# LAKE ARROWHEAD COMMUNITY SERVICES DISTRICT

# MEMORANDUM

*DATE:*   **JANUARY 26, 2021**

*TO:*    **BOARD OF DIRECTORS**
Lake Arrowhead Community Services District

*FROM:*   **MARC LIPPERT, Public Programs Supervisor**

      **CATHERINE CERRI, General Manager**

*SUBJECT:*  **ANNUAL WATER AUDIT**

## A. RECOMMENDATION

This is an information item only.

## B. REASON FOR RECOMMENDATION

This is an information item only.

## C. BACKGROUND INFORMATION

Senate Bill 555 requires all urban retail water suppliers to annually submit a water audit to assess water loss. LACSD has been conducting these audits annually using the software provided by the American Water Works Association (AWWA). This top-down method takes into consideration many aspects of the system and provides the score called the Infrastructure Leakage Index (ILl). The Lake Arrowhead Woods Water System Data Validity Score for the audit reporting period of 2019/2020 increased to 71 from the previous audit period of 2018/2019 which was a score of 65. This year will be the first AWWA Annual Water Audits for the Deer Lodge Park and Rimforest Water Systems. The District was required to conduct audits for both Deer Lodge Park and Rimforest for fiscal years 18/19 and 19/20.

The audits reflect three (3) areas to address for the next audit. 1) Volume from own sources, which is related to the metering of water from the treatment plants into the distribution system, 2) Customer metering inaccuracies 3) Billed metered. The District has been addressing the metering services with the AMI system and replacing old infrastructure with new. Because of the District's due diligence, the Arrowhead Woods Water System Data Validity Score rose six (6) points and our score is above the median.

The tables below represent the data compiled by the AWWA from audits across the state. The table reflects that the District has made improvements from the previous year.

| Performance Indicator | *Median | Woods 2018/2019 | Woods 2019/2020 |
|---|---|---|---|
| Infrastructure Leakage Index | 1.5 | 0.68 | 0.90 |
| Real Losses (gallons/connection/day) | 26.6 | 13.45 | 17.83 |
| Apparent Losses (gallons/connection/day) | 8.3 | 0.95 | 1.30 |
| Data Validity Score | **64** | **65** | **71** |

| Performance Indicator | *Median | Deer Lodge 2018/2019 | Deer Lodge 2019/2020 |
|---|---|---|---|
| **Infrastructure Leakage Index | 1.5 | n/a | n/a |
| Real Losses (gallons/connection/day) | 26.6 | 12.91 | 28.53 |
| Apparent Losses (gallons/connection/day) | 8.3 | 1.34 | 1.34 |
| Data Validity Score | **64** | **68** | **67** |

| Performance Indicator | *Median | Rimforest 2018/2019 | Rimforest 2019/2020 |
|---|---|---|---|
| **Infrastructure Leakage Index | 1.5 | n/a | n/a |
| Real Losses (gallons/connection/day) | 26.6 | 5.78 | 31.69 |
| Apparent Losses (gallons/connection/day) | 8.3 | 1.08 | 1.19 |
| Data Validity Score | **64** | **69** | **71** |

*2017/2018 data
**The ILI is only provided for systems above a certain size and pressure.

## D.    FISCAL IMPACT

This is an information item only.

## E.    ENVIRONMENTAL IMPACT

This is an information item only.

## F.    ATTACHMENTS

AWWA Article "Reporting Water Losses"
LACSD 2018/2019 Water Audit for Deer Lodge Park
LACSD 2019/2020 Water Audit for Deer Lodge Park
LACSD 2018/2019 Water Audit for Rimforest
LACSD 2019/2020 Water Audit for Rimforest
LACSD 2019/2020 Water Audit for Lake Arrowhead Woods

Water Audit Report for: Lake Arrowhead Community Services District (Deer Lodge Park) (CA3610087)
Reporting Year: 2019    7/2018 - 6/2019

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: ACRE-FEET 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.

<----------- Enter grading in column 'E' and 'J' ----------->

Master Meter and Supply Error Adjustments

**WATER SUPPLIED**

| | | Pcnt: | Value: | |
|---|---|---|---|---|
| Volume from own sources: | 7 | 17.110 | acre-ft/yr | 3 | | acre-ft/yr |
| Water imported: | 5 | 17.850 | acre-ft/yr | 3 | | acre-ft/yr |
| Water exported: | n/a | 0.000 | acre-ft/yr | | | acre-ft/yr |

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

**WATER SUPPLIED:**   34.960   acre-ft/yr

**AUTHORIZED CONSUMPTION**

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

| | | | | Pcnt: | Value: |
|---|---|---|---|---|---|
| Billed metered: | 7 | 31.093 | acre-ft/yr | | |
| Billed unmetered: | n/a | 0.000 | acre-ft/yr | | |
| Unbilled metered: | 10 | 0.348 | acre-ft/yr | | |
| Unbilled unmetered: | 5 | 0.087 | acre-ft/yr | | 0.087 acre-ft/yr |

Use buttons to select percentage of water supplied **OR** value

**AUTHORIZED CONSUMPTION:**   31.528   acre-ft/yr

**WATER LOSSES (Water Supplied - Authorized Consumption)**   3.432   acre-ft/yr

**Apparent Losses**

| | | | | Pcnt: | Value: |
|---|---|---|---|---|---|
| Unauthorized consumption: | | 0.087 | acre-ft/yr | 0.25% | acre-ft/yr |

*Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed*

| | | | | | |
|---|---|---|---|---|---|
| Customer metering inaccuracies: | 5 | 0.158 | acre-ft/yr | 0.50% | acre-ft/yr |
| Systematic data handling errors: | 5 | 0.078 | acre-ft/yr | 0.25% | acre-ft/yr |

*Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed*

**Apparent Losses:**   0.323   acre-ft/yr

**Real Losses (Current Annual Real Losses or CARL)**

**Real Losses = Water Losses - Apparent Losses:**   3.108   acre-ft/yr

**WATER LOSSES:**   3.432   acre-ft/yr

**NON-REVENUE WATER**

**NON-REVENUE WATER:**   3.867   acre-ft/yr
= Water Losses + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

| | | | |
|---|---|---|---|
| Length of mains: | 9 | 1.1 | miles |
| Number of active AND inactive service connections: | 8 | 215 | |
| Service connection density: | | 197 | conn./mile main |
| Are customer meters typically located at the curbstop or property line? | | Yes | |
| Average length of customer service line: | | | (length of service line, beyond the property boundary, that is the responsibility of the utility) |

*Average length of customer service line has been set to zero and a data grading score of 10 has been applied*

| | | | |
|---|---|---|---|
| Average operating pressure: | 5 | 68.0 | psi |

**COST DATA**

| | | | |
|---|---|---|---|
| Total annual cost of operating water system: | 10 | $222,873 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | 9 | $3.81 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | 5 | $766.16 | $/acre-ft   ☐ Use Customer Retail Unit Cost to value real losses |

**WATER AUDIT DATA VALIDITY SCORE:**

**\*\*\* YOUR SCORE IS: 68 out of 100 \*\*\***

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

**PRIORITY AREAS FOR ATTENTION:**

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

1: Water imported

2: Volume from own sources

3: Customer metering inaccuracies

# AWWA Free Water Audit Software:
## Reporting Worksheet

**Water Audit Report for:** Lake Arrowhead Community Services District (Deer Lodge Park)  (CA3610087)
**Reporting Year:** 2020    7/2019 - 6/2020

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: ACRE-FEET 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.

Master Meter and Supply Error Adjustments

**WATER SUPPLIED**

<----------- Enter grading in column 'E' and 'J' ---------->

| | | | Pcnt: | Value: | |
|---|---|---|---|---|---|
| Volume from own sources: | + ? | 7 | 16.450 | acre-ft/yr | + ? 3 | | | acre-ft/yr |
| Water imported: | + ? | 5 | 22.280 | acre-ft/yr | + ? 3 | | | acre-ft/yr |
| Water exported: | + ? | n/a | 0.000 | acre-ft/yr | + ? | | | acre-ft/yr |

**WATER SUPPLIED:** 38.730 acre-ft/yr

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

**AUTHORIZED CONSUMPTION**

Click here: ? for help using option buttons below

| | | | | |
|---|---|---|---|---|
| Billed metered: | + ? | 7 | 30.810 | acre-ft/yr |
| Billed unmetered: | + ? | n/a | 0.000 | acre-ft/yr |
| Unbilled metered: | + ? | 10 | 0.430 | acre-ft/yr |
| Unbilled unmetered: | + ? | 5 | 0.097 | acre-ft/yr |

Pcnt:   Value:
( ) (●) 0.097 acre-ft/yr

**AUTHORIZED CONSUMPTION:** ? 31.337 acre-ft/yr

Use buttons to select percentage of water supplied **OR** value

**WATER LOSSES (Water Supplied - Authorized Consumption)** 7.393 acre-ft/yr

**Apparent Losses**

Pcnt:   Value:

| | | | |
|---|---|---|---|
| Unauthorized consumption: | + ? | 0.097 | acre-ft/yr |

0.25% (●) ( ) acre-ft/yr

*Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed*

| | | | |
|---|---|---|---|
| Customer metering inaccuracies: | + ? 5 | 0.157 | acre-ft/yr |
| Systematic data handling errors: | + ? 5 | 0.077 | acre-ft/yr |

0.50% (●) ( ) acre-ft/yr
0.25% (●) ( ) acre-ft/yr

*Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed*

**Apparent Losses:** ? 0.331 acre-ft/yr

**Real Losses (Current Annual Real Losses or CARL)**
**Real Losses = Water Losses - Apparent Losses:** ? 7.062 acre-ft/yr

**WATER LOSSES:** 7.393 acre-ft/yr

**NON-REVENUE WATER**
**NON-REVENUE WATER:** ? 7.920 acre-ft/yr
= Water Losses + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

| | | | |
|---|---|---|---|
| Length of mains: | + ? 9 | 1.1 | miles |
| Number of active AND inactive service connections: | + ? 8 | 221 | |
| Service connection density: | ? | 203 | conn./mile main |

Are customer meters typically located at the curbstop or property line?   Yes

Average length of customer service line: + ?    (length of service line, beyond the property boundary, that is the responsibility of the utility)

*Average length of customer service line has been set to zero and a data grading score of 10 has been applied*

| | | | |
|---|---|---|---|
| Average operating pressure: | + ? 5 | 68.0 | psi |

**COST DATA**

| | | | |
|---|---|---|---|
| Total annual cost of operating water system: | + ? 10 | $235,503 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | + ? 9 | $4.09 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | + ? 5 | $811.57 | $/acre-ft    □ Use Customer Retail Unit Cost to value real losses |

**WATER AUDIT DATA VALIDITY SCORE:**

**\*\*\* YOUR SCORE IS: 67 out of 100 \*\*\***

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

**PRIORITY AREAS FOR ATTENTION:**

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

**1: Water imported**

**2: Volume from own sources**

**3: Customer metering inaccuracies**

# AWWA Free Water Audit Software:
## Reporting Worksheet

**Water Audit Report for:** Lake Arrowhead Community Services District (Rimforest)  (CA3610045)
**Reporting Year:** 2019    7/2018 - 6/2019

? Click to access definition
+ Click to add a comment

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: ACRE-FEET 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.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

**WATER SUPPLIED**

| | Pcnt: | Value: |
|---|---|---|
| Volume from own sources: + ? n/a | 0.000 acre-ft/yr | + ? | ● ○ | acre-ft/yr |
| Water imported: + ? 7 | 37.880 acre-ft/yr | + ? 3 | ● ○ | acre-ft/yr |
| Water exported: + ? n/a | 0.000 acre-ft/yr | + ? | ● ○ | acre-ft/yr |

**WATER SUPPLIED:** 37.880 acre-ft/yr

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

**AUTHORIZED CONSUMPTION**

Click here: ?  for help using option buttons below

| | | | Pcnt: | Value: |
|---|---|---|---|---|
| Billed metered: + ? 7 | 35.481 | acre-ft/yr | | |
| Billed unmetered: + ? n/a | 0.000 | acre-ft/yr | | |
| Unbilled metered: + ? n/a | 0.000 | acre-ft/yr | | |
| Unbilled unmetered: + ? 5 | 0.095 | acre-ft/yr | ( ) (●) | 0.095 acre-ft/yr |

**AUTHORIZED CONSUMPTION:** ? 35.576 acre-ft/yr

Use buttons to select percentage of water supplied
**OR**
value

**WATER LOSSES (Water Supplied - Authorized Consumption)** 2.304 acre-ft/yr

**Apparent Losses**

| | | | Pcnt: | Value: |
|---|---|---|---|---|
| Unauthorized consumption: + ? | 0.095 acre-ft/yr | | 0.25% (●) ( ) | acre-ft/yr |

*Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed*

| | | | | |
|---|---|---|---|---|
| Customer metering inaccuracies: + ? 5 | 0.178 acre-ft/yr | | 0.50% (●) ( ) | acre-ft/yr |
| Systematic data handling errors: + ? 5 | 0.089 acre-ft/yr | | 0.25% (●) ( ) | acre-ft/yr |

*Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed*

**Apparent Losses:** ? 0.362 acre-ft/yr

**Real Losses (Current Annual Real Losses or CARL)**
**Real Losses = Water Losses - Apparent Losses:** ? 1.943 acre-ft/yr

**WATER LOSSES:** 2.304 acre-ft/yr

**NON-REVENUE WATER**
**NON-REVENUE WATER:** ? 2.399 acre-ft/yr
= Water Losses + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

| | | |
|---|---|---|
| Length of mains: + ? 9 | 0.7 | miles |
| Number of active AND inactive service connections: + ? 8 | 300 | |
| Service connection density: ? | 405 | conn./mile main |

Are customer meters typically located at the curbstop or property line? — Yes
Average length of customer service line: + ?

(length of service line, beyond the property boundary, that is the responsibility of the utility)

*Average length of customer service line has been set to zero and a data grading score of 10 has been applied*

Average operating pressure: + ? 5 — 67.5 psi

**COST DATA**

| | | |
|---|---|---|
| Total annual cost of operating water system: + ? 10 | $241,365 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): + ? 9 | $5.10 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): + ? 5 | $456.44 | $/acre-ft |

☐ Use Customer Retail Unit Cost to value real losses

**WATER AUDIT DATA VALIDITY SCORE:**

**\*\*\* YOUR SCORE IS: 69 out of 100 \*\*\***

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

**PRIORITY AREAS FOR ATTENTION:**

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

1: Water imported

2: Customer metering inaccuracies

3: Variable production cost (applied to Real Losses)

? Click to access definition
+ Click to add a comment

**Water Audit Report for:** Lake Arrowhead Community Services District (Rimforest) (CA3610045)
**Reporting Year:** 2020 | 7/2019 - 6/2020

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: ACRE-FEET 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.

<----------- Enter grading in column 'E' and 'J' ----------->

**Master Meter and Supply Error Adjustments**

**WATER SUPPLIED**

| | Grade | Value | | Pcnt: | Value: | |
|---|---|---|---|---|---|---|
| Volume from own sources: | n/a | 0.000 | acre-ft/yr | | | acre-ft/yr |
| Water imported: | 7 | 48.350 | acre-ft/yr | 3 | | acre-ft/yr |
| Water exported: | n/a | 0.000 | acre-ft/yr | | | acre-ft/yr |

**WATER SUPPLIED:** 48.350 acre-ft/yr

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

**AUTHORIZED CONSUMPTION**

Click here: ? for help using option buttons below

| | Grade | Value | | Pcnt: | Value: | |
|---|---|---|---|---|---|---|
| Billed metered: | 7 | 37.170 | acre-ft/yr | | | |
| Billed unmetered: | n/a | 0.000 | acre-ft/yr | | | |
| Unbilled metered: | 10 | 0.009 | acre-ft/yr | | | |
| Unbilled unmetered: | 5 | 0.121 | acre-ft/yr | | 0.121 | acre-ft/yr |

**AUTHORIZED CONSUMPTION:** 37.300 acre-ft/yr

Use buttons to select percentage of water supplied **OR** value

**WATER LOSSES (Water Supplied - Authorized Consumption)** 11.050 acre-ft/yr

**Apparent Losses**

Pcnt: | Value:

| | Grade | Value | | | | |
|---|---|---|---|---|---|---|
| Unauthorized consumption: | | 0.121 | acre-ft/yr | 0.25% | | acre-ft/yr |

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

| | Grade | Value | | | | |
|---|---|---|---|---|---|---|
| Customer metering inaccuracies: | 5 | 0.187 | acre-ft/yr | 0.50% | | acre-ft/yr |
| Systematic data handling errors: | 5 | 0.093 | acre-ft/yr | 0.25% | | acre-ft/yr |

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

**Apparent Losses:** 0.401 acre-ft/yr

**Real Losses (Current Annual Real Losses or CARL)**
**Real Losses = Water Losses - Apparent Losses:** 10.649 acre-ft/yr

**WATER LOSSES:** 11.050 acre-ft/yr

**NON-REVENUE WATER**
**NON-REVENUE WATER:** 11.180 acre-ft/yr
= Water Losses + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

| | Grade | Value | |
|---|---|---|---|
| Length of mains: | 9 | 0.7 | miles |
| Number of active AND inactive service connections: | 8 | 300 | |
| Service connection density: | | 405 | conn./mile main |
| Are customer meters typically located at the curbstop or property line? | | Yes | |
| Average length of customer service line: | | | (length of service line, beyond the property boundary, that is the responsibility of the utility) |

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

| | Grade | Value | |
|---|---|---|---|
| Average operating pressure: | 5 | 67.5 | psi |

**COST DATA**

| | Grade | Value | |
|---|---|---|---|
| Total annual cost of operating water system: | 10 | $267,466 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | 9 | $5.10 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | 5 | $443.49 | $/acre-ft |

☐ Use Customer Retail Unit Cost to value real losses

**WATER AUDIT DATA VALIDITY SCORE:**

**\*\*\* YOUR SCORE IS: 71 out of 100 \*\*\***

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

**PRIORITY AREAS FOR ATTENTION:**

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

**1: Water imported**

**2: Customer metering inaccuracies**

**3: Variable production cost (applied to Real Losses)**

# AWWA Free Water Audit Software:
## Reporting Worksheet

**Water Audit Report for:** Lake Arrowhead Community Services District  (CA3610005)
**Reporting Year:** 2020    7/2019 - 6/2020

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: ACRE-FEET 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.

<----------- Enter grading in column 'E' and 'J' ---------->

**Master Meter and Supply Error Adjustments**

### WATER SUPPLIED

| | | Pcnt: | Value: | |
|---|---|---|---|---|
| Volume from own sources: | 7 | 1,307.470 | acre-ft/yr | 3 | | acre-ft/yr |
| Water imported: | 7 | 53.300 | acre-ft/yr | 3 | | acre-ft/yr |
| Water exported: | n/a | | acre-ft/yr | | | acre-ft/yr |

**WATER SUPPLIED:** 1,360.770 acre-ft/yr

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

### AUTHORIZED CONSUMPTION

Click here: for help using option buttons below

| | | | | Pcnt: | Value: | |
|---|---|---|---|---|---|---|
| Billed metered: | 7 | 1,169.580 | acre-ft/yr | | | |
| Billed unmetered: | n/a | 0.000 | acre-ft/yr | | | |
| Unbilled metered: | 10 | 7.861 | acre-ft/yr | | | |
| Unbilled unmetered: | 5 | 3.402 | acre-ft/yr | | 3.402 | acre-ft/yr |

**AUTHORIZED CONSUMPTION:** 1,180.843 acre-ft/yr

Use buttons to select percentage of water supplied
**OR**
value

### WATER LOSSES (Water Supplied - Authorized Consumption)    179.927 acre-ft/yr

#### Apparent Losses

| | | | | Pcnt: | Value: | |
|---|---|---|---|---|---|---|
| Unauthorized consumption: | | 3.402 | acre-ft/yr | 0.25% | | acre-ft/yr |

*Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed*

| | | | | | | |
|---|---|---|---|---|---|---|
| Customer metering inaccuracies: | 5 | 5.917 | acre-ft/yr | 0.50% | | acre-ft/yr |
| Systematic data handling errors: | 5 | 2.924 | acre-ft/yr | 0.25% | | acre-ft/yr |

*Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed*

**Apparent Losses:** 12.243 acre-ft/yr

#### Real Losses (Current Annual Real Losses or CARL)
**Real Losses = Water Losses - Apparent Losses:** 167.684 acre-ft/yr

**WATER LOSSES:** 179.927 acre-ft/yr

### NON-REVENUE WATER
**NON-REVENUE WATER:** 191.190 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

### SYSTEM DATA

| | | | |
|---|---|---|---|
| Length of mains: | 9 | 130.6 | miles |
| Number of active AND inactive service connections: | 8 | 8,397 | |
| Service connection density: | | 64 | conn./mile main |

Are customer meters typically located at the curbstop or property line?    Yes

Average length of customer service line:    (length of service line, beyond the property boundary, that is the responsibility of the utility)

*Average length of customer service line has been set to zero and a data grading score of 10 has been applied*

| | | | |
|---|---|---|---|
| Average operating pressure: | 5 | 85.0 | psi |

### COST DATA

| | | | |
|---|---|---|---|
| Total annual cost of operating water system: | 10 | $6,074,259 | $/Year |
| Customer retail unit cost (applied to Apparent Losses): | 9 | $4.00 | $/100 cubic feet (ccf) |
| Variable production cost (applied to Real Losses): | 5 | $248.41 | $/acre-ft |

☐ Use Customer Retail Unit Cost to value real losses

### WATER AUDIT DATA VALIDITY SCORE:

**\*\*\* YOUR SCORE IS: 71 out of 100 \*\*\***

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

### PRIORITY AREAS FOR ATTENTION:

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

1: Volume from own sources

2: Customer metering inaccuracies

3: Variable production cost (applied to Real Losses)

# Reporting Water Losses

Highlights from California's second year of water loss audits

*By Kate Gasner and Sarah Reed-Guy*

FOR THE SECOND YEAR IN A ROW, urban retail water suppliers in California submitted level 1 validated water audits to the California Department of Water Resources in compliance with Senate Bill 555, commonly known as the Water Loss Management Act. The water audit describes each distribution system's water losses — both real and apparent — and Level 1 validation is a process by which audit inputs are reviewed and data maintenance practices are acknowledged.

The 2018 submissions include water audits that describe the 2017 calendar year and the 2017-2018 fiscal year. As of early October 2018, 325 urban retail water suppliers submitted a level 1 validated water audit, representing nearly 79 percent of all water agencies required to report.

Last year's submission rate was higher at 93 percent of required water suppliers reporting. However, those submissions were a product of the Water Loss Technical Assistance Program, funded by the Environmental Protection Agency and the California State Water Resources Board and administered through the California-Nevada Section. This two-year program educated water suppliers on water audit methodology and provided the first round of level 1 validations at no cost to the supplier. This year, submissions required water suppliers to pursue validation on their own, either by having staff successfully secure a water audit validator certificate or by hiring a certified consultant.
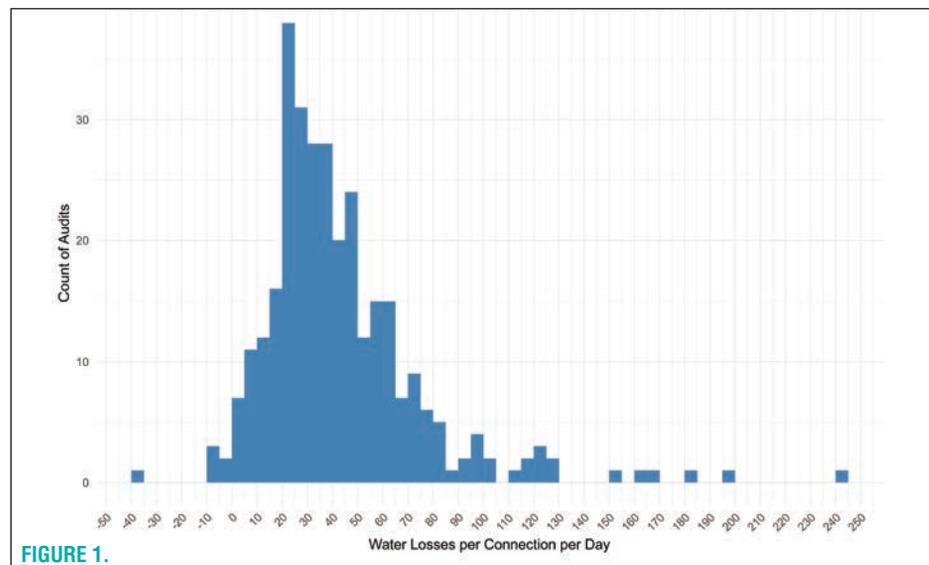
## Water Audit Results

The 2018 validated water audit submissions provide the most recent snapshot of water loss and utility operations for large California water utilities. Table 1 summarizes the key performance indicators for the complete dataset of level 1 validated audits. All audit results — including those with outlier performance — are presented here.

Please note that it is not safe to assume each audit's leakage estimation is accurate. Level 1 validation does

Table 1: Key Performance Indicators for 2018 Water Audits

**All Audits — Key Performance Indicators Summary (N = 325)**

| | Key Performance Indicator | Median | Mean | Min | Max |
|---|---|---|---|---|---|
| Volumetric | Water Losses per Service Connection per Day (gal) | 36.5 | 43.1 | -37.9 | 244.5 |
| | Apparent Losses per Service Connection per Day (gal) | 8.3 | 11.6 | -6.3 | 205.4 |
| | Real Losses per Service Connection per Day (gal) | 26.6 | 32.9 | -41.4 | 240.3 |
| | Real Losses per Service Connection per Day per PSI | 0.3 | 0.5 | -0.7 | 4.8 |
| | Infrastructure Leakage Index (ILI) | 1.5 | 2.0 | -3.2 | 21.5 |
| Financial | Annual Cost of Apparent Losses | $183,718 | $523,843 | -$109,883 | $24,433,925 |
| | Annual Cost of Real Losses | $166,055 | $516,307 | - $1,883,349 | $24,299,856 |
| | Non-Revenue Water as a % of Total Operating Cost | 3.7% | 4.1% | -3.7% | 43.9% |
| | Data Validity Score | 64 | 64 | 43 | 89 |



FIGURE 1.

not guarantee a perfect calculation of water losses for each utility, but it does confirm that each utility is compiling the best audit possible given their current data sources.

Each performance indicator varies widely, highlighting the spread of water loss audit results throughout the state. The distribution of total water losses per connection per day is presented in Figure 1. Though it is critical to distinguish between apparent losses and real losses for cost considerations and action planning, we present the total water loss indicator here to summarize audit results.

The middle 50 percent of reporting water suppliers report between 24 and 56 water losses per connection per day. The highest quarter of reporting water suppliers report water losses across a much wider range, between 56 and 245 water losses per connection per day.
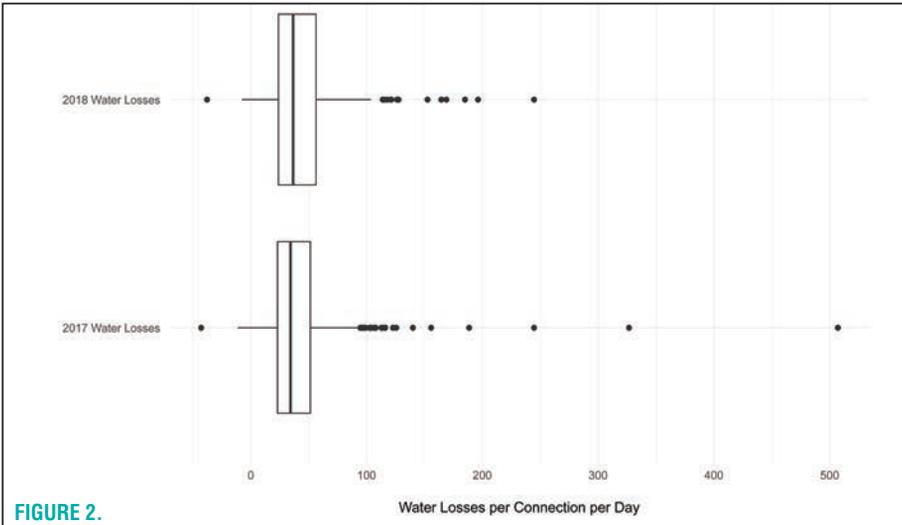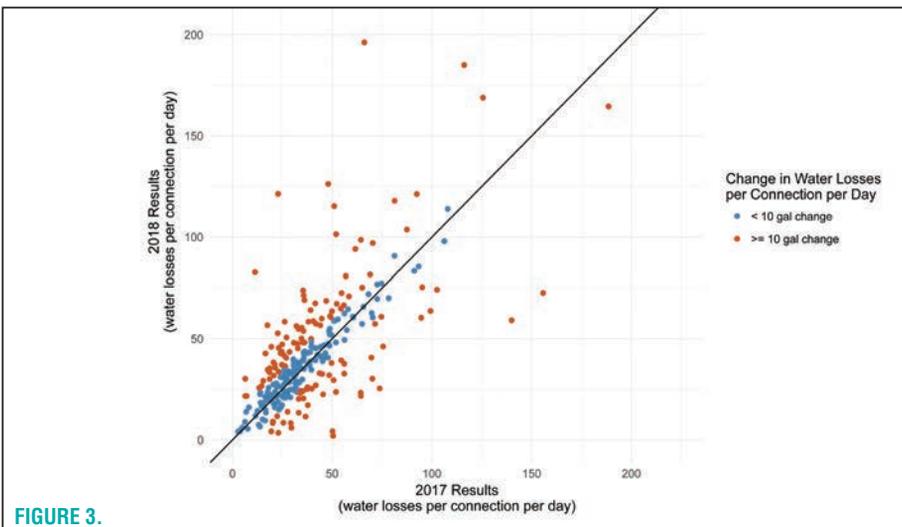
**FIGURE 2.**

Water Losses per Connection per Day



**FIGURE 3.**

per day between submissions.

Variable water audits present challenges for water suppliers and regulatory agencies alike. Without more insight into the suppliers' water loss efforts or data improvement work, we cannot easily distinguish between different sources of this variability. Some changes will be result of improving data sources and some changes will reflect shifts in water loss performance. As 2019 ushers in a phase of performance target setting, we encourage attention and sensitivity to the prevalence of variability in audit results. 🌢

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**FURTHER READING**

Sturm, R., Gasner, K., and Andrews, L. (2015). *Water audits in the United States: A review of water losses and data validity.* Water Research Foundation Project 4372B. *http://www.waterrf.org/Pages/Projects.aspx?PID=4372*

## Variation in Water Losses

Comparing the two years of level 1 validated water audit submissions, the population statistics remain similar. Figure 2 shows box plots for each year's submission, presenting similar concentration of results around comparable medians (34.1 water losses per connection per day for 2017 submissions and 36.5 water losses per connection per day for 2018 submissions).

However, that consistency does not hold when examining changes between submissions for individual suppliers. Figure 3 shows results for each water supplier with both 2017 and 2018 submissions. A data point on the line presents a water supplier with the same results in each year of submission. Data points highlighted in blue did not change more than 10 gallons per connection per day; data points highlighted in red changed at least 10 gallons per connection