



VIA E-FILING

Utility Code: 210104

April 28, 2023

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street
Harrisburg, PA 17120

**RE: Aqua Pennsylvania, Inc.
2022 Water Audit Summary
Docket No. M-2023-3037451**

Dear Secretary Chiavetta:

Enclosed for filing are Aqua Pennsylvania, Inc.'s 2022 Annual Water Audit Summaries for the following divisions: (1) Honesdale, (2) Roaring Creek, (3) Southeast Pennsylvania, (4) Shenango, (5) Susquehanna, and (6) Whitehaven. The electronic files of the water audit summaries in Excel format are being sent separately on a Compact Disc via overnight delivery to the Secretary's Bureau.

If you have any questions regarding this filing, please contact me at 610-645-1130.

Sincerely,

A handwritten signature in blue ink, appearing to read "Alex Stahl".

Alexander R. Stahl
Regulatory Counsel

cc: Clinton McKinley, Bureau of Technical Utility Services (via Email)

Enclosures



AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.
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Water Audit Report for: **Aqua Pennsylvania - Honesdale Division**
 Audit Year: **2022** **Jan 01 2022 - Dec 31 2022** **2022**

To access definitions, click the [input name](#) Click 'n' to add notes Click 'g' to determine data validity grade To edit water system info: [go to start page](#)
 All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

choose entry option:

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/>	807.557 MG/Yr		<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>	2.00% percent	
	Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000 MG/Yr				under-registration
	Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000 MG/Yr				VOSEA WIEA WEEA
WATER SUPPLIED:		824.038 MG/Yr				

AUTHORIZED CONSUMPTION

choose entry option:

BMAC BUAC UMAC UUAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/>	493.726 MG/Yr				
	Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000 MG/Yr				
	Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>	21.431 MG/Yr				
	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/>	0.751 MG/Yr			custom 0.751 MG/Yr	
AUTHORIZED CONSUMPTION:		515.908 MG/Yr				

WATER LOSSES

308.130 MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

choose entry option:

SDHE CMI UC	Systematic Data Handling Errors: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	1.234 MG/Yr		<input type="text" value="0.25%"/> <input type="text" value="default"/>		
	Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/>	10.513 MG/Yr		<input type="text" value="2.00%"/> <input type="text" value="percent"/>	under-registration	
	Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	1.234 MG/Yr		<input type="text" value="0.25%"/> <input type="text" value="default"/>		
Apparent Losses:		12.982 MG/Yr				

Real Losses

Real Losses: **295.148** MG/Yr

WATER LOSSES: **308.130** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **330.312** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	264.0 miles			
	Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/>	12,008		(including fire hydrant lead lengths (active and inactive))	
	Service connection density:	45		conn./mile main	
	Are customer meters typically located at the curbstop/property line?	No			
Lp	Average length of (private) customer service line: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/>	35.0 ft		(average distance between property line and meter)	
AOP	Average Operating Pressure: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	60.0 psi			

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/>	\$11.46	\$/1000 gallons (US)	
	Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	\$360.00	\$/Million gallons	Total Annual Operating Cost
				\$4,611,000 \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. *****

[go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

- | |
|---------------------------------------|
| 1: Volume from Own Sources (VOS) |
| 2: Billed Metered (BMAC) |
| 3: Number of Service Connections (Nc) |

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

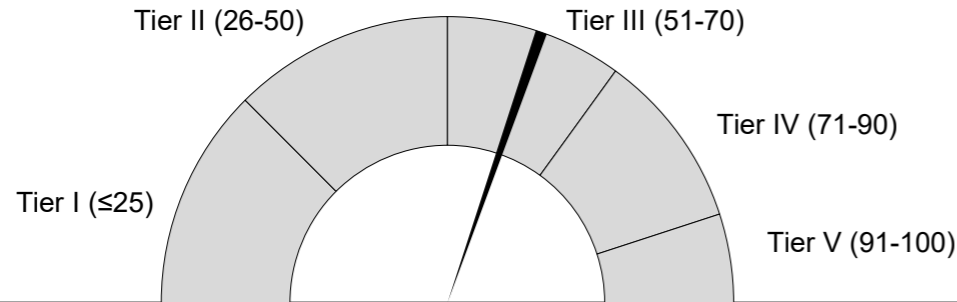
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Data Validity

Data Validity Score: 60 **Data Validity Tier: Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details

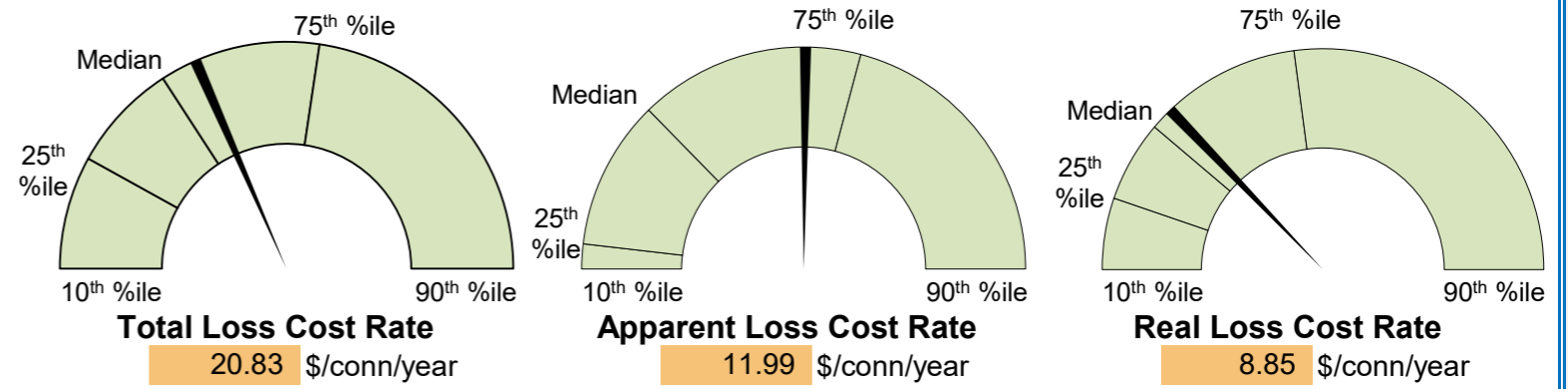


Actual KPI result

Key Performance Indicators

Target (see Worksheet)

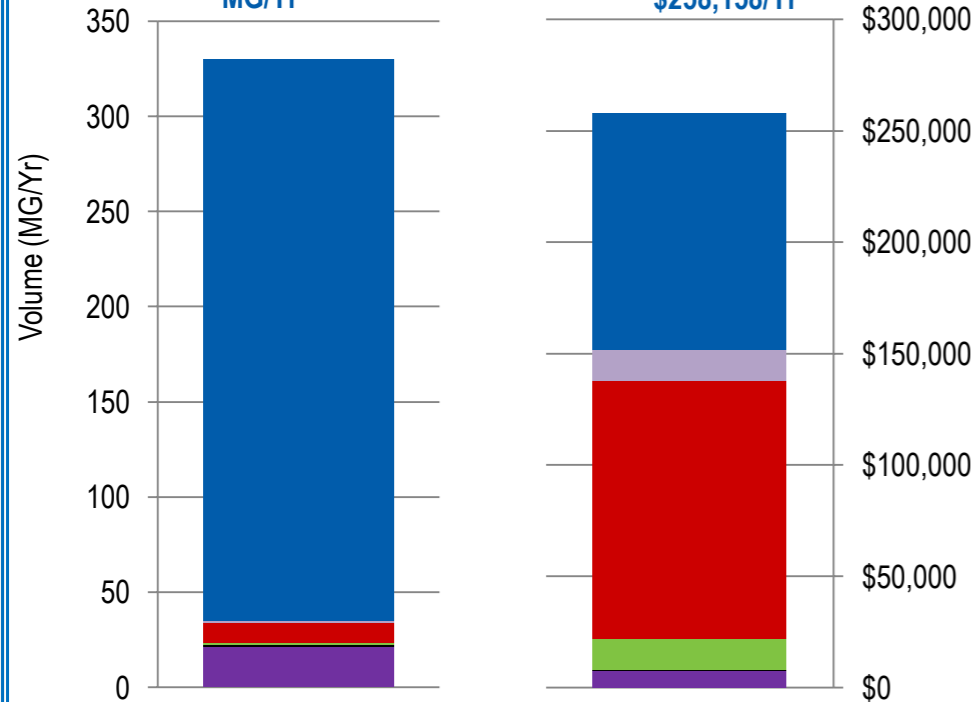
gauge %iles per validated industry ranges²



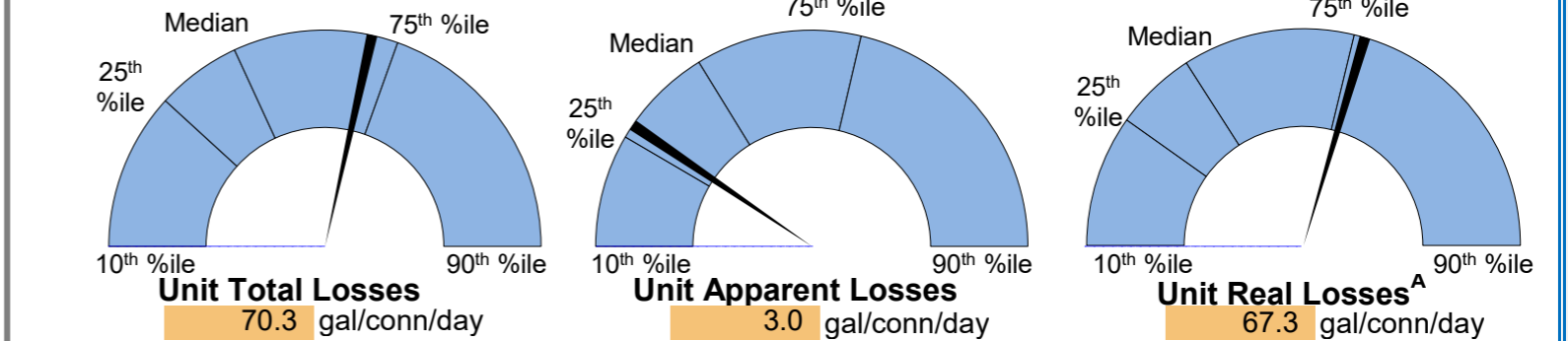
NRW Components Summary

Total Volume of NRW = 330 MG/Yr

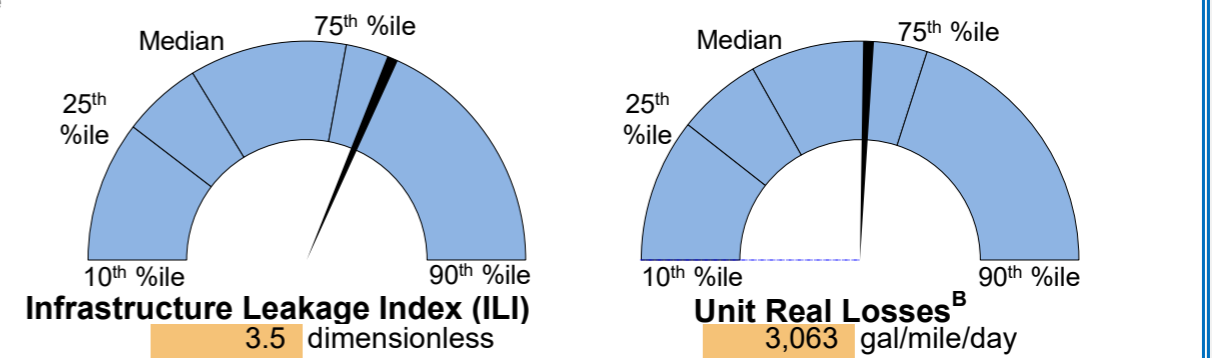
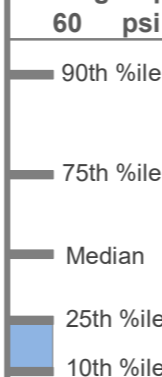
Total Cost of NRW = \$258,158/Yr



	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	13.0	\$143,919	CRUC
Real Losses	295.1	\$106,253	VPC
Unbilled Authorized Cons	22.2	\$7,986	VPC
Non-Revenue Water	330.3	\$258,158	Blended



Average Operating Pressure



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **83.8** MG/Yr **19.1** gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs¹.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)¹, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)².
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)⁵.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.
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Water Audit Report for: **Aqua Pennsylvania - Roaring Creek Division**
 Audit Year: **2022** **Jan 01 2022 - Dec 31 2022** **2022**

To access definitions, click the [input name](#) Click 'n' to add notes Click 'g' to determine data validity grade To edit water system info: [go to start page](#)

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

WATER SUPPLIED

choose entry option:

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="6"/>	<input type="text" value="1,806.868"/>	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="4"/>	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>	
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	<input type="text" value="0.000"/>	MG/Yr							VOSEA
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	<input type="text" value="0.000"/>	MG/Yr							WIEA WEEA

WATER SUPPLIED: MG/Yr

AUTHORIZED CONSUMPTION

choose entry option:

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="8"/>	<input type="text" value="1,048.436"/>	MG/Yr						
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	<input type="text" value="0.000"/>	MG/Yr						
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="4"/>	<input type="text" value="58.484"/>	MG/Yr						
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="2.621"/>	MG/Yr						

Default option selected for Unbilled Unmetered, with automatic data grading of 3

AUTHORIZED CONSUMPTION: MG/Yr

WATER LOSSES

MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

choose entry option:

SDHE	Systematic Data Handling Errors:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="2.621"/>	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>					
CMI	Customer Metering Inaccuracies:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="6"/>	<input type="text" value="22.590"/>	MG/Yr	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>				
UC	Unauthorized Consumption:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="2.621"/>	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>					

Default option selected for Unauthorized Consumption, with automatic data grading of 3

Apparent Losses: MG/Yr

Real Losses

Real Losses: MG/Yr

WATER LOSSES: MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="7"/>	<input type="text" value="300.0"/>	miles	(including fire hydrant lead lengths)						
Nc	Number of service connections:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="5"/>	<input type="text" value="22,020"/>		(active and inactive)						
	Service connection density:					<input type="text" value="73"/>	conn./mile main						
Are customer meters typically located at the curbstop/property line?													<input type="text" value="No"/>
Lp	Average length of (private) customer service line:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="1"/>	<input type="text" value="25.0"/>	ft	(average distance between property line and meter)						
AOP	Average Operating Pressure:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="7"/>	<input type="text" value="60.0"/>	psi							

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="5"/>	<input type="text" value="\$11.46"/>	\$/1000 gallons (US)	Total Annual Operating Cost					
VPC	Variable Production Cost:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	<input type="text" value="\$360.00"/>	\$/Million gallons	<input type="text" value="\$3,439,000"/> \$/yr (optional input)					

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***** [go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

- | |
|---------------------------------------|
| 1: Volume from Own Sources (VOS) |
| 2: Billed Metered (BMAC) |
| 3: Number of Service Connections (Nc) |

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

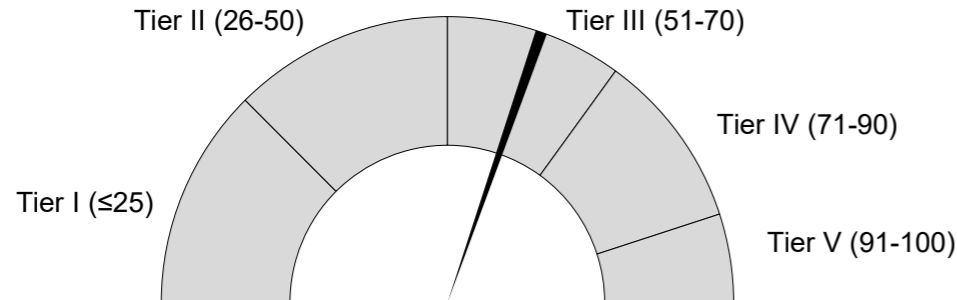
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Data Validity

Data Validity Score: 60 **Data Validity Tier: Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details

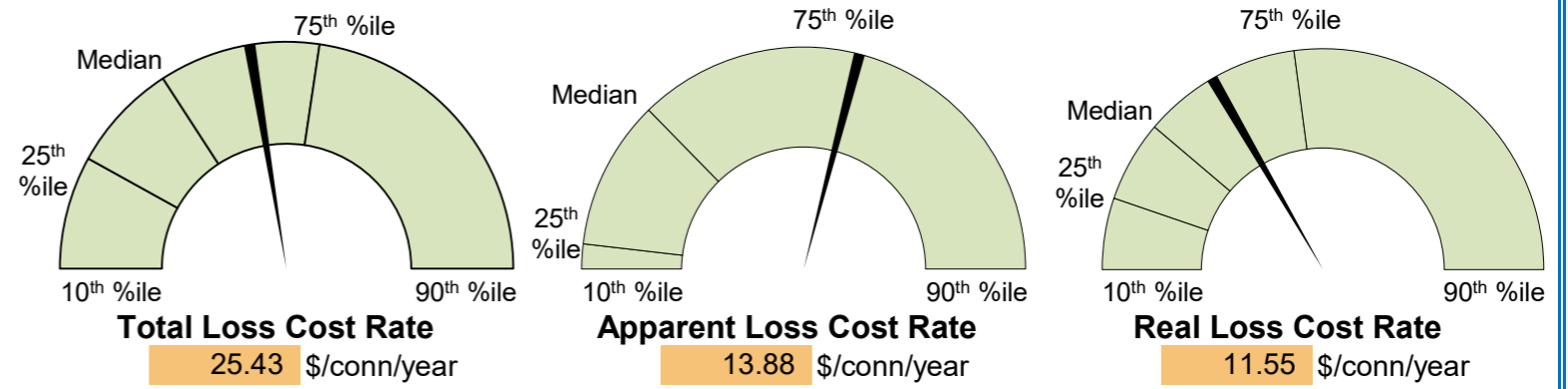


Actual KPI result

Key Performance Indicators

Target (see Worksheet)

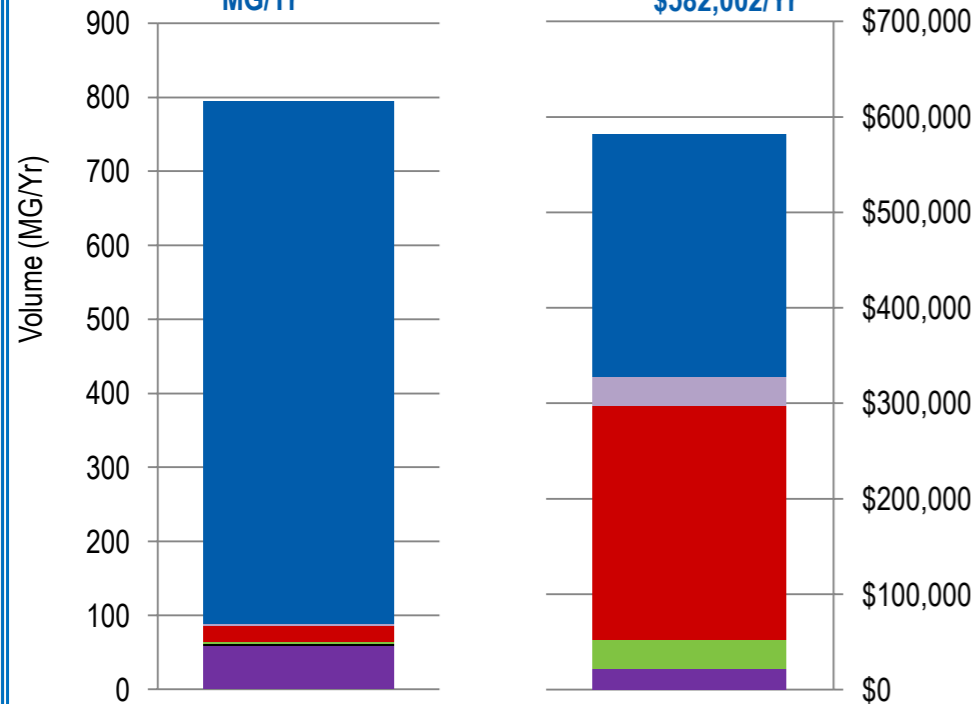
gauge %iles per validated industry ranges²



NRW Components Summary

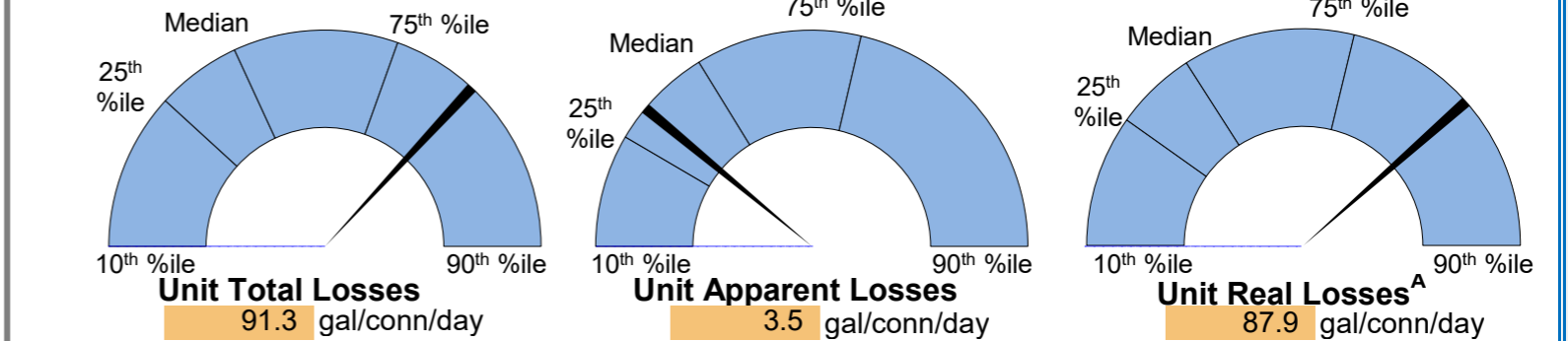
Total Volume of NRW = 794 MG/Yr

Total Cost of NRW = \$582,002/Yr

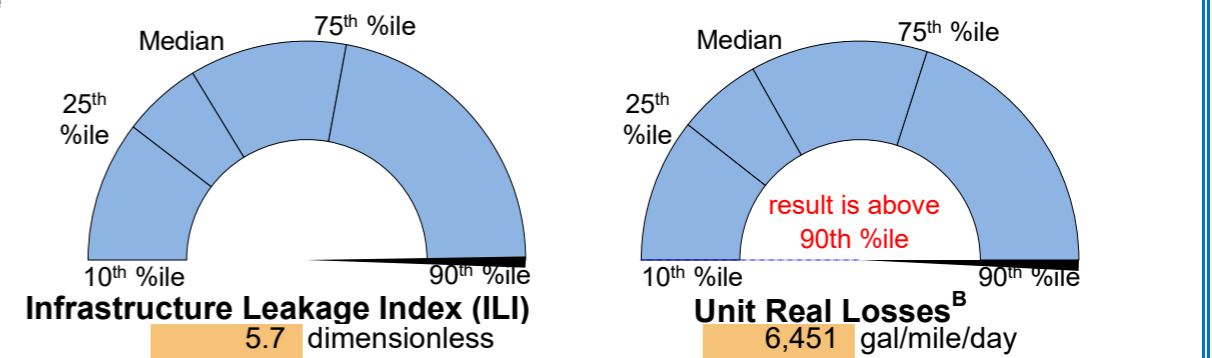
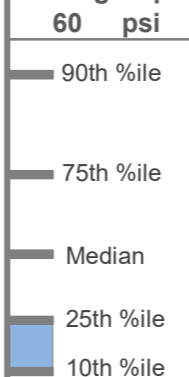


Real Losses	Unauthorized Consumption
Systematic Data Handling Errors	Unbilled Unmetered Auth Cons
Customer Metering Inaccuracies	Unbilled Metered Authorized Cons

	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	27.8	\$305,711	CRUC
Real Losses	706.4	\$254,293	VPC
Unbilled Authorized Cons	61.1	\$21,998	VPC
Non-Revenue Water	795.3	\$582,002	Blended



Average Operating Pressure



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses 125.0 MG/Yr 15.6 gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs¹.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)¹, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)².
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)⁵.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.
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Water Audit Report for: **Aqua Pennsylvania - Shenango Division**

Audit Year: **2022** **Jan 01 2022 - Dec 31 2022** **2022**

To access definitions, click the [input name](#)

Click 'n' to add notes To edit water system info: [go to start page](#)

Click 'g' to determine data validity grade

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

choose entry option:

	Volume from Own Sources:									
VOS		<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="6"/>	<input type="text" value="3,677.924"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="4"/>	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>
WI	Water Imported:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="6"/>	<input type="text" value="188.141"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="4"/>	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>
WE	Water Exported:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="6"/>	<input type="text" value="8.210"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="4"/>	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>

WATER SUPPLIED: MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="8"/>	<input type="text" value="2,986.951"/>	MG/Yr				
BUAC	Billed Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="n/a"/>	<input type="text" value="0.000"/>	MG/Yr				
UMAC	Unbilled Metered:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="4"/>	<input type="text" value="103.671"/>	MG/Yr				
UUAC	Unbilled Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="7.467"/>	MG/Yr				

choose entry option:

Default option selected for Unbilled Unmetered, with automatic data grading of 3

AUTHORIZED CONSUMPTION: MG/Yr

WATER LOSSES

MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

SDHE	Systematic Data Handling Errors:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="7.467"/>	MG/Yr				
CMI	Customer Metering Inaccuracies:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="6"/>	<input type="text" value="63.074"/>	MG/Yr				
UC	Unauthorized Consumption:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="7.467"/>	MG/Yr				

choose entry option:

Default option selected for Unauthorized Consumption, with automatic data grading of 3

Apparent Losses: MG/Yr

Real Losses

Real Losses: MG/Yr

WATER LOSSES: MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="7"/>	<input type="text" value="534.0"/>	miles	(including fire hydrant lead lengths)				
Nc	Number of service connections:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="5"/>	<input type="text" value="30,800"/>		(active and inactive)				
	Service connection density:				<input type="text" value="58"/>	conn./mile main				
Lp	Are customer meters typically located at the curbstop/property line?				<input type="text" value="No"/>					
	Average length of (private) customer service line:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="1"/>	<input type="text" value="25.0"/>	ft	(average distance between property line and meter)				
AOP	Average Operating Pressure:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="7"/>	<input type="text" value="60.0"/>	psi					

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="5"/>	<input type="text" value="\$11.46"/>	\$/1000 gallons (US)				
VPC	Variable Production Cost:	<input type="text" value="n"/> <input type="text" value="g"/>	<input type="text" value="9"/>	<input type="text" value="\$360.00"/>	\$/Million gallons				
						Total Annual Operating Cost			
						<input type="text" value="\$22,028,000"/>		\$/yr (optional input)	

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. *****

[go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

- | |
|---------------------------------------|
| 1: Volume from Own Sources (VOS) |
| 2: Billed Metered (BMAC) |
| 3: Number of Service Connections (Nc) |

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

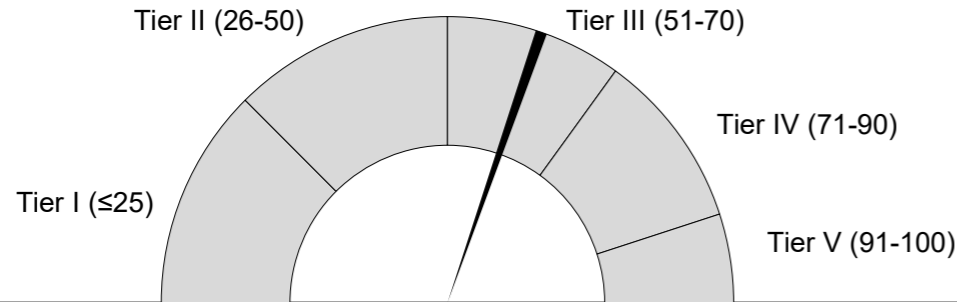
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details

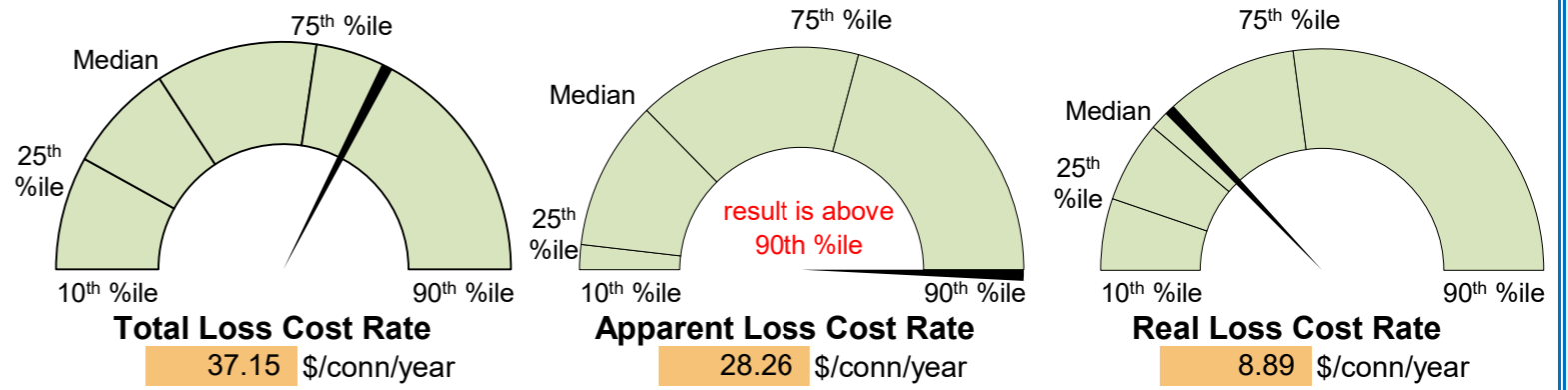


Actual KPI result

Key Performance Indicators

Target (see Worksheet)

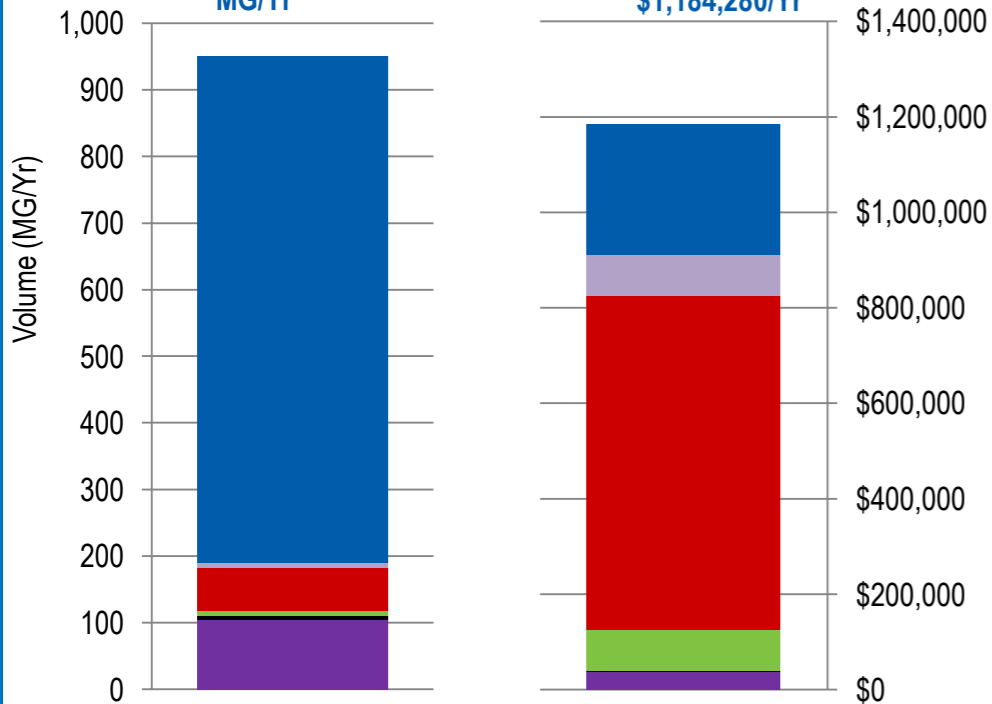
gauge %iles per validated industry ranges²



NRW Components Summary

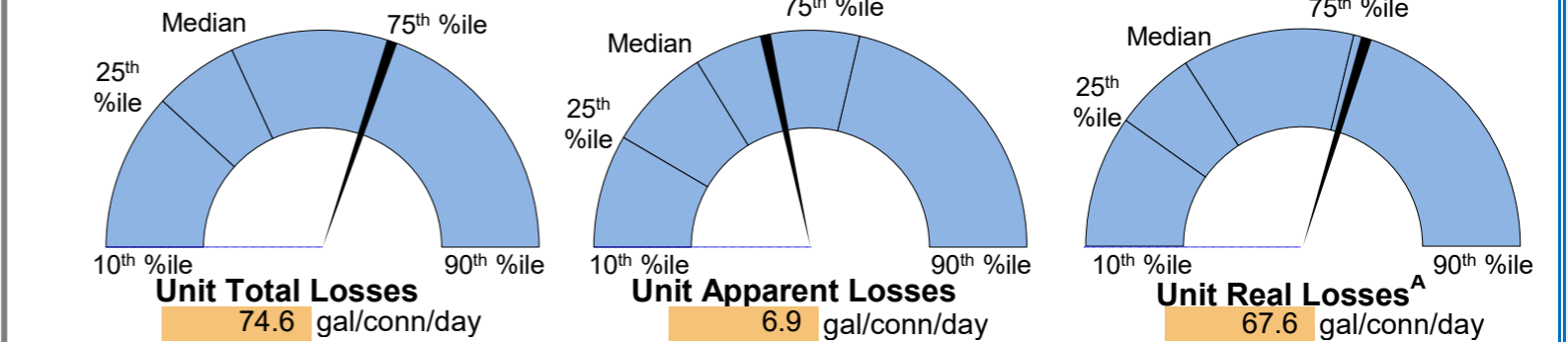
Total Volume of NRW = 948 MG/Yr

Total Cost of NRW = \$1,184,280/Yr

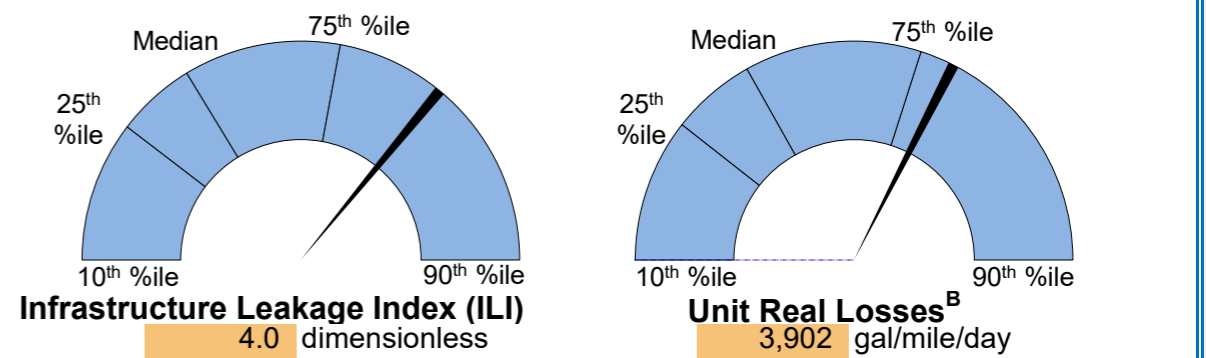
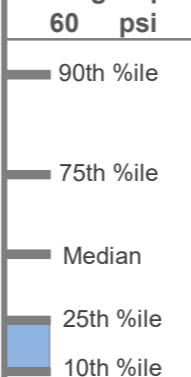


Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	760.5	\$273,776	VPC
Systematic Data Handling Errors	111.1	\$40,010	VPC
Customer Metering Inaccuracies	78.0	\$870,495	CRUC
Unauthorized Consumption	0	0	0
Unbilled Unmetered Auth Cons	0	0	0
Unbilled Metered Authorized Cons	0	0	0

Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	78.0	\$870,495	CRUC
Real Losses	760.5	\$273,776	VPC
Unbilled Authorized Cons	111.1	\$40,010	VPC
Non-Revenue Water	949.6	\$1,184,280	Blended



Average Operating Pressure



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **188.4** MG/Yr **16.8** gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs¹.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)¹, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)².
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)⁵.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.
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Water Audit Report for: **Aqua Pennsylvania - SEPA Division**

Audit Year: **2022** **Jan 01 2022 - Dec 31 2022** **2022**

To access definitions, click the [input name](#) Click 'n' to add notes To edit water system info: [go to start page](#)
 Click 'g' to determine data validity grade All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

choose entry option:

VOS WI WE	Volume from Own Sources:	n g 6	33,084.221	MG/Yr	n g 4	2.00%	percent		
	Water Imported:	n g 6	991.041	MG/Yr	n g 4	2.00%	percent		
	Water Exported:	n g 6		MG/Yr					
WATER SUPPLIED:			34,770.676	MG/Yr					

under-registration VOSEA
under-registration WIEA
WEEA

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUAC	Billed Metered:	n g 8	29,024.818	MG/Yr					
	Billed Unmetered:	n g n/a	0.000	MG/Yr					
	Unbilled Metered:	n g n/a	0.000	MG/Yr					
	Unbilled Unmetered:	n g 3	72.562	MG/Yr					
AUTHORIZED CONSUMPTION:			29,097.380	MG/Yr					

choose entry option:
0.25% default

Default option selected for Unbilled Unmetered, with automatic data grading of 3

WATER LOSSES

5,673.295 MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

SDHE CMI UC	Systematic Data Handling Errors:	n g 3	72.562	MG/Yr	0.25%	default		
	Customer Metering Inaccuracies:	n g 6	592.343	MG/Yr	2.00%	percent		
	Unauthorized Consumption:	n g 3	72.562	MG/Yr	0.25%	default		
Apparent Losses:			737.467	MG/Yr				

choose entry option:
0.25% default
2.00% percent
0.25% default

under-registration

Real Losses

Real Losses: **4,935.828** MG/Yr

WATER LOSSES: **5,673.295** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **5,745.858** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains:	n g 7	5,866.0	miles	(including fire hydrant lead lengths)				
	Number of service connections:	n g 5	385,000		(active and inactive)				
	Service connection density:		66	conn./mile main					
Lp	Are customer meters typically located at the curbstop/property line?		No						
	Average length of (private) customer service line:	n g 1	35.0	ft	(average distance between property line and meter)				
AOP	Average Operating Pressure:		n g 7	60.0	psi				

COST DATA

CRUC VPC	Customer Retail Unit Charge:	n g 5	\$11.46	\$/1000 gallons (US)				
	Variable Production Cost:	n g 9	\$360.00	\$/Million gallons	Total Annual Operating Cost		\$194,140,000	\$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***** [go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

- | |
|---------------------------------------|
| 1: Volume from Own Sources (VOS) |
| 2: Billed Metered (BMAC) |
| 3: Number of Service Connections (Nc) |

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

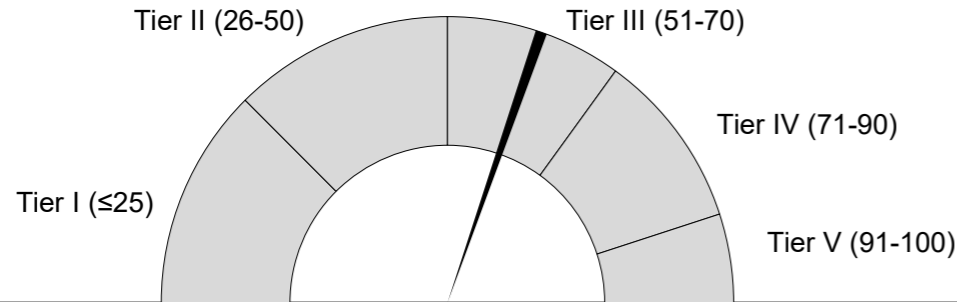
Unit Total Losses:	[input]	gal/conn/day
Unit Apparent Losses:	[input]	gal/conn/day
Unit Real Losses ^A :	[input]	gal/conn/day
Unit Real Losses ^B :	[input]	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details

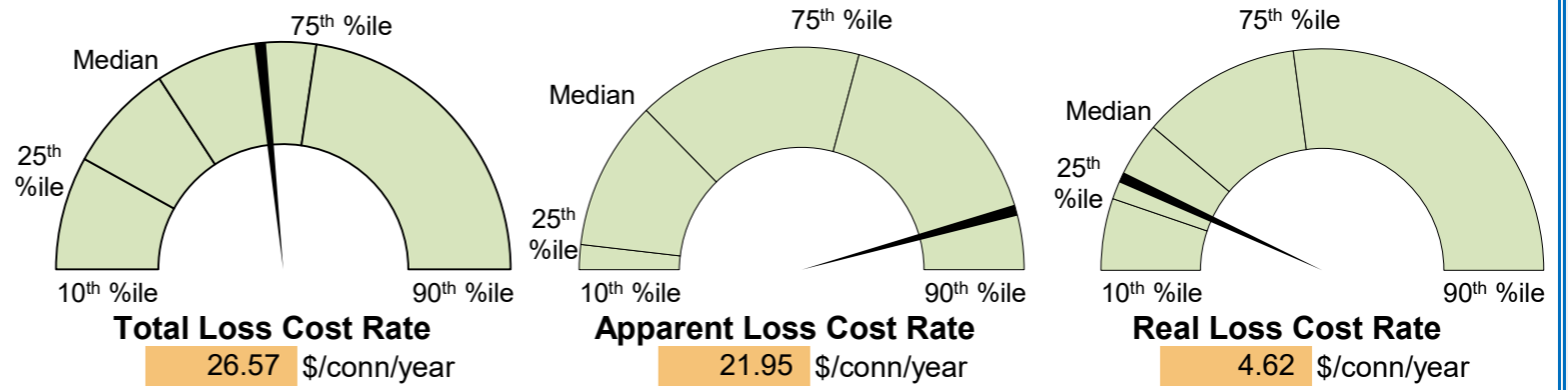


Actual KPI result

Key Performance Indicators

Target (see Worksheet)

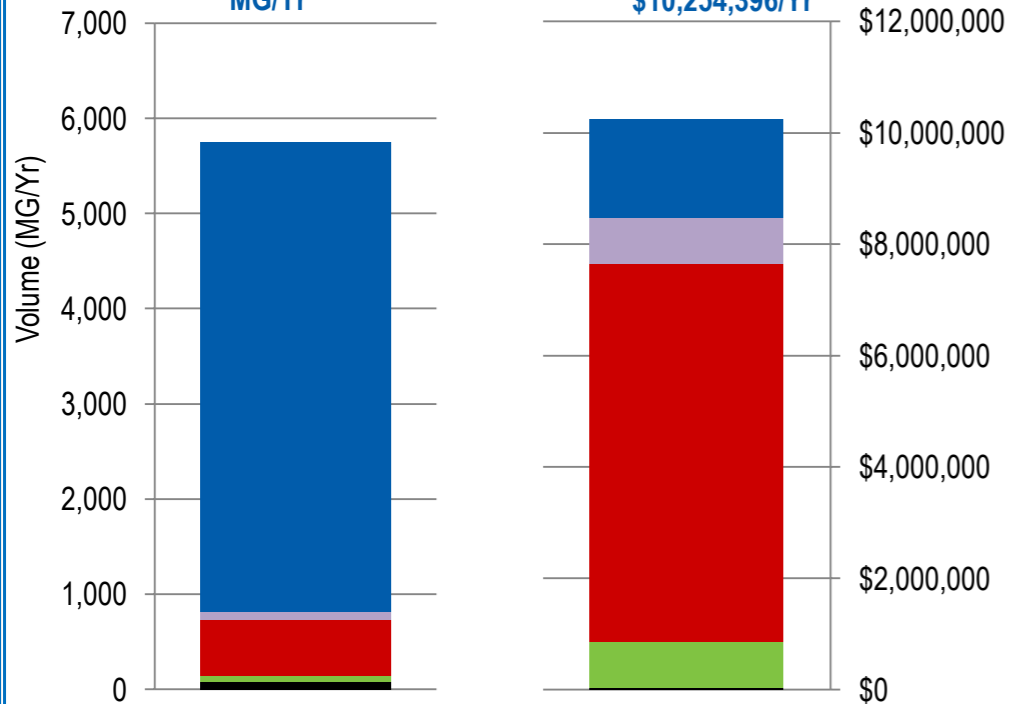
gauge %iles per validated industry ranges²



NRW Components Summary

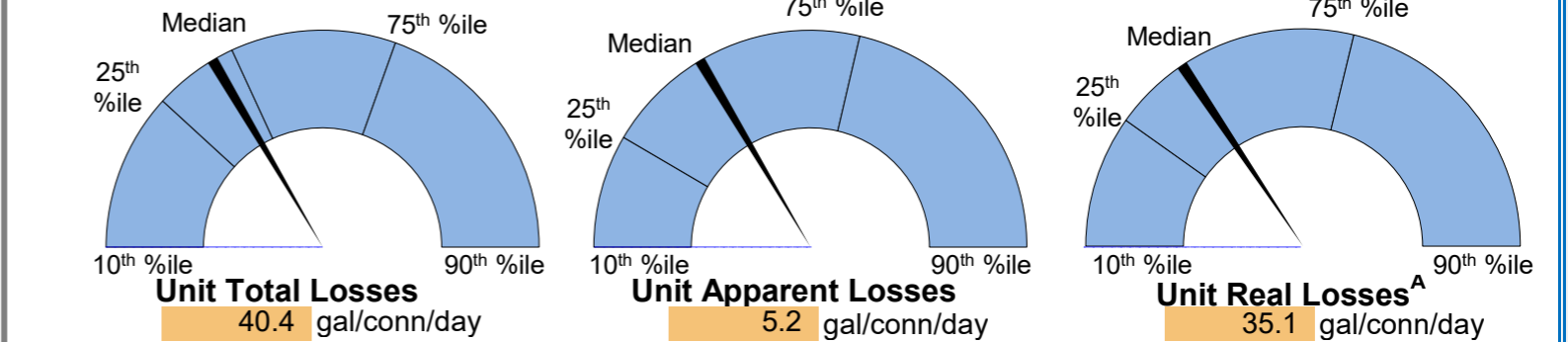
Total Volume of NRW = 5,746 MG/Yr

Total Cost of NRW = \$10,254,396/Yr

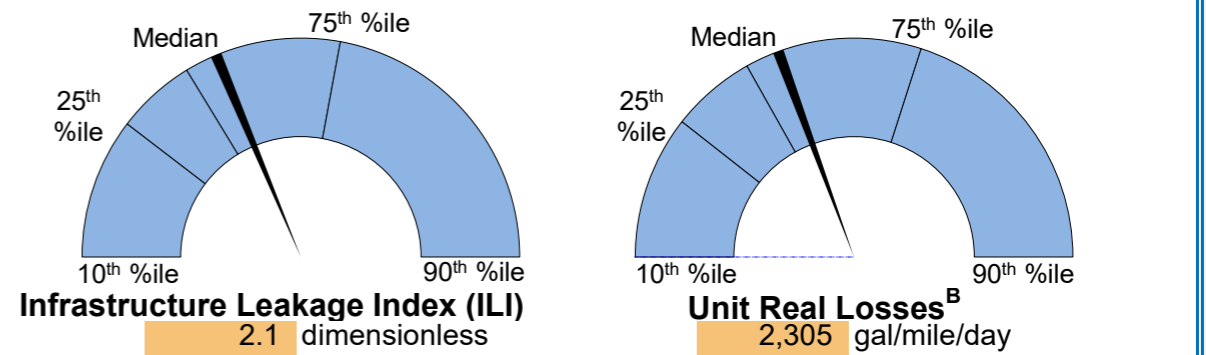
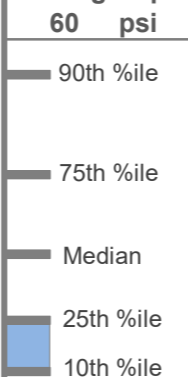


Real Losses	Unauthorized Consumption
Systematic Data Handling Errors	Unbilled Unmetered Auth Cons
Customer Metering Inaccuracies	Unbilled Metered Authorized Cons

	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	737.5	\$8,451,375	CRUC
Real Losses	4,935.8	\$1,776,898	VPC
Unbilled Authorized Cons	72.6	\$26,122	VPC
Non-Revenue Water	5,745.9	\$10,254,396	Blended



Average Operating Pressure



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **2,378.9** MG/Yr **16.9** gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs¹.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)¹, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)².
- KPI %iles shown above are not segregated by cohorts. Limited
- KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)⁵.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



AWWA Free Water Audit Software: Worksheet

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American Water Works Association.
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Water Audit Report for: **Aqua Pennsylvania - Susquehanna Division**
 Audit Year: **2022** **Jan 01 2022 - Dec 31 2022** **2022**

To access definitions, click the [input name](#) Click 'n' to add notes Click 'g' to determine data validity grade To edit water system info: [go to start page](#)

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

choose entry option:

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/>	428.392 MG/Yr		<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>	2.00% percent	
	Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000 MG/Yr				under-registration
	Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000 MG/Yr				VOSEA WIEA WEEA
WATER SUPPLIED:		437.135 MG/Yr				

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/>	313.005 MG/Yr				
	Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000 MG/Yr				
	Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/>	11.231 MG/Yr				choose entry option:
	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	0.783 MG/Yr				0.25% default
Default option selected for Unbilled Unmetered, with automatic data grading of 3						
AUTHORIZED CONSUMPTION:		325.019 MG/Yr				

WATER LOSSES

112.116 MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

SDHE CMI UC	Systematic Data Handling Errors: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	0.783 MG/Yr				
	Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="6"/>	6.617 MG/Yr				under-registration
	Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	0.783 MG/Yr				0.25% default
Default option selected for Unauthorized Consumption, with automatic data grading of 3						
Apparent Losses:		8.182 MG/Yr				

Real Losses

Real Losses: 103.934 MG/Yr

WATER LOSSES: 112.116 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 124.130 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	85.0 miles			(including fire hydrant lead lengths)
	Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/>	5,377			(active and inactive)
	Service connection density:	63	conn./mile main		
Are customer meters typically located at the curbstop/property line? <input type="text" value="No"/>					
Lp	Average length of (private) customer service line: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="1"/>	25.0 ft	(average distance between property line and meter)		
AOP	Average Operating Pressure: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	85.0 psi			

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="5"/>	\$11.46	\$/1000 gallons (US)		
	Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	\$360.00	\$/Million gallons		Total Annual Operating Cost
					\$815,000 \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. ***** [go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

- | |
|---------------------------------------|
| 1: Volume from Own Sources (VOS) |
| 2: Billed Metered (BMAC) |
| 3: Number of Service Connections (Nc) |

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

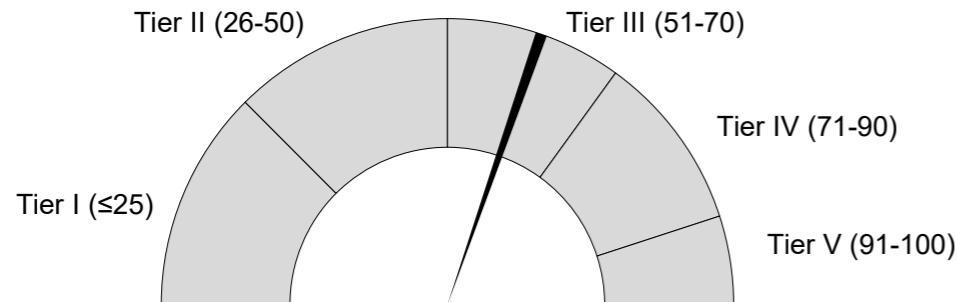
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Data Validity

Data Validity Score: **60** Data Validity Tier: **Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details

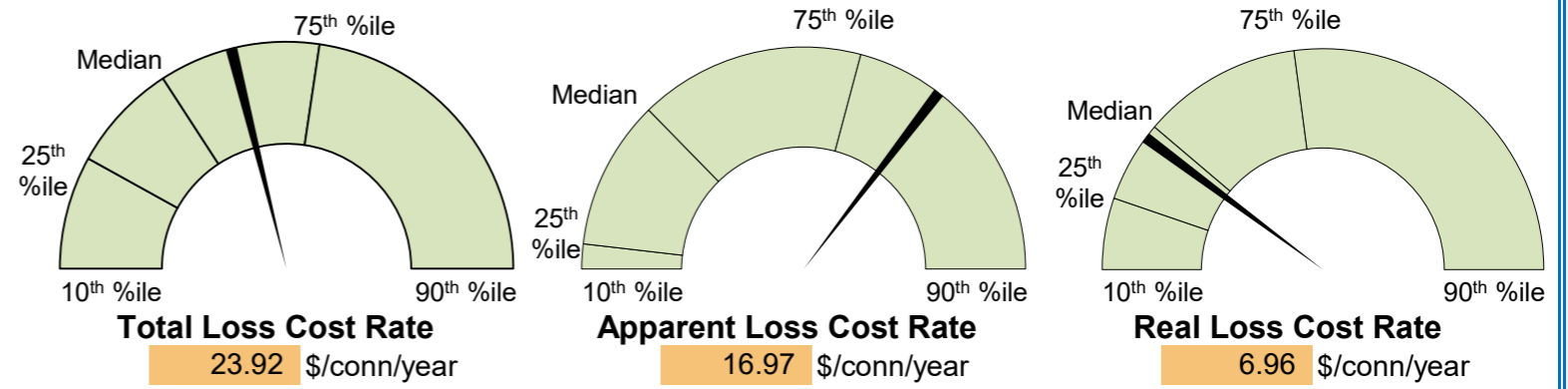


Actual KPI result

Key Performance Indicators

Target (see Worksheet)

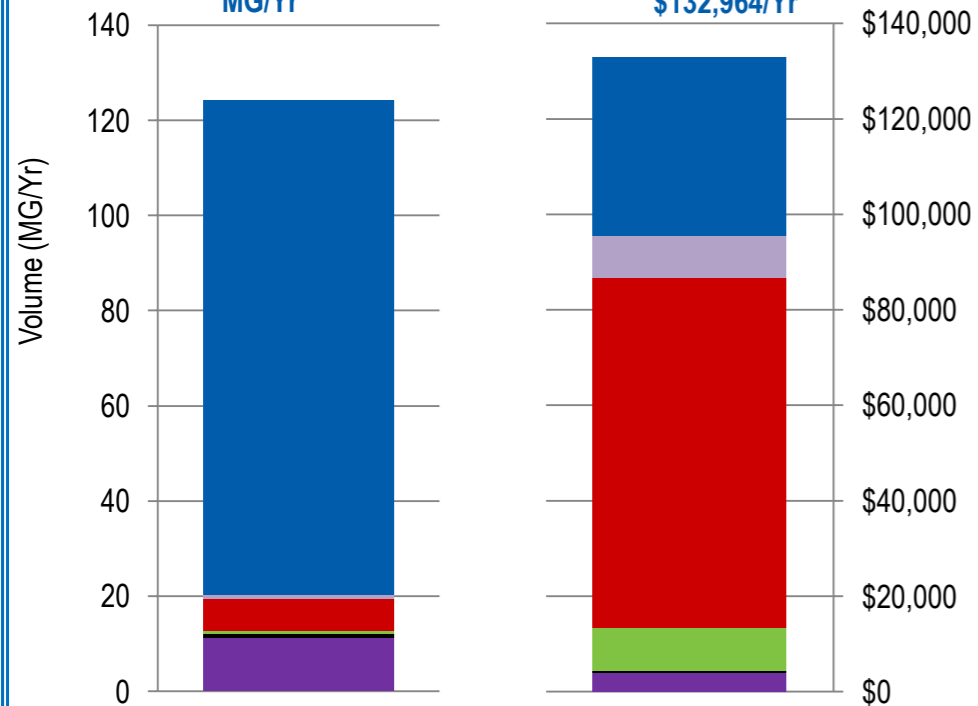
gauge %iles per validated industry ranges²



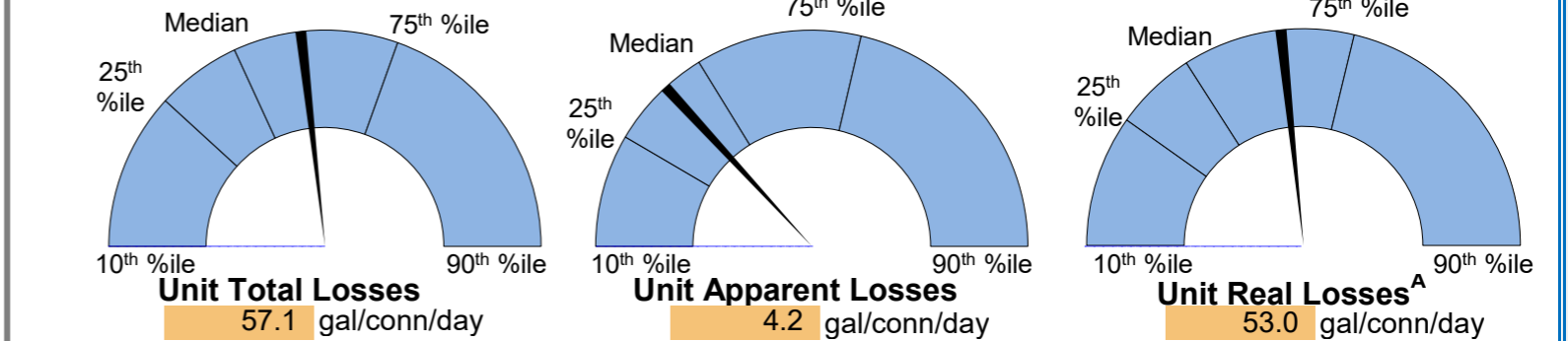
NRW Components Summary

Total Volume of NRW = 124 MG/Yr

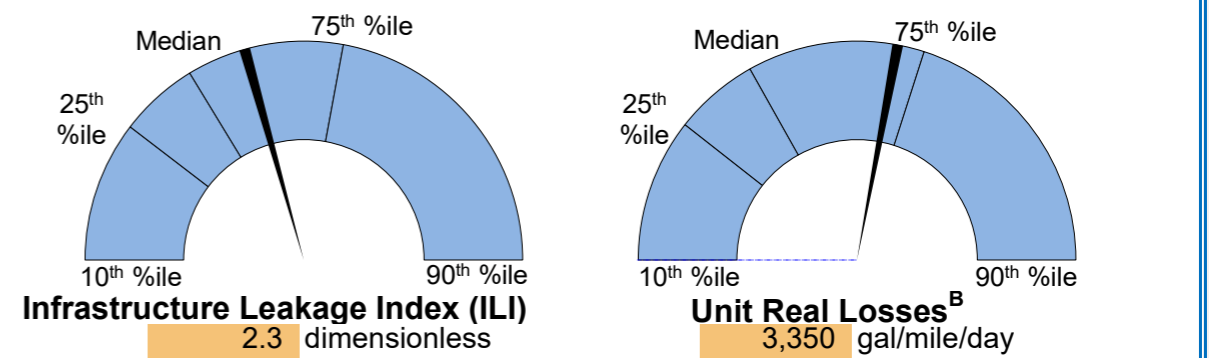
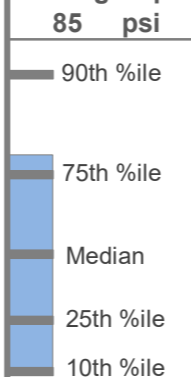
Total Cost of NRW = \$132,964/Yr



	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	8.2	\$91,223	CRUC
Real Losses	103.9	\$37,416	VPC
Unbilled Authorized Cons	12.0	\$4,325	VPC
Non-Revenue Water	124.1	\$132,964	Blended



Average Operating Pressure



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **45.2** MG/Yr **23.0** gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs¹.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)¹, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)².
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)⁵.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.



AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.
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Water Audit Report for: **Aqua Pennsylvania - Whitehaven Division**
 Audit Year: **2022** **Jan 01 2022 - Dec 31 2022** **2022**

To access definitions, click the [input name](#) Click 'n' to add notes Click 'g' to determine data validity grade To edit water system info: [go to start page](#)

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

Water Supplied Error Adjustments

choose entry option:

VOS WI WE	Volume from Own Sources: Water Imported: Water Exported:	n g 6 n g 6 n g 6	473.781 14.153 0.653	MG/Yr MG/Yr MG/Yr	n g 4 n g 4 n g 4	2.00% 2.00% 2.00%	percent percent percent	under-registration under-registration under-registration	VOSEA WIEA WEEA	
WATER SUPPLIED:					497.226					MG/Yr

AUTHORIZED CONSUMPTION

choose entry option:

BMAC BUAC UMAC UUAC	Billed Metered: Billed Unmetered: Unbilled Metered: Unbilled Unmetered:	n g 8 n g 10 n g 4 n g 6	368.206 2.126 8.476 8.631	MG/Yr MG/Yr MG/Yr MG/Yr	custom	8.631				
AUTHORIZED CONSUMPTION:									387.439	MG/Yr

WATER LOSSES

109.787 MG/Yr

Apparent Losses

Default option selected for Systematic Data Handling Errors, with automatic data grading of 3

choose entry option:

SDHE CMI UC	Systematic Data Handling Errors: Customer Metering Inaccuracies: Unauthorized Consumption:	n g 3 n g 6 n g 3	0.926 7.687 0.926	MG/Yr MG/Yr MG/Yr	0.25% 2.00% 0.25%	default percent default				
Apparent Losses:									9.539	MG/Yr

Default option selected for Unauthorized Consumption, with automatic data grading of 3

Real Losses

Real Losses: 100.247 MG/Yr

WATER LOSSES: 109.787 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 126.894 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: Number of service connections: Service connection density:	n g 7 n g 5	243.0 9,392 39	miles conn./mile main					
Are customer meters typically located at the curbstop/property line? <input type="text" value="No"/>									
Lp	Average length of (private) customer service line:	n g 1	35.0	ft	(average distance between property line and meter)				
AOP	Average Operating Pressure:	n g 7	60.0	psi					

COST DATA

CRUC VPC	Customer Retail Unit Charge: Variable Production Cost:	n g 5 n g 9	\$11.46 \$360.00	\$/1000 gallons (US) \$/Million gallons		Total Annual Operating Cost	\$2,782,000	\$/yr (optional input)
-------------	---	----------------	---------------------	--	--	------------------------------------	--------------------	------------------------

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier III (51-70). See Dashboard tab for additional outputs. *****

[go to dashboard](#)

A weighted scale for the components of supply, consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION TO IMPROVE DATA VALIDITY:

Based on the information provided, audit reliability can be most improved by addressing the following components:

- | |
|---------------------------------------|
| 1: Volume from Own Sources (VOS) |
| 2: Billed Metered (BMAC) |
| 3: Number of Service Connections (Nc) |

KEY PERFORMANCE INDICATOR TARGETS:

OPTIONAL: If targets exist for the operational performance indicators, they can be input below:

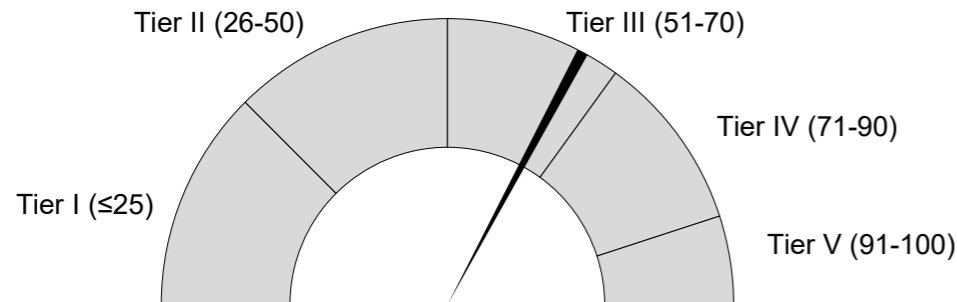
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

If entered above by user, targets will display on KPI gauges (see Dashboard)

Data Validity

Data Validity Score: **65** Data Validity Tier: **Tier III (51-70)**

See [Loss Control Planning](#) for Tier Details

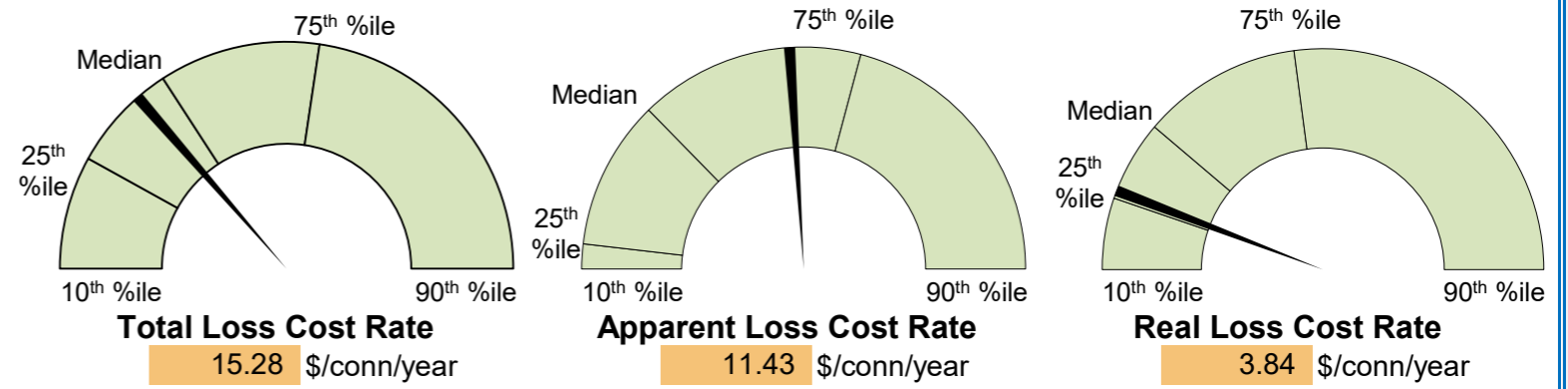


Actual KPI result

Key Performance Indicators

Target (see Worksheet)

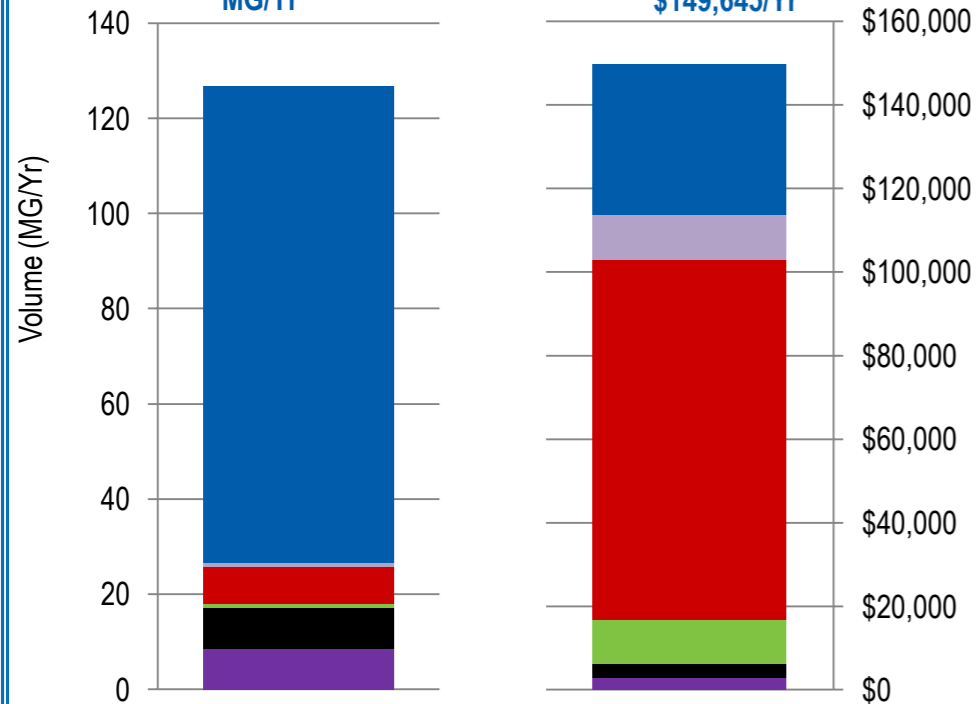
gauge %iles per validated industry ranges²



NRW Components Summary

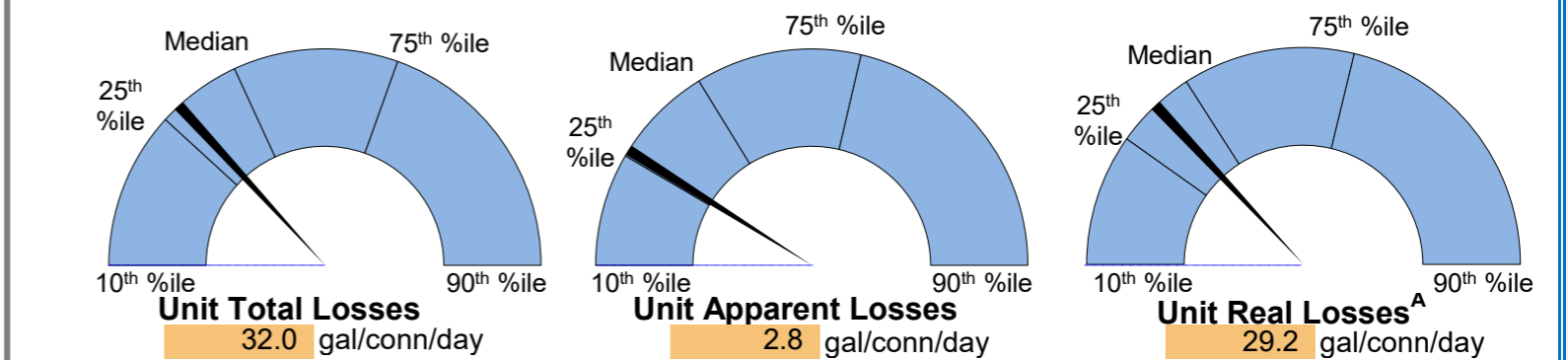
Total Volume of NRW = 127 MG/Yr

Total Cost of NRW = \$149,645/Yr

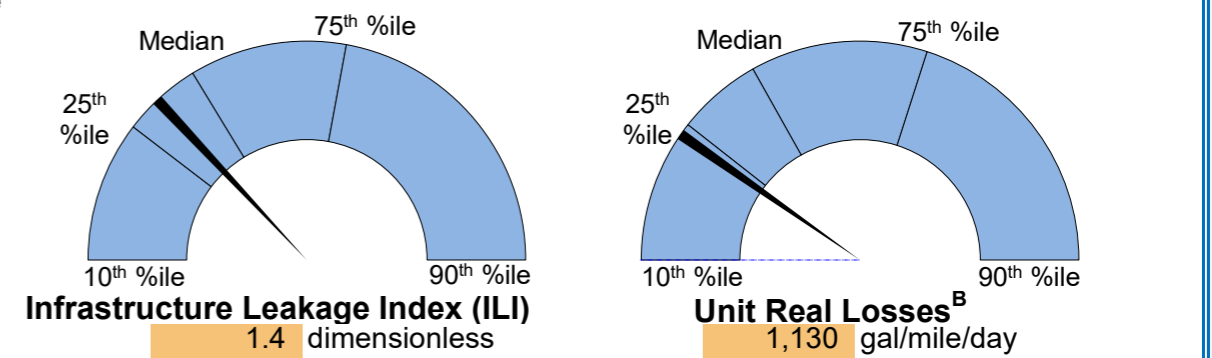
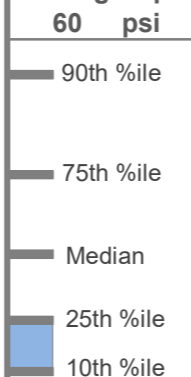


Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	100.2	\$36,089	VPC
Systematic Data Handling Errors	17.1	\$6,159	VPC
Customer Metering Inaccuracies	9.5	\$107,397	CRUC
Unauthorized Consumption	126.9	\$149,645	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	9.5	\$107,397	CRUC
Real Losses	100.2	\$36,089	VPC
Unbilled Authorized Cons	17.1	\$6,159	VPC
Non-Revenue Water	126.9	\$149,645	Blended



Average Operating Pressure



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **69.9** MG/Yr **20.4** gal/conn/day

Guidance Information for Key Performance

- The eight indicators shown are the recommended suite per the AWWA Water Loss Control Committee 2020 Position on KPIs¹.
- A suite of KPIs is necessary, as no single KPI can holistically communicate water loss performance for a given water system.
- See Table 1 below for Uses and Limitations for each KPI, excerpted from the AWWA Water Loss Control Committee Report (2020)¹, with naming conventions updated.
- Percentiles (%iles) shown on KPI gauges come from Level 1 validated data in the AWWA WLCC Reference Water Audit Dataset (2020)².
- KPI %iles shown above are not segregated by cohorts. Limited KPI data by cohorts may be found in WRF 4695 Guidance Manual, Appendix B (2019)⁵.
- Actual KPI results that fall below 10th %ile or above 90th %ile do not necessarily imply error, but should be viewed with scrutiny.
- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
- Systems that fall on the extreme ends of size or connection density should use caution when interpreting Unit Losses KPIs.