



Teresa K. Harrold

Director, Corporate Counsel

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VIA eFiling

April 29, 2022

Rosemary Chiavetta, Secretary
Commonwealth of Pennsylvania
Pennsylvania Public Utility Commission
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120

Re: Annual Water Audit Summaries for year ended December 31, 2021
Docket No. M-2022-3030282

Dear Secretary Chiavetta:

On behalf of Pennsylvania-American Water Company, I am filing the Company's annual water audit summaries for the year ended December 31, 2021.

As directed by the Commission's filing requirements, the Company is also providing a working electronic copy in Microsoft Excel format.

If you have any questions, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Teresa Harrold", written over a horizontal line.

Teresa K. Harrold

Enclosures

cc: C. McKinley w/Annual Water Audit Summaries and Microsoft Excel Files



AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.

Water Audit Report for: **Pennsylvania American Water**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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="9"/> <input style="width: 100px;" type="text" value="69,955.363"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input style="width: 100px;" type="text" value="1,018.061"/> MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input style="width: 100px;" type="text" value="731.669"/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 50px;" type="text" value="0.32%"/> <input style="width: 50px;" type="text" value="percent"/>	<input type="text" value="under-registration"/> VOSEA <input type="text" value=""/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED:		70,466.331 MG/Yr	

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input style="width: 100px;" type="text" value="44,850.784"/> MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value=""/> MG/Yr Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="308.772"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="1,033.488"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input style="width: 50px;" type="text" value="1,033.488"/> MG/Yr	
AUTHORIZED CONSUMPTION:		46,193.044 MG/Yr	

WATER LOSSES

24,273.287 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"/> <input style="width: 100px;" type="text" value="112.127"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input style="width: 100px;" type="text" value="921.624"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input style="width: 100px;" type="text" value="112.127"/> MG/Yr	choose entry option: <input style="width: 50px;" type="text" value="0.25%"/> <input style="width: 50px;" type="text" value="default"/> <input style="width: 50px;" type="text" value="2.00%"/> <input style="width: 50px;" type="text" value="percent"/> <input style="width: 50px;" type="text" value="0.25%"/> <input style="width: 50px;" type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses:		1,145.878 MG/Yr	

Real Losses

Real Losses: **23,127.409** MG/Yr

WATER LOSSES: **24,273.287** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **25,615.547** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="10,256.4"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="670,565"/>	(including fire hydrant lead lengths) (active <i>and</i> inactive)	
Service connection density:		65 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="10"/> <input style="width: 100px;" type="text" value="19.1"/> 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="8"/> <input style="width: 100px;" type="text" value="83.6"/> psi		

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="\$572.31"/> \$/Million gallons	Total Annual Operating Cost <input style="width: 150px;" type="text" value="\$201,310,329"/> \$/yr (optional input)
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WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

KEY PERFORMANCE INDICATOR TARGETS:

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

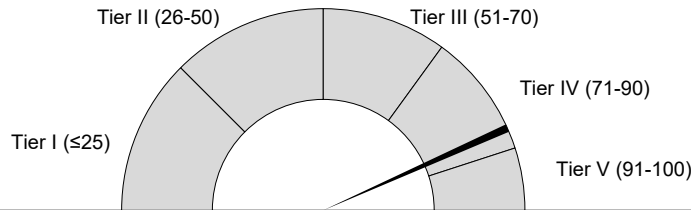
Unit Total Losses:	<input style="width: 100px;" type="text"/>	gal/conn/day
Unit Apparent Losses:	<input style="width: 100px;" type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input style="width: 100px;" type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input style="width: 100px;" type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **86** Data Validity Tier: **Tier IV (71-90)**

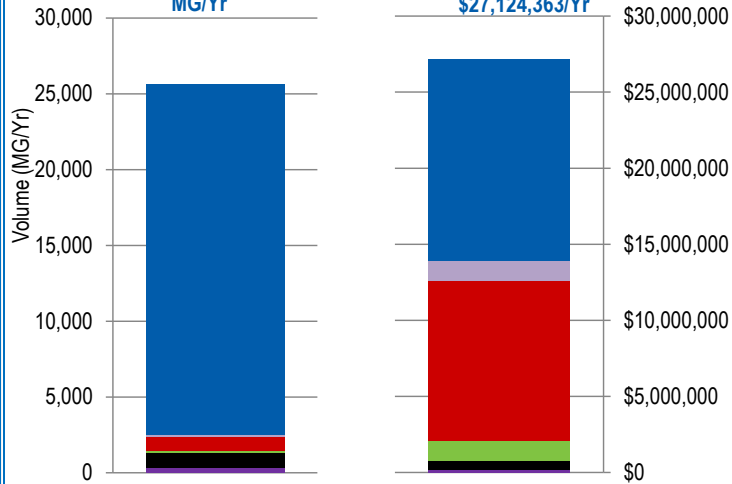
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 25,609 MG/Yr

Total Cost of NRW = \$27,124,363/Yr



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

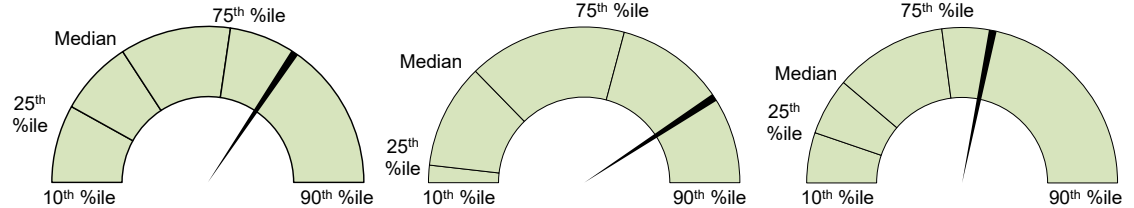
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	1,145.9	\$13,120,127	CRUC
Real Losses	23,127.4	\$13,236,048	VPC
Unbilled Authorized Cons	1,342.3	\$768,189	VPC
Non-Revenue Water	25,615.5	\$27,124,363	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

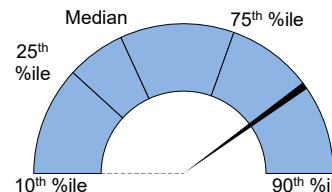
Target (see Worksheet)



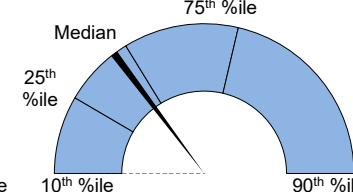
Total Loss Cost Rate
39.30 \$/conn/year

Apparent Loss Cost Rate
19.57 \$/conn/year

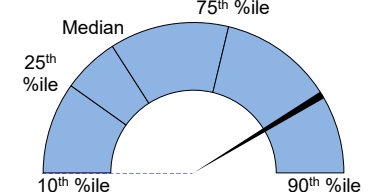
Real Loss Cost Rate
19.74 \$/conn/year



Unit Total Losses
99.2 gal/conn/day



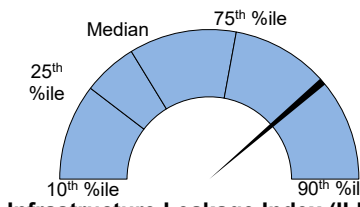
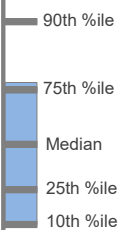
Unit Apparent Losses
4.7 gal/conn/day



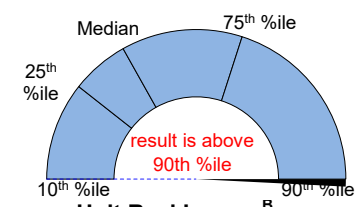
Unit Real Losses^A
94.5 gal/conn/day

Average Operating Pressure

83.62 psi



Infrastructure Leakage Index (ILI)
4.3 dimensionless



Unit Real Losses^B
6,178 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **5,318.2 MG/Yr** **21.7 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)³.
- 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.

Water Audit Report for: **PAW- Pittsburgh Districts (110;210;220)**
 Audit Year: **2021** **Jan 01 2021 - Dec 31 2021** **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	22,103.209	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	0.39%	percent		
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	5.402	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	0.39%	percent	<input type="text" value="under-registration"/>	VOSEA
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	513.449	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>		percent	<input type="text" value="under-registration"/>	WIEA WEEA
WATER SUPPLIED:					21,681.723	MG/Yr							

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	13,173.320	MG/Yr							
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr							
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	188.570	MG/Yr							
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="8"/>	92.931	MG/Yr							
AUTHORIZED CONSUMPTION:					13,454.821	MG/Yr							

WATER LOSSES

8,226.902 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"/>	32.933	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="7"/>	272.692	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"/>	32.933	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>					
Apparent Losses:					338.558	MG/Yr							

Real Losses

Real Losses: 7,888.344 MG/Yr

WATER LOSSES: 8,226.902 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 8,508.403 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	3,111.0	miles	(including fire hydrant lead lengths) (active and inactive)						
Nc	Number of service connections:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	206,927								
Service connection density:					67	conn./mile main							
Are customer meters typically located at the curbstops/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="10"/>	17.2	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="10"/>	110.0	psi							

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$11.51	\$/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="10"/>	\$374.41	\$/Million gallons	\$64,079,101 \$/yr (optional input)						

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

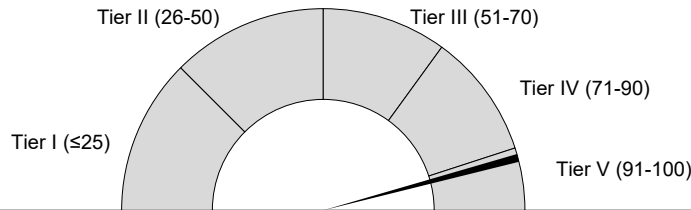
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **91** Data Validity Tier: **Tier V (91-100)**

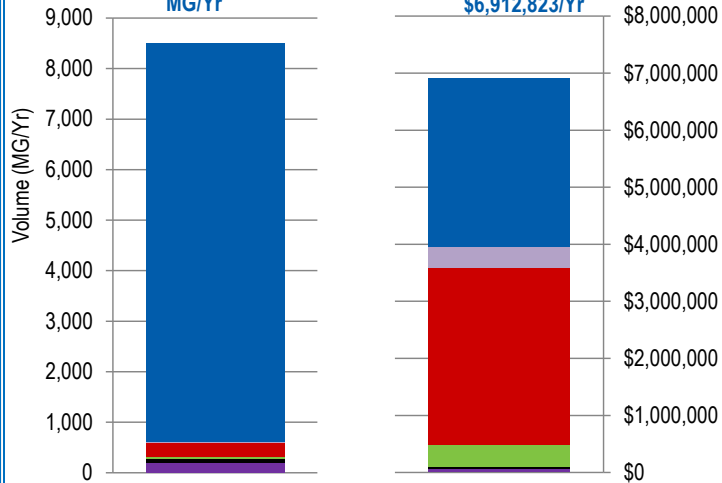
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = **8,505** MG/Yr

Total Cost of NRW = **\$6,912,823/Yr**



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	7,888.3	\$2,953,475	VPC
Systematic Data Handling Errors	281.5	\$105,397	VPC
Customer Metering Inaccuracies	338.6	\$3,853,951	CRUC
Unauthorized Consumption	8,508.4	\$6,912,823	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

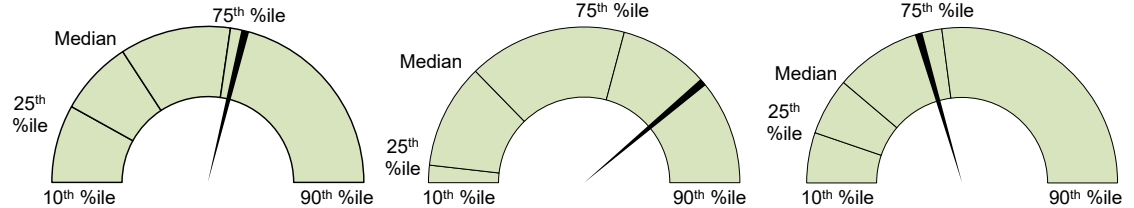
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	338.6	\$3,853,951	CRUC
Real Losses	7,888.3	\$2,953,475	VPC
Unbilled Authorized Cons	281.5	\$105,397	VPC
Non-Revenue Water	8,508.4	\$6,912,823	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

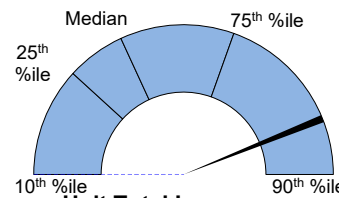
Target (see Worksheet)



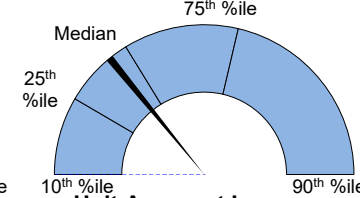
Total Loss Cost Rate
32.90 \$/conn/year

Apparent Loss Cost Rate
18.62 \$/conn/year

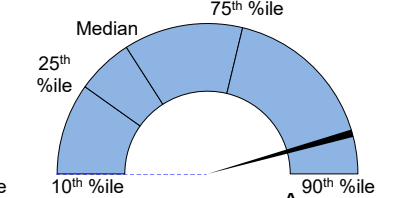
Real Loss Cost Rate
14.27 \$/conn/year



Unit Total Losses
108.9 gal/conn/day



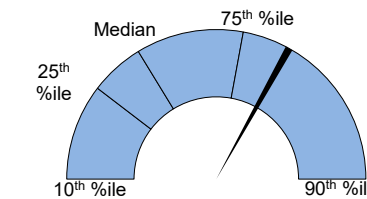
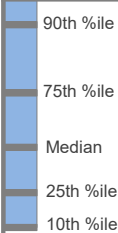
Unit Apparent Losses
4.5 gal/conn/day



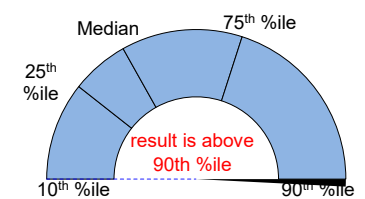
Unit Real Losses^A
104.4 gal/conn/day

Average Operating Pressure

110 psi



Infrastructure Leakage Index (ILI)
3.7 dimensionless



Unit Real Losses^B
6,947 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **2,124.9** MG/Yr **28.1** 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.
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- 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)³.
- 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.

Water Audit Report for: **PAW - 140 Steelton**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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="9"/> <input type="text" value="380.877"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="3.751"/> MG/Yr 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	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.20%"/> percent <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="4.50%"/> percent	<input type="text" value="under-registration"/> VOSEA <input type="text" value="over-registration"/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED: 385.230 MG/Yr			

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="230.213"/> MG/Yr 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 Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="33.611"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="36.551"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="36.551"/> MG/Yr	
AUTHORIZED CONSUMPTION: 300.375 MG/Yr			

WATER LOSSES

WATER LOSSES: 84.855 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"/> <input type="text" value="0.576"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="5.384"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="0.576"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses: 6.535 MG/Yr			

Real Losses

Real Losses: 78.320 MG/Yr

WATER LOSSES: 84.855 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 155.017 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="28.3"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="2,424"/> Service connection density: <input type="text" value=""/> <input type="text" value="86"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)
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="10"/> <input type="text" value="16.8"/> 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="10"/> <input type="text" value="83.6"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$619.54"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$697,605"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

KEY PERFORMANCE INDICATOR TARGETS:

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

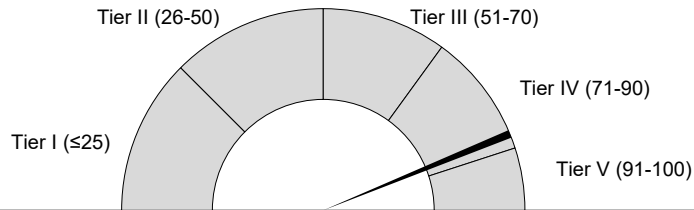
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

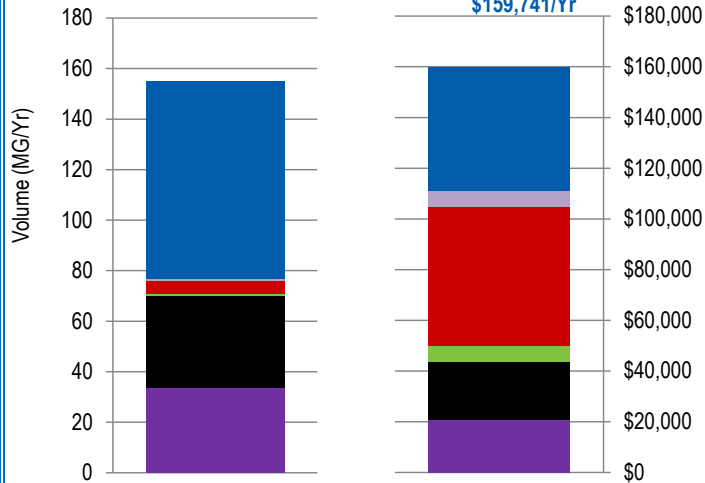
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 154 MG/Yr

Total Cost of NRW = \$159,741/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	78.3	\$48,522	VPC
Systematic Data Handling Errors	6.5	\$67,750	CRUC
Customer Metering Inaccuracies	70.2	\$43,468	VPC
Unauthorized Consumption	155.0	\$159,741	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

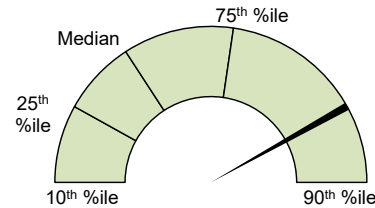
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	6.5	\$67,750	CRUC
Real Losses	78.3	\$48,522	VPC
Unbilled Authorized Cons	70.2	\$43,468	VPC
Non-Revenue Water	155.0	\$159,741	Blended

Actual KPI result

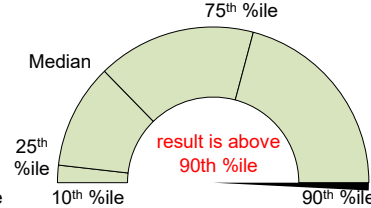
Key Performance Indicators

gauge %iles per validated industry ranges²

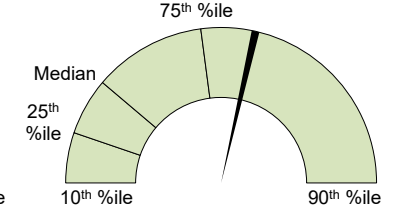
Target (see Worksheet)



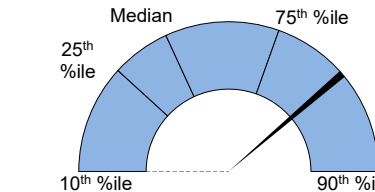
Total Loss Cost Rate
47.97 \$/conn/year



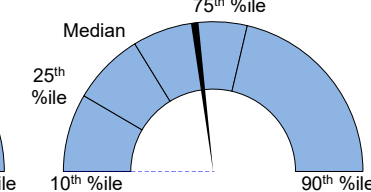
Apparent Loss Cost Rate
27.95 \$/conn/year



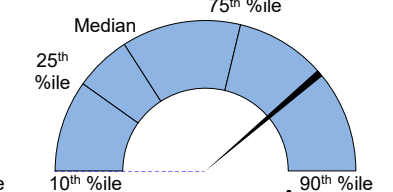
Real Loss Cost Rate
20.02 \$/conn/year



Unit Total Losses
95.9 gal/conn/day



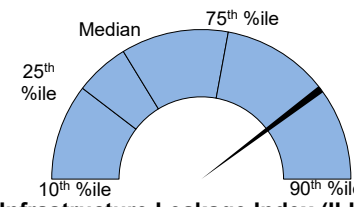
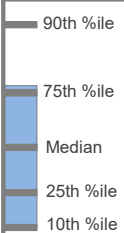
Unit Apparent Losses
7.4 gal/conn/day



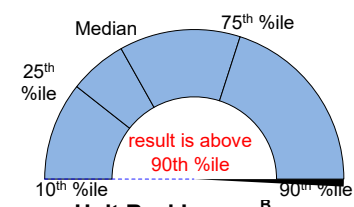
Unit Real Losses^A
88.5 gal/conn/day

Average Operating Pressure

83.6 psi



Infrastructure Leakage Index (ILI)
4.5 dimensionless



Unit Real Losses^B
7,582 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses 17.5 MG/Yr 19.8 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)³.
- 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.

Water Audit Report for: **PAW- Uniontown/Connellsville District 230**
 Audit Year: **2021** **Jan 01 2021 - Dec 31 2021** **Calendar**

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="10"/> <input type="text" value="604.698"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="769.288"/> MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input type="text" value=""/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="0.00%"/> percent <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value=""/> percent	VOSEA WIEA WEEA
WATER SUPPLIED: 1,373.986 MG/Yr			

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="806.282"/> MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input type="text" value=""/> MG/Yr Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="43.016"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="77.346"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="77.346"/> MG/Yr	
AUTHORIZED CONSUMPTION: 926.644 MG/Yr			

WATER LOSSES

447.342 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"/> <input type="text" value="2.016"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="17.333"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="2.016"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	under-registration
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Default option selected for Unauthorized Consumption, with automatic data grading of 3

Apparent Losses: 21.364 MG/Yr

Real Losses

Real Losses: 425.978 MG/Yr

WATER LOSSES: 447.342 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 567.704 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="233.1"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="11,695"/> Service connection density: <input type="text" value=""/> <input type="text" value="50"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)	
Lp	Are customer meters typically located at the curbsto/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="10"/> <input type="text" value="16.4"/> 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="10"/> <input type="text" value="98.0"/> psi		

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$1,404.29"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$4,037,481"/> \$/yr (optional input)
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WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

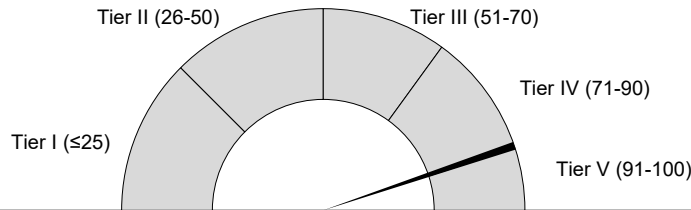
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **89** Data Validity Tier: **Tier IV (71-90)**

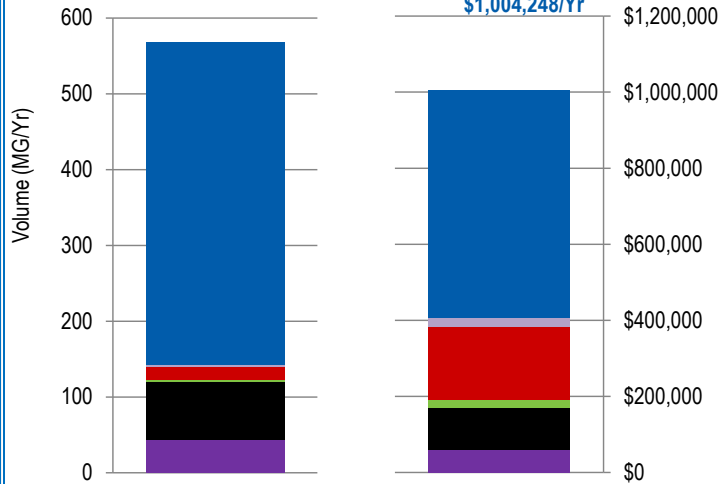
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 567 MG/Yr

Total Cost of NRW = \$1,004,248/Yr



	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Real Losses			
Systematic Data Handling Errors			
Customer Metering Inaccuracies			
Unauthorized Consumption			
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

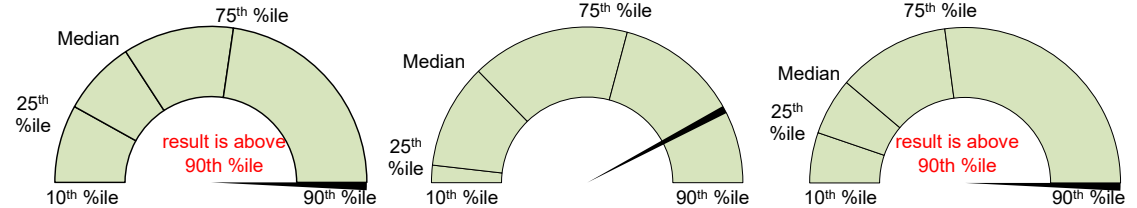
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	21.4	\$237,028	CRUC
Real Losses	426.0	\$598,197	VPC
Unbilled Authorized Cons	120.4	\$169,023	VPC
Non-Revenue Water	567.7	\$1,004,248	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

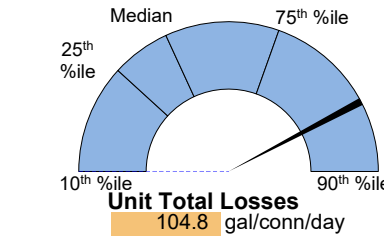
Target (see Worksheet)



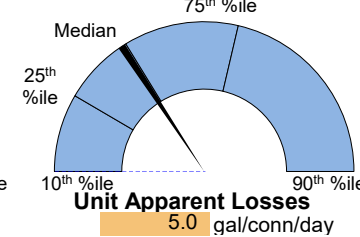
Total Loss Cost Rate
71.42 \$/conn/year

Apparent Loss Cost Rate
20.27 \$/conn/year

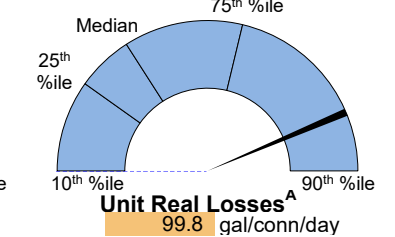
Real Loss Cost Rate
51.15 \$/conn/year



Unit Total Losses
104.8 gal/conn/day

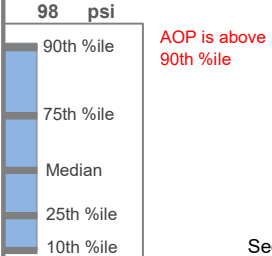


Unit Apparent Losses
5.0 gal/conn/day

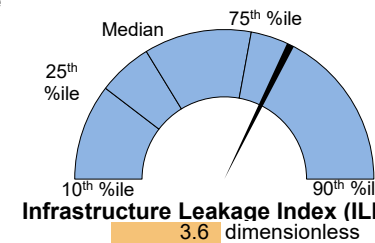


Unit Real Losses^A
99.8 gal/conn/day

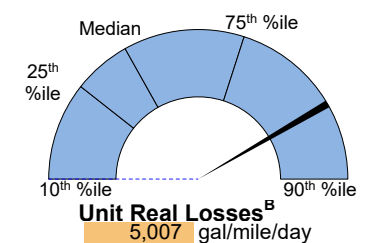
Average Operating Pressure



98 psi
AOP is above 90th %ile



Infrastructure Leakage Index (ILI)
3.6 dimensionless



Unit Real Losses^B
5,007 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **117.6 MG/Yr** **27.6 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)³.
- 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.

Water Audit Report for: **PAW-Brownsville District 250**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="313.712"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="0.156"/> MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input type="text" value=""/> MG/Yr	choose entry option: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="0.00%"/> <input type="text" value="percent"/> <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="0.00%"/> <input type="text" value="percent"/>	VOSEA WIEA WEEA
WATER SUPPLIED:		313.868	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"/> <input type="text" value="240.829"/> MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input type="text" value=""/> MG/Yr Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="1.362"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="7.356"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="7.356"/> MG/Yr	
AUTHORIZED CONSUMPTION:		249.547	MG/Yr

WATER LOSSES

64.321 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"/> <input type="text" value="0.602"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="4.943"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="0.602"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	under-registration
Apparent Losses:		6.147	MG/Yr

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

Real Losses

Real Losses: 58.174 MG/Yr

WATER LOSSES: 64.321 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 73.039 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="111.9"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="3,678"/> Service connection density: <input type="text" value=""/> <input type="text" value="33"/> conn./mile main	(including fire hydrant lead lengths) (active and inactive)	
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="10"/> <input type="text" value="16.4"/> 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="8"/> <input type="text" value="93.4"/> psi		

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$2,032.24"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$1,395,210"/> \$/yr (optional input)	
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WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)

KEY PERFORMANCE INDICATOR TARGETS:

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

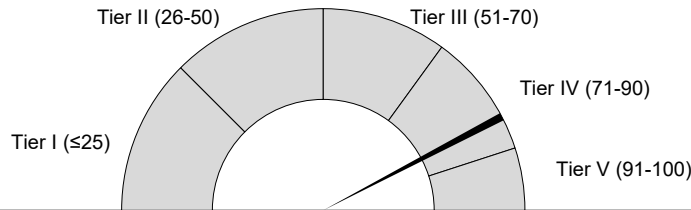
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **84** Data Validity Tier: **Tier IV (71-90)**

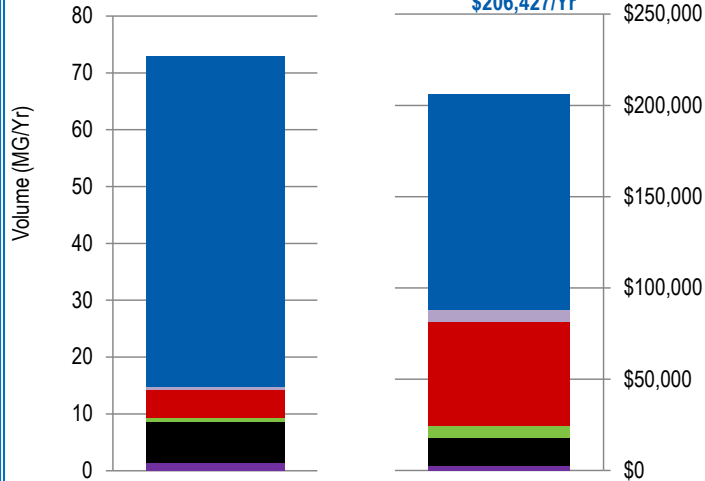
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 73 MG/Yr

Total Cost of NRW = \$206,427/Yr



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

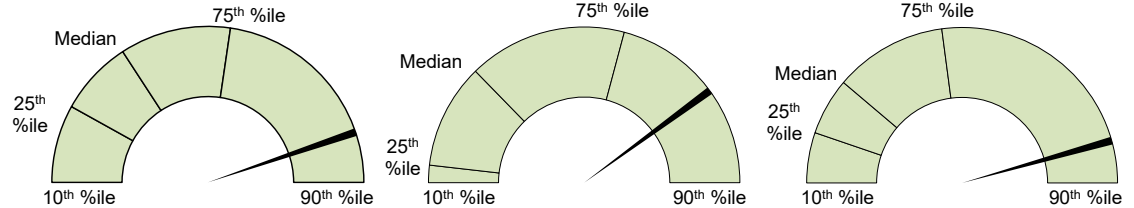
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	6.1	\$70,486	CRUC
Real Losses	58.2	\$118,224	VPC
Unbilled Authorized Cons	8.7	\$17,717	VPC
Non-Revenue Water	73.0	\$206,427	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

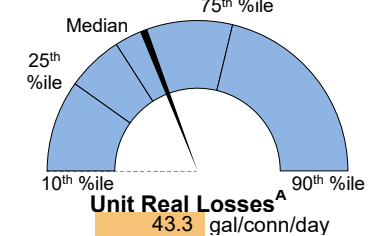
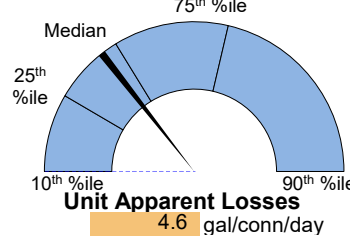
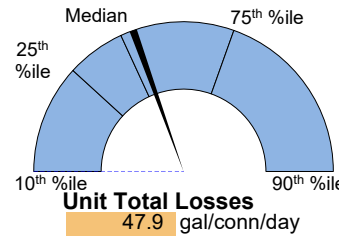
gauge %iles per validated industry ranges²



Total Loss Cost Rate
51.31 \$/conn/year

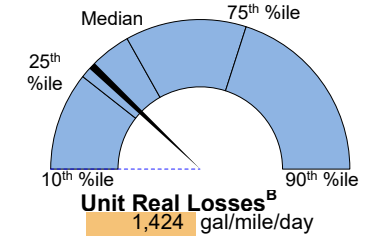
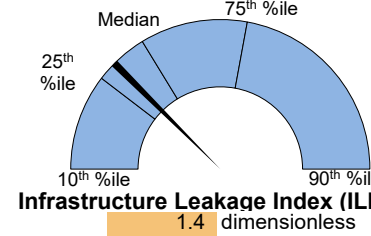
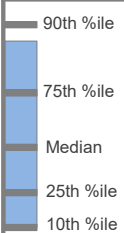
Apparent Loss Cost Rate
19.16 \$/conn/year

Real Loss Cost Rate
32.14 \$/conn/year



Average Operating Pressure

93.4 psi



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **42.4** MG/Yr **31.6** 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)³.
- 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.

Water Audit Report for: **PAW- New Castle District 310**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	2,889.281	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	2.00%	percent	
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr						<input type="text" value="under-registration"/> VOSEA
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	73.398	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>			percent	WIEA WEEA
WATER SUPPLIED:					2,874.848	MG/Yr						

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	1,611.806	MG/Yr						
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr						
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	4.329	MG/Yr						
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	26.000	MG/Yr						
AUTHORIZED CONSUMPTION:					1,642.135	MG/Yr						

WATER LOSSES

1,232.713 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"/>	4.030	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="7"/>	32.982	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"/>	4.030	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>				
Apparent Losses:					41.041	MG/Yr						

Real Losses

1,191.672 MG/Yr

WATER LOSSES: 1,232.713 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 1,263.042 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	505.7	miles	(including fire hydrant lead lengths) (active and inactive)					
Nc	Number of service connections:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	29,532							
Service connection density:					58	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="10"/>	18.5	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="10"/>	92.0	psi						

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$11.51	\$/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="10"/>	\$514.15	\$/Million gallons	\$7,915,213 \$/yr (optional input)					

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

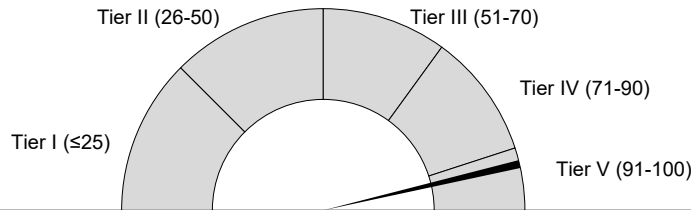
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

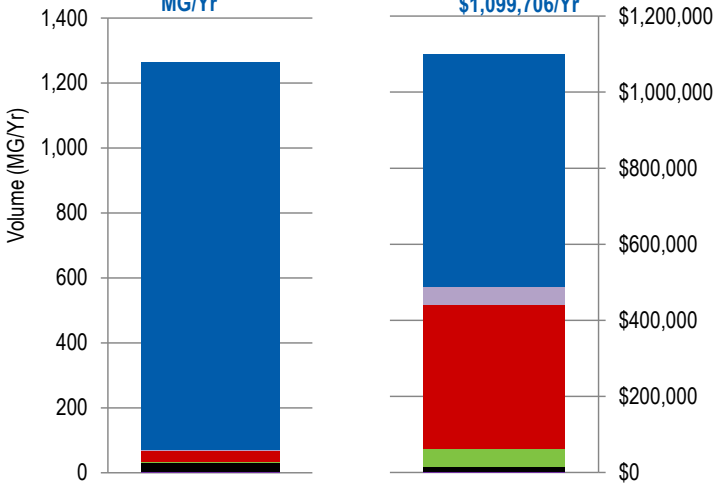
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = **1,263 MG/Yr**

Total Cost of NRW = **\$1,099,706/Yr**



	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Real Losses			
Unauthorized Consumption			
Systematic Data Handling Errors			
Customer Metering Inaccuracies			
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

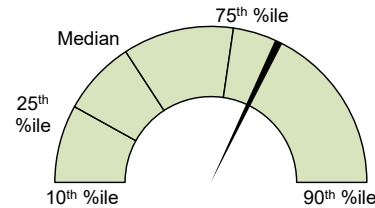
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	41.0	\$471,415	CRUC
Real Losses	1,191.7	\$612,698	VPC
Unbilled Authorized Cons	30.3	\$15,594	VPC
Non-Revenue Water	1,263.0	\$1,099,706	Blended

Actual KPI result

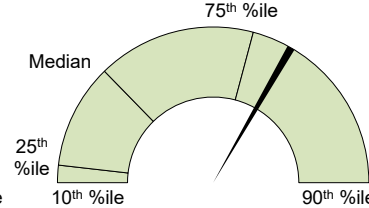
Key Performance Indicators

gauge %iles per validated industry ranges²

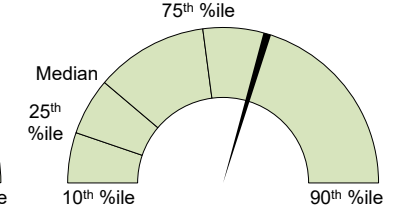
Target (see Worksheet)



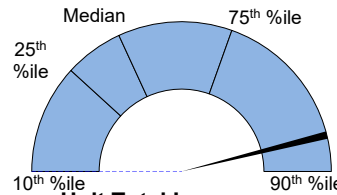
Total Loss Cost Rate
36.71 \$/conn/year



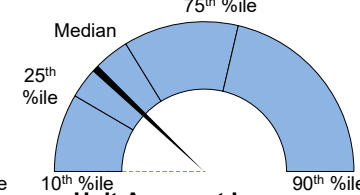
Apparent Loss Cost Rate
15.96 \$/conn/year



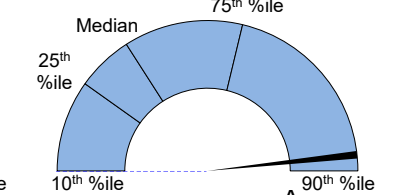
Real Loss Cost Rate
20.75 \$/conn/year



Unit Total Losses
114.4 gal/conn/day



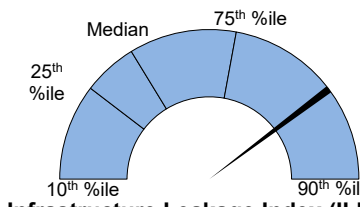
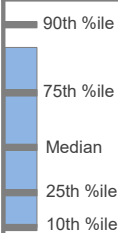
Unit Apparent Losses
3.8 gal/conn/day



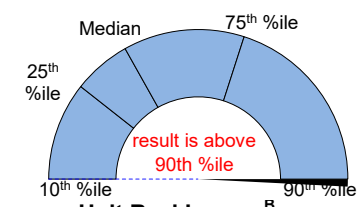
Unit Real Losses^A
110.6 gal/conn/day

Average Operating Pressure

92 psi



Infrastructure Leakage Index (ILI)
4.5 dimensionless



Unit Real Losses^B
6,456 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **266.7 MG/Yr** **24.7 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)³.
- 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.

Water Audit Report for: **PAW-Butler District 330**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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="10"/> <input type="text" value="2,013.073"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	<input type="text" value="1.70%"/> <input type="text" value="percent"/>	<input type="text" value="under-registration"/> VOSEA <input type="text" value=""/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED:		2,047.887 MG/Yr		

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="727.887"/> MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="926.389"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="22.468"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="22.468"/> MG/Yr	
AUTHORIZED CONSUMPTION:		1,676.744 MG/Yr	

WATER LOSSES

371.143 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"/> <input type="text" value="1.820"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="33.761"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="1.820"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses:		37.400 MG/Yr	

Real Losses

Real Losses: **333.743** MG/Yr

WATER LOSSES: **371.143** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **1,320.000** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="329.8"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="20,198"/> Service connection density: <input type="text" value="61"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)
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="10"/> <input type="text" value="18.0"/> 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="10"/> <input type="text" value="78.2"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$375.87"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$5,801,871"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

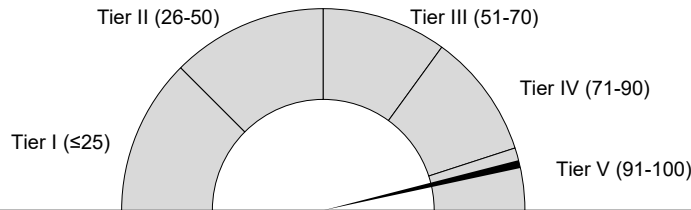
Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
 Unit Real Losses^B: gal/mile/day

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

Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

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



NRW Components Summary

Total Volume of NRW = **1,301** MG/Yr

Total Cost of NRW = **\$702,066/Yr**



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	333.7	\$125,444	VPC
Systematic Data Handling Errors	0	0	VPC
Customer Metering Inaccuracies	948.9	\$356,647	VPC
Unauthorized Consumption	0	0	Blended
Unbilled Unmetered Auth Cons	0	0	Blended
Unbilled Metered Authorized Cons	1,320.0	\$702,066	Blended

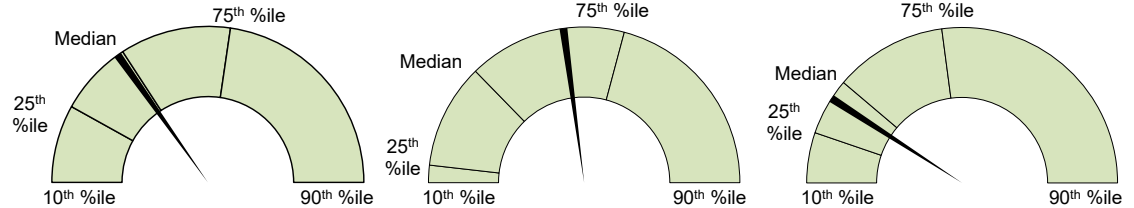
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	37.4	\$219,975	CRUC
Real Losses	333.7	\$125,444	VPC
Unbilled Authorized Cons	948.9	\$356,647	VPC
Non-Revenue Water	1,320.0	\$702,066	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

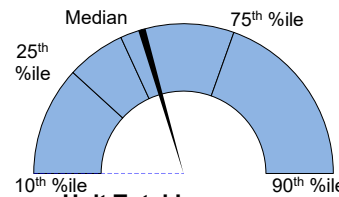
Target (see Worksheet)



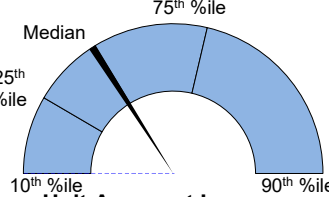
Total Loss Cost Rate
17.10 \$/conn/year

Apparent Loss Cost Rate
10.89 \$/conn/year

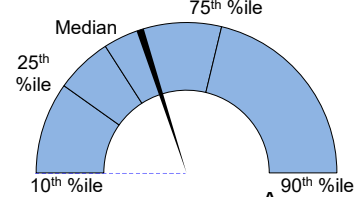
Real Loss Cost Rate
6.21 \$/conn/year



Unit Total Losses
50.3 gal/conn/day



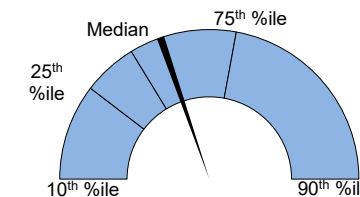
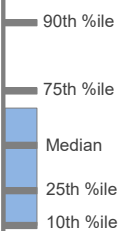
Unit Apparent Losses
5.1 gal/conn/day



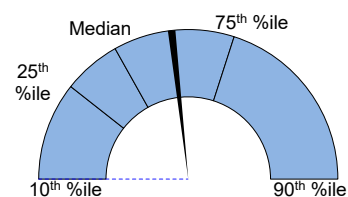
Unit Real Losses^A
45.3 gal/conn/day

Average Operating Pressure

78.2 psi



Infrastructure Leakage Index (ILI)
2.2 dimensionless



Unit Real Losses^B
2,772 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **152.1** MG/Yr **20.6** 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.
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- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
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- 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.

Water Audit Report for: **PAW- Indiana District 410**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	691.607	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	2.00%	percent	
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr						<input type="text" value="under-registration"/>
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	13.527	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>			percent	<input type="text" value="VOSEA"/>
												<input type="text" value="WIEA"/>
												<input type="text" value="WEEA"/>

WATER SUPPLIED: 692.194 MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	559.058	MG/Yr						
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr						
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	0.587	MG/Yr						
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="8"/>	1.334	MG/Yr						

AUTHORIZED CONSUMPTION: 560.979 MG/Yr

WATER LOSSES

WATER LOSSES: 131.215 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"/>	1.398	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="7"/>	11.421	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"/>	1.398	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: 14.217 MG/Yr

Real Losses

Real Losses: 116.999 MG/Yr

WATER LOSSES: 131.215 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 133.136 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	118.7	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="10"/>	7,154		(active and inactive)				
	Service connection density:				60	conn./mile main					
	Are customer meters typically located at the curbstops/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="10"/>	19.4	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="10"/>	79.4	psi					

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$11.51	\$/1000 gallons (US)					
VPC	Variable Production Cost:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$506.01	\$/Million gallons					
							Total Annual Operating Cost \$2,234,121 \$/yr (optional input)				

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

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

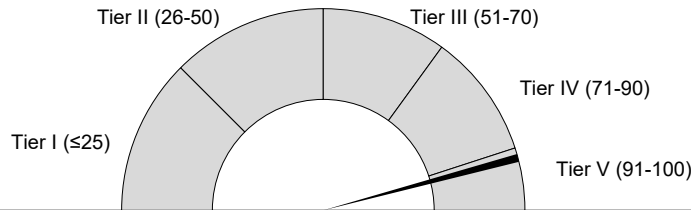
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **91** Data Validity Tier: **Tier V (91-100)**

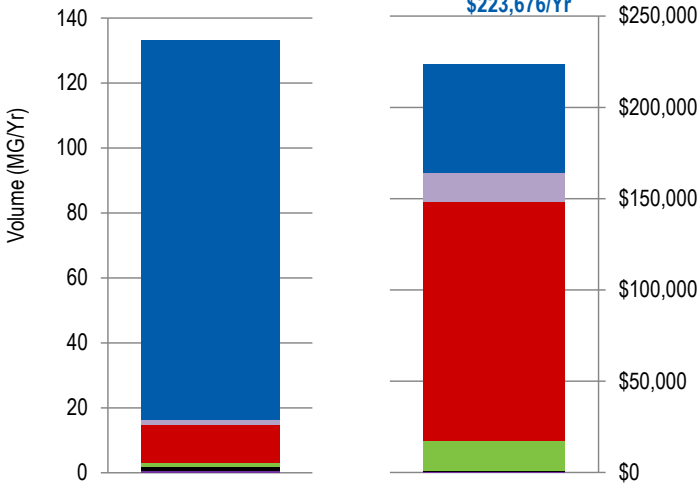
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 133 MG/Yr

Total Cost of NRW = \$223,676/Yr



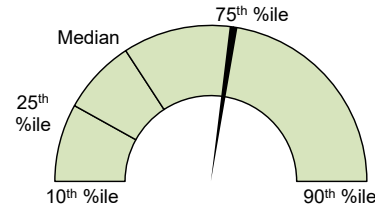
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	117.0	\$59,203	VPC
Systematic Data Handling Errors	14.2	\$163,501	CRUC
Customer Metering Inaccuracies	1.9	\$972	VPC
Unauthorized Consumption	133.1	\$223,676	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

Actual KPI result

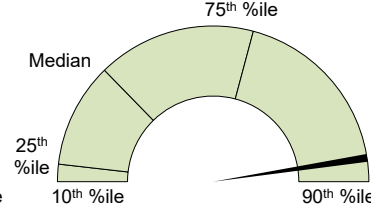
Key Performance Indicators

gauge %iles per validated industry ranges²

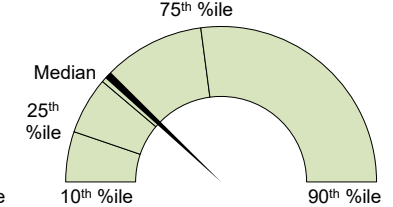
Target (see Worksheet)



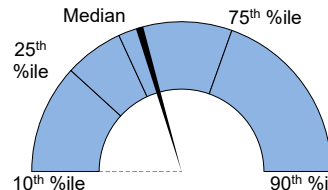
Total Loss Cost Rate
31.13 \$/conn/year



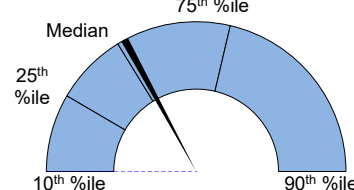
Apparent Loss Cost Rate
22.85 \$/conn/year



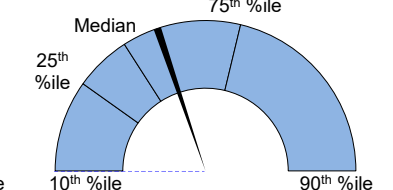
Real Loss Cost Rate
8.28 \$/conn/year



Unit Total Losses
50.3 gal/conn/day



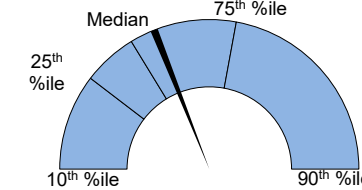
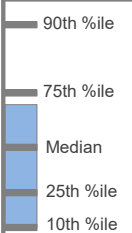
Unit Apparent Losses
5.4 gal/conn/day



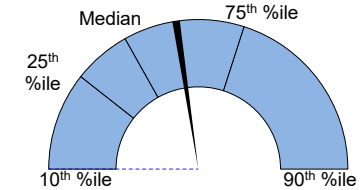
Unit Real Losses^A
44.8 gal/conn/day

Average Operating Pressure

79.4 psi



Infrastructure Leakage Index (ILI)
2.1 dimensionless



Unit Real Losses^B
2,700 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **55.4** MG/Yr **21.2** 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)³.
- 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.

Water Audit Report for: **PAW- Punxsutawney District 420**

Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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="10"/>	<input type="text" value="288.238"/>	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	<input type="text" value="0.98%"/>	<input type="text" value="percent"/>	<input type="text" value="over-registration"/>	
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr							VOSEA
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr							WIEA WEEA

WATER SUPPLIED: 285.441 MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="215.157"/>	MG/Yr						
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr						
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="0.160"/>	MG/Yr						
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="5.264"/>	MG/Yr						

choose entry option:

MG/Yr

AUTHORIZED CONSUMPTION: 220.581 MG/Yr

WATER LOSSES

64.860 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="0.538"/>	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="7"/>	<input type="text" value="4.394"/>	MG/Yr	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>					
UC	Unauthorized Consumption:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="3"/>	<input type="text" value="0.538"/>	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>					

choose entry option:

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

Apparent Losses: 5.470 MG/Yr

Real Losses

Real Losses: 59.390 MG/Yr

WATER LOSSES: 64.860 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 70.284 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="86.4"/>	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="10"/>	<input type="text" value="3,693"/>		(active and inactive)							
	Service connection density:					<input type="text" value="43"/>	conn./mile main							
Lp	Average length of (private) customer service line:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="18.0"/>	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="10"/>	<input type="text" value="93.7"/>	psi								

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="\$11.51"/>	\$/1000 gallons (US)							
VPC	Variable Production Cost:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="\$453.75"/>	\$/Million gallons							
							Total Annual Operating Cost						
							<input type="text" value="\$1,077,792"/> \$/yr (optional input)						

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

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

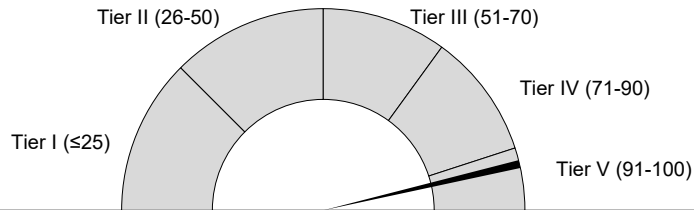
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

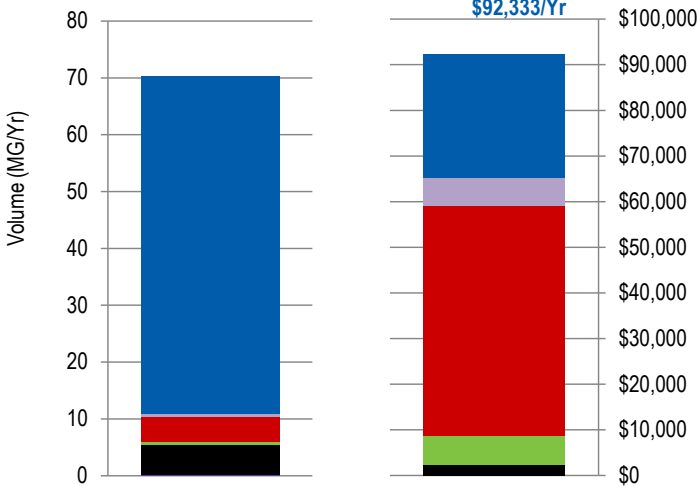
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 70 MG/Yr

Total Cost of NRW = \$92,333/Yr



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

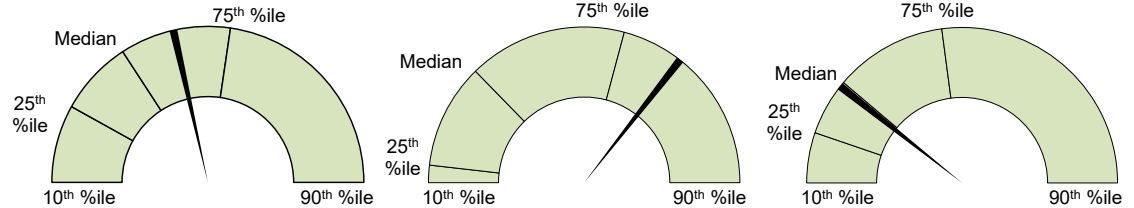
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	5.5	\$62,924	CRUC
Real Losses	59.4	\$26,948	VPC
Unbilled Authorized Cons	5.4	\$2,461	VPC
Non-Revenue Water	70.3	\$92,333	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

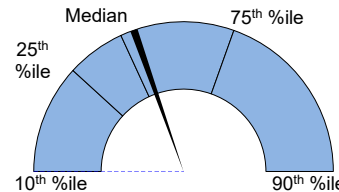
gauge %iles per validated industry ranges²



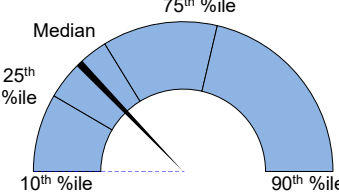
Total Loss Cost Rate
24.34 \$/conn/year

Apparent Loss Cost Rate
17.04 \$/conn/year

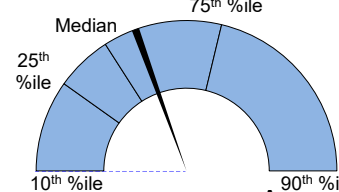
Real Loss Cost Rate
7.30 \$/conn/year



Unit Total Losses
48.1 gal/conn/day

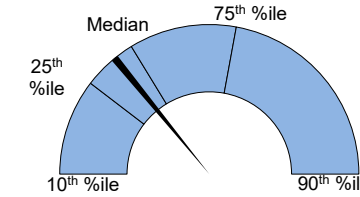
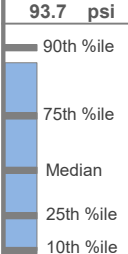


Unit Apparent Losses
4.1 gal/conn/day

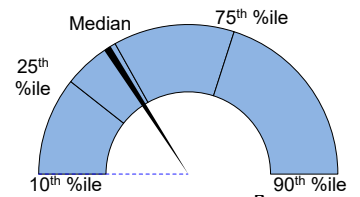


Unit Real Losses^A
44.1 gal/conn/day

Average Operating Pressure



Infrastructure Leakage Index (ILI)
1.6 dimensionless



Unit Real Losses^B
1,883 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **38.2** MG/Yr **28.3** 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)³.
- 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.

Water Audit Report for: **PAW- Clarion District 430**
Audit Year: **2021** Jan 01 2021 - Dec 31 2021 **Calendar**

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	Volume from Own Sources:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="521.802"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>	VOSEA
WI	Water Imported:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>		MG/Yr					WIEA
WE	Water Exported:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="18.363"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/>		<input type="text" value="percent"/>		WEEA
WATER SUPPLIED:			514.088	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="283.294"/>	MG/Yr					
BUAC	Billed Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>		MG/Yr					
UMAC	Unbilled Metered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="5.375"/>	MG/Yr					
UUAC	Unbilled Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="7.259"/>	MG/Yr					
AUTHORIZED CONSUMPTION:			295.928	MG/Yr					

WATER LOSSES

218.160 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="0.708"/>	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="7"/>	<input type="text" value="5.891"/>	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="0.708"/>	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: 7.308 MG/Yr

Real Losses

Real Losses: 210.852 MG/Yr

WATER LOSSES: 218.160 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 230.794 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="128.3"/>	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="10"/>	<input type="text" value="4,464"/>		(active and inactive)				
	Service connection density:		<input type="text" value="35"/>	conn./mile main					
Lp	Average length of (private) customer service line:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="21.6"/>	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="10"/>	<input type="text" value="85.2"/>	psi					

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="\$11.51"/>	\$/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="10"/>	<input type="text" value="\$871.66"/>	\$/Million gallons	<input type="text" value="\$1,259,259"/> \$/yr (optional input)				

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

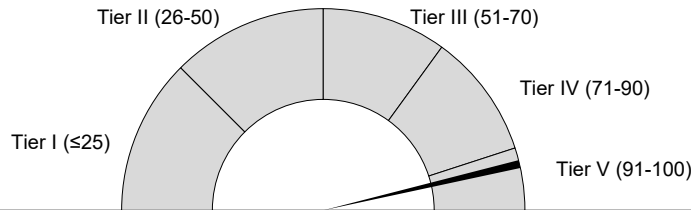
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

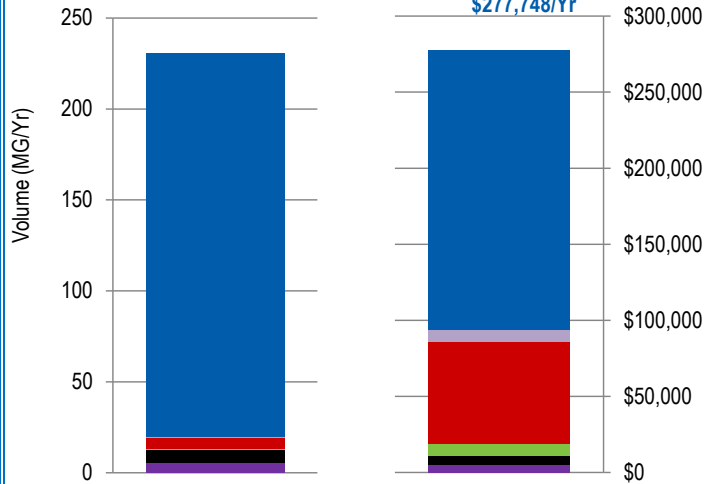
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 231 MG/Yr

Total Cost of NRW = \$277,748/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	210.9	\$183,792	VPC
Systematic Data Handling Errors	12.6	\$11,013	VPC
Customer Metering Inaccuracies	7.3	\$82,944	CRUC
Unauthorized Consumption	12.6	\$11,013	VPC
Unbilled Unmetered Auth Cons	12.6	\$11,013	VPC
Unbilled Metered Authorized Cons	230.8	\$277,748	Blended

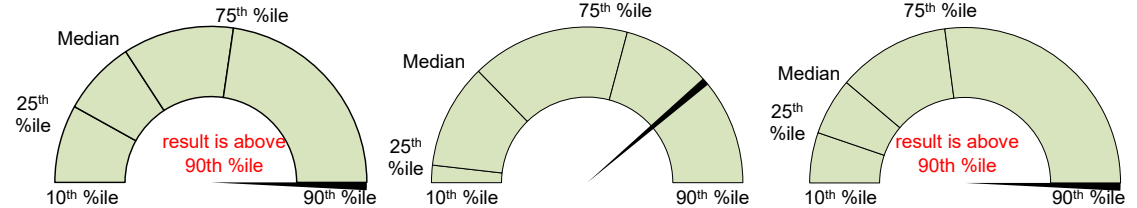
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	7.3	\$82,944	CRUC
Real Losses	210.9	\$183,792	VPC
Unbilled Authorized Cons	12.6	\$11,013	VPC
Non-Revenue Water	230.8	\$277,748	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

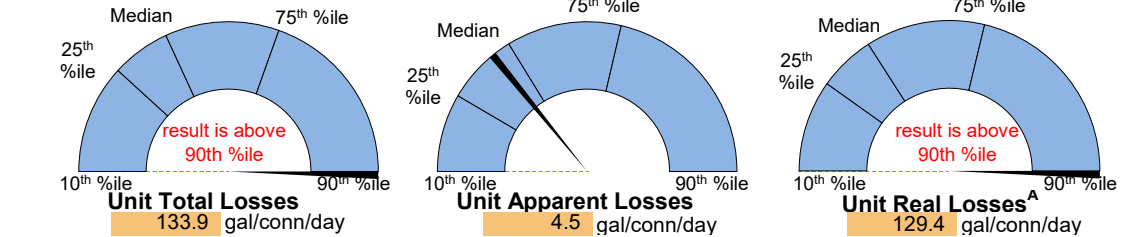
Target (see Worksheet)



Total Loss Cost Rate
59.75 \$/conn/year

Apparent Loss Cost Rate
18.58 \$/conn/year

Real Loss Cost Rate
41.17 \$/conn/year



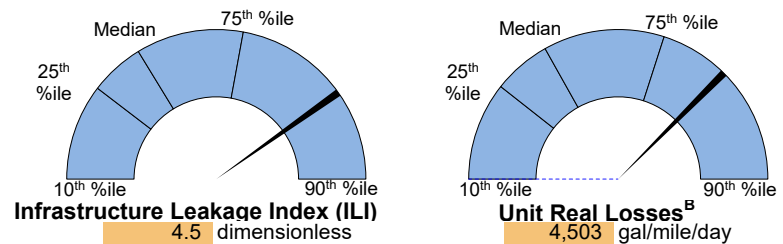
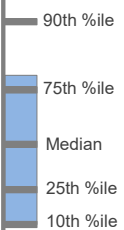
Unit Total Losses
133.9 gal/conn/day

Unit Apparent Losses
4.5 gal/conn/day

Unit Real Losses^A
129.4 gal/conn/day

Average Operating Pressure

85.2 psi



Infrastructure Leakage Index (ILI)
4.5 dimensionless

Unit Real Losses^B
4,503 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **46.7** MG/Yr **28.6** gal/conn/day

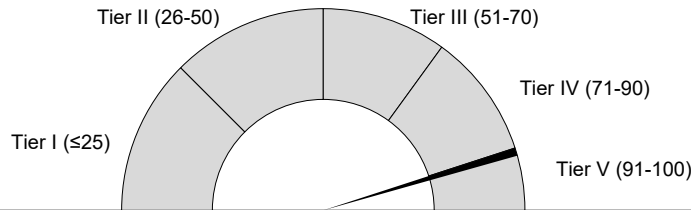
Guidance Information for Key Performance

- 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)³.
- 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.

Data Validity

Data Validity Score: **90** Data Validity Tier: **Tier IV (71-90)**

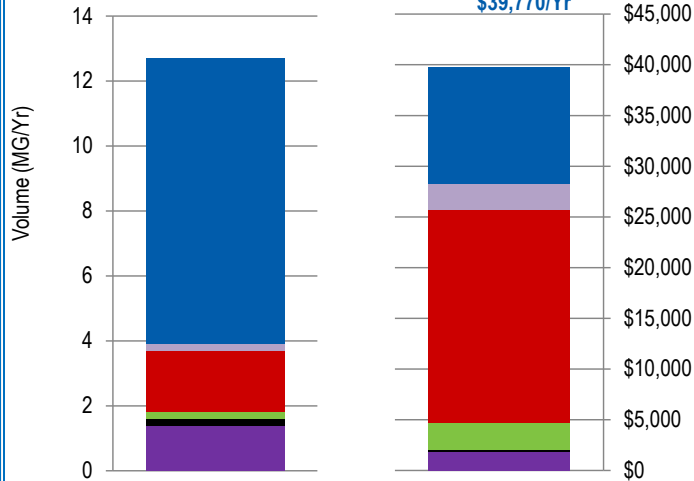
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 13 MG/Yr

Total Cost of NRW = \$39,770/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	8.8	\$11,457	VPC
Systematic Data Handling Errors	1.6	\$2,100	VPC
Customer Metering Inaccuracies	2.3	\$26,212	CRUC
Unauthorized Consumption	12.7	\$39,770	Blended
Unbilled Metered Authorized Cons			
Unbilled Unmetered Auth Cons			

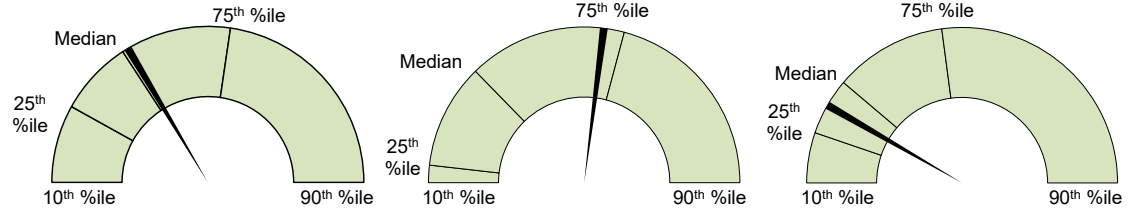
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	2.3	\$26,212	CRUC
Real Losses	8.8	\$11,457	VPC
Unbilled Authorized Cons	1.6	\$2,100	VPC
Non-Revenue Water	12.7	\$39,770	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

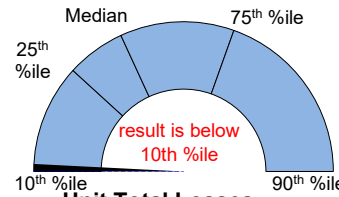
gauge %iles per validated industry ranges²



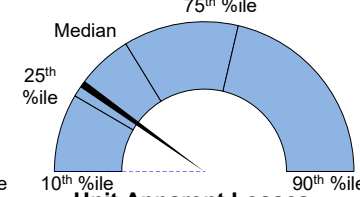
Total Loss Cost Rate
18.54 \$/conn/year

Apparent Loss Cost Rate
12.90 \$/conn/year

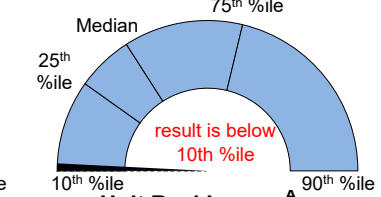
Real Loss Cost Rate
5.64 \$/conn/year



Unit Total Losses
14.9 gal/conn/day



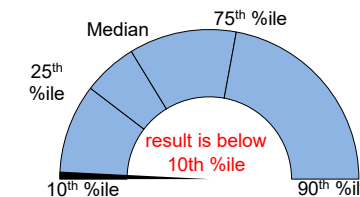
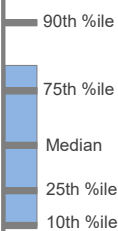
Unit Apparent Losses
3.1 gal/conn/day



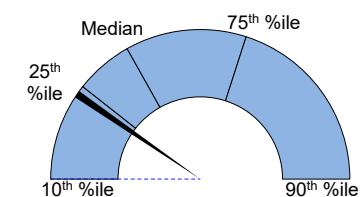
Unit Real Losses^A
11.8 gal/conn/day

Average Operating Pressure

87.6 psi



Infrastructure Leakage Index (ILI)
0.6 dimensionless



Unit Real Losses^B
1,118 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **14.9** MG/Yr **20.1** 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)³.
- 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.

Water Audit Report for: **PAW- Warren District 450**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	702.297	MG/Yr	
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr	
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr	
WATER SUPPLIED:					739.260	MG/Yr	

Water Supplied Error Adjustments
choose entry option:

5.00% percent

under-registration VOSEA
WIEA
WEEA

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	474.467	MG/Yr	
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>		MG/Yr	
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	10.519	MG/Yr	
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	7.876	MG/Yr	
AUTHORIZED CONSUMPTION:					492.862	MG/Yr	

choose entry option:
custom 7.876 MG/Yr

WATER LOSSES

246.398 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"/>	1.186	MG/Yr	
CMI	Customer Metering Inaccuracies:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="7"/>	9.898	MG/Yr	
UC	Unauthorized Consumption:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="3"/>	1.186	MG/Yr	

choose entry option:

default
 percent
 default

under-registration

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

Apparent Losses: 12.270 MG/Yr

Real Losses

Real Losses: 234.128 MG/Yr

WATER LOSSES: 246.398 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 264.793 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	89.3	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="10"/>	5,749		(active and inactive)
	Service connection density:					64	conn./mile main
Lp	Average length of (private) customer service line:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	20.3	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="10"/>	84.5	psi	

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$11.51	\$/1000 gallons (US)	
VPC	Variable Production Cost:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$136.24	\$/Million gallons	
					Total Annual Operating Cost		
					\$1,613,267	\$/yr (optional input)	

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

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

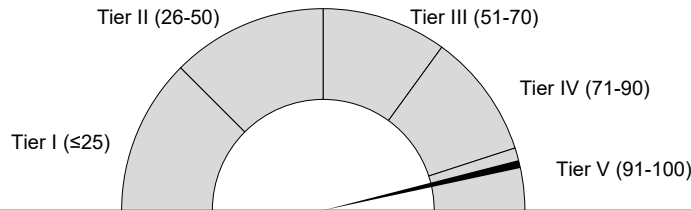
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

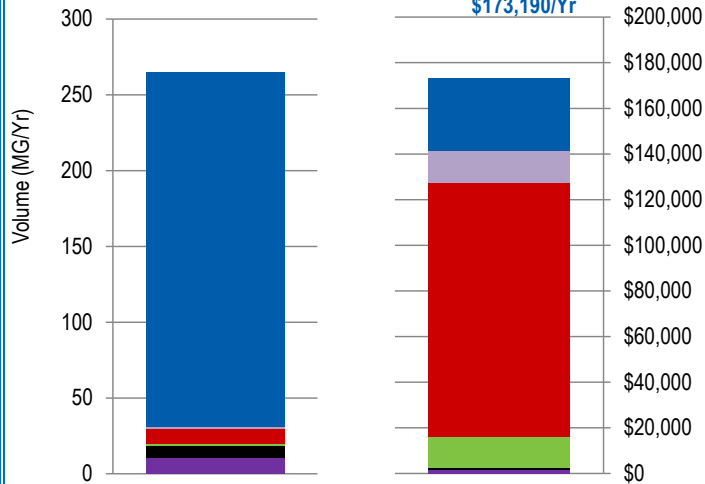
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 265 MG/Yr

Total Cost of NRW = \$173,190/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	234.1	\$31,898	VPC
Systematic Data Handling Errors	18.4	\$2,506	VPC
Customer Metering Inaccuracies	12.3	\$138,786	CRUC
Unauthorized Consumption	264.8	\$173,190	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

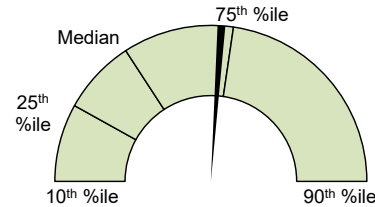
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	12.3	\$138,786	CRUC
Real Losses	234.1	\$31,898	VPC
Unbilled Authorized Cons	18.4	\$2,506	VPC
Non-Revenue Water	264.8	\$173,190	Blended

Actual KPI result

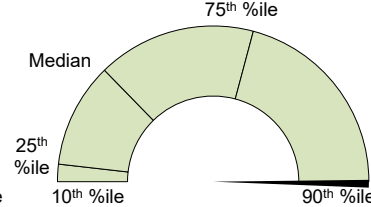
Key Performance Indicators

gauge %iles per validated industry ranges²

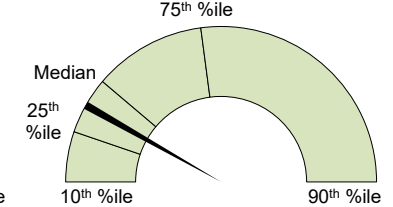
Target (see Worksheet)



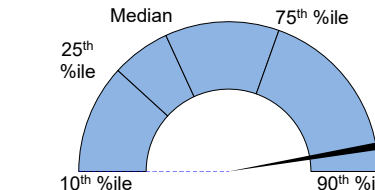
Total Loss Cost Rate
29.69 \$/conn/year



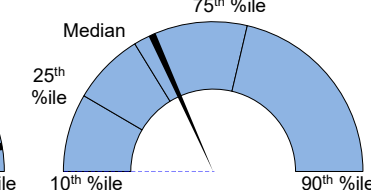
Apparent Loss Cost Rate
24.14 \$/conn/year



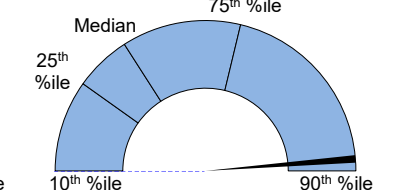
Real Loss Cost Rate
5.55 \$/conn/year



Unit Total Losses
117.4 gal/conn/day



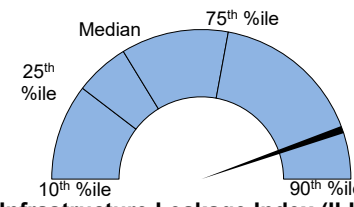
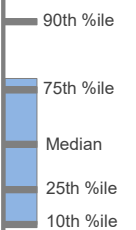
Unit Apparent Losses
5.8 gal/conn/day



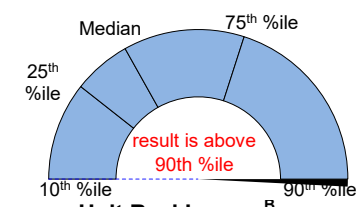
Unit Real Losses^A
111.6 gal/conn/day

Average Operating Pressure

84.5 psi



Infrastructure Leakage Index (ILI)
5.0 dimensionless



Unit Real Losses^B
7,183 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **46.6** MG/Yr **22.2** 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.
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- See UARL and ILI in Definitions tab for discussion of size and pressure limitations.
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AWWA Free Water Audit Software: Worksheet

FWAS v6.0
American Water Works Association.

Water Audit Report for: **PAW- Kane District 460**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="129.753"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value=""/> MG/Yr	choose entry option: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/>	<input type="text" value="under-registration"/> VOSEA <input type="text" value=""/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED:		132.401	MG/Yr

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="103.166"/> MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="5.159"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="5.226"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="5.226"/> MG/Yr	
AUTHORIZED CONSUMPTION:		113.551	MG/Yr

WATER LOSSES

18.850 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"/> <input type="text" value="0.258"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="2.211"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="0.258"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses:		2.727	MG/Yr

Real Losses

Real Losses: **16.123** MG/Yr

WATER LOSSES: **18.850** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **29.235** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="42.9"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="2,379"/> Service connection density: <input type="text" value=""/> <input type="text" value="55"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)
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="10"/> <input type="text" value="19.8"/> 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="10"/> <input type="text" value="97.9"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$564.48"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$617,284"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

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

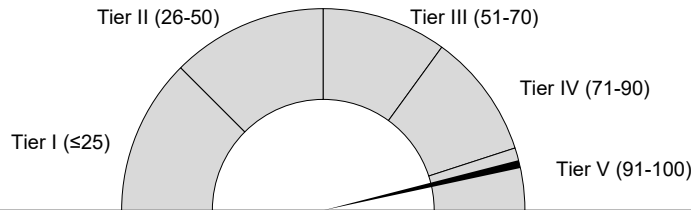
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

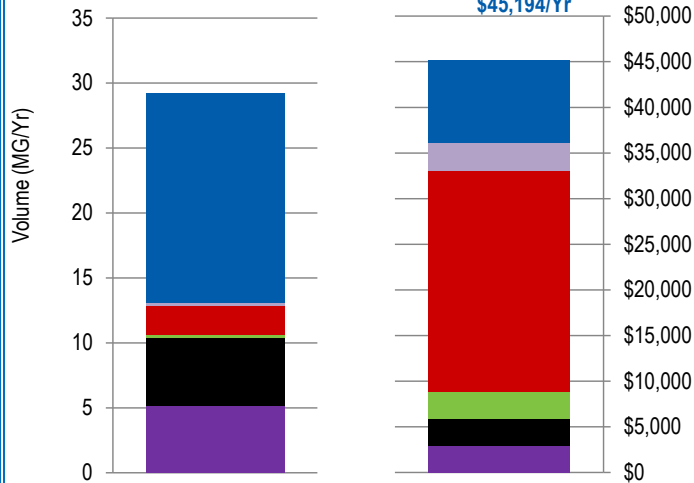
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 29 MG/Yr

Total Cost of NRW = \$45,194/Yr



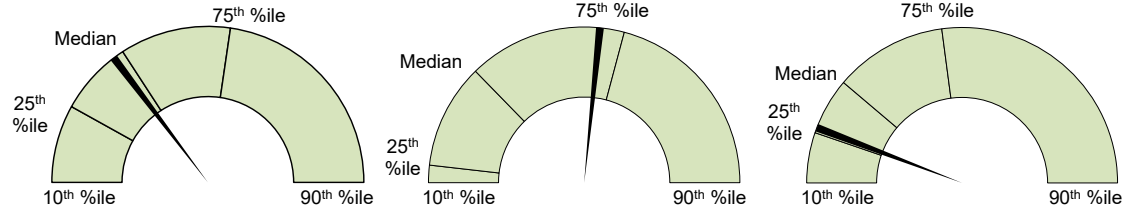
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	2.7	\$30,230	CRUC
Real Losses	16.1	\$9,101	VPC
Unbilled Authorized Cons	10.4	\$5,862	VPC
Non-Revenue Water	29.2	\$45,194	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

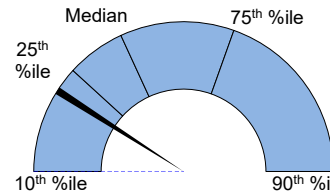
Target (see Worksheet)



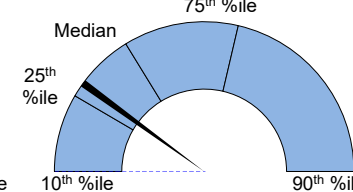
Total Loss Cost Rate
16.53 \$/conn/year

Apparent Loss Cost Rate
12.71 \$/conn/year

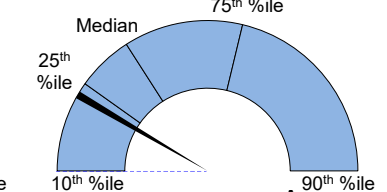
Real Loss Cost Rate
3.83 \$/conn/year



Unit Total Losses
21.7 gal/conn/day



Unit Apparent Losses
3.1 gal/conn/day

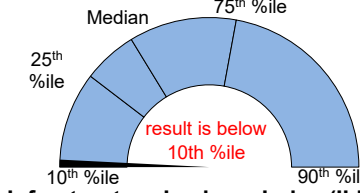
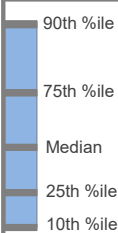


Unit Real Losses^A
18.6 gal/conn/day

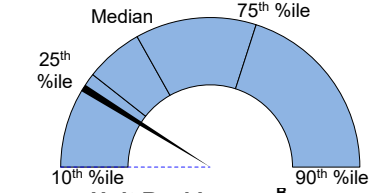
Average Operating Pressure

97.9 psi

AOP is above 90th %ile



Infrastructure Leakage Index (ILI)
0.7 dimensionless



Unit Real Losses^B
1,030 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **23.4** MG/Yr **27.0** 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)³.
- 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.

Water Audit Report for: **PAW - 510 Norristown**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="3,283.234"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="7.719"/> MG/Yr 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	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.00%"/> percent <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="0.00%"/> percent	choose entry option: <input type="text" value="custom"/> <input type="text" value="51.062"/> MG/Yr	VOSEA WIEA WEEA
WATER SUPPLIED: 3,290.953 MG/Yr				

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="2,303.080"/> MG/Yr 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 Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="7.632"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="51.062"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="51.062"/> MG/Yr	
AUTHORIZED CONSUMPTION: 2,361.774 MG/Yr			

WATER LOSSES

929.179 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"/> <input type="text" value="5.758"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="47.157"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="5.758"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses: 58.673 MG/Yr			

Real Losses

Real Losses: 870.506 MG/Yr

WATER LOSSES: 929.179 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 987.873 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="387.9"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="31,180"/> Service connection density: <input type="text" value="80"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)	
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="10"/> <input type="text" value="19.3"/> 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="10"/> <input type="text" value="80.3"/> psi		

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$550.95"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$9,867,911"/> \$/yr (optional input)
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WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

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

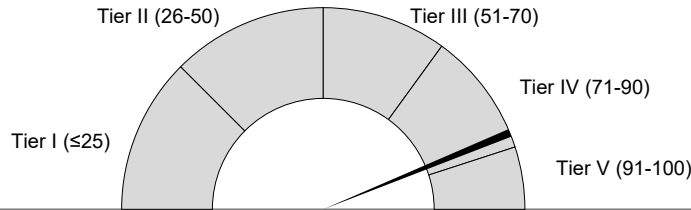
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

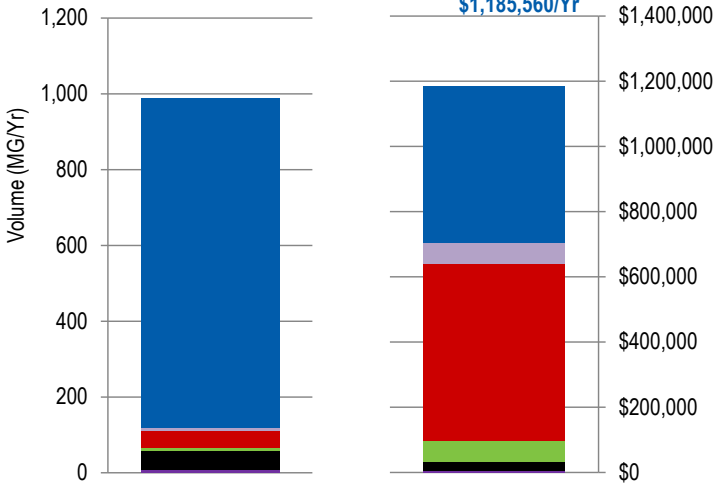
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 988 MG/Yr

Total Cost of NRW = \$1,185,560/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	870.5	\$479,605	VPC
Systematic Data Handling Errors	58.7	\$32,337	VPC
Customer Metering Inaccuracies	58.7	\$32,337	VPC
Unauthorized Consumption	58.7	\$32,337	VPC
Unbilled Unmetered Auth Cons	58.7	\$32,337	VPC
Unbilled Metered Authorized Cons	58.7	\$32,337	VPC
Total	988.0	\$1,185,560	Blended

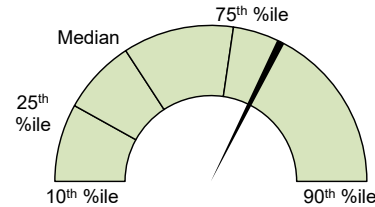
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	58.7	\$673,617	CRUC
Real Losses	870.5	\$479,605	VPC
Unbilled Authorized Cons	58.7	\$32,337	VPC
Non-Revenue Water	987.9	\$1,185,560	Blended

Actual KPI result

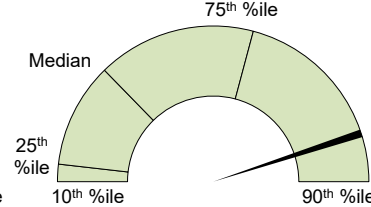
Key Performance Indicators

gauge %iles per validated industry ranges²

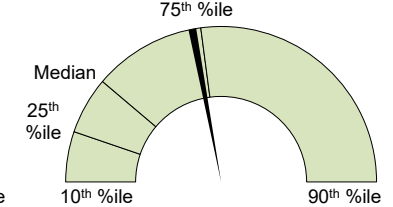
Target (see Worksheet)



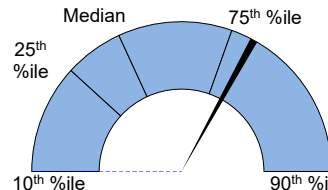
Total Loss Cost Rate
36.99 \$/conn/year



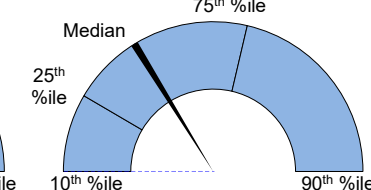
Apparent Loss Cost Rate
21.60 \$/conn/year



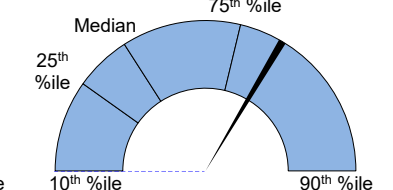
Real Loss Cost Rate
15.38 \$/conn/year



Unit Total Losses
81.6 gal/conn/day



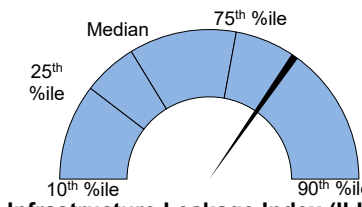
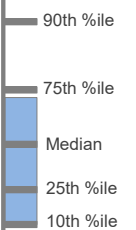
Unit Apparent Losses
5.2 gal/conn/day



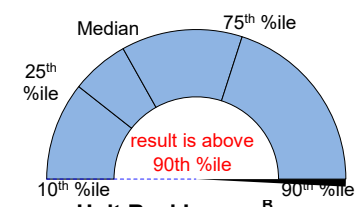
Unit Real Losses^A
76.5 gal/conn/day

Average Operating Pressure

80.3 psi



Infrastructure Leakage Index (ILI)
3.9 dimensionless



Unit Real Losses^B
6,148 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **223.6** MG/Yr **19.7** 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)³.
- 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.

Water Audit Report for: **PAW - 520 Yardley**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="1,109.687"/> MG/Yr 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 Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="73.936"/> MG/Yr	choose entry option: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.63%"/> <input type="text" value="percent"/> <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="0.00%"/> <input type="text" value="percent"/>	<input type="text" value="over-registration"/> VOSEA <input type="text" value=""/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED: 1,028.804 MG/Yr			

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="853.083"/> MG/Yr 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 Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="2.771"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="12.349"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="12.349"/> MG/Yr	
AUTHORIZED CONSUMPTION: 868.203 MG/Yr			

WATER LOSSES

Apparent Losses

SDHE CMI UC	Default option selected for Systematic Data Handling Errors, with automatic data grading of 3 Systematic Data Handling Errors: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="2.133"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="17.466"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="2.133"/> MG/Yr Default option selected for Unauthorized Consumption, with automatic data grading of 3 Apparent Losses: 21.732 MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
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Real Losses

Real Losses: **138.869 MG/Yr**
WATER LOSSES: 160.601 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 175.721 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="192.6"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="11,737"/> Service connection density: <input type="text" value="61"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)	
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="10"/> <input type="text" value="22.0"/> 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="10"/> <input type="text" value="62.4"/> psi		

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$442.51"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$3,817,044"/> \$/yr (optional input)
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WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

KEY PERFORMANCE INDICATOR TARGETS:

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

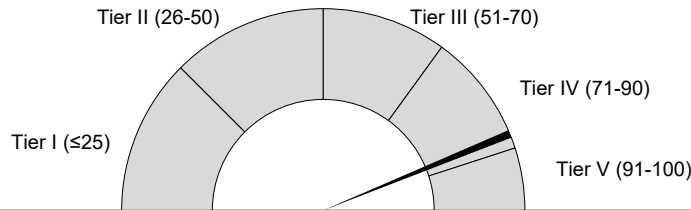
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

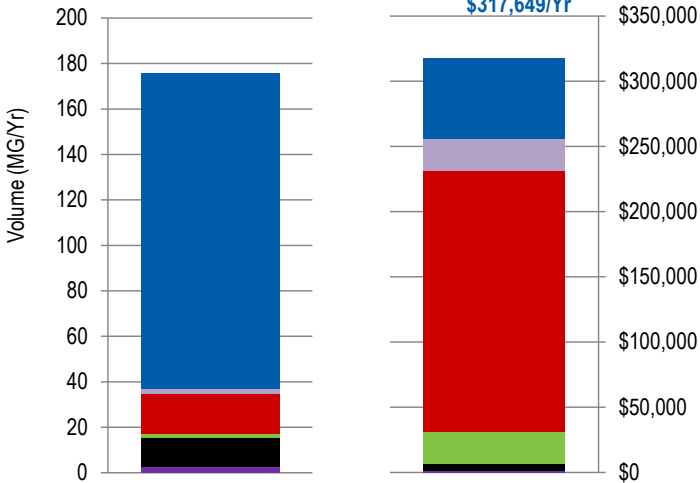
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 176 MG/Yr

Total Cost of NRW = \$317,649/Yr



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

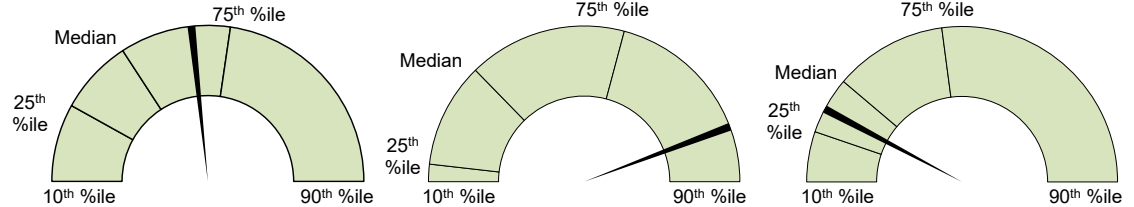
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	21.7	\$249,507	CRUC
Real Losses	138.9	\$61,451	VPC
Unbilled Authorized Cons	15.1	\$6,691	VPC
Non-Revenue Water	175.7	\$317,649	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

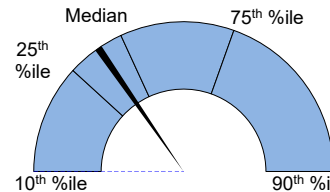
gauge %iles per validated industry ranges²



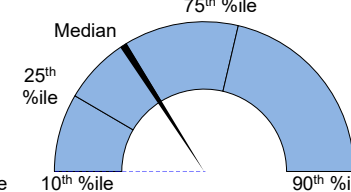
Total Loss Cost Rate
26.49 \$/conn/year

Apparent Loss Cost Rate
21.26 \$/conn/year

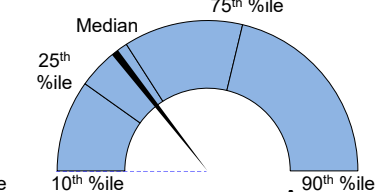
Real Loss Cost Rate
5.24 \$/conn/year



Unit Total Losses
37.5 gal/conn/day



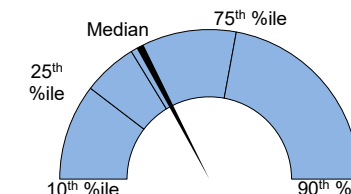
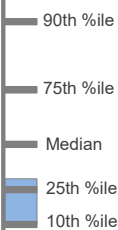
Unit Apparent Losses
5.1 gal/conn/day



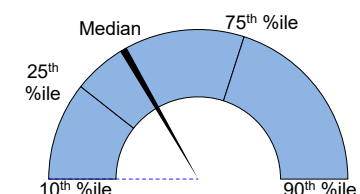
Unit Real Losses^A
32.4 gal/conn/day

Average Operating Pressure

62.4 psi



Infrastructure Leakage Index (ILI)
1.9 dimensionless



Unit Real Losses^B
1,975 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **72.2** 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)³.
- 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.

Water Audit Report for: **PAW - 530 Abington**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	588.828	MG/Yr			
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	0.000	MG/Yr			
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	0.000	MG/Yr			
WATER SUPPLIED:					590.304	MG/Yr			

Water Supplied Error Adjustments
choose entry option:

0.25% percent

under-registration VOSEA
WIEA
WEEA

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	352.166	MG/Yr			
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	0.000	MG/Yr			
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	0.750	MG/Yr			
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	13.324	MG/Yr			
AUTHORIZED CONSUMPTION:					366.240	MG/Yr			

choose entry option:
custom 13.324 MG/Yr

WATER LOSSES

224.064 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"/>	0.880	MG/Yr		
CMI	Customer Metering Inaccuracies:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="8"/>	7.202	MG/Yr		
UC	Unauthorized Consumption:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="3"/>	0.880	MG/Yr		

choose entry option:

default
 percent
 default

under-registration

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

Apparent Losses: 8.963 MG/Yr

Real Losses

Real Losses: 215.101 MG/Yr

WATER LOSSES: 224.064 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 238.138 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	137.2	miles		
Nc	Number of service connections:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	6,523		(including fire hydrant lead lengths)	(active and inactive)
	Service connection density:				48	conn./mile main		
Lp	Are customer meters typically located at the curbstop/property line?				No			
	Average length of (private) customer service line:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	20.8	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="10"/>	95.0	psi		

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$11.51	\$/1000 gallons (US)		
VPC	Variable Production Cost:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$281.32	\$/Million gallons	Total Annual Operating Cost	
							\$1,883,682	\$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

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

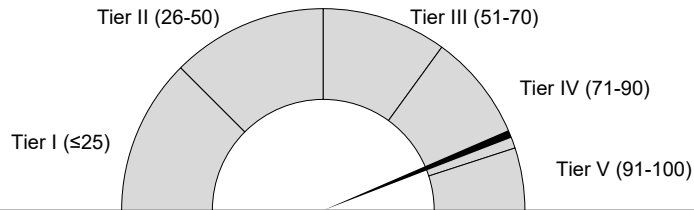
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

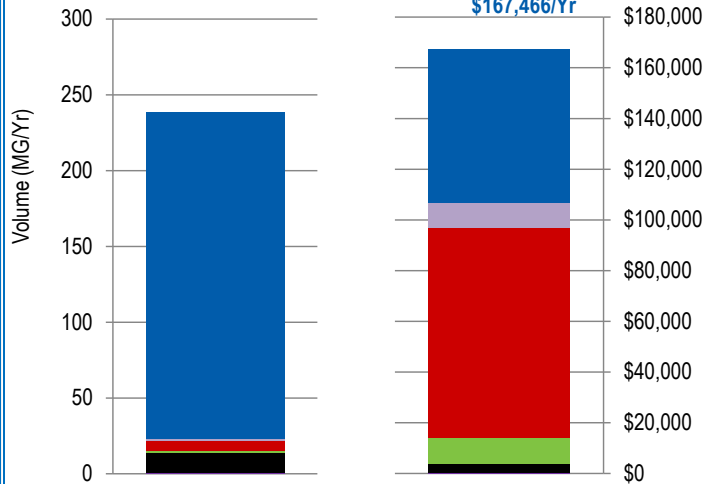
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 238 MG/Yr

Total Cost of NRW = \$167,466/Yr



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

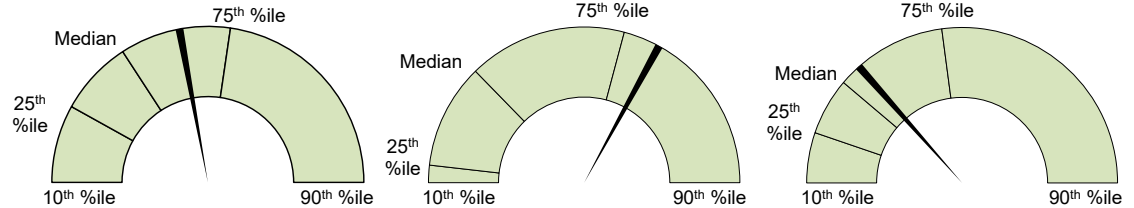
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	9.0	\$102,995	CRUC
Real Losses	215.1	\$60,512	VPC
Unbilled Authorized Cons	14.1	\$3,959	VPC
Non-Revenue Water	238.1	\$167,466	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

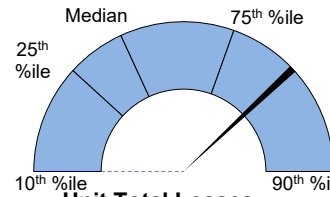
gauge %iles per validated industry ranges²



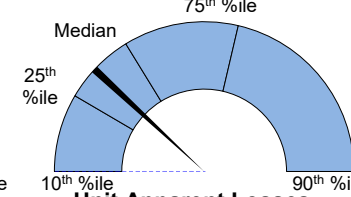
Total Loss Cost Rate
25.07 \$/conn/year

Apparent Loss Cost Rate
15.79 \$/conn/year

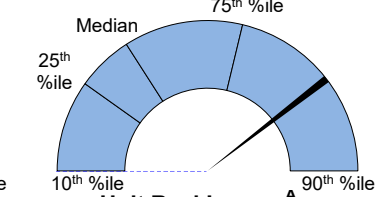
Real Loss Cost Rate
9.28 \$/conn/year



Unit Total Losses
94.1 gal/conn/day

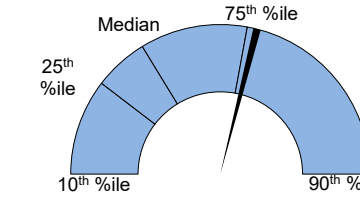
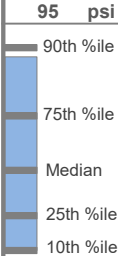


Unit Apparent Losses
3.8 gal/conn/day

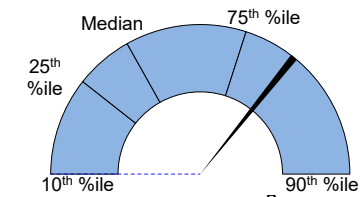


Unit Real Losses^A
90.3 gal/conn/day

Average Operating Pressure



Infrastructure Leakage Index (ILI)
3.2 dimensionless



Unit Real Losses^B
4,295 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **66.3** MG/Yr **27.9** 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)³.
- 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.

Water Audit Report for: **PAW - 540 Susquehanna**
 Audit Year: **2021** **Jan 01 2021 - Dec 31 2021** **Calendar**

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="7"/> 235.291 MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> n/a 0.000 MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> n/a 0.000 MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 0.71% percent	<input type="text" value="under-registration"/> VOSEA <input type="text" value=""/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED:		236.974	MG/Yr

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> 130.458 MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> n/a 0.000 MG/Yr Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 1.094 MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 7.269 MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="7.269"/> MG/Yr	
AUTHORIZED CONSUMPTION:		138.821	MG/Yr

WATER LOSSES

98.153 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"/> 0.326 MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> 2.685 MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> 0.326 MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses:		3.337	MG/Yr

Real Losses

Real Losses: 94.815 MG/Yr

WATER LOSSES: 98.153 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 106.516 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 62.0 miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 2,892 Service connection density: 47 conn./mile main	(including fire hydrant lead lengths) (active and inactive)
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="10"/> 18.8 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="10"/> 79.2 psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> \$11.51 \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> \$750.25 \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$755.020"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

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

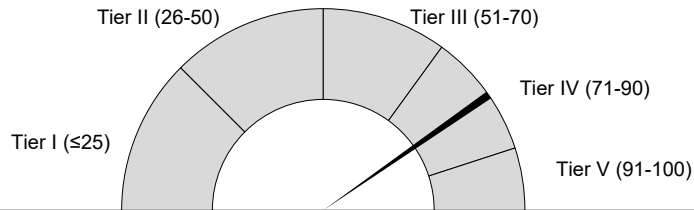
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **80** Data Validity Tier: **Tier IV (71-90)**

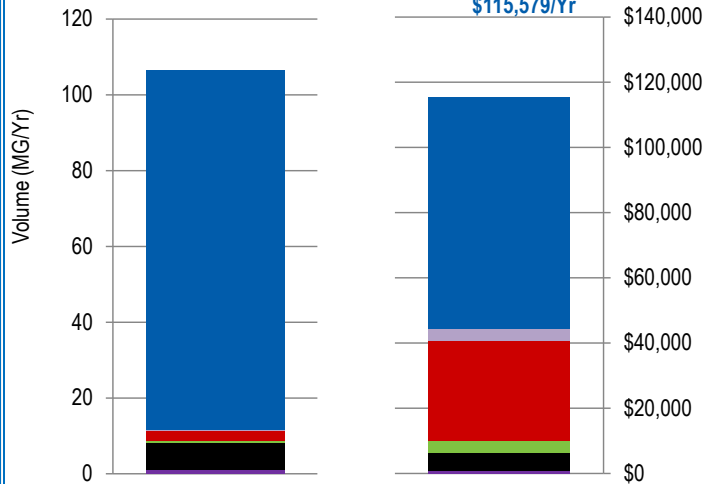
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 106 MG/Yr

Total Cost of NRW = \$115,579/Yr



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

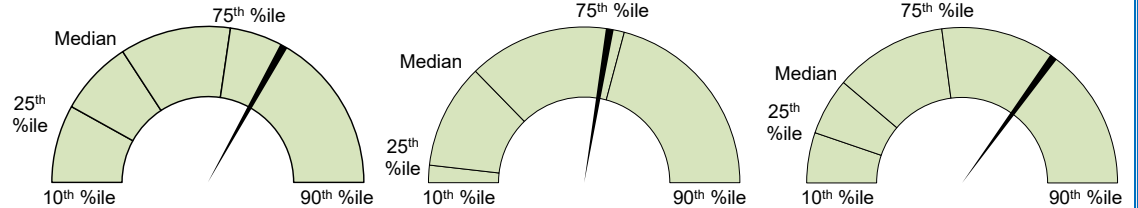
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	3.3	\$38,169	CRUC
Real Losses	94.8	\$71,135	VPC
Unbilled Authorized Cons	8.4	\$6,274	VPC
Non-Revenue Water	106.5	\$115,579	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

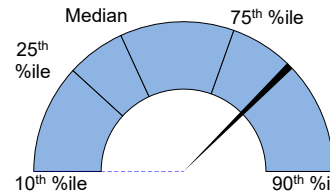
Target (see Worksheet)



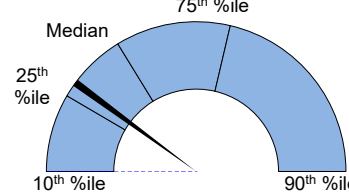
Total Loss Cost Rate
37.80 \$/conn/year

Apparent Loss Cost Rate
13.20 \$/conn/year

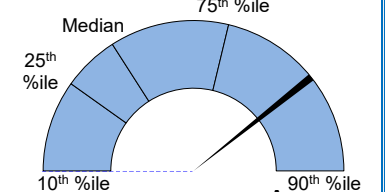
Real Loss Cost Rate
24.60 \$/conn/year



Unit Total Losses
93.0 gal/conn/day



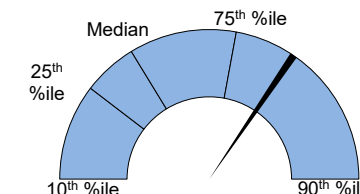
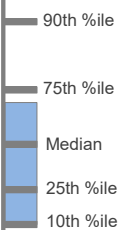
Unit Apparent Losses
3.2 gal/conn/day



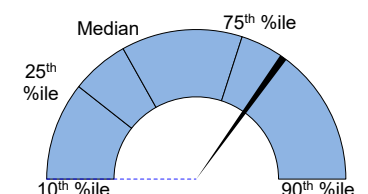
Unit Real Losses^A
89.8 gal/conn/day

Average Operating Pressure

79.2 psi



Infrastructure Leakage Index (ILI)
3.9 dimensionless



Unit Real Losses^B
4,190 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **24.5** MG/Yr **23.2** 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)³.
- 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.

Water Audit Report for: **PAW - 550 Bangor**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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 WI WE	Volume from Own Sources:	n g 9	255.469	MG/Yr	n g 10	1.16%	percent		
	Water Imported:	n g n/a	0.000	MG/Yr					over-registration
	Water Exported:	n g n/a	0.000	MG/Yr					VOSEA WIEA WEEA
WATER SUPPLIED:			252.540	MG/Yr					

AUTHORIZED CONSUMPTION

choose entry option:

BMAC BUAC UMAC UUC	Billed Metered:	n g 9	179.416	MG/Yr					
	Billed Unmetered:	n g n/a	0.000	MG/Yr					
	Unbilled Metered:	n g 10	0.544	MG/Yr					
	Unbilled Unmetered:	n g 10	2.190	MG/Yr					
AUTHORIZED CONSUMPTION:			182.150	MG/Yr		custom	2.190	MG/Yr	

WATER LOSSES

70.390 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:	n g 3	0.449	MG/Yr	0.25%	default		
	Customer Metering Inaccuracies:	n g 8	3.673	MG/Yr	2.00%	percent		under-registration
	Unauthorized Consumption:	n g 3	0.449	MG/Yr	0.25%	default		
Apparent Losses:			4.570	MG/Yr				

Real Losses

Real Losses: 65.820 MG/Yr

WATER LOSSES: 70.390 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 73.124 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains:	n g 10	57.0	miles	(including fire hydrant lead lengths) (active and inactive)				
	Number of service connections:	n g 10	3,477						
	Service connection density:		61	conn./mile main					
	Are customer meters typically located at the curbsto/property line?		No						
Lp	Average length of (private) customer service line:	n g 10	16.4	ft	(average distance between property line and meter)				
AOP	Average Operating Pressure:	n g 10	83.9	psi					

COST DATA

CRUC VPC	Customer Retail Unit Charge:	n g 10	\$11.51	\$/1000 gallons (US)		Total Annual Operating Cost	
	Variable Production Cost:	n g 10	\$392.01	\$/Million gallons		\$1,116,168	\$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

KEY PERFORMANCE INDICATOR TARGETS:

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

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

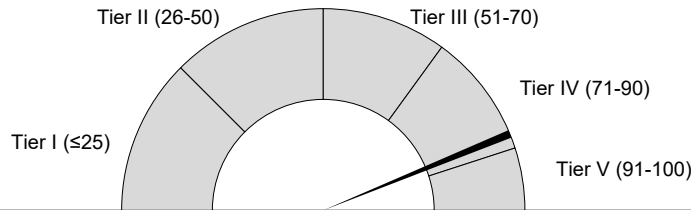
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

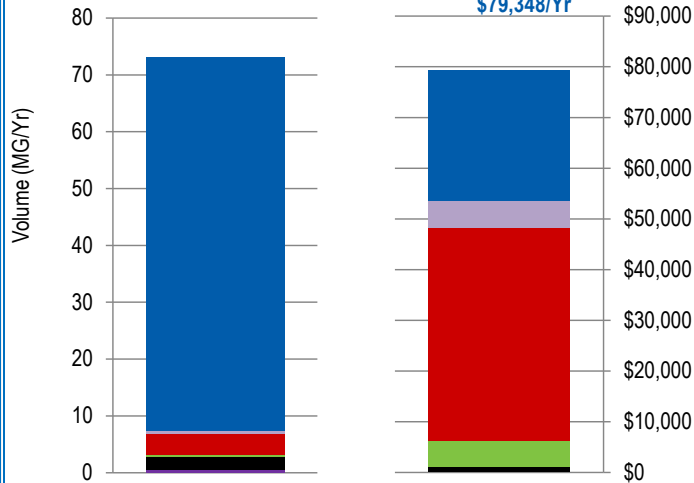
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 73 MG/Yr

Total Cost of NRW = \$79,348/Yr



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

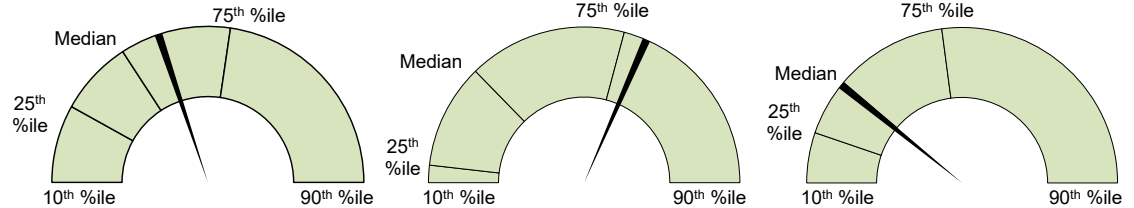
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	4.6	\$52,474	CRUC
Real Losses	65.8	\$25,802	VPC
Unbilled Authorized Cons	2.7	\$1,072	VPC
Non-Revenue Water	73.1	\$79,348	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

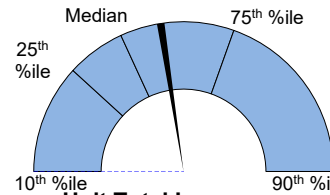
gauge %iles per validated industry ranges²



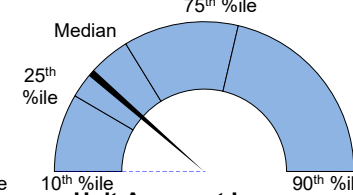
Total Loss Cost Rate
22.51 \$/conn/year

Apparent Loss Cost Rate
15.09 \$/conn/year

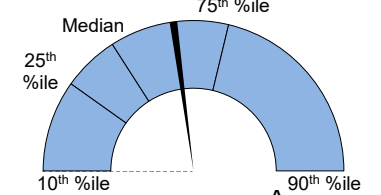
Real Loss Cost Rate
7.42 \$/conn/year



Unit Total Losses
55.5 gal/conn/day



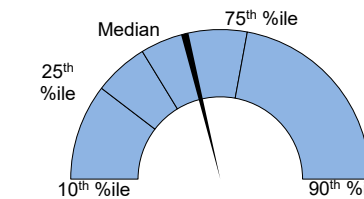
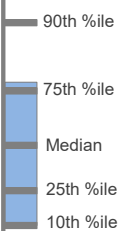
Unit Apparent Losses
3.6 gal/conn/day



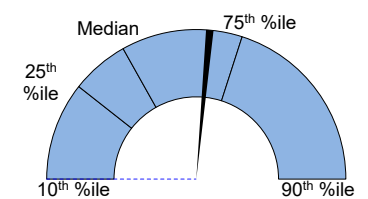
Unit Real Losses^A
51.9 gal/conn/day

Average Operating Pressure

83.9 psi



Infrastructure Leakage Index (ILI)
2.4 dimensionless



Unit Real Losses^B
3,164 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **27.9** MG/Yr **22.0** 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)³.
- 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.

Water Audit Report for: **PAW - 560 Nazareth**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> 743.938 MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> 0.000 MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> 0.000 MG/Yr	choose entry option: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 0.50% <input type="text" value="percent"/>	<input type="text" value="over-registration"/> VOSEA <input type="text" value="WIEA"/> <input type="text" value="WEEA"/>
WATER SUPPLIED:		740.237 MG/Yr	

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> 612.241 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="10"/> 17.454 MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 7.718 MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="7.718"/> MG/Yr	
AUTHORIZED CONSUMPTION:		637.413 MG/Yr	

WATER LOSSES

102.824 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"/> 1.531 MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> 12.851 MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> 1.531 MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Apparent Losses:		15.912 MG/Yr	

Real Losses

Real Losses: **86.912** MG/Yr

WATER LOSSES: **102.824** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **127.996** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 156.5 miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 10,452 Service connection density: 67 conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)	
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="10"/> 18.9 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="10"/> 94.9 psi		

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> \$11.51 \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> \$305.34 \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$3,005,502"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

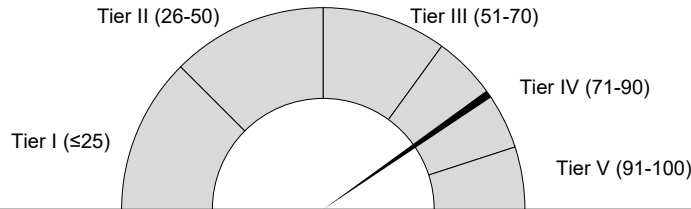
Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
 Unit Real Losses^B: gal/mile/day

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

Data Validity

Data Validity Score: **80** Data Validity Tier: **Tier IV (71-90)**

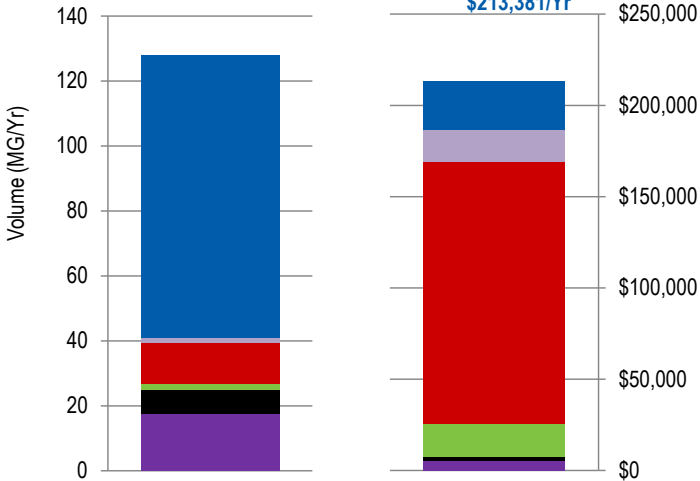
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 128 MG/Yr

Total Cost of NRW = \$213,381/Yr



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

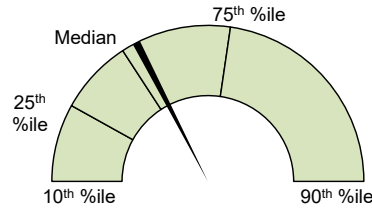
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	15.9	\$179,157	CRUC
Real Losses	86.9	\$26,538	VPC
Unbilled Authorized Cons	25.2	\$7,686	VPC
Non-Revenue Water	128.0	\$213,381	Blended

Actual KPI result

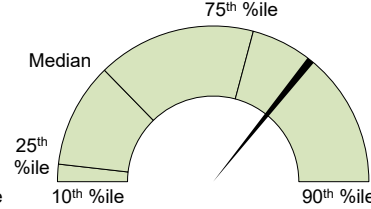
Key Performance Indicators

Target (see Worksheet)

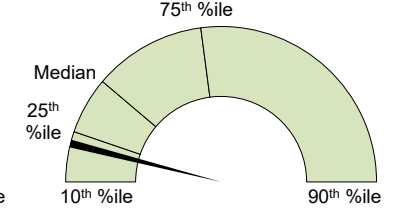
gauge %iles per validated industry ranges²



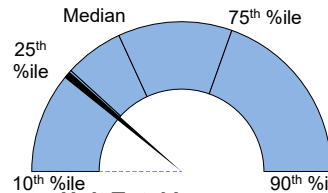
Total Loss Cost Rate
19.68 \$/conn/year



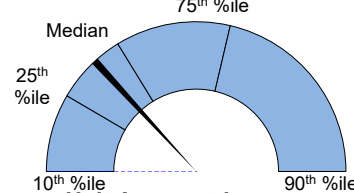
Apparent Loss Cost Rate
17.14 \$/conn/year



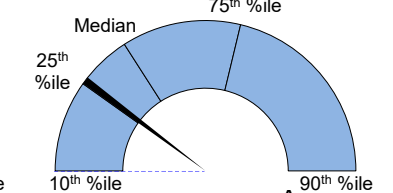
Real Loss Cost Rate
2.54 \$/conn/year



Unit Total Losses
27.0 gal/conn/day



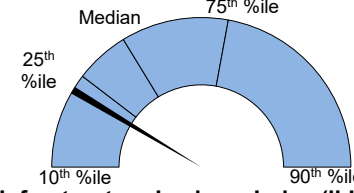
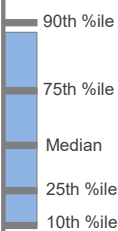
Unit Apparent Losses
4.2 gal/conn/day



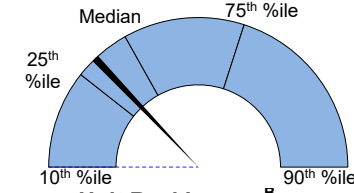
Unit Real Losses^A
22.8 gal/conn/day

Average Operating Pressure

94.9 psi



Infrastructure Leakage Index (ILI)
0.9 dimensionless



Unit Real Losses^B
1,521 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **93.4** MG/Yr **24.5** 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)³.
- 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.

Water Audit Report for: **PAW - 570 Pocono**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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:

WATER SUPPLIED	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="619.949"/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.10%"/> <input type="text" value="percent"/>	<input type="text" value="over-registration"/> VOSEA
VDHE	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		WIEA
WI	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		WEEA
WE			
WATER SUPPLIED:		619.330	MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="373.085"/> 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="10"/> <input type="text" value="6.966"/> MG/Yr		
UUAC	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="8.444"/> MG/Yr		
AUTHORIZED CONSUMPTION:		388.495	MG/Yr

WATER LOSSES

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="0.933"/> 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="8"/> <input type="text" value="7.756"/> 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="0.933"/> 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:		9.622	MG/Yr

Real Losses

Real Losses: **221.213** MG/Yr
WATER LOSSES: **230.835** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **246.245** MG/Yr

SYSTEM DATA

Lm	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="157.2"/> 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="10"/> <input type="text" value="9,964"/>	(active and inactive)	
	Service connection density: <input type="text" value="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="10"/> <input type="text" value="21.4"/> 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="10"/> <input type="text" value="67.2"/> psi		

COST DATA

CRUC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/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="10"/> <input type="text" value="\$537.02"/> \$/Million gallons		<input type="text" value="\$2,525,359"/> \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

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

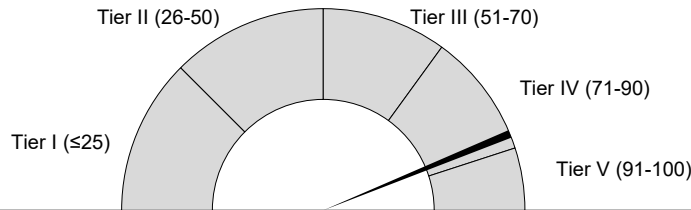
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

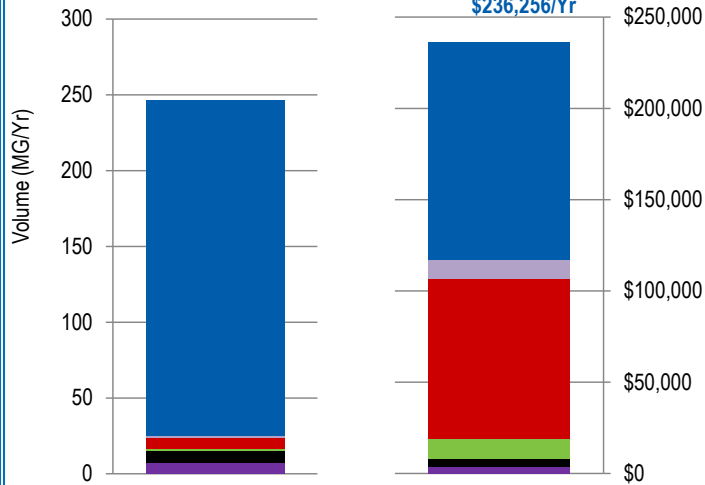
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 246 MG/Yr

Total Cost of NRW = \$236,256/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	221.2	\$118,796	VPC
Systematic Data Handling Errors	9.6	\$109,184	CRUC
Customer Metering Inaccuracies	15.4	\$8,275	VPC
Unauthorized Consumption	15.4	\$8,275	VPC
Unbilled Unmetered Auth Cons	15.4	\$8,275	VPC
Unbilled Metered Authorized Cons	246.2	\$236,256	Blended

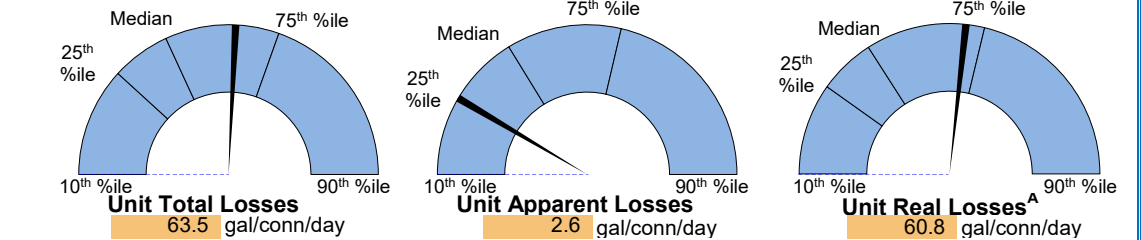
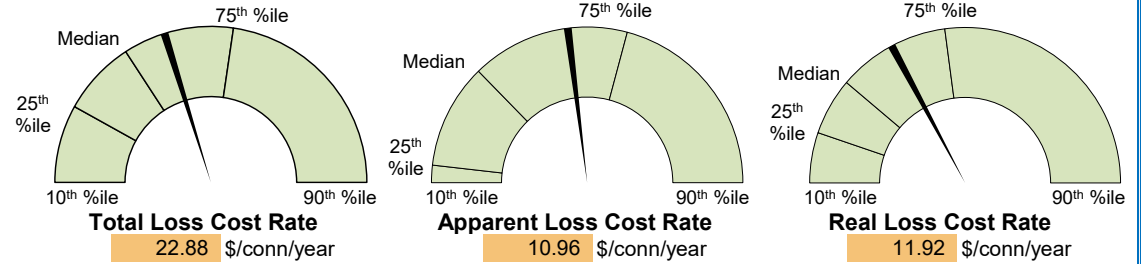
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	9.6	\$109,184	CRUC
Real Losses	221.2	\$118,796	VPC
Unbilled Authorized Cons	15.4	\$8,275	VPC
Non-Revenue Water	246.2	\$236,256	Blended

Actual KPI result

Key Performance Indicators

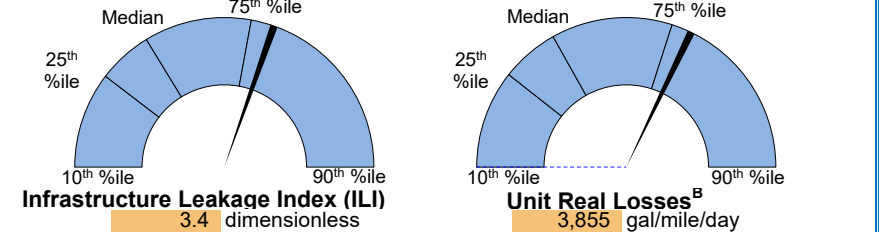
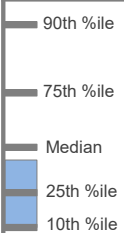
gauge %iles per validated industry ranges²

Target (see Worksheet)



Average Operating Pressure

67.2 psi



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **64.9** MG/Yr **17.9** 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)³.
- 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.

Water Audit Report for: **PAW - 590 Glen Alsace**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> 465.847 MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> 173.543 MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> 0.000 MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 0.13% percent <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> 0.00% percent	under-registration VOSEA WIEA WEEA
WATER SUPPLIED: 639.996 MG/Yr			

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> 570.987 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="10"/> 0.033 MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 22.399 MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="22.399"/> MG/Yr	
AUTHORIZED CONSUMPTION: 593.419 MG/Yr			

WATER LOSSES

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"/> 1.427 MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> 11.653 MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> 1.427 MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	under-registration
Default option selected for Unauthorized Consumption, with automatic data grading of 3 Apparent Losses: 14.508 MG/Yr			

Real Losses

Real Losses: **32.069** MG/Yr
WATER LOSSES: 46.577 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 69.009 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 144.3 miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> 9,355 Service connection density: 65 conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)
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="10"/> 21.2 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="10"/> 81.8 psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> \$11.51 \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> \$1,001.02 \$/Million gallons	Total Annual Operating Cost \$2,821,656 \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 2: Systematic Data Handling Errors (SDHE) |
| 3: Water Imported (WI) |

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

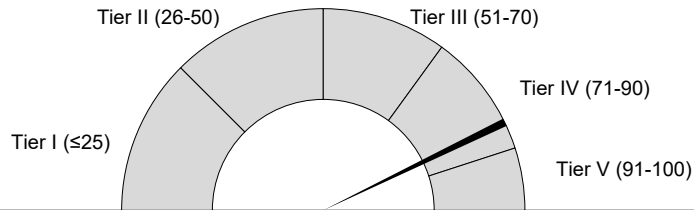
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **85** Data Validity Tier: **Tier IV (71-90)**

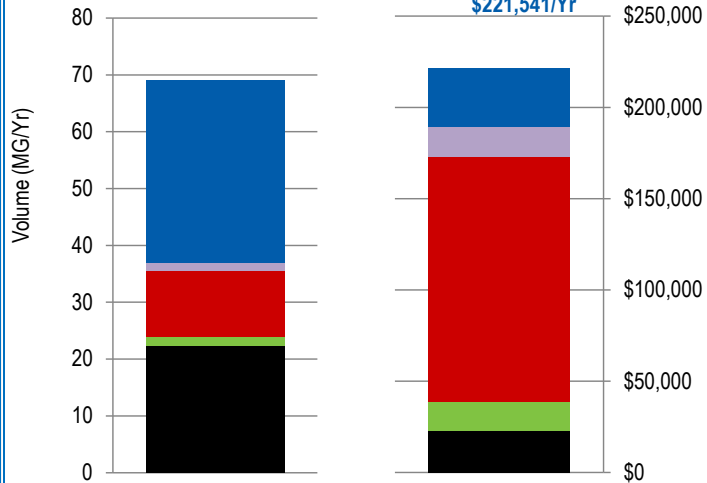
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 69 MG/Yr

Total Cost of NRW = \$221,541/Yr



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

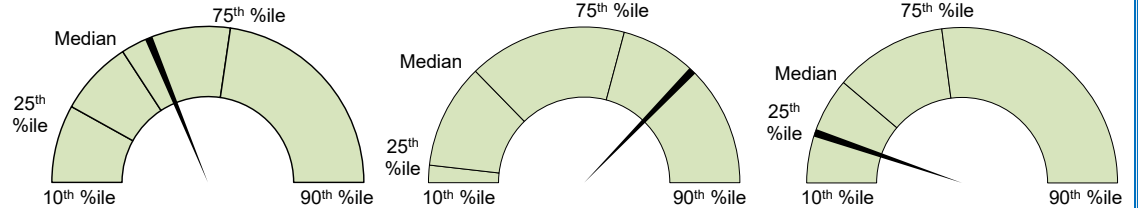
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	14.5	\$166,985	CRUC
Real Losses	32.1	\$32,102	VPC
Unbilled Authorized Cons	22.4	\$22,455	VPC
Non-Revenue Water	69.0	\$221,541	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

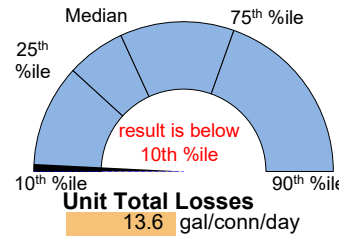
Target (see Worksheet)



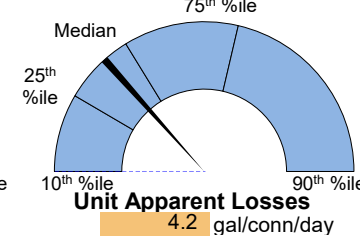
Total Loss Cost Rate
21.28 \$/conn/year

Apparent Loss Cost Rate
17.85 \$/conn/year

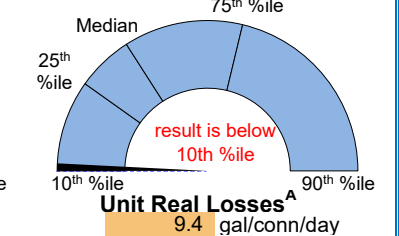
Real Loss Cost Rate
3.43 \$/conn/year



Unit Total Losses
13.6 gal/conn/day



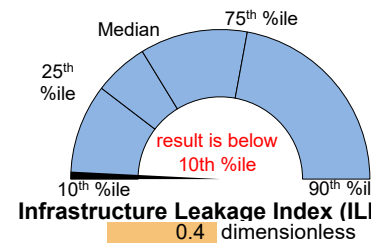
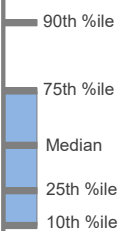
Unit Apparent Losses
4.2 gal/conn/day



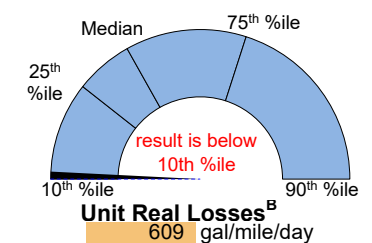
Unit Real Losses^A
9.4 gal/conn/day

Average Operating Pressure

81.8 psi



Infrastructure Leakage Index (ILI)
0.4 dimensionless



Unit Real Losses^B
609 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **73.6** MG/Yr **21.6** 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)³.
- 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.

Water Audit Report for: **PAW - 610 Mechanicsburg**

Audit Year: **2021** **Jan 01 2021 - Dec 31 2021** **Calendar**

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

To access definitions, click the input name

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="9"/> <input type="text" value="4,017.168"/> MG/Yr 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 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	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="1.33%"/> <input type="text" value="percent"/>	<input type="text" value="over-registration"/> VOSEA WIEA WEEA
WATER SUPPLIED:		3,964.441 MG/Yr	

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="2,811.373"/> MG/Yr 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 Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="16.384"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="101.280"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="101.280"/> MG/Yr	
AUTHORIZED CONSUMPTION:		2,929.037 MG/Yr	

WATER LOSSES

1,035.404 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"/> <input type="text" value="7.028"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="57.709"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="7.028"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
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Default option selected for Unauthorized Consumption, with automatic data grading of 3

Apparent Losses: 71.766 MG/Yr

Real Losses

Real Losses: 963.638 MG/Yr

WATER LOSSES: 1,035.404 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 1,153.068 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="545.5"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="50,156"/> Service connection density: <input type="text" value="92"/> conn./mile main	(including fire hydrant lead lengths) (active and inactive)
Lp	Are customer meters typically located at the curbstops/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="10"/> <input type="text" value="17.5"/> 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="10"/> <input type="text" value="92.8"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$404.40"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$12,408,740"/> \$/yr (optional input)
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WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

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

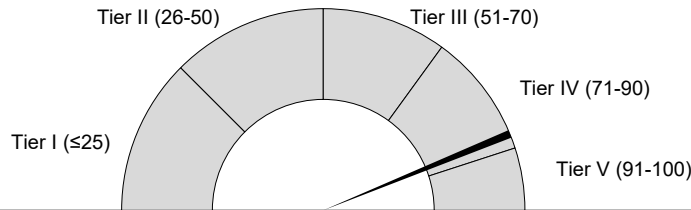
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

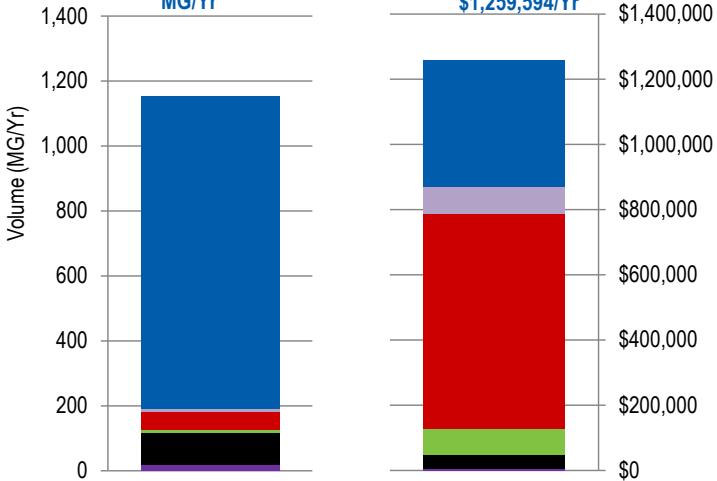
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 1,153 MG/Yr

Total Cost of NRW = \$1,259,594/Yr



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

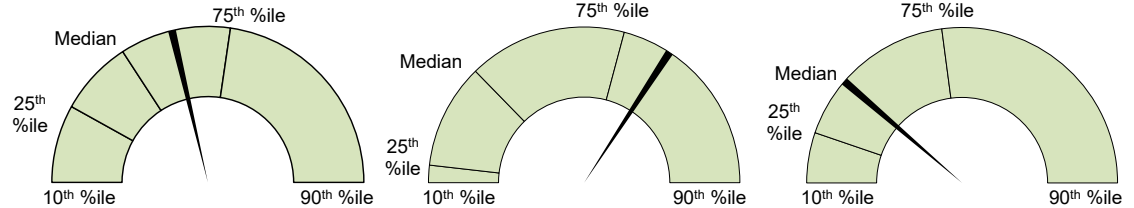
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	71.8	\$822,316	CRUC
Real Losses	963.6	\$389,695	VPC
Unbilled Authorized Cons	117.7	\$47,583	VPC
Non-Revenue Water	1,153.1	\$1,259,594	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

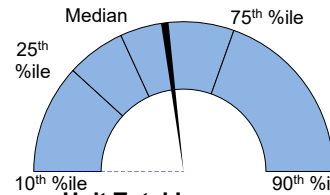
gauge %iles per validated industry ranges²



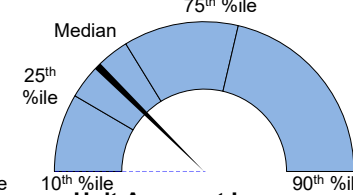
Total Loss Cost Rate
24.16 \$/conn/year

Apparent Loss Cost Rate
16.40 \$/conn/year

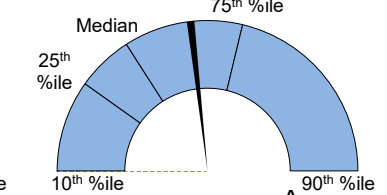
Real Loss Cost Rate
7.77 \$/conn/year



Unit Total Losses
56.6 gal/conn/day



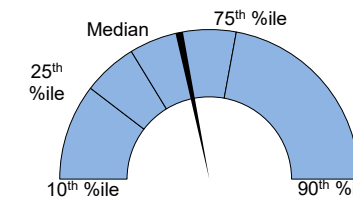
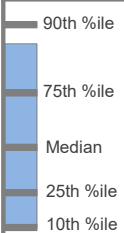
Unit Apparent Losses
3.9 gal/conn/day



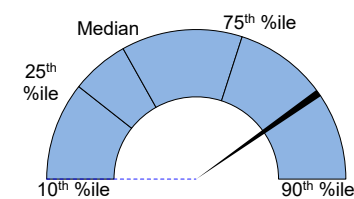
Unit Real Losses^A
52.6 gal/conn/day

Average Operating Pressure

92.8 psi



Infrastructure Leakage Index (ILI)
2.4 dimensionless



Unit Real Losses^B
4,840 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **397.0 MG/Yr** **21.7 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)³.
- 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.

Water Audit Report for: **PAW - 620 Hershey**
 Audit Year: **2021** **Jan 01 2021 - Dec 31 2021** **Calendar**

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:

WATER SUPPLIED

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	<input type="text" value="2,327.225"/>	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="0.75%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>	VOSEA
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="7"/>	<input type="text" value="2.023"/>	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	<input type="text" value="0.53%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>	WIEA
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							WEEA
WATER SUPPLIED:					<input type="text" value="2,346.845"/>	MG/Yr							

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	<input type="text" value="1,859.356"/>	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="10"/>	<input type="text" value="10.418"/>	MG/Yr							
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="16.096"/>	MG/Yr							
AUTHORIZED CONSUMPTION:					<input type="text" value="1,885.870"/>	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="4.648"/>	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="8"/>	<input type="text" value="38.159"/>	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="4.648"/>	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>					
Apparent Losses:					<input type="text" value="47.455"/>	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="10"/>	<input type="text" value="323.4"/>	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="10"/>	<input type="text" value="23,653"/>		(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="10"/>	<input type="text" value="20.5"/>	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="10"/>	<input type="text" value="79.1"/>	psi							

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	<input type="text" value="\$11.51"/>	\$/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="10"/>	<input type="text" value="\$416.61"/>	\$/Million gallons	<input type="text" value="\$6,033,316"/> \$/yr (optional input)						

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

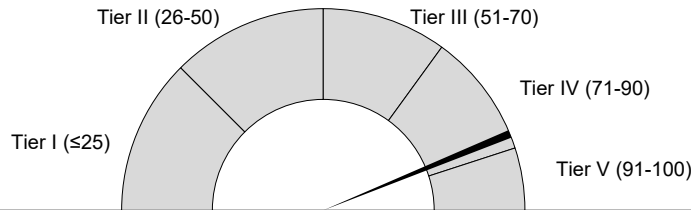
Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
 Unit Real Losses^B: gal/mile/day

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

Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

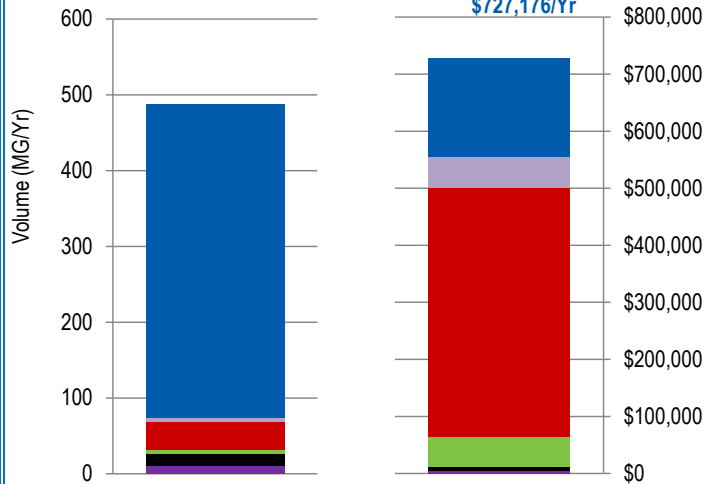
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 487 MG/Yr

Total Cost of NRW = \$727,176/Yr



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

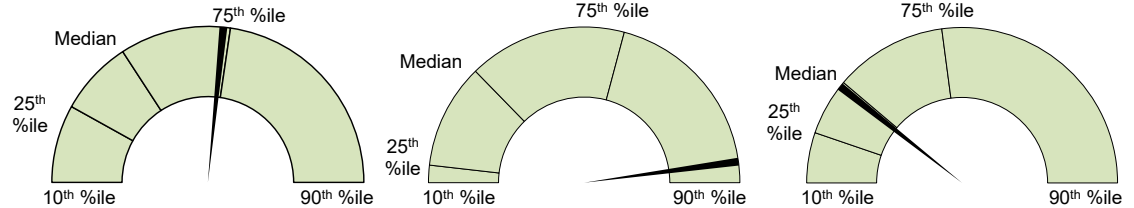
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	47.5	\$543,853	CRUC
Real Losses	413.5	\$172,276	VPC
Unbilled Authorized Cons	26.5	\$11,046	VPC
Non-Revenue Water	487.5	\$727,176	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

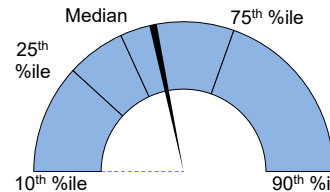
gauge %iles per validated industry ranges²



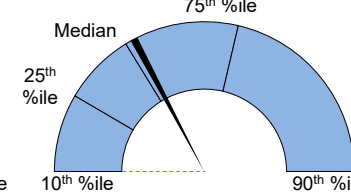
Total Loss Cost Rate
30.28 \$/conn/year

Apparent Loss Cost Rate
22.99 \$/conn/year

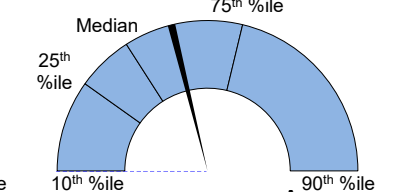
Real Loss Cost Rate
7.28 \$/conn/year



Unit Total Losses
53.4 gal/conn/day



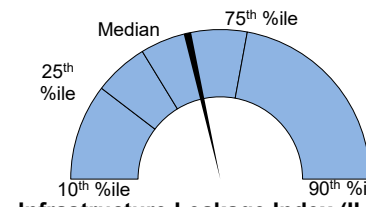
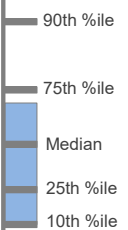
Unit Apparent Losses
5.5 gal/conn/day



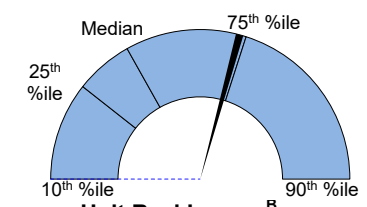
Unit Real Losses^A
47.9 gal/conn/day

Average Operating Pressure

79.1 psi



Infrastructure Leakage Index (ILI)
2.4 dimensionless



Unit Real Losses^B
3,503 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **172.8** MG/Yr **20.0** 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)³.
- 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.

Water Audit Report for: **PAW - 630 Wyomissing**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="933.981"/> MG/Yr 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 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	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.47%"/> <input type="text" value="percent"/>	<input type="text" value="under-registration"/> VOSEA <input type="text" value=""/> WIEA <input type="text" value=""/> WEEA
WATER SUPPLIED:		938.391	MG/Yr

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="798.027"/> MG/Yr 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 Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="13.367"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="7.530"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="7.530"/> MG/Yr	
AUTHORIZED CONSUMPTION:		818.924	MG/Yr

WATER LOSSES

119.467 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"/> <input type="text" value="1.995"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="16.559"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="1.995"/> MG/Yr	<input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	<input type="text" value="under-registration"/>
Default option selected for Unauthorized Consumption, with automatic data grading of 3			
Apparent Losses:		20.549	MG/Yr

Real Losses

Real Losses: **98.918** MG/Yr

WATER LOSSES: **119.467** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **140.364** MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="163.9"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="11,826"/> Service connection density: <input type="text" value=""/> <input type="text" value="72"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)
Lp	Are customer meters typically located at the curbsto/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="10"/> <input type="text" value="21.0"/> 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="10"/> <input type="text" value="86.2"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$183.06"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$3,748,027"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

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

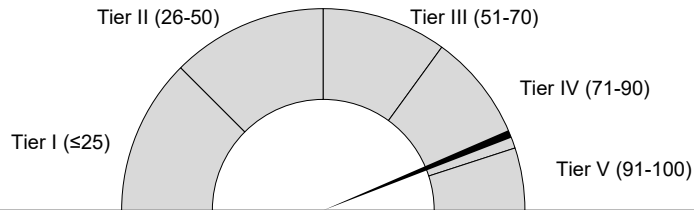
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

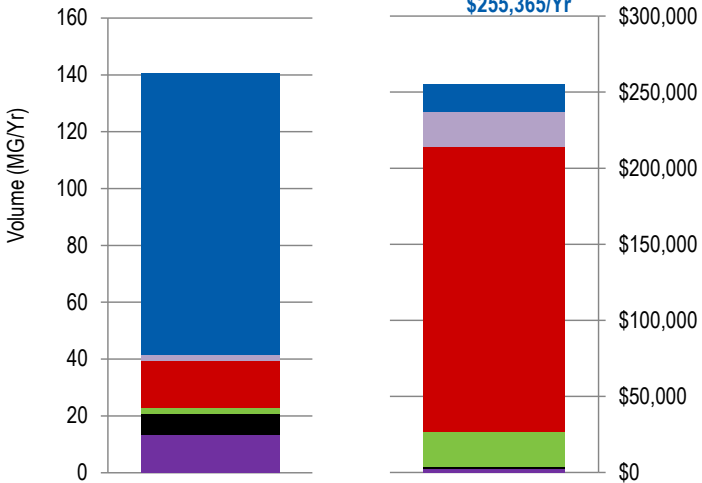
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 140 MG/Yr

Total Cost of NRW = \$255,365/Yr



	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Real Losses	98.9	\$18,108	VPC
Systematic Data Handling Errors	20.9	\$3,825	VPC
Customer Metering Inaccuracies	20.5	\$233,431	CRUC
Unauthorized Consumption	140.4	\$255,365	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

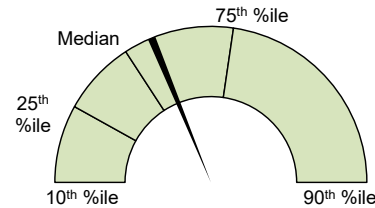
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	20.5	\$233,431	CRUC
Real Losses	98.9	\$18,108	VPC
Unbilled Authorized Cons	20.9	\$3,825	VPC
Non-Revenue Water	140.4	\$255,365	Blended

Actual KPI result

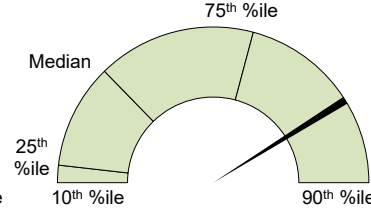
Key Performance Indicators

gauge %iles per validated industry ranges²

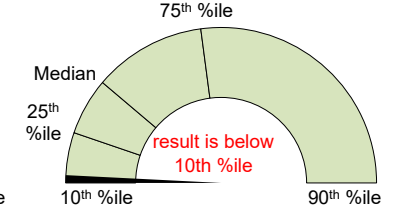
Target (see Worksheet)



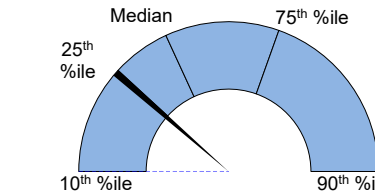
Total Loss Cost Rate
21.27 \$/conn/year



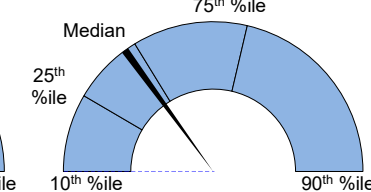
Apparent Loss Cost Rate
19.74 \$/conn/year



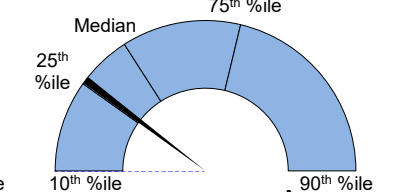
Real Loss Cost Rate
1.53 \$/conn/year



Unit Total Losses
27.7 gal/conn/day



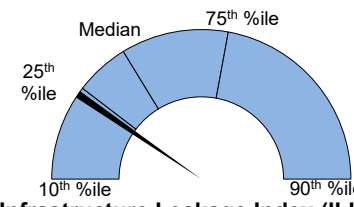
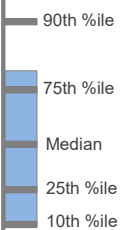
Unit Apparent Losses
4.8 gal/conn/day



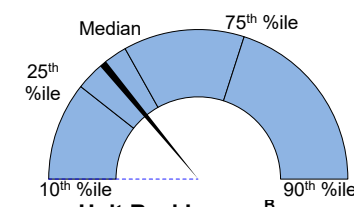
Unit Real Losses^A
22.9 gal/conn/day

Average Operating Pressure

86.2 psi



Infrastructure Leakage Index (ILI)
1.0 dimensionless



Unit Real Losses^B
1,654 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **94.8** MG/Yr **22.0** 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)³.
- 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.

Water Audit Report for: **PAW - 640 Royersford**

Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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:

WATER SUPPLIED	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	1,467.734	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	2.94%	percent	<input type="text" value="under-registration"/>	<input type="text" value="VOSEA"/>
WOS	Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	54.036	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	49.63%	percent	<input type="text" value="under-registration"/>	<input type="text" value="WIEA"/>
WI	Water Exported: <input type="text" value="n"/> <input type="text" value="g"/>	0.000	MG/Yr					<input type="text" value="WEEA"/>
WE								

WATER SUPPLIED: 1,619.471 MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	1,324.883	MG/Yr					
BUAC	Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000	MG/Yr					
UMAC	Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	5.410	MG/Yr					
UUC	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	9.223	MG/Yr					

choose entry option:

MG/Yr

AUTHORIZED CONSUMPTION: 1,339.516 MG/Yr

WATER LOSSES

279.955 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"/>	3.312	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="8"/>	27.149	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"/>	3.312	MG/Yr	<input type="text" value="0.25%"/>	<input type="text" value="default"/>			

choose entry option:

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

Apparent Losses: 33.773 MG/Yr

Real Losses

Real Losses: 246.181 MG/Yr

WATER LOSSES: 279.955 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 294.588 MG/Yr

SYSTEM DATA

Lm	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	285.1	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="10"/>	16,790		(active and inactive)					
	Service connection density:	59	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="10"/>	19.9	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="10"/>	70.3	psi						

COST DATA

CRUC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	\$11.51	\$/1000 gallons (US)						
VPC	Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	\$528.61	\$/Million gallons	Total Annual Operating Cost		<input type="text" value="\$5,529,969"/> \$/yr (optional input)			

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

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

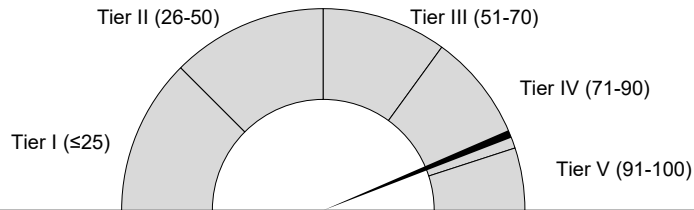
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

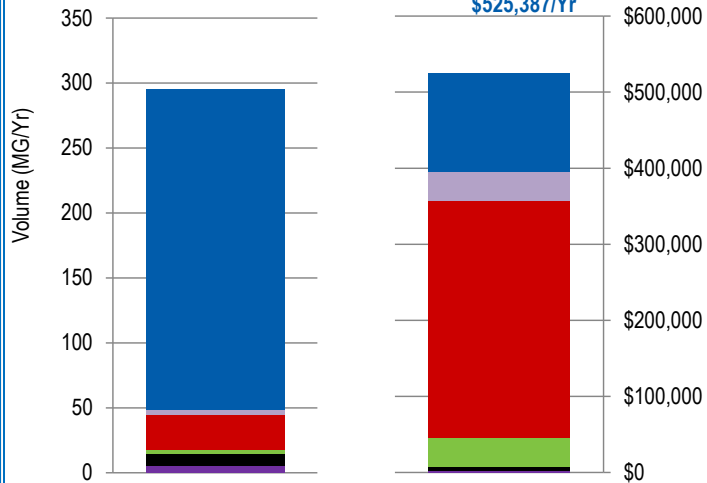
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 294 MG/Yr

Total Cost of NRW = \$525,387/Yr



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

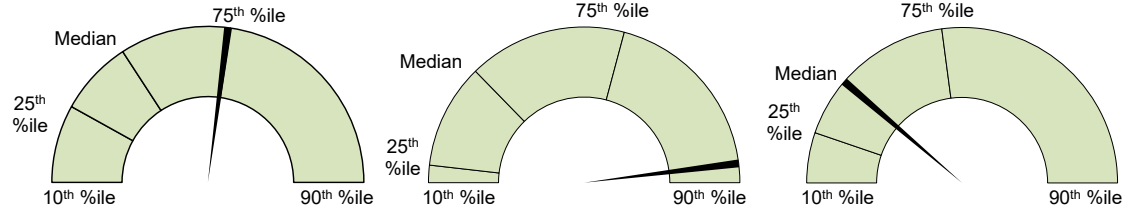
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	33.8	\$387,518	CRUC
Real Losses	246.2	\$130,134	VPC
Unbilled Authorized Cons	14.6	\$7,735	VPC
Non-Revenue Water	294.6	\$525,387	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

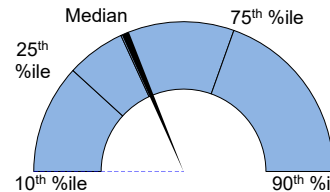
gauge %iles per validated industry ranges²



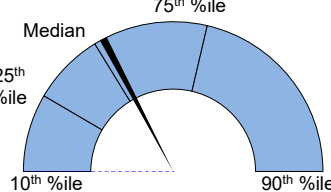
Total Loss Cost Rate
30.83 \$/conn/year

Apparent Loss Cost Rate
23.08 \$/conn/year

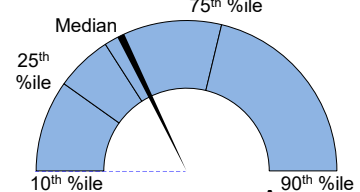
Real Loss Cost Rate
7.75 \$/conn/year



Unit Total Losses
45.7 gal/conn/day



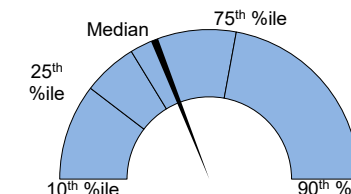
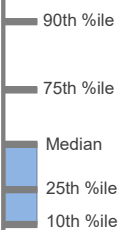
Unit Apparent Losses
5.5 gal/conn/day



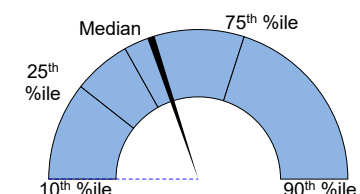
Unit Real Losses^A
40.2 gal/conn/day

Average Operating Pressure

70.3 psi



Infrastructure Leakage Index (ILI)
2.1 dimensionless



Unit Real Losses^B
2,366 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **116.4** MG/Yr **19.0** 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)³.
- 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.

Water Audit Report for: **PAW - 650 Coatesville**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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:

WATER SUPPLIED	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="1,241.827"/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.30%"/> percent	<input type="text" value="over-registration"/> VOSEA
WOS	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		WIEA
WI	Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input type="text" value="38.971"/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="4"/> <input type="text" value="0.00%"/> percent	WEEA
WE			
WATER SUPPLIED: 1,199.142 MG/Yr			

AUTHORIZED CONSUMPTION

BMAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="885.125"/> MG/Yr		
BUAC	Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <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="10"/> <input type="text" value="55.712"/> MG/Yr		
UUAC	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="24.282"/> MG/Yr		
choose entry option:			
			<input type="text" value="custom"/> <input type="text" value="24.282"/> MG/Yr
AUTHORIZED CONSUMPTION: 965.119 MG/Yr			

WATER LOSSES

234.023 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="2.213"/> MG/Yr		
CMI	Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="0.000"/> MG/Yr		
UC	Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="2.213"/> MG/Yr		
choose entry option:			
			<input type="text" value="0.25%"/> <input type="text" value="default"/> percent
			<input type="text" value="0.25%"/> <input type="text" value="default"/> percent
<input type="text" value="under-registration"/>			
Apparent Losses: 4.426 MG/Yr			

Real Losses

Real Losses: 229.597 MG/Yr

WATER LOSSES: 234.023 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 314.017 MG/Yr

SYSTEM DATA

Lm	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="223.5"/> 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="10"/> <input type="text" value="13,124"/>		(active and inactive)
	Service connection density: <input type="text" value="59"/> 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="10"/> <input type="text" value="19.7"/> 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="10"/> <input type="text" value="83.4"/> psi		

COST DATA

CRUC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/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="10"/> <input type="text" value="\$996.74"/> \$/Million gallons		<input type="text" value="\$4,322,770"/> \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

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

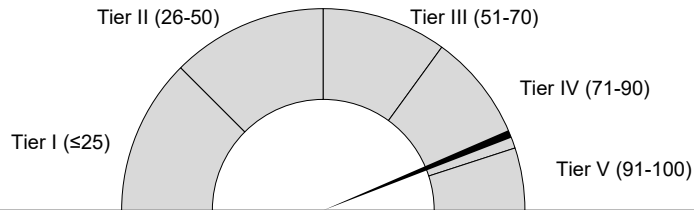
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

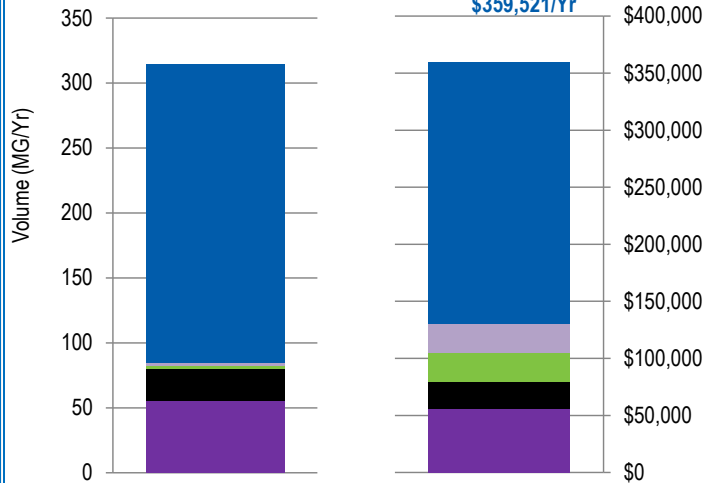
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 314 MG/Yr

Total Cost of NRW = \$359,521/Yr



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

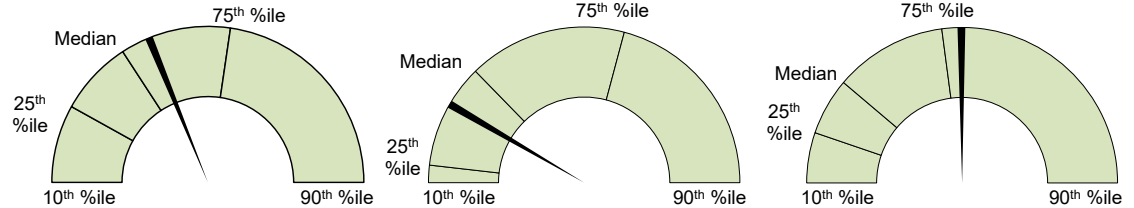
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	4.4	\$50,939	CRUC
Real Losses	229.6	\$228,849	VPC
Unbilled Authorized Cons	80.0	\$79,733	VPC
Non-Revenue Water	314.0	\$359,521	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

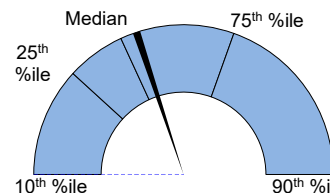
Target (see Worksheet)



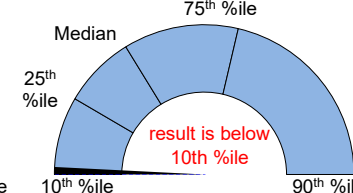
Total Loss Cost Rate
21.32 \$/conn/year

Apparent Loss Cost Rate
3.88 \$/conn/year

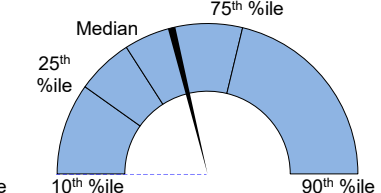
Real Loss Cost Rate
17.44 \$/conn/year



Unit Total Losses
48.9 gal/conn/day



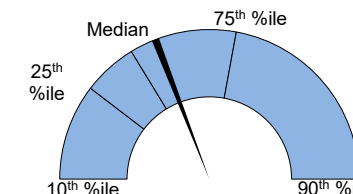
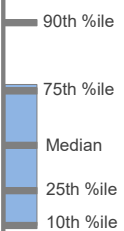
Unit Apparent Losses
0.9 gal/conn/day



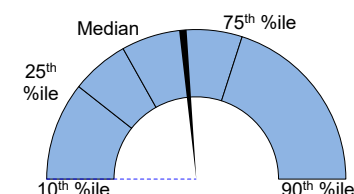
Unit Real Losses^A
47.9 gal/conn/day

Average Operating Pressure

83.4 psi



Infrastructure Leakage Index (ILI)
2.1 dimensionless



Unit Real Losses^B
2,814 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **107.9** MG/Yr **22.5** 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)³.
- 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.

Water Audit Report for: **PAW - 660 Lake Heritage**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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:

WATER SUPPLIED	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	43.763	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	0.00%	<input type="text" value="percent"/>	
VOSE	Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000	MG/Yr				VOSEA
WI	Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000	MG/Yr				WIEA
WE							WEEA
WATER SUPPLIED:		43.763	MG/Yr				

AUTHORIZED CONSUMPTION

BMAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	37.030	MG/Yr			
BUAC	Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>	0.000	MG/Yr			
UMAC	Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	0.465	MG/Yr			
UUAC	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	0.642	MG/Yr			
AUTHORIZED CONSUMPTION:		38.137	MG/Yr			

WATER LOSSES

5.626 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"/>	0.093	MG/Yr			
CMI	Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/>	0.000	MG/Yr			
UC	Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	0.093	MG/Yr			

choose entry option:

0.25%	default
percent	
0.25%	default

under-registration

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

Apparent Losses: 0.185 MG/Yr

Real Losses

Real Losses: 5.441 MG/Yr

WATER LOSSES: 5.626 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 6.733 MG/Yr

SYSTEM DATA

Lm	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	13.0	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="10"/>	755			(active and inactive)
	Service connection density: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	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="10"/>	20.9	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="10"/>	74.6	psi		

COST DATA

CRUC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	\$11.51	\$/1000 gallons (US)		
VPC	Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	\$264.58	\$/Million gallons		
				Total Annual Operating Cost	
				\$257,920	\$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

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

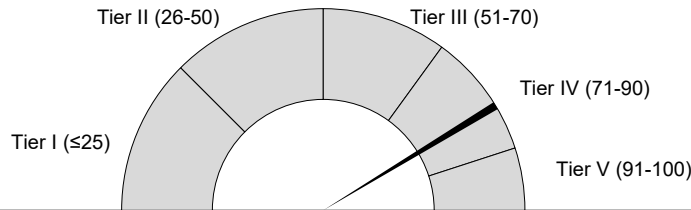
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **82** Data Validity Tier: **Tier IV (71-90)**

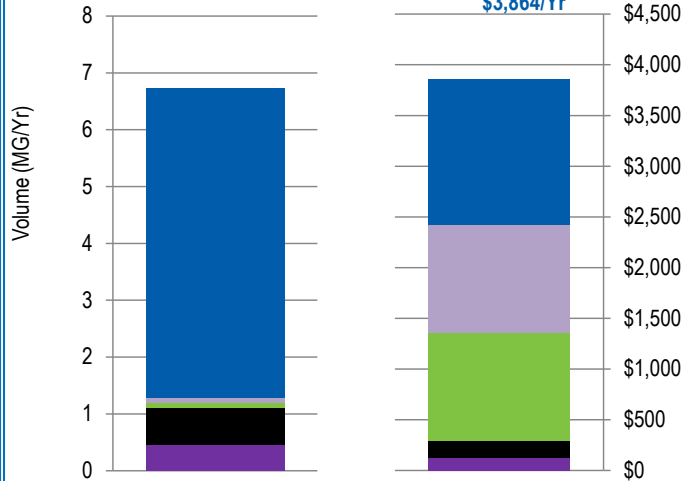
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 7 MG/Yr

Total Cost of NRW = \$3,864/Yr



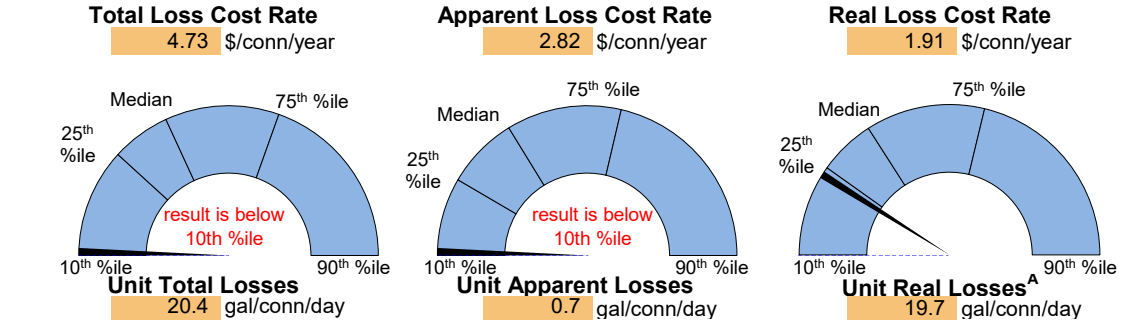
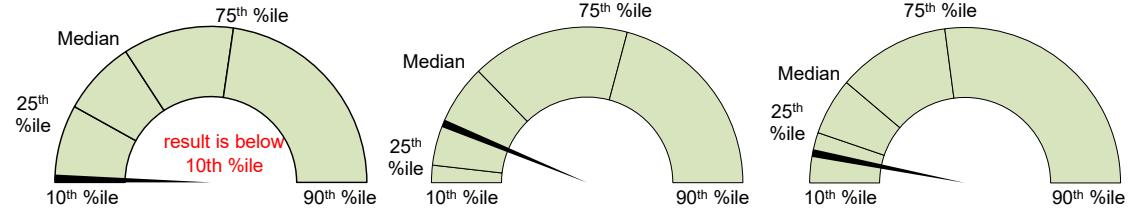
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	0.2	\$2,131	CRUC
Real Losses	5.4	\$1,440	VPC
Unbilled Authorized Cons	1.1	\$293	VPC
Non-Revenue Water	6.7	\$3,864	Blended

Actual KPI result

Key Performance Indicators

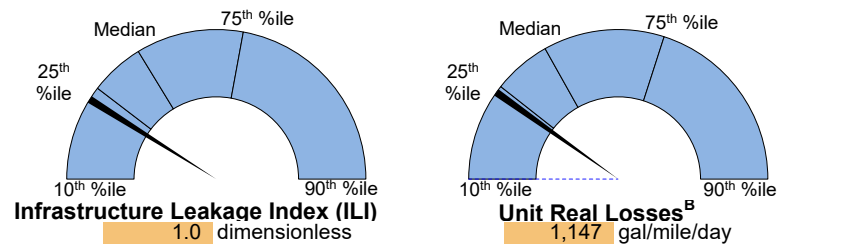
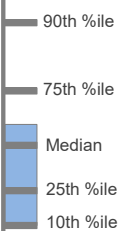
gauge %iles per validated industry ranges²

Target (see Worksheet)



Average Operating Pressure

74.6 psi



See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **5.6** 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)³.
- 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.

Water Audit Report for: **PAW - 680 Lehman Pike**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS WI WE	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="552.175"/> MG/Yr 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 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	choose entry option: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="0.00%"/> <input type="text" value="percent"/>	VOSEA WIEA WEEA
WATER SUPPLIED:		552.175	MG/Yr

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="306.563"/> MG/Yr 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 Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="6.597"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="9.006"/> MG/Yr	choose entry option: <input type="text" value="custom"/> <input type="text" value="9.006"/> MG/Yr	
AUTHORIZED CONSUMPTION:		322.166	MG/Yr

WATER LOSSES

230.009 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"/> <input type="text" value="0.766"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="6.391"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="0.766"/> MG/Yr	choose entry option: <input type="text" value="0.25%"/> <input type="text" value="default"/> <input type="text" value="2.00%"/> <input type="text" value="percent"/> <input type="text" value="0.25%"/> <input type="text" value="default"/>	under-registration
Apparent Losses:		7.924	MG/Yr

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

Real Losses

Real Losses: 222.085 MG/Yr

WATER LOSSES: 230.009 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 245.612 MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="173.1"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="9,468"/> Service connection density: <input type="text" value="55"/> conn./mile main	(including fire hydrant lead lengths) (active and inactive)
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="10"/> <input type="text" value="23.1"/> 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="10"/> <input type="text" value="53.7"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$678.91"/> \$/Million gallons	Total Annual Operating Cost <input type="text" value="\$2,445,931"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

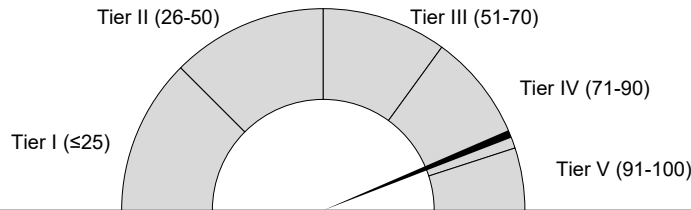
Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
 Unit Real Losses^B: gal/mile/day

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

Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

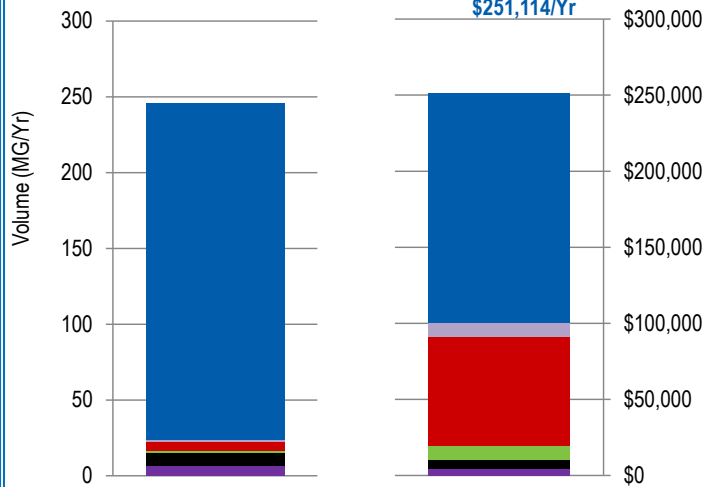
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 245 MG/Yr

Total Cost of NRW = \$251,114/Yr



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

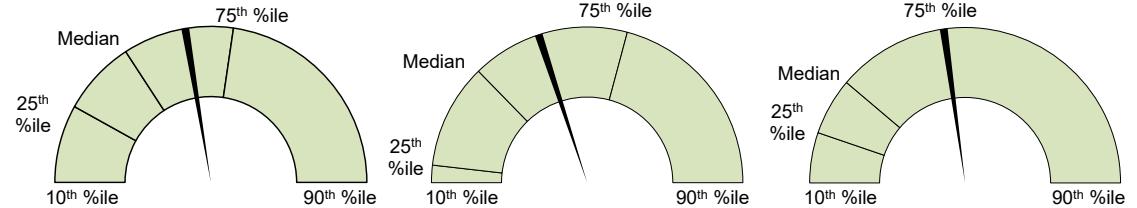
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	7.9	\$89,745	CRUC
Real Losses	222.1	\$150,776	VPC
Unbilled Authorized Cons	15.6	\$10,593	VPC
Non-Revenue Water	245.6	\$251,114	Blended

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

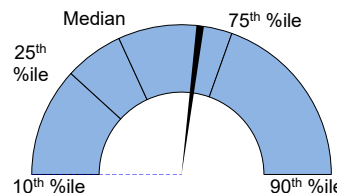
gauge %iles per validated industry ranges²



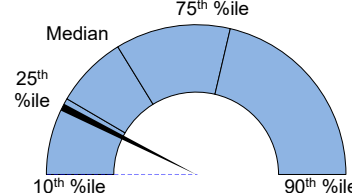
Total Loss Cost Rate
25.40 \$/conn/year

Apparent Loss Cost Rate
9.48 \$/conn/year

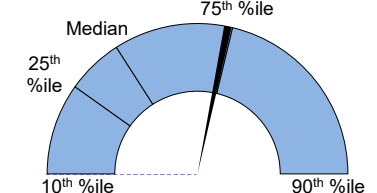
Real Loss Cost Rate
15.92 \$/conn/year



Unit Total Losses
66.6 gal/conn/day



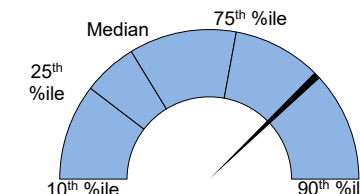
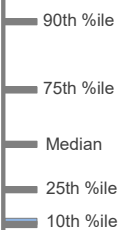
Unit Apparent Losses
2.3 gal/conn/day



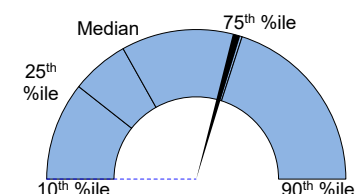
Unit Real Losses^A
64.3 gal/conn/day

Average Operating Pressure

53.7 psi



Infrastructure Leakage Index (ILI)
4.2 dimensionless



Unit Real Losses^B
3,515 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **52.3** MG/Yr **15.1** 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)³.
- 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.

Water Audit Report for: **PAW - 710 Milton**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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:

WATER SUPPLIED

VOS	Volume from Own Sources:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/>	<input type="text" value="1,971.400"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="0.58%"/>	<input type="text" value="percent"/>	<input type="text" value="under-registration"/>	VOSEA
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					WIEA
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					WEEA
WATER SUPPLIED:			<input type="text" value="1,982.901"/>	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	<input type="text" value="1,574.082"/>	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="10"/>	<input type="text" value="2.038"/>	MG/Yr					
UUAC	Unbilled Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="43.998"/>	MG/Yr					
AUTHORIZED CONSUMPTION:			<input type="text" value="1,620.118"/>	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="3.935"/>	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="8"/>	<input type="text" value="32.166"/>	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="3.935"/>	MG/Yr	<input type="text" value="0.25%"/> <input type="text" value="default"/>				
Apparent Losses:			<input type="text" value="40.036"/>	MG/Yr					

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="10"/>	<input type="text" value="248.1"/>	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="10"/>	<input type="text" value="14,148"/>		(active and inactive)				
	Service connection density:		<input type="text" value="57"/>	conn./mile main					
Lp	Average length of (private) customer service line:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="20.6"/>	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="10"/>	<input type="text" value="73.3"/>	psi					

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="\$11.51"/>	\$/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="10"/>	<input type="text" value="\$297.12"/>	\$/Million gallons	<input type="text" value="\$3,823,589"/> \$/yr (optional input)				

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

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

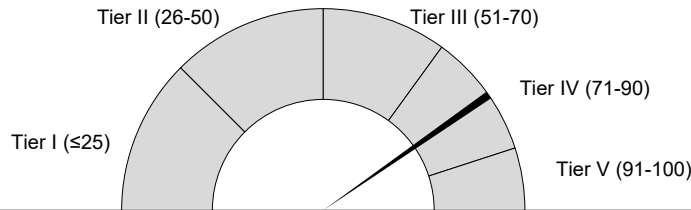
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **80** Data Validity Tier: **Tier IV (71-90)**

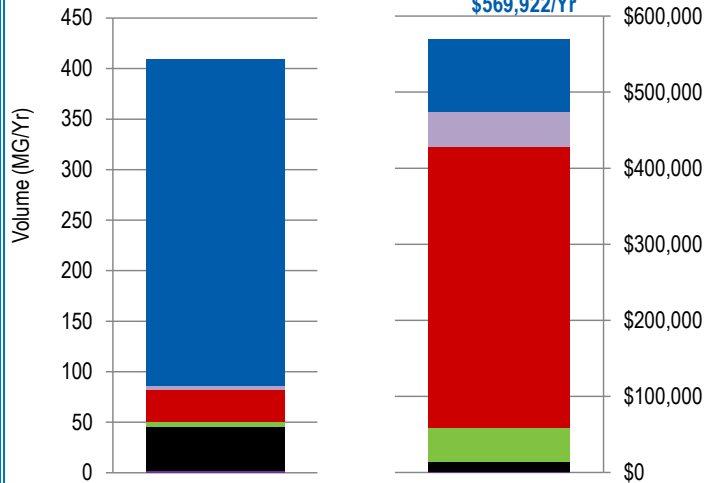
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 409 MG/Yr

Total Cost of NRW = \$569,922/Yr



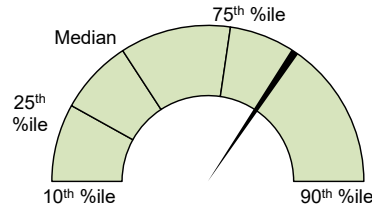
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	322.7	\$95,894	VPC
Systematic Data Handling Errors	46.0	\$13,678	VPC
Customer Metering Inaccuracies	40.0	\$460,349	CRUC
Unauthorized Consumption	46.0	\$13,678	VPC
Unbilled Unmetered Auth Cons	46.0	\$13,678	VPC
Unbilled Metered Authorized Cons	408.8	\$569,922	Blended

Actual KPI result

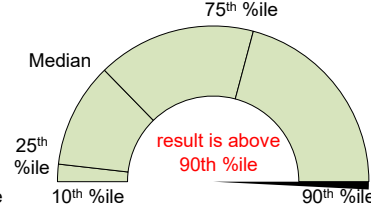
Key Performance Indicators

gauge %iles per validated industry ranges²

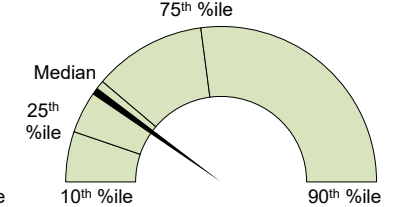
Target (see Worksheet)



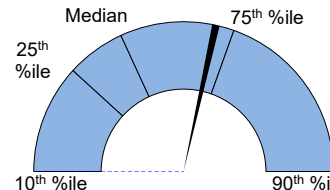
Total Loss Cost Rate
39.32 \$/conn/year



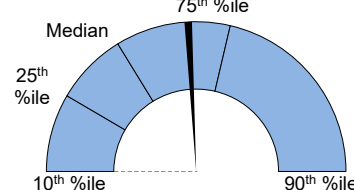
Apparent Loss Cost Rate
32.54 \$/conn/year



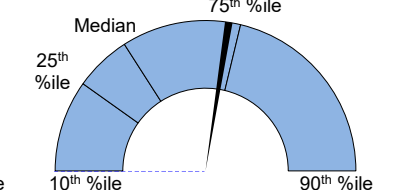
Real Loss Cost Rate
6.78 \$/conn/year



Unit Total Losses
70.3 gal/conn/day



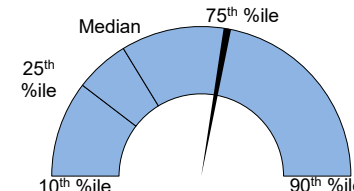
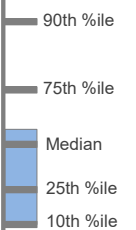
Unit Apparent Losses
7.8 gal/conn/day



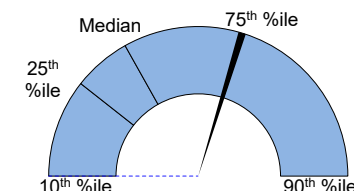
Unit Real Losses^A
62.5 gal/conn/day

Average Operating Pressure

73.3 psi



Infrastructure Leakage Index (ILI)
3.1 dimensionless



Unit Real Losses^B
3,564 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses 103.8 MG/Yr 20.1 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)³.
- 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.

Water Audit Report for: **PAW- Philipsburg District 720**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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="10"/> <input style="width: 100px;" type="text" value="695.929"/> MG/Yr Water Imported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input style="width: 100px;" type="text" value=""/> MG/Yr Water Exported: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input style="width: 100px;" type="text" value=""/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input style="width: 50px;" type="text" value="1.23%"/> <input style="width: 50px;" type="text" value="percent"/>	<input style="width: 100px;" type="text" value="over-registration"/> VOSEA <input style="width: 100px;" type="text" value=""/> WIEA <input style="width: 100px;" type="text" value=""/> WEEA
WATER SUPPLIED: <input style="width: 100px;" type="text" value="687.473"/> MG/Yr			

AUTHORIZED CONSUMPTION

BMAC BUAC UMAC UUC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="370.843"/> MG/Yr Billed Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/> <input style="width: 100px;" type="text" value=""/> MG/Yr Unbilled Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="3.593"/> MG/Yr Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="4.603"/> MG/Yr	choose entry option: <input style="width: 50px;" type="text" value="custom"/> <input style="width: 50px;" type="text" value="4.603"/> MG/Yr	
AUTHORIZED CONSUMPTION: <input style="width: 100px;" type="text" value="379.039"/> MG/Yr			

WATER LOSSES

308.434 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"/> <input style="width: 100px;" type="text" value="0.927"/> MG/Yr Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="7"/> <input style="width: 100px;" type="text" value="7.642"/> MG/Yr Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input style="width: 100px;" type="text" value="0.927"/> MG/Yr	choose entry option: <input style="width: 50px;" type="text" value="0.25%"/> <input style="width: 50px;" type="text" value="default"/> <input style="width: 50px;" type="text" value="2.00%"/> <input style="width: 50px;" type="text" value="percent"/> <input style="width: 50px;" type="text" value="0.25%"/> <input style="width: 50px;" type="text" value="default"/>	<input style="width: 100px;" type="text" value="under-registration"/>
Default option selected for Unauthorized Consumption, with automatic data grading of 3 Apparent Losses: <input style="width: 100px;" type="text" value="9.496"/> MG/Yr			

Real Losses

Real Losses: MG/Yr

WATER LOSSES: MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: MG/Yr

SYSTEM DATA

Lm Nc	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="300.0"/> miles Number of service connections: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="9,562"/> Service connection density: <input style="width: 100px;" type="text" value="32"/> conn./mile main	(including fire hydrant lead lengths) (active <i>and</i> inactive)
Lp	Are customer meters typically located at the curbstop/property line? <input style="width: 50px;" 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="10"/> <input style="width: 100px;" type="text" value="17.0"/> 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="10"/> <input style="width: 100px;" type="text" value="99.0"/> psi	

COST DATA

CRUC VPC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="\$11.51"/> \$/1000 gallons (US) Variable Production Cost: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input style="width: 100px;" type="text" value="\$574.00"/> \$/Million gallons	Total Annual Operating Cost <input style="width: 100px;" type="text" value="\$2,346,570"/> \$/yr (optional input)
-------------	--	---

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC) |
| 2: Systematic Data Handling Errors (SDHE) |
| 3: Customer Metering Inaccuracies (CMI) |

KEY PERFORMANCE INDICATOR TARGETS:

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

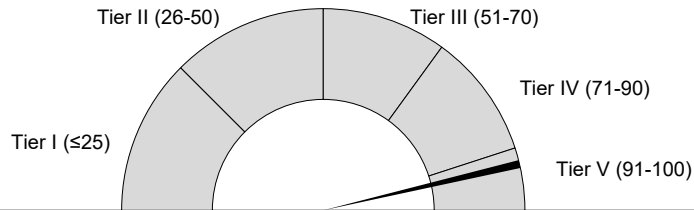
Unit Total Losses:	<input style="width: 50px;" type="text"/>	gal/conn/day
Unit Apparent Losses:	<input style="width: 50px;" type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input style="width: 50px;" type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input style="width: 50px;" type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

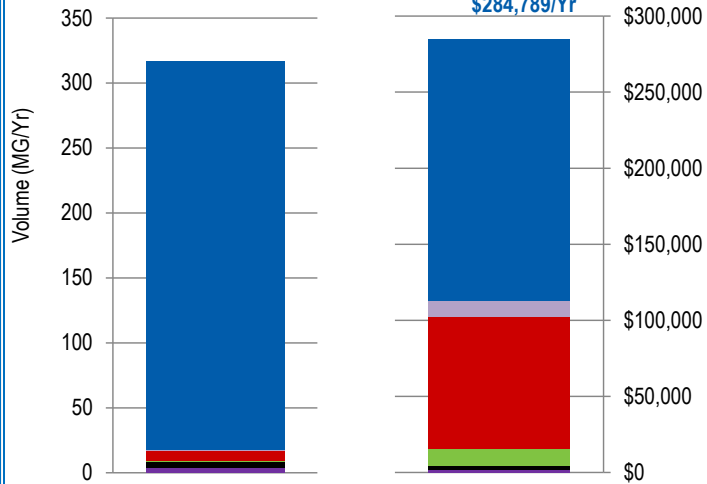
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 317 MG/Yr

Total Cost of NRW = \$284,789/Yr



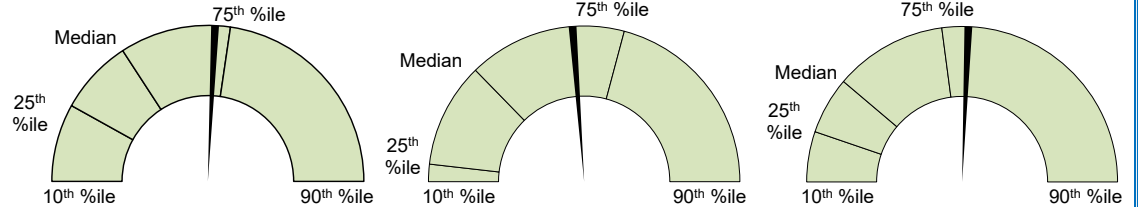
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	298.9	\$171,591	VPC
Systematic Data Handling Errors	8.2	\$4,705	VPC
Customer Metering Inaccuracies	9.5	\$108,494	CRUC
Unauthorized Consumption	316.6	\$284,789	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

Actual KPI result

Key Performance Indicators

Target (see Worksheet)

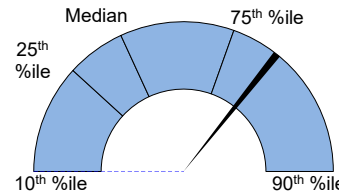
gauge %iles per validated industry ranges²



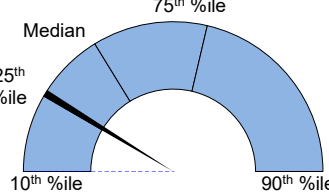
Total Loss Cost Rate
29.29 \$/conn/year

Apparent Loss Cost Rate
11.35 \$/conn/year

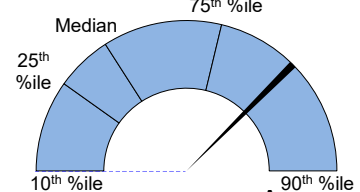
Real Loss Cost Rate
17.95 \$/conn/year



Unit Total Losses
88.4 gal/conn/day



Unit Apparent Losses
2.7 gal/conn/day

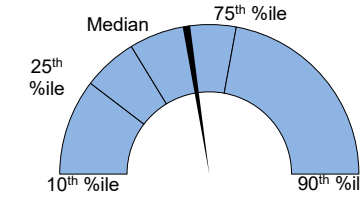
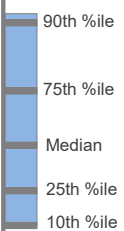


Unit Real Losses^A
85.7 gal/conn/day

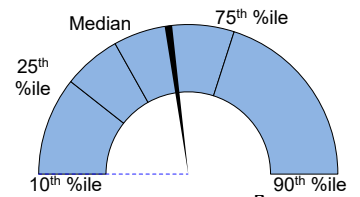
Average Operating Pressure

99 psi

AOP is above 90th %ile



Infrastructure Leakage Index (ILI)
2.5 dimensionless



Unit Real Losses^B
2,730 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **118.8** MG/Yr **34.0** 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)³.
- 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.

Water Audit Report for: **PAW - 730 Berwick**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="7"/>	451.672	MG/Yr	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	0.80%	percent	<input type="text" value="under-registration"/>	VOSEA WIEA WEEA
WI	Water Imported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	0.000	MG/Yr							
WE	Water Exported:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	0.000	MG/Yr							
WATER SUPPLIED:					455.315	MG/Yr							

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="9"/>	321.751	MG/Yr							
BUAC	Billed Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="n/a"/>	0.000	MG/Yr							
UMAC	Unbilled Metered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	0.737	MG/Yr							
UUAC	Unbilled Unmetered:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	12.779	MG/Yr							
AUTHORIZED CONSUMPTION:					335.267	MG/Yr							

WATER LOSSES

120.048 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"/>	0.804	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="8"/>	0.000	MG/Yr		<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"/>	0.804	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:					1.609	MG/Yr							

Real Losses

118.439 MG/Yr

WATER LOSSES: 120.048 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 133.564 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	81.7	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="10"/>	7,009		(active and inactive)						
		Service connection density:			86	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="10"/>	17.5	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="10"/>	90.5	psi							

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/>	<input type="text" value="g"/>	<input type="text" value="10"/>	\$11.51	\$/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="10"/>	\$188.68	\$/Million gallons	\$1,868,510 \$/yr (optional input)						

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

KEY PERFORMANCE INDICATOR TARGETS:

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

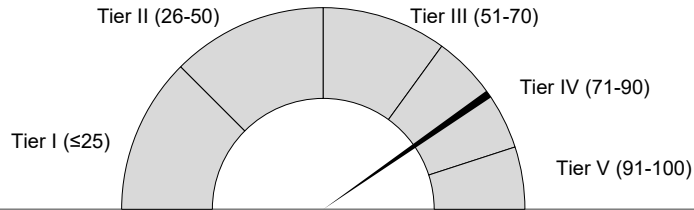
Unit Total Losses: gal/conn/day
 Unit Apparent Losses: gal/conn/day
 Unit Real Losses^A: gal/conn/day
 Unit Real Losses^B: gal/mile/day

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

Data Validity

Data Validity Score: **80** Data Validity Tier: **Tier IV (71-90)**

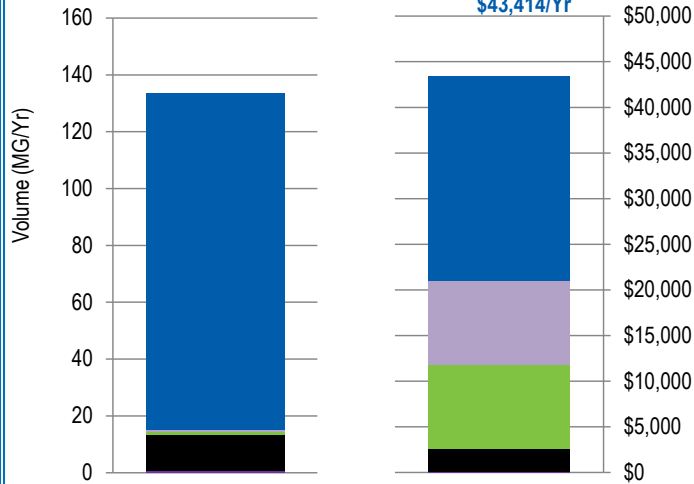
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 134 MG/Yr

Total Cost of NRW = \$43,414/Yr



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

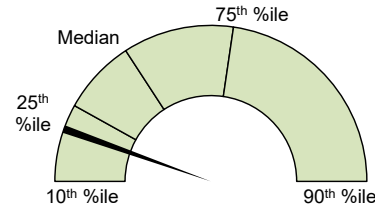
	Volume MG/Yr	Value \$/Yr	Basis of Valuation
Apparent Losses	1.6	\$18,517	CRUC
Real Losses	118.4	\$22,347	VPC
Unbilled Authorized Cons	13.5	\$2,550	VPC
Non-Revenue Water	133.6	\$43,414	Blended

Actual KPI result

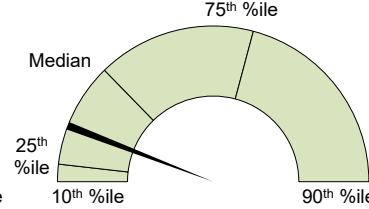
Key Performance Indicators

gauge %iles per validated industry ranges²

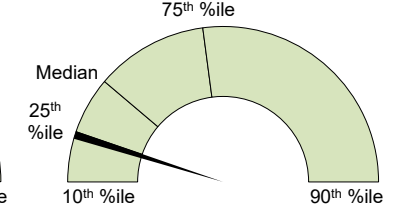
Target (see Worksheet)



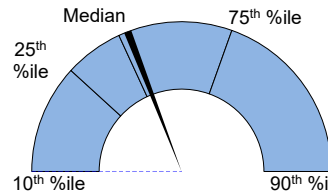
Total Loss Cost Rate
5.83 \$/conn/year



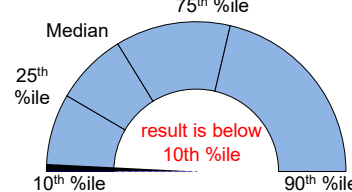
Apparent Loss Cost Rate
2.64 \$/conn/year



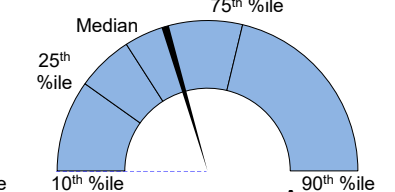
Real Loss Cost Rate
3.19 \$/conn/year



Unit Total Losses
46.9 gal/conn/day



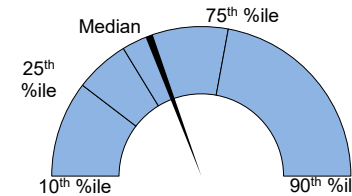
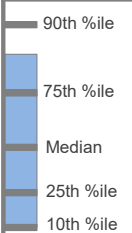
Unit Apparent Losses
0.6 gal/conn/day



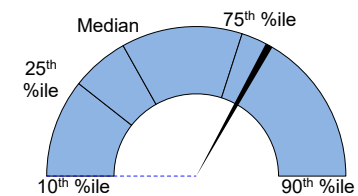
Unit Real Losses^A
46.3 gal/conn/day

Average Operating Pressure

90.5 psi



Infrastructure Leakage Index (ILI)
2.2 dimensionless



Unit Real Losses^B
3,972 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **55.1** MG/Yr **21.5** 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)³.
- 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.

Water Audit Report for: **PAW - 740 Frackville**
Audit Year: **2021** Jan 01 2021 - Dec 31 2021 **Calendar**

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:

WATER SUPPLIED

VOS	Volume from Own Sources:	<input type="text" value="n"/> <input type="text" value="g"/> 7	110.138	MG/Yr
WI	Water Imported:	<input type="text" value="n"/> <input type="text" value="g"/> 9	2.143	MG/Yr
WE	Water Exported:	<input type="text" value="n"/> <input type="text" value="g"/> n/a	0.000	MG/Yr

<input type="text" value="n"/> <input type="text" value="g"/> 10	0.89%	percent
<input type="text" value="n"/> <input type="text" value="g"/> 9	0.89%	percent

VOSEA
 WIEA
 WEEA

WATER SUPPLIED: 113.289 MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/> <input type="text" value="g"/> 9	98.143	MG/Yr
BUAC	Billed Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> n/a	0.000	MG/Yr
UMAC	Unbilled Metered:	<input type="text" value="n"/> <input type="text" value="g"/> 10	0.175	MG/Yr
UUAC	Unbilled Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> 10	0.821	MG/Yr

choose entry option:

0.821 MG/Yr

AUTHORIZED CONSUMPTION: 99.139 MG/Yr

WATER LOSSES

14.150 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"/> 3	0.245	MG/Yr
CMI	Customer Metering Inaccuracies:	<input type="text" value="n"/> <input type="text" value="g"/> 8	2.006	MG/Yr
UC	Unauthorized Consumption:	<input type="text" value="n"/> <input type="text" value="g"/> 3	0.245	MG/Yr

choose entry option:

<input type="text" value="0.25%"/>	default
<input type="text" value="2.00%"/>	percent
<input type="text" value="0.25%"/>	default

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

Apparent Losses: 2.497 MG/Yr

Real Losses

Real Losses: 11.653 MG/Yr

WATER LOSSES: 14.150 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 15.146 MG/Yr

SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/> <input type="text" value="g"/> 10	26.8	miles	(including fire hydrant lead lengths)
Nc	Number of service connections:	<input type="text" value="n"/> <input type="text" value="g"/> 10	2,650		(active and inactive)
	Service connection density:		99	conn./mile main	
Lp	Average length of (private) customer service line:	<input type="text" value="n"/> <input type="text" value="g"/> 10	18.8	ft	(average distance between property line and meter)
AOP	Average Operating Pressure:	<input type="text" value="n"/> <input type="text" value="g"/> 10	49.7	psi	

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/> <input type="text" value="g"/> 10	\$11.51	\$/1000 gallons (US)	Total Annual Operating Cost
VPC	Variable Production Cost:	<input type="text" value="n"/> <input type="text" value="g"/> 10	\$664.81	\$/Million gallons	

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC)
- 3: Systematic Data Handling Errors (SDHE)

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

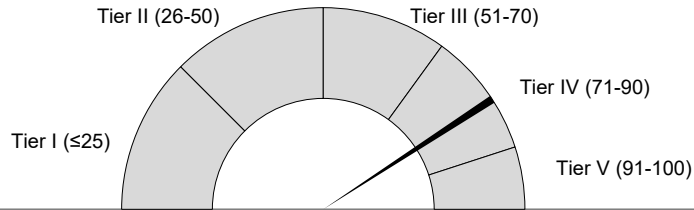
If entered above by user, targets will display on KPI gauges (see Dashboard)



Data Validity

Data Validity Score: **81** Data Validity Tier: **Tier IV (71-90)**

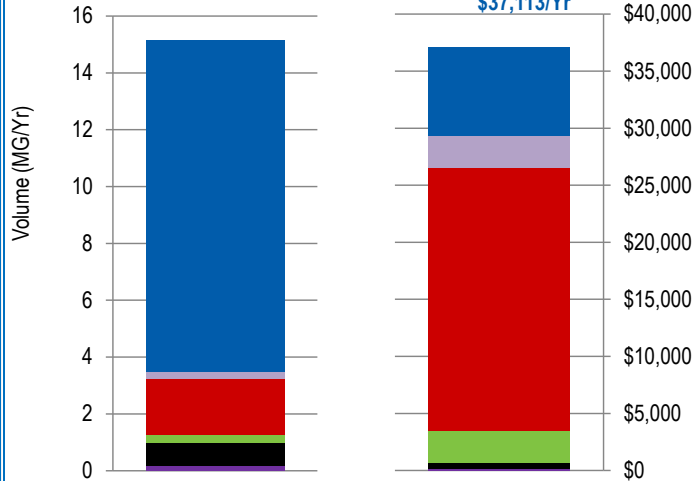
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 15 MG/Yr

Total Cost of NRW = \$37,113/Yr



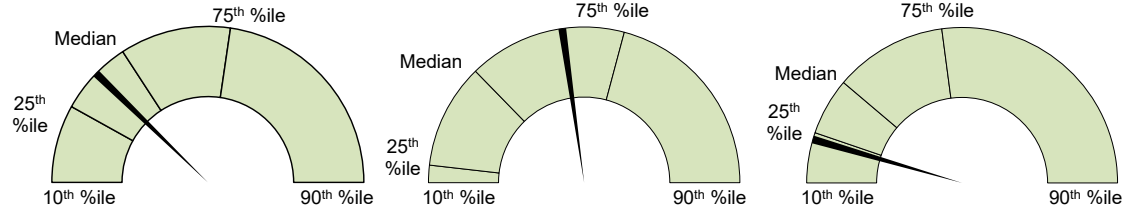
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	11.7	\$7,747	VPC
Systematic Data Handling Errors	1.0	\$662	VPC
Customer Metering Inaccuracies	2.5	\$28,704	CRUC
Unauthorized Consumption	1.0	\$662	VPC
Unbilled Unmetered Auth Cons	1.0	\$662	VPC
Unbilled Metered Authorized Cons	15.1	\$37,113	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

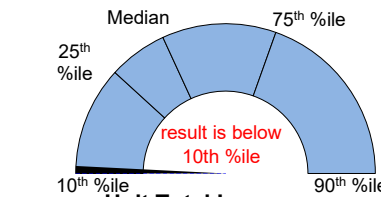
Target (see Worksheet)



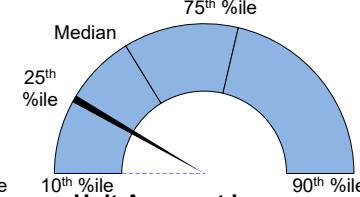
Total Loss Cost Rate
13.76 \$/conn/year

Apparent Loss Cost Rate
10.83 \$/conn/year

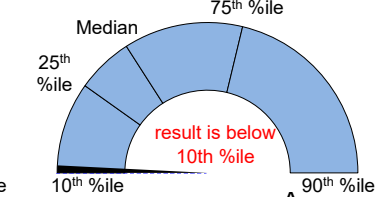
Real Loss Cost Rate
2.92 \$/conn/year



Unit Total Losses
14.6 gal/conn/day



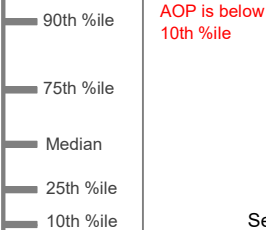
Unit Apparent Losses
2.6 gal/conn/day



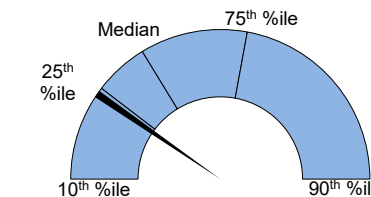
Unit Real Losses^A
12.0 gal/conn/day

Average Operating Pressure

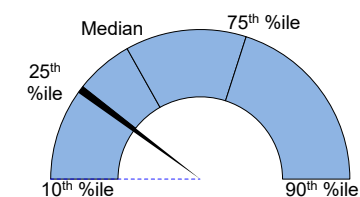
49.7 psi



AOP is below 10th %ile



Infrastructure Leakage Index (ILI)
1.0 dimensionless



Unit Real Losses^B
1,191 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **11.1** MG/Yr **11.5** 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.
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- Percentiles not intended to imply targets. Targets may be input by user for operational KPIs, if desired, on Worksheet.
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- 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.

Water Audit Report for: **PAW- 780 Center County Boggs/Nittany**
 Audit Year: **2021** | **Jan 01 2021 - Dec 31 2021** | **Calendar**

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

VOS	Volume from Own Sources:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="63.977"/>	MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/>	<input type="text" value="1.23%"/>	<input type="text" value="percent"/>		
WI	Water Imported:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>		MG/Yr					<input type="text" value="over-registration"/>
WE	Water Exported:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>		MG/Yr					<input type="text" value="VOSEA"/> <input type="text" value="WIEA"/> <input type="text" value="WEEA"/>
WATER SUPPLIED:			<input type="text" value="63.200"/>	MG/Yr					

AUTHORIZED CONSUMPTION

BMAC	Billed Metered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="42.852"/>	MG/Yr					
BUAC	Billed Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>		MG/Yr					
UMAC	Unbilled Metered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="n/a"/>		MG/Yr					
UUAC	Unbilled Unmetered:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="4.600"/>	MG/Yr					
AUTHORIZED CONSUMPTION:			<input type="text" value="47.452"/>	MG/Yr					

WATER LOSSES

WATER LOSSES:			<input type="text" value="15.748"/>	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="0.107"/>	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="7"/>	<input type="text" value="0.875"/>	MG/Yr	<input type="text" value="2.00%"/>	<input type="text" value="percent"/>			
UC	Unauthorized Consumption:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/>	<input type="text" value="0.107"/>	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:			<input type="text" value="1.089"/>	MG/Yr					

Real Losses

Real Losses:			<input type="text" value="14.659"/>	MG/Yr					
WATER LOSSES:			<input type="text" value="15.748"/>	MG/Yr					

NON-REVENUE WATER

NON-REVENUE WATER:			<input type="text" value="20.348"/>	MG/Yr					
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SYSTEM DATA

Lm	Length of mains:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="18.8"/>	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="10"/>	<input type="text" value="754"/>		(active and inactive)				
Service connection density:			<input type="text" value="40"/>	conn./mile main					
Are customer meters typically located at the curbstops/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="10"/>	<input type="text" value="18.6"/>	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="10"/>	<input type="text" value="99.0"/>	psi					

COST DATA

CRUC	Customer Retail Unit Charge:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="\$11.51"/>	\$/1000 gallons (US)					
VPC	Variable Production Cost:	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/>	<input type="text" value="\$566.52"/>	\$/Million gallons					
Total Annual Operating Cost			<input type="text" value="\$178,789"/>	\$/yr (optional input)					

WATER AUDIT DATA VALIDITY TIER:

*** The Water Audit Data Validity Score is in Tier V (91-100). 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: Unauthorized Consumption (UC)
- 2: Systematic Data Handling Errors (SDHE)
- 3: Customer Metering Inaccuracies (CMI)

KEY PERFORMANCE INDICATOR TARGETS:

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

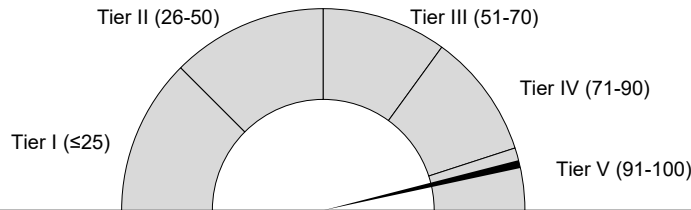
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **92** Data Validity Tier: **Tier V (91-100)**

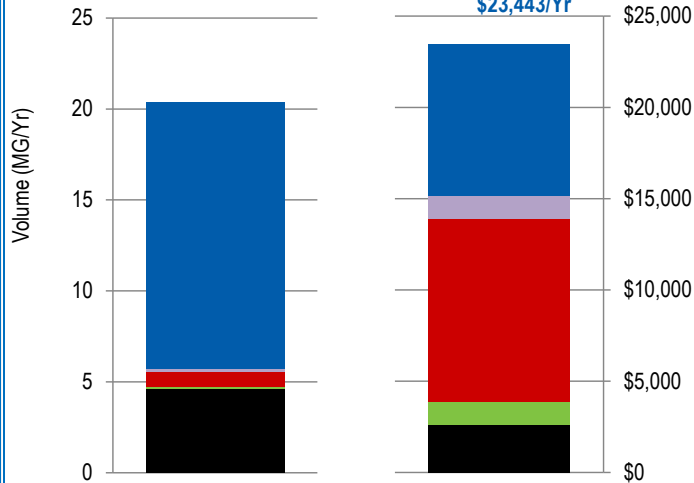
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 20 MG/Yr

Total Cost of NRW = \$23,443/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	14.7	\$8,305	VPC
Systematic Data Handling Errors	1.1	\$12,532	CRUC
Customer Metering Inaccuracies	4.6	\$2,606	VPC
Unbilled Authorized Cons	4.6	\$2,606	VPC
Unbilled Metered Authorized Cons	20.3	\$23,443	Blended

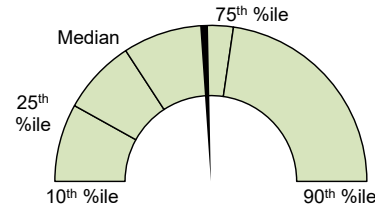
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	1.1	\$12,532	CRUC
Real Losses	14.7	\$8,305	VPC
Unbilled Authorized Cons	4.6	\$2,606	VPC
Non-Revenue Water	20.3	\$23,443	Blended

Actual KPI result

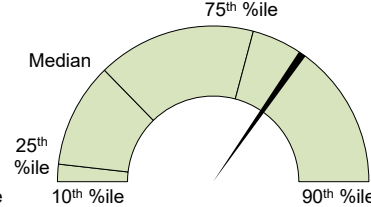
Key Performance Indicators

gauge %iles per validated industry ranges²

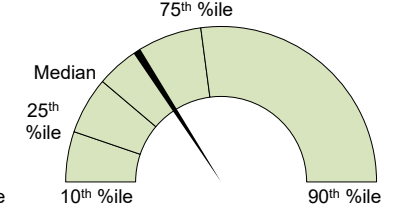
Target (see Worksheet)



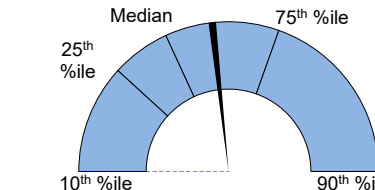
Total Loss Cost Rate
27.63 \$/conn/year



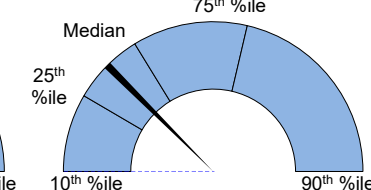
Apparent Loss Cost Rate
16.62 \$/conn/year



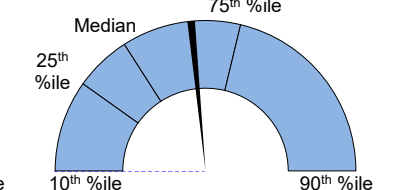
Real Loss Cost Rate
11.01 \$/conn/year



Unit Total Losses
57.2 gal/conn/day



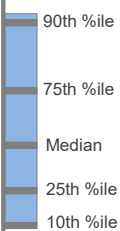
Unit Apparent Losses
4.0 gal/conn/day



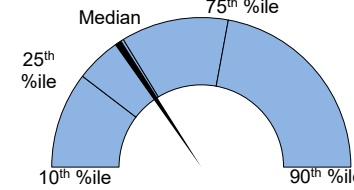
Unit Real Losses^A
53.3 gal/conn/day

Average Operating Pressure

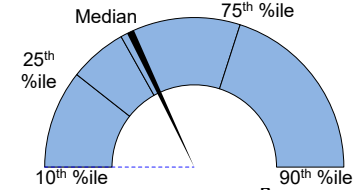
99 psi



AOP is above 90th %ile



Infrastructure Leakage Index (ILI)
1.7 dimensionless



Unit Real Losses^B
2,136 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses **8.5** MG/Yr **30.8** 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)³.
- 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.

Water Audit Report for: **PAW - 910 Scranton**

Audit Year: **2021** **Jan 01 2021 - Dec 31 2021** **Calendar**

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

To access definitions, click the input name

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

[Water Supplied Error Adjustments](#)

choose entry option:

WATER SUPPLIED	Volume from Own Sources: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="17,034.063"/> MG/Yr	<input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="1.50%"/> percent	<input type="text" value="over-registration"/> VOSEA
WOS	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		WIEA
WI	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		WEEA
WE			

WATER SUPPLIED: 16,782.328 MG/Yr

AUTHORIZED CONSUMPTION

BMAC	Billed Metered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="9"/> <input type="text" value="9,531.247"/> 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="10"/> <input type="text" value="344.559"/> MG/Yr		
UUAC	Unbilled Unmetered: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="199.158"/> MG/Yr		

choose entry option:

MG/Yr

AUTHORIZED CONSUMPTION: 10,074.964 MG/Yr

WATER LOSSES

6,707.364 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="23.828"/> MG/Yr		
CMI	Customer Metering Inaccuracies: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="8"/> <input type="text" value="201.547"/> MG/Yr		
UC	Unauthorized Consumption: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="3"/> <input type="text" value="23.828"/> MG/Yr		

choose entry option:

0.25%	default
2.00%	percent
0.25%	default

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

Apparent Losses: 249.203 MG/Yr

Real Losses

Real Losses: 6,458.161 MG/Yr

WATER LOSSES: 6,707.364 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 7,251.081 MG/Yr

SYSTEM DATA

Lm	Length of mains: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="1,781.0"/> 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="10"/> <input type="text" value="125,165"/>		(active and inactive)
	Service connection density: <input type="text" value="70"/> conn./mile main		
	Are customer meters typically located at the curbstops/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="10"/> <input type="text" value="18.2"/> 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="10"/> <input type="text" value="95.0"/> psi		

COST DATA

CRUC	Customer Retail Unit Charge: <input type="text" value="n"/> <input type="text" value="g"/> <input type="text" value="10"/> <input type="text" value="\$11.51"/> \$/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="10"/> <input type="text" value="\$205.01"/> \$/Million gallons		<input type="text" value="\$40,544,975"/> \$/yr (optional input)

WATER AUDIT DATA VALIDITY TIER:

***** The Water Audit Data Validity Score is in Tier IV (71-90). 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: Unauthorized Consumption (UC) |
| 3: Systematic Data Handling Errors (SDHE) |

KEY PERFORMANCE INDICATOR TARGETS:

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

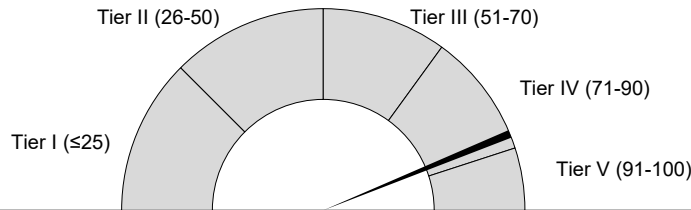
Unit Total Losses:	<input type="text"/>	gal/conn/day
Unit Apparent Losses:	<input type="text"/>	gal/conn/day
Unit Real Losses ^A :	<input type="text"/>	gal/conn/day
Unit Real Losses ^B :	<input type="text"/>	gal/mile/day

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

Data Validity

Data Validity Score: **87** Data Validity Tier: **Tier IV (71-90)**

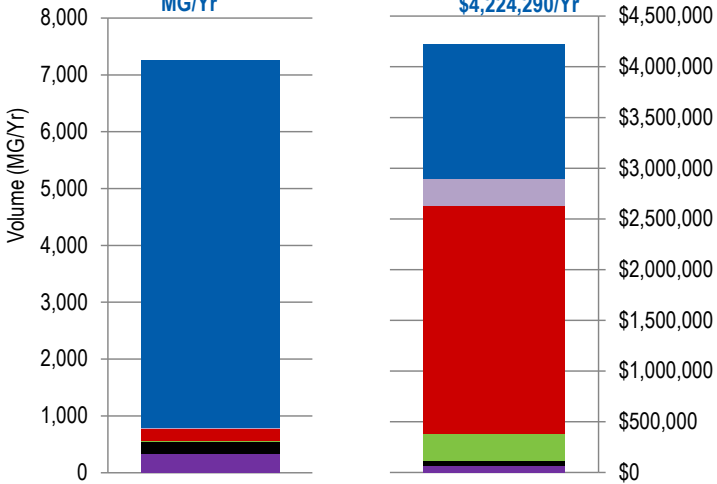
See [Loss Control Planning](#) for Tier Details



NRW Components Summary

Total Volume of NRW = 7,244 MG/Yr

Total Cost of NRW = \$4,224,290/Yr



Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Real Losses	6,458.2	\$1,323,988	VPC
Systematic Data Handling Errors	249.2	\$2,788,835	CRUC
Customer Metering Inaccuracies	543.7	\$111,467	VPC
Unauthorized Consumption	7,251.1	\$4,224,290	Blended
Unbilled Unmetered Auth Cons			
Unbilled Metered Authorized Cons			

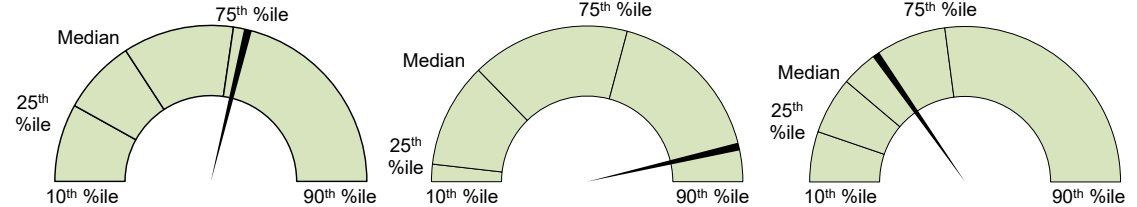
Component	Volume (MG/Yr)	Value (\$/Yr)	Basis of Valuation
Apparent Losses	249.2	\$2,788,835	CRUC
Real Losses	6,458.2	\$1,323,988	VPC
Unbilled Authorized Cons	543.7	\$111,467	VPC
Non-Revenue Water	7,251.1	\$4,224,290	Blended

Actual KPI result

Key Performance Indicators

gauge %iles per validated industry ranges²

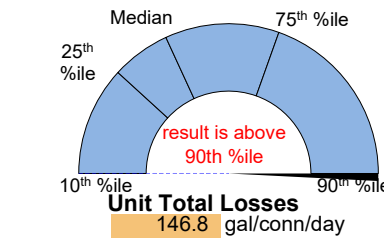
Target (see Worksheet)



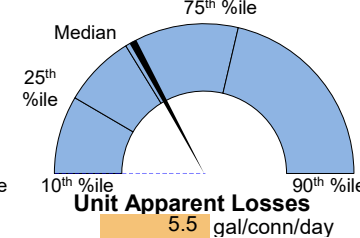
Total Loss Cost Rate
32.86 \$/conn/year

Apparent Loss Cost Rate
22.28 \$/conn/year

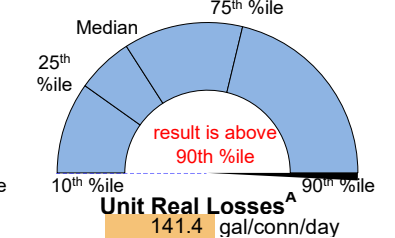
Real Loss Cost Rate
10.58 \$/conn/year



Unit Total Losses
146.8 gal/conn/day

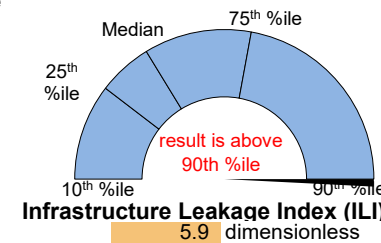
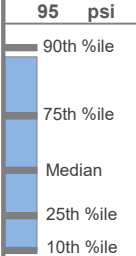


Unit Apparent Losses
5.5 gal/conn/day

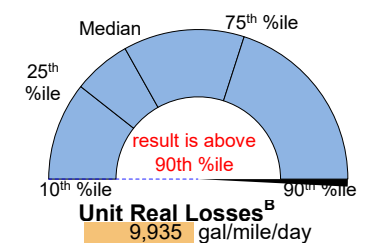


Unit Real Losses^A
141.4 gal/conn/day

Average Operating Pressure



Infrastructure Leakage Index (ILI)
5.9 dimensionless



Unit Real Losses^B
9,935 gal/mile/day

See UARL definition for additional guidance on the ILI

(UARL) Unavoidable Annual Real Losses 1,097.3 MG/Yr 24.0 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.
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- 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.