

Improving Water Efficiency in the Delaware River Basin through Water System Audits



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Delaware River Basin Commission
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Tyson's Corner, VA



DRBC's Water Audit Program

Today's talk is will cover...

- The Water Audit concept
- Available Tools
- The DRBC water audit program
- Results from CY2012
- What we learned



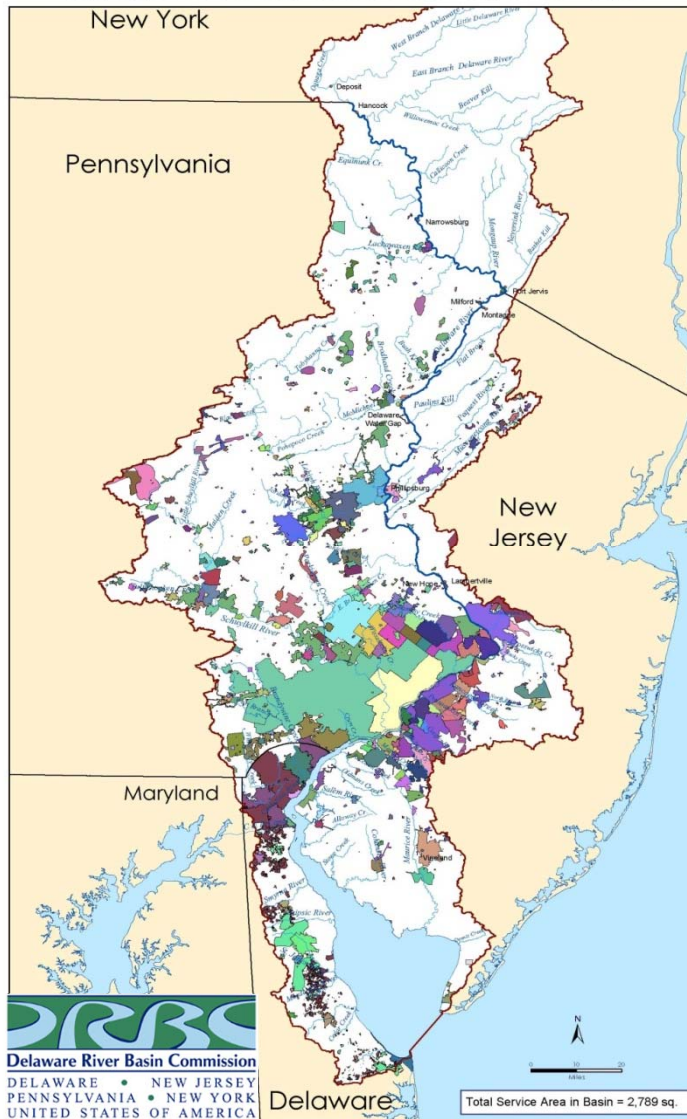
DRBC Water Audit Program: What is it?

The purpose of DRBC's water audit program is to track how efficiently water is moved from its source to the customer (within a public water supply system) and to ensure that systems quantify and are accountable for water losses.



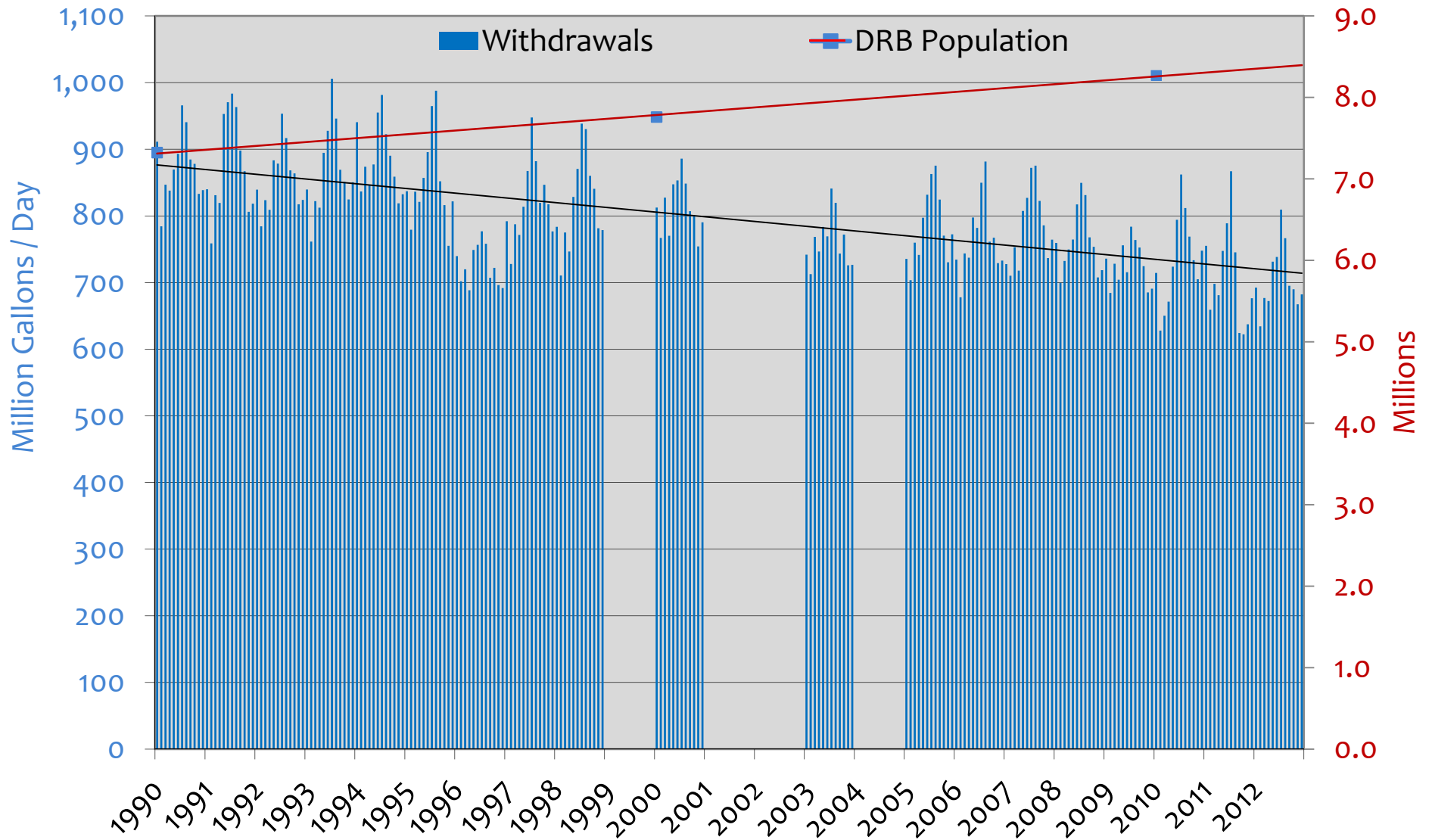
Public Water Supply Service Area in the Delaware River Basin

Water Service Areas in the Delaware River Basin



- Total PWS withdrawals:
~785 MGD
- 2nd largest water use sector in the Basin
- Approx. 21% of Basin covered by service area
- Serve 6.7 million customers (80% of basin residents)
- Approx. 250 systems subject to Water Audit Requirement

Aggregate Withdrawals of 40 Public Water Supply Systems in the DRB (Million Gallons/Day)



History of DRBC Water Conservation Regulations

- 1986:** Source & Service Metering
- 1987:** Leak Detection & Repair (UFW)
- 1988:** Conservation Plumbing Standards
- 1992:** Water Conservation Pricing
- 2006-9:** Water Loss Accountability (Committee)
- 2009-11:** “Water Audit” Rule/Outreach
- 2012:** First year for new water audit format
- 2013:** First water audit reports due

DRBC Rule change

~~Unaccounted for water (UFW)~~

IWA/AWWA Water Audit
Methodology

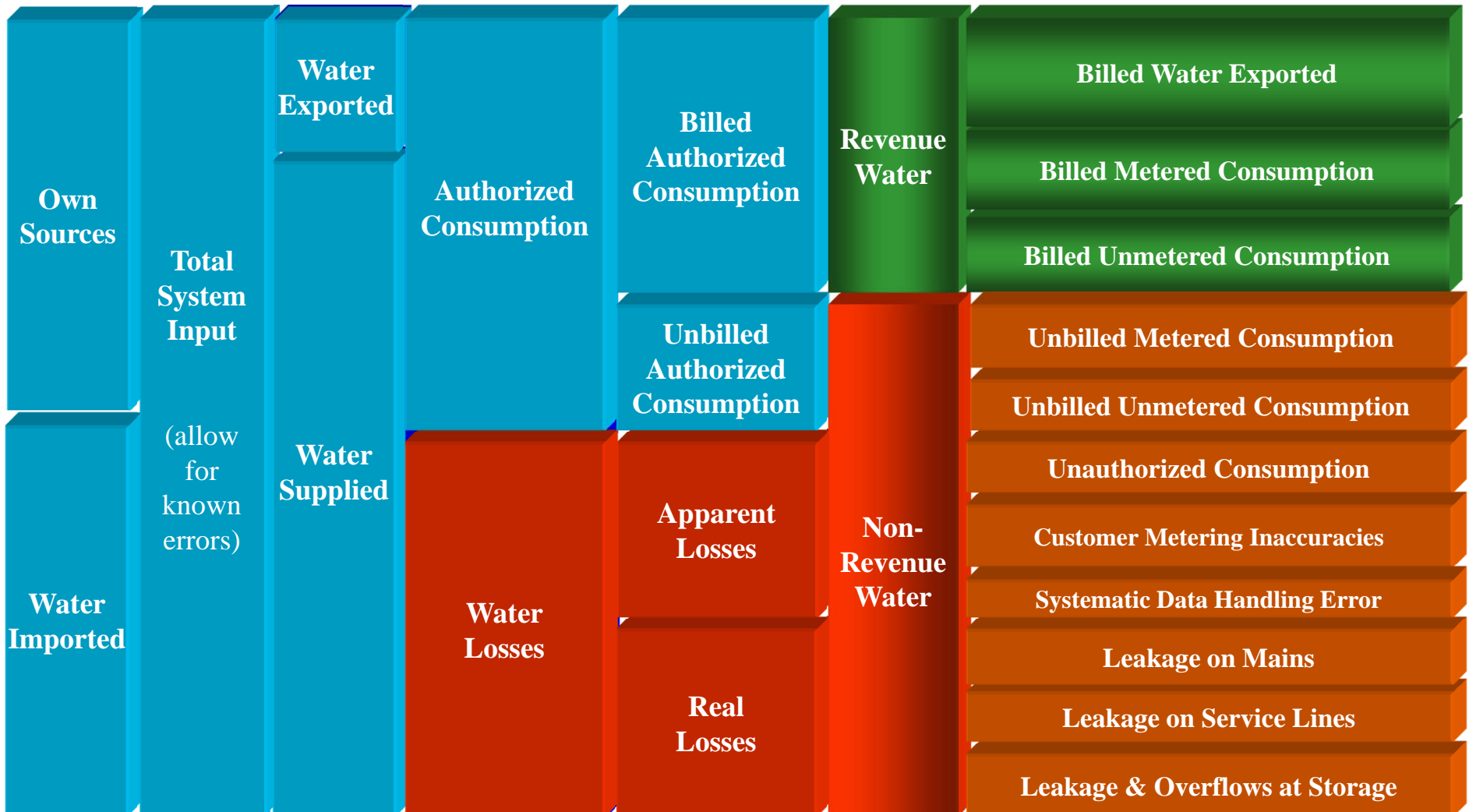




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IWA/AWWA Water Audit Components





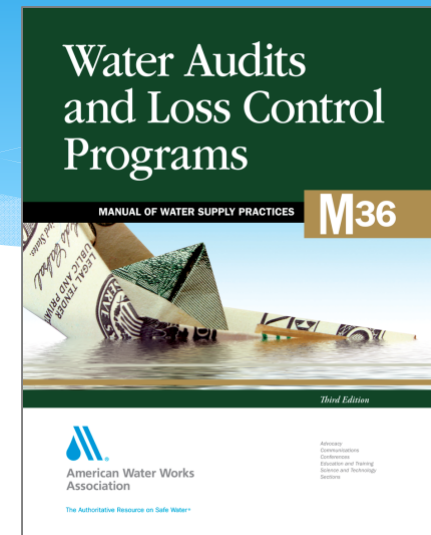
Benefits of the IWA/AWWA Water Audit Methodology

- UFW:
 - Vague / inconsistent definitions / value
 - Negative UFW values reported!?
- AWWA Method:
 - **Best Practice** Approach
 - Standardized definitions / terminology
 - Meaningful indicators (ILI, gpd/conn)
 - Real losses vs apparent losses
- Better Indicators = better water management

AWWA Resources / Software

- * M36 Water Audit manual
- * Free interactive audit software available
- * Data grading capability assesses the validity of the input data
- * Instructions, definitions provided in software

www.awwa.org



AWWA Free Water Audit Software: Reporting Worksheet

Water Audit Report for: Philadelphia Water Department
Reporting Year: 2013 1/2013 - 12/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable, please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades.

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

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED		Master Meter Error Adjustments	
Volume	Grading	Pct	Value
Volume from own sources	7	10	1,304,420 MG/yr
Water imported	n/a	10	0.000 MG/yr
Water exported	10	10	-82,580 MG/yr
WATER SUPPLIED:			80,628,500 MG/yr

AUTHORIZED CONSUMPTION	
Volume	Grading
Billed metered	7
Billed unmetered	n/a
Unbilled metered	n/a
Unbilled unmetered	8
AUTHORIZED CONSUMPTION:	51,866,000 MG/yr

Unbilled Unmetered volume entered is greater than the recommended default value

WATER LOSSES (Water Supplied - Authorized Consumption)	
Volume	Grading
WATER LOSSES:	28,762,500 MG/yr

Apparent Losses	
Volume	Grading
Unauthorized consumption	8
Apparent Losses:	2,425,500 MG/yr

Unauthorized consumption volume entered is greater than the recommended default value

AWWA v6.0
American Water Works Association
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Instructions Reporting Worksheet Performance Indicators Comments Water Balance Dashboard Grading Matrix Service Connection Diagram Definitions Loss Control Planning Exams

AWWA Free Water Audit Software v5.0

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0
American Water Works Association.
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Water Audit Report for: Philadelphia Water Department
Reporting Year: 2013 | 2013 - 12/2013

n/a

1 = VALUE ENTERED IS ESTIMATED

1. Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.
2. 25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.
3. Conditions between 2 and 4
4. 50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.
5. Conditions between 4 and 6
6. At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.
7. Conditions between 6 and 8
8. 100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy
9. Conditions between 8 and 10
10. 100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed

10 = HIGH CONFIDENCE IN ENTERED VALUE

Apparent Losses: ? 7,495.000 MGYr

Real Losses (Current Annual Real Losses or CARL)
Real Losses = Water Losses - Apparent Losses: ? 21,267.500 MGYr

WATER LOSSES: 28,762.500 MGYr

Instructions Reporting Worksheet Performance Indicators Comments Water Balance Dashboard Grading Matrix Service Connection Diagram

AWWA Free Water Audit Software v5.0



AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

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[?](#) Click to access definition
[+](#) Click to add a comment

Water Audit Report for: **Philadelphia Water Department**
Reporting Year: **2013** **12/2013 - 12/2013**

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

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

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

Volume from own sources: [+](#) [?](#) [7](#) 87,417.500 MG/Yr
Water imported: [+](#) [?](#) [n/a](#) 0.000 MG/Yr
Water exported: [+](#) [?](#) [10](#) 5,402.000 MG/Yr

Master Meter Error Adjustments

Enter grading in column 'E' and 'J' -----> Pcnt: Value:
[+](#) [?](#) [10](#) 1,304.420 MG/Yr
[+](#) [?](#) MG/Yr
[+](#) [?](#) [10](#) -82.580 MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: **80,628.500** MG/Yr

AUTHORIZED CONSUMPTION

Billed metered: [+](#) [?](#) [7](#) 49,907.000 MG/Yr
Billed unmetered: [+](#) [?](#) [n/a](#) 0.000 MG/Yr
Unbilled metered: [+](#) [?](#) [n/a](#) 0.000 MG/Yr
Unbilled unmetered: [+](#) [?](#) [8](#) 1,959.000 MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

AUTHORIZED CONSUMPTION: **51,866.000** MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

28,762.500 MG/Yr

Apparent Losses

Unauthorized consumption: [+](#) [?](#) [8](#) 2,425.500 MG/Yr

Unauthorized consumption volume entered is greater than the recommended default value

Customer metering inaccuracies: [+](#) [?](#) [7](#) 1,490.200 MG/Yr
Systematic data handling errors: [+](#) [?](#) [5](#) 3,579.300 MG/Yr

Apparent Losses: **7,495.000** MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: [?](#) **21,267.500** MG/Yr

WATER LOSSES: **28,762.500** MG/Yr

Click here: [?](#) for help using option buttons below

Pcnt: Value: 1,959.000 MG/Yr

Use buttons to select percentage of water supplied OR value

Pcnt: Value: 2,425.500 MG/Yr

1,490.200 MG/Yr

3,579.300 MG/Yr

DEFAULT VALUES

Water Audit Data Analysis: CY2012 Results...

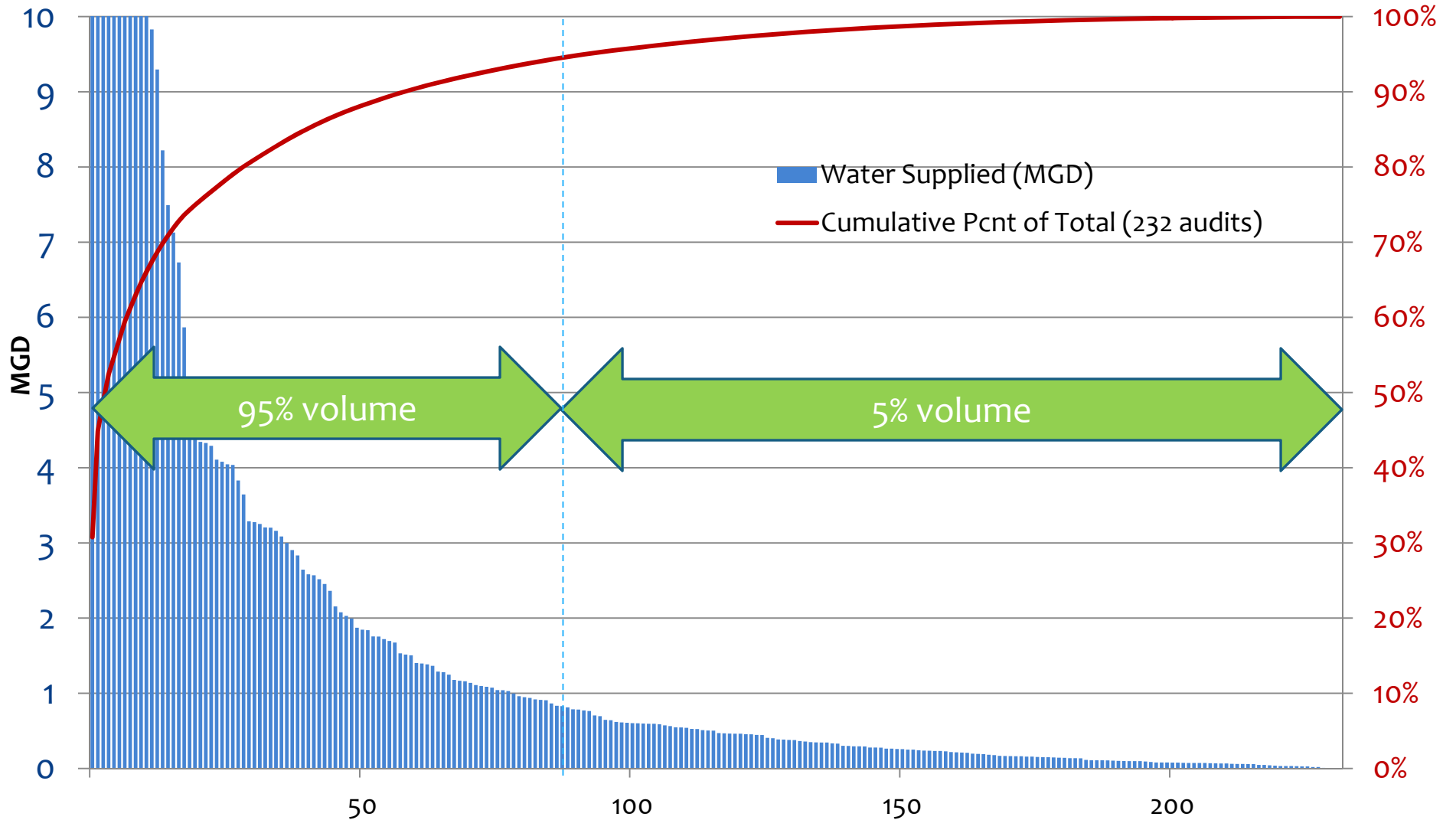




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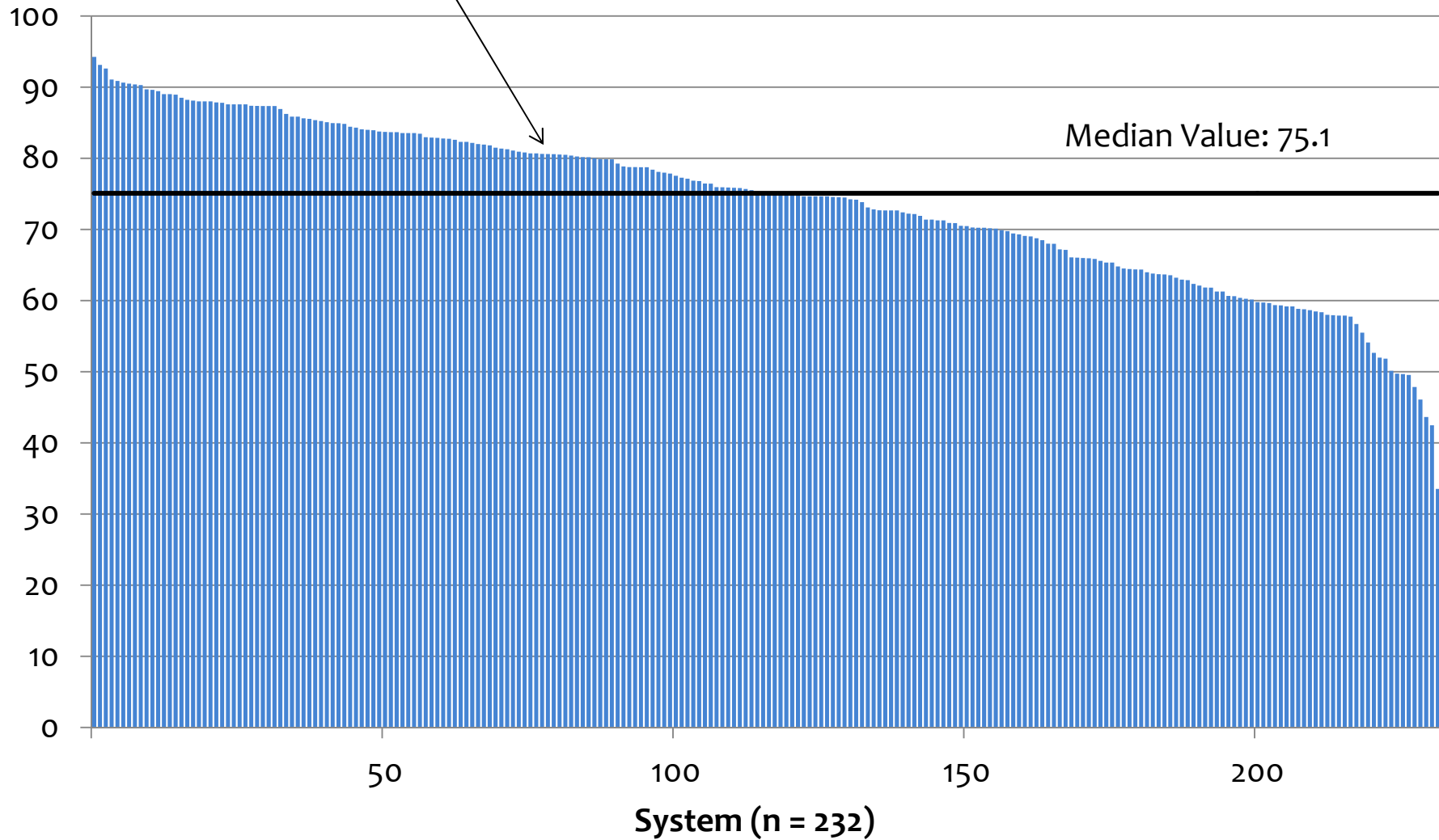
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Water Supplied in CY2012 (MGD)

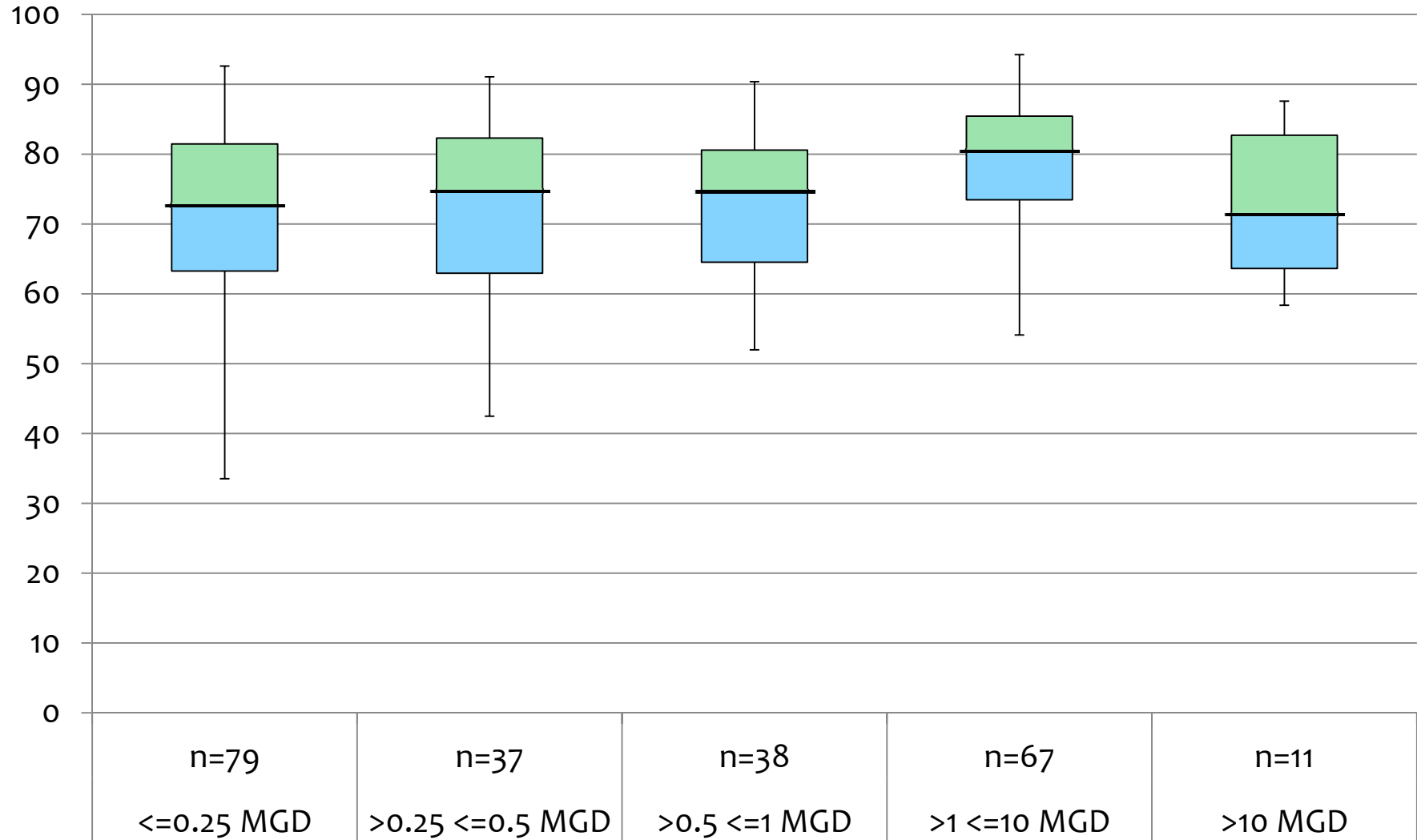


Water Audit Data Validity Score CY2012

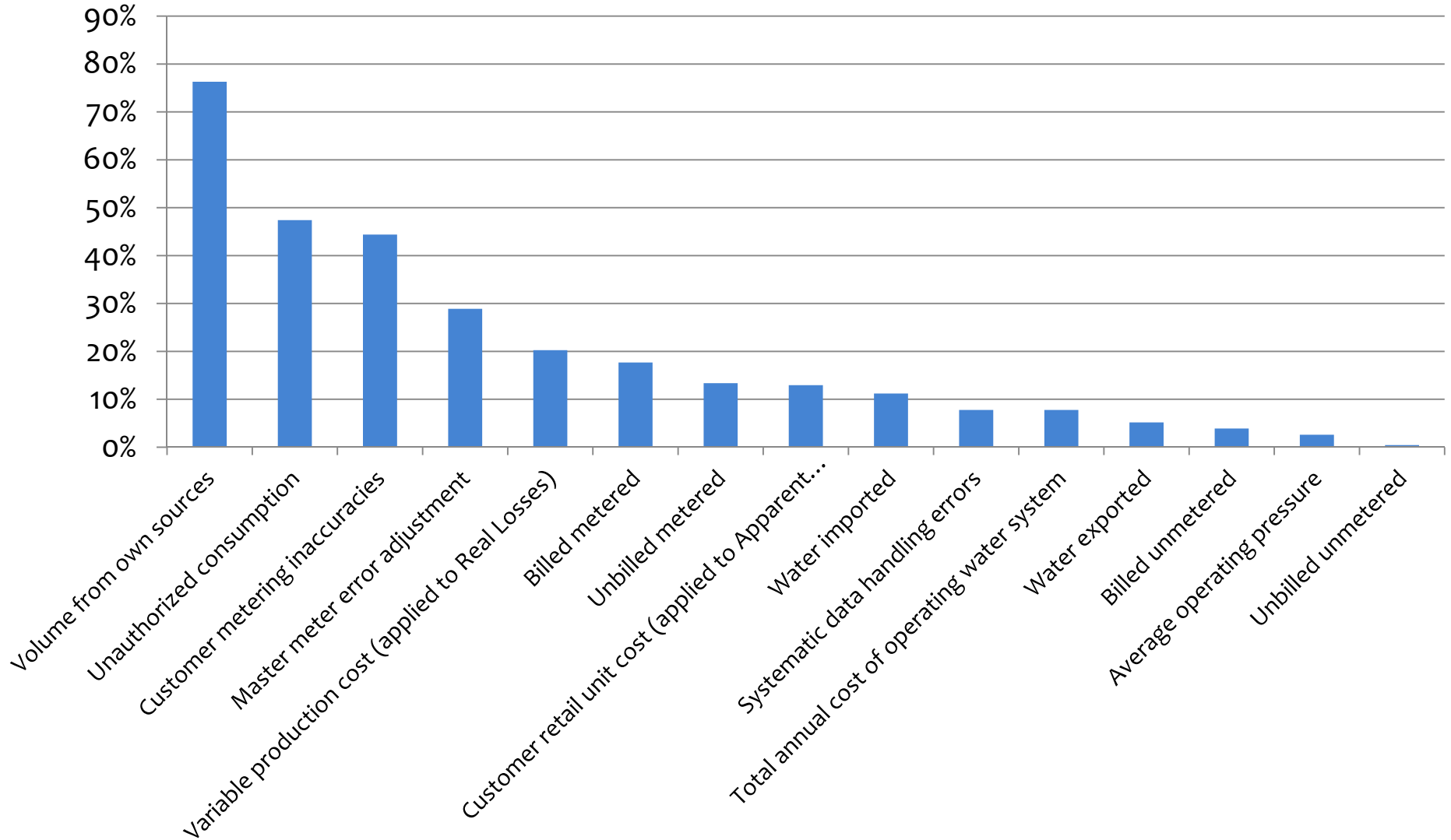
Philadelphia Water Department



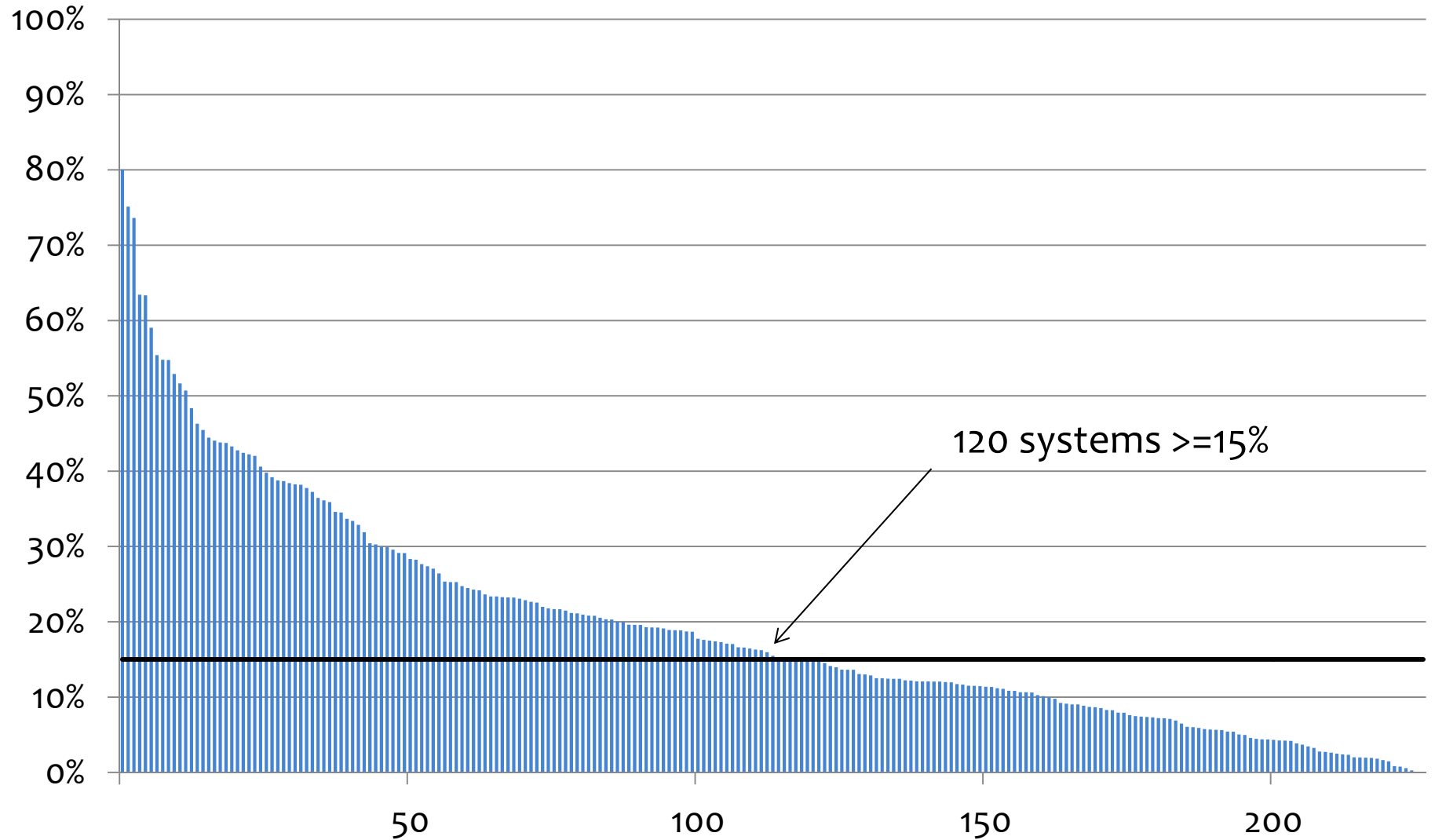
Water Audit Data Validity Score (aka “Grading Score”) By system size



Priority Areas to Improve Grading Score



Non-Revenue Water as % of Water Supplied



New / Future Indicators

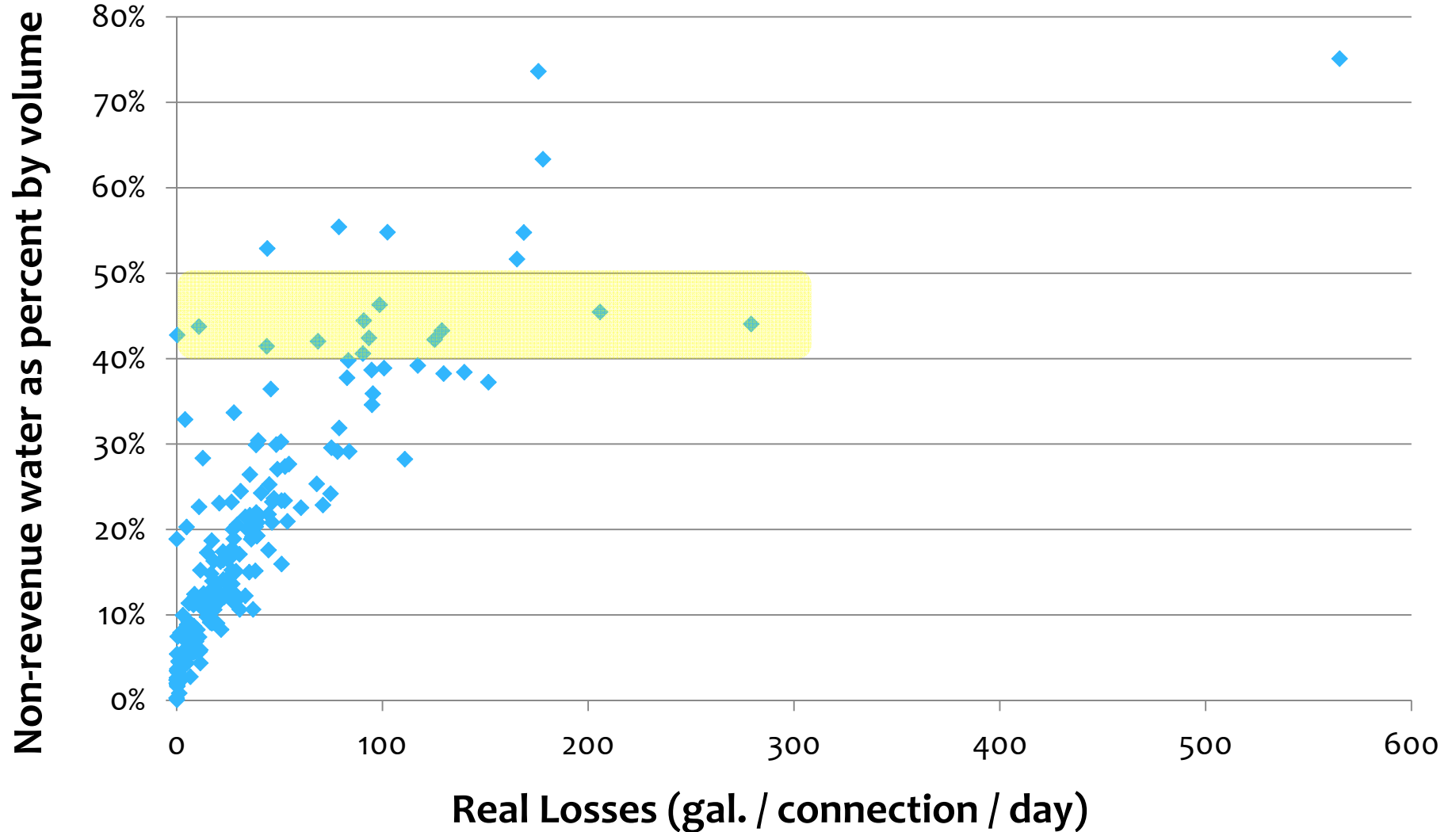




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Non-revenue water as percent by volume vs Real Losses per connection / day



DRBC water audit program summary (CY2012)



Conclusions / Next Steps

- Evolution not Revolution
- Raising awareness of **best practice**
- Several **success** stories
- **Asset Management Tool**
- Training / Support / Validation Program (funding?)
- Consider alternative **Performance Indicators** (e.g., gal./conn./day, ILI) and metrics
- AWWA Partnership / **DRBC Leadership** role

Thank You!



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