Water Loss Audit Guide

This guide provides additional information about the three numbers municipal staff may be asked to provide for the drinking water loss audit:

1. Total Annual Cost of Operating a Drinking Water System
2. Customer Retail Unit Cost
3. Variable Production Cost

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1. Total Annual Cost of Operating a Drinking Water System

What is the Total Annual Cost of operating a drinking water system?

- The Total Annual Cost includes all expenses related to keeping the water system up and running.

Why is this number important?

- Estimating annual operating expenses has many practical uses. Utility staff and other stakeholders can better plan budgets and manage rates when they know all the costs involved in running the utility. Additionally, expressing water loss costs as a percent of the total cost helps prioritize financial investments.

How do I find the Total Annual Cost of operating a drinking water System?

- The Total Annual Cost includes all expenses related to operating only the drinking water system. It does not include any costs associated with wastewater or other non-drinking water systems.

Costs may include, but are not limited to:

Employee salaries and benefits
Supplies and equipment
Electricity
Purchased water costs
Equipment rental and repair
Phone and internet

Facility rent and mortgage
Insurance
Chemicals and analysis
Loan repayments
Legal fees
Depreciation transfers

Example 1: Calculating Total Annual Cost of Operating a Drinking Water System

Expense Categories	**2018 Year End Expended**
Salaries & Wages	$ 225,978
Employee Benefits	$ 78,314
Power Purchase	$ 10,528
Water Purchase	$ 333,828
Materials & Supplies	$ 71,963
General & Misc.	$ 169,011
Contract Services	$ 116,460
New Equipment	$ 37,040
Depreciation Transfers	$ 15,616
Capital Improvements	$ 5,272
Bond & Loan Transfers	$ 74,041
Total Annual Cost of Operating a Drinking Water System	$1,138,051

2. Customer Retail Unit Cost

What is the Customer Retail Unit Cost?

- The Customer Retail Unit Cost (CRUC) is the average price a customer pays for a unit of water.

Why is this number important?

- The Customer Retail Unit Cost values the amount of water a customer receives, but is not billed for due to metering errors. This difference between the amount billed and the amount received is part of the utility system's apparent losses.

How do I find the Customer Retail Unit Cost?

- A utility can use several methods to find the Customer Retail Unit Cost. One option is as follows:

$$CRUC = \frac{variable\ (volume\ based)\ revenue}{total\ volume\ billed}$$

Where do these numbers come from?

- Volume based revenue (e.g., income from selling water) can be found by subtracting fixed revenue (e.g., meter charges) from total revenue:

Total revenue = fixed revenue + variable revenue

- The total volume billed is the amount of water the utility billed customers.

What if I cannot separate out fixed revenues?

- If your billing system does not allow you to separate out fixed revenues, you can estimate based on the number of meters and the meter size rate schedule.

Other Tips:

- Make sure you track the units your billing software provides (e.g., gallons or 1,000 gallons or million gallons)
- Average range of Customer Retail Unit Costs is $4 - $18. If you're outside of this range, double-check your math or sources to verify your result.
- If you do not remove fixed costs, indicate this on your notes/documentation
- If you are interested in other ways to calculate the Customer Retail Unit Cost, reach out to the IFA's Project Manager, Daniel Lundberg, at 317-232-3195 or dlundberg@ifa.in.gov

Example 2: Calculating Customer Retail Unit Costs

Total revenue = fixed revenue + variable revenue

Variable revenue = total revenue – fixed revenue

$$CRUC = \frac{variable\ (volume\ based)\ revenue}{total\ volume\ billed} = \frac{\$}{1000\ gallons}$$

		Fixed Revenue			*Variable Revenue*			
Code	**Meter count**	**Annual Rate by Meter Size** 5/8"	1"	**Fixed Annual Revenue ($)**	**Annual Units (gallons)**	**Annual Units (1000 gallons)**	**Variable Annual Revenue ($)**	**Total Annual Revenue**
Residential	1,095	$ 89.40	$ -	$ 97,870.65	58,075,000	58,075	$ 949,231.25	$ 1,047,101.90
Shop	67	$ 89.40	$ -	$ 6,027.05	3,244,000	3,244	$ 53,791.05	$ 59,818.10
Commercial	103	$ 89.40	$ -	$ 9,193.30	36,080,000	36,080	$ 550,226.42	$ 559,419.72
Government	23	$ -	$ 135.72	$ 3,132.87	5,942,000	5,942	$ 77,401.49	$ 80,534.36
School	11	$ -	$ 135.72	$ 1,436.37	4,666,000	4,666	$ 64,981.73	$ 66,418.10
Religious	17	$ 89.40	$ -	$ 1,519.80	704,000	704	$ 13,895.93	$ 15,415.73
Total	1,316			$ 119,180.04	108,711,000	108,711	$ 1,709,527.85	$ 1,828,707.89

CRUC = $15.73 per thousand gallons

3. Variable Production Cost

What is Variable Production Cost?

- The Variable Production Cost is the cost to produce one more additional unit of water than you are producing right now.

Why is this number important?

- The Variable Production Cost puts a value on the real water losses in your system (i.e. the water lost through leaks/breaks/theft).

How do I find the Variable Production Cost?

- You can find the Variable Production Cost by adding all the costs to treat and pump water, and then dividing that sum by the total annual volume of water pumped.

  Note: the total volume of water pumped will be different from the total volume of water billed.

$$\text{Variable Production Cost} = \frac{electricity + chemicals + purchased\ water + residuals\ disposal}{annual\ volume\ of\ water\ pumped}$$

Other Tips:

- Utilities supplying their own water will likely be in the $200 - $800 range. Utilities purchasing most of their water may have higher variable production costs, up to the $4,000 range.

Example 3: Calculating Variable Production Cost

$$\text{Variable Production Cost} = \frac{electricity + purchased\ water}{annual\ volume\ of\ water\ pumped} = \frac{\$10{,}528 + \$333{,}828}{108.711 \text{ million gallons}}$$

$$\text{Variable Production Cost} = \$\ 3{,}168 \text{ per million gallons}$$

(Numbers from Examples 1 and 2)