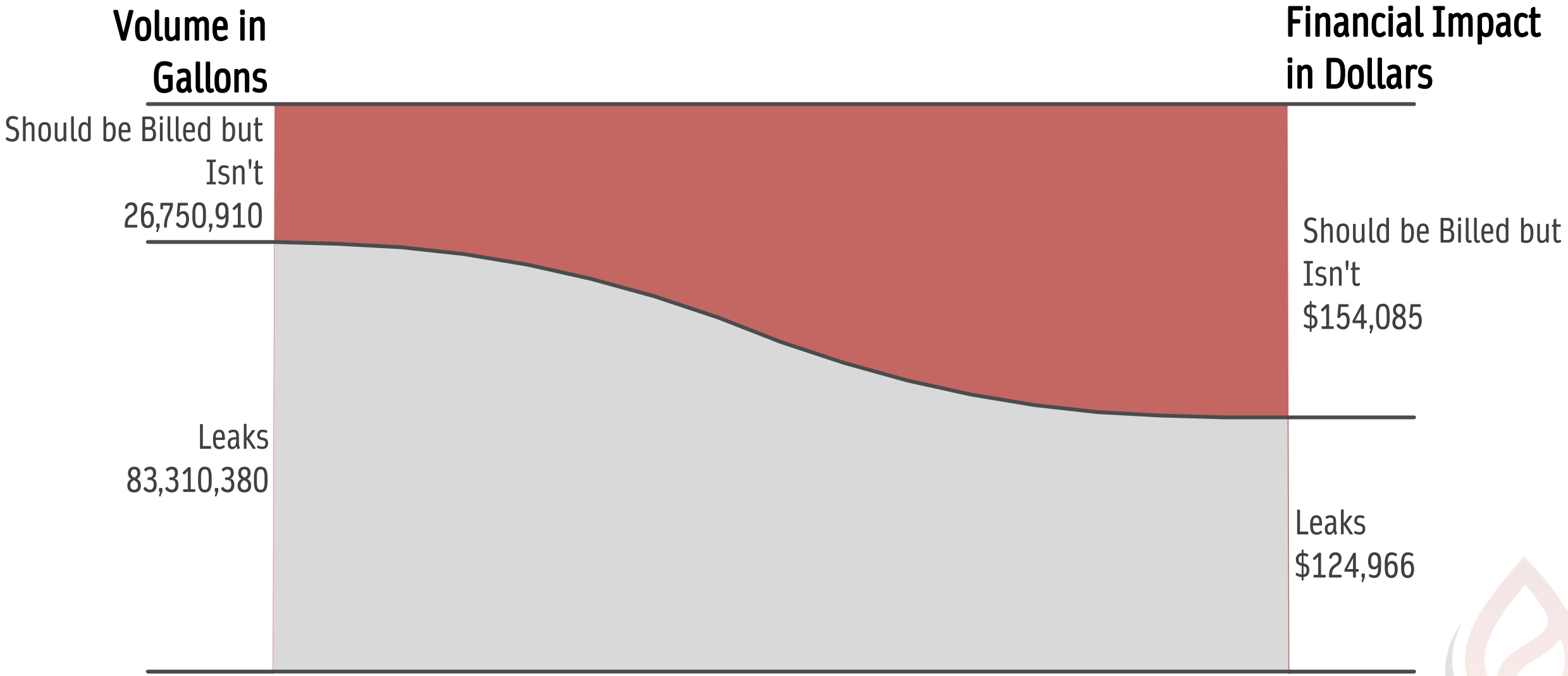
(UARL) Unavoidable Annual Real Losses	11.3	MG/Yr	72.7

Guidance Information for Key Performance Indicators

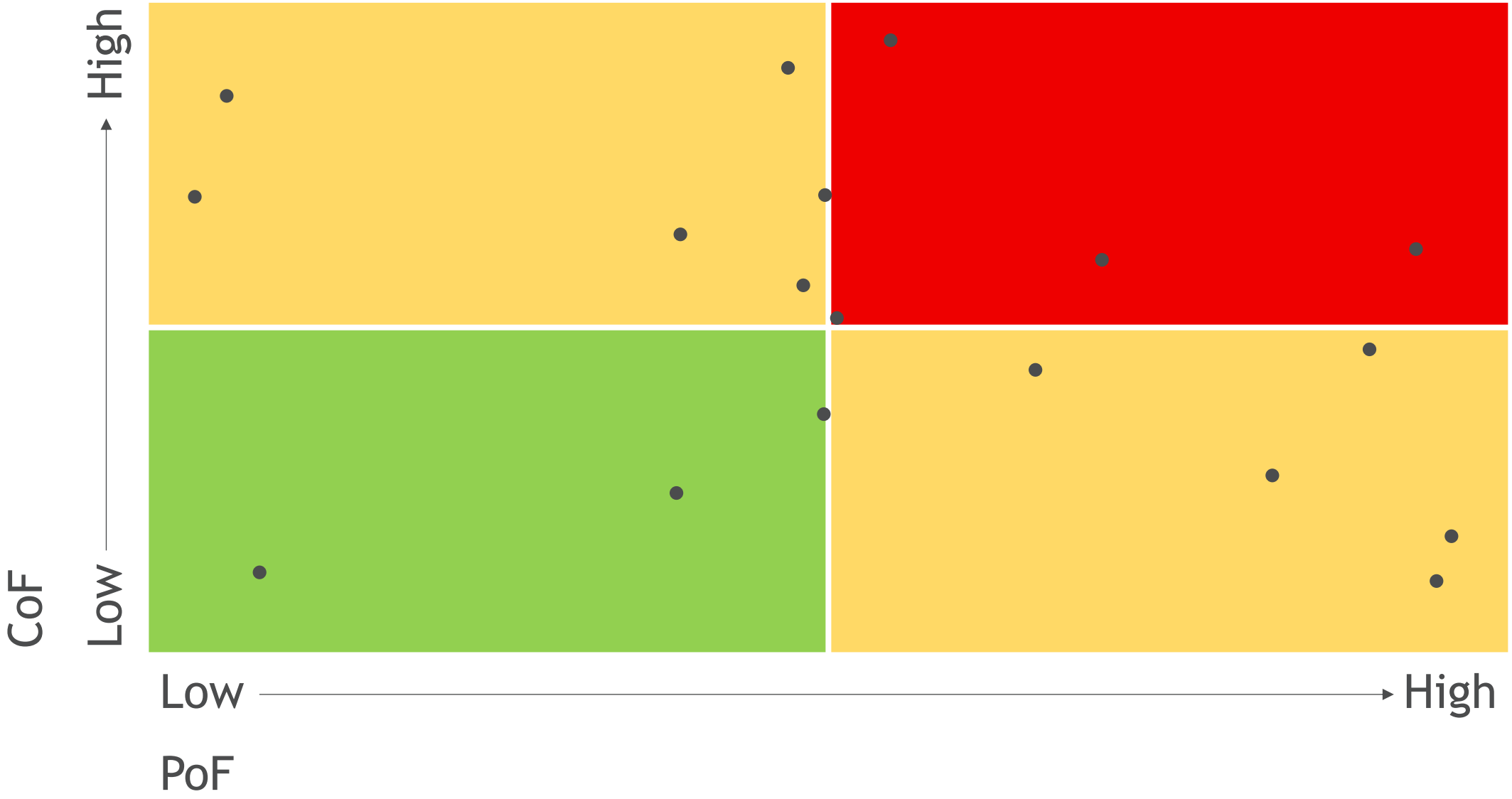
- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs[1].

KPI data by cohorts may be found in WR Manual, Appendix B (2019)[5].

Do This Instead

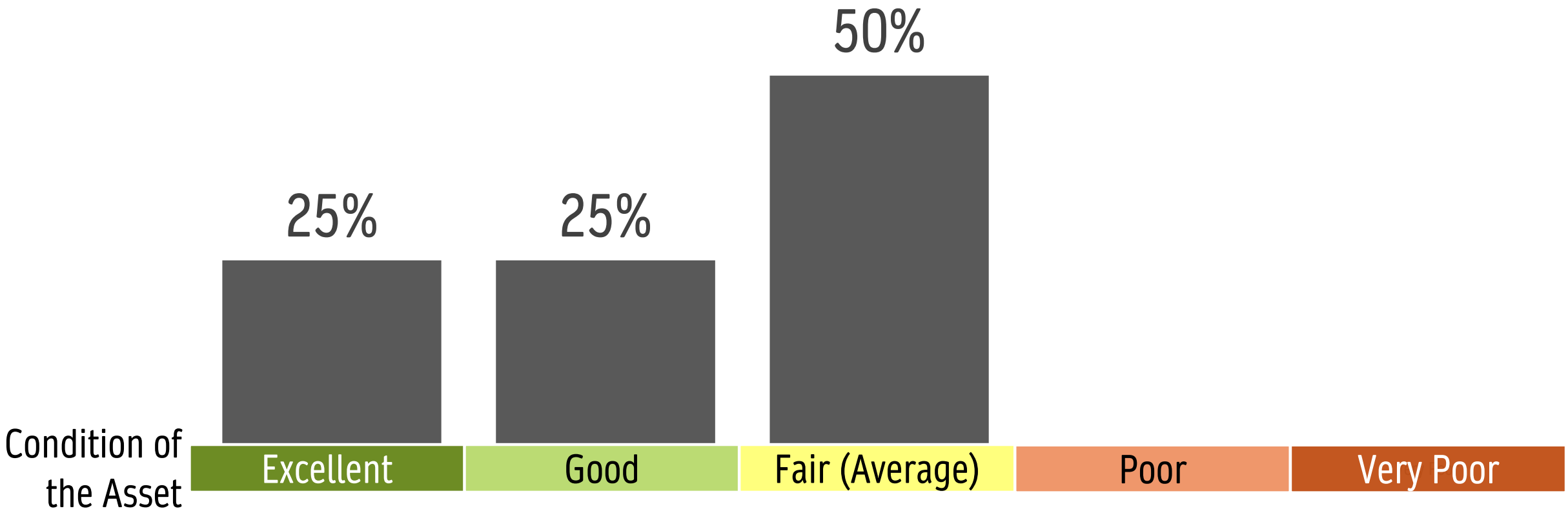


The Classic Asset Management Chart

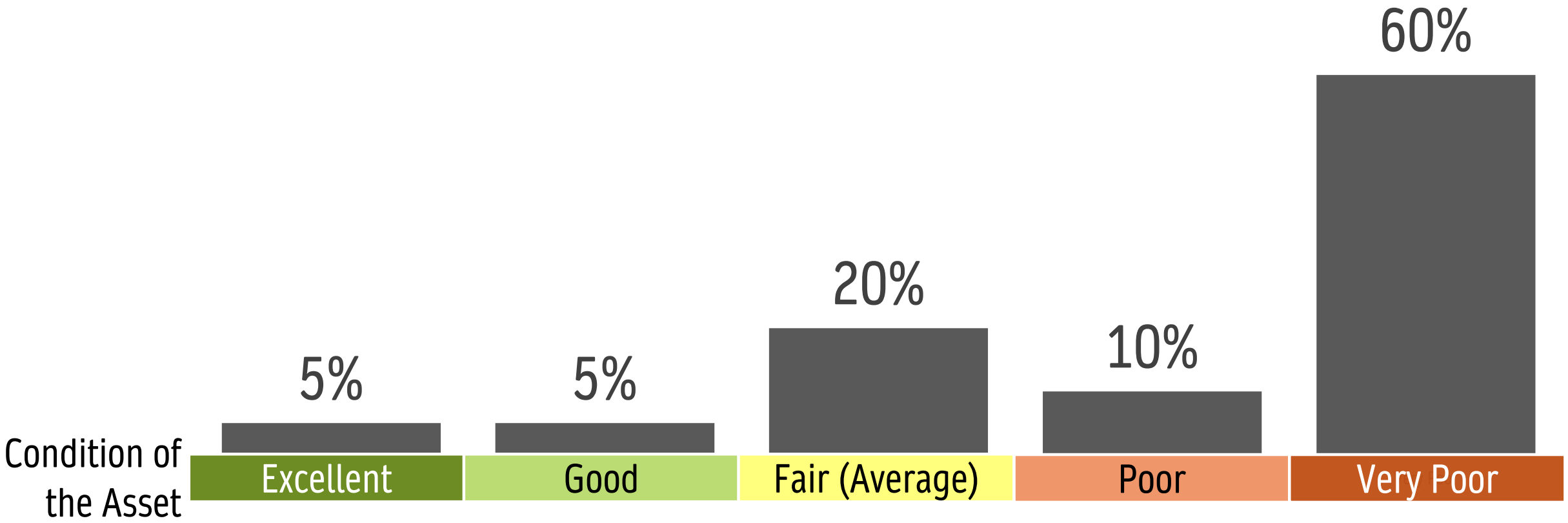


Do this instead!

This utility has assets that are in generally good condition.



This utility has assets that are **NOT** in generally good condition.



Remember the Most Important Asset List?

At Least 50% of Customers Rely on These Assets

- Well #1
- Well #2
- Treatment Plant
- High Service Pump
- Tank #3
- Well Line #1
- Well Line #2
- Main Distribution Line
- Line to Tank #3
- Main After Tank #3

Vital Customers Rely on These Assets

- Line to Tank #4
- Tank #4
- Main After Tank #4
- School Service Line
- Hospital Service Line

Add the Asset Condition to the List

At Least 50% of Customers Rely on These Assets

Well #1	Fair (Average)
Well #2	Fair (Average)
Treatment Plant	Good
High Service Pump	Poor
Tank #3	Poor
Well Line #1	Good
Well Line #2	Good
Main Distribution Line	Fair (Average)
Line to Tank #3	Poor
Main After Tank #3	Fair (Average)

Vital Customers Rely on These Assets

Line to Tank #4	Fair (Average)
Tank #4	Very Poor
Main After Tank #4	Fair (Average)
School Service Line	Fair (Average)
Hospital Service Line	Fair (Average)

Replace These Assets as Quickly as Possible

At Least 50% of Customers Rely on These Assets

Well #1	Fair (Average)
Well #2	Fair (Average)
Treatment Plant	Good
High Service Pump	Poor
Tank #3	Poor
Well Line #1	Good
Well Line #2	Good
Main Distribution Line	Fair (Average)
Line to Tank #3	Poor
Main After Tank #3	Fair (Average)

Vital Customers Rely on These Assets

Line to Tank #4	Fair (Average)
Tank #4	Very Poor
Main After Tank #4	Fair (Average)
School Service Line	Fair (Average)
Hospital Service Line	Fair (Average)

Monitor These Assets Closely

At Least 50% of Customers Rely on These Assets

Well #1	Fair (Average)
Well #2	Fair (Average)
Treatment Plant	Good
High Service Pump	Poor
Tank #3	Poor
Well Line #1	Good
Well Line #2	Good
Main Distribution Line	Fair (Average)
Line to Tank #3	Poor
Main After Tank #3	Fair (Average)

Vital Customers Rely on These Assets

Line to Tank #4	Fair (Average)
Tank #4	Very Poor
Main After Tank #4	Fair (Average)
School Service Line	Fair (Average)
Hospital Service Line	Fair (Average)

Bottom Line

1. Speak to what they care about
2. Use plain language, not jargon or acronyms
3. Have effective data visualizations

Thank You!

Glenn Barnes

Director

Water Finance Assistance

glenn@waterfinanceassistance.com

617-388-4404

WATER FINANCE ASSISTANCE