

WATER AUDITS

GUIDELINES AND WORKSHEETS

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Resource Conservation and Development Department
Water Resource Projects Section**

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The Southwest Florida Water Management District (District) does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of the District's functions, including one's access to, participation, employment, or treatment in its programs or activities. Anyone requiring reasonable accommodation as provided for in the Americans With Disabilities Act should contact the Resource Conservation and Development Department, at (352) 796-7211 or 1-(800) 423-1476 (Florida), extension 4215; TDD Only 1-(800) 231-6103 (Florida); FAX (904) 754-6885/SUNCOM 663-6885.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
2379 Broad Street (U.S. 41 South)
Brooksville, Florida 34609-6899

WATER AUDIT WORKSHEET

WATER AUDITS

All public supply permittees with permits for 100,000 gallons per day and greater in Water Use Caution Areas (WUCA) are required to perform periodic water audits. The purpose of this document is to provide a simplified worksheet which will allow permittees to comply with this requirement. Submission of a correctly completed worksheet with required documentation to the attention of the District's Permits Data Section at the above address will ensure compliance with the WUCA water audit requirement.

A water audit is an accounting procedure. The purpose of a water audit is to accurately determine the amount of unaccounted-for water (UAW) in a water distribution system. UAW is calculated from verified supply and consumption records, factoring in various estimated usage figures. Due to potential short-term inaccuracies, a water audit generally considers data from the most recent 12-month period. Any period less than 12 months will not reflect seasonal climatic and population variations. Detailed guidance for conducting a water audit can be found in the American Water Works Association's (AWWA) Manual #36, entitled Water Audits and Leak Detection. The forms found in AWWA Manual #36 are also acceptable for the purpose of documenting a water audit. This manual can be obtained from the AWWA. The AWWA's address and telephone number is listed below.

American Water Works Association
6666 West Quincy Avenue
Denver, Colorado 80235
Telephone (303) 794-7711

The results of a water audit can be considered valid only if the figures used to calculate the level of UAW are accurate. The production and consumption figures used to calculate UAW come from metering data, which is dependent upon meter accuracy. Because of this, meter accuracy testing is an essential part of a water audit. The AWWA provides testing guidelines in Manual #6, Water Meters: Selection, Installation, Testing, and Maintenance. As a general rule, all source meters should be verified annually. A representative sample of service meters (1%-5%) should be bench- or field-tested during the water audit. In calculating UAW, supply and consumption figures can be adjusted up or down according to meter accuracy rates. It should be noted that inaccurate service meters usually under-register. The level

of UAW can be adjusted to compensate for service meter under-registration. On the other hand, the customer's bills cannot be adjusted, and under-registration can have a significant negative effect on system revenue. Meter change-out programs generally prove to be a cost-effective method of boosting system revenue. To comply with the Southwest Florida Water Management District's Water Use Caution Area (WUCA) Public Supply Special Conditions, all public supply water use permit holders with permits for 100,000 gallons per day and greater, geographically located within a WUCA, must conduct periodic water audits. The attached worksheet is intended to assist permittees in conducting a simple water audit. Submission of this worksheet to the District's Permit Data Section will ensure compliance with the WUCA water audit requirement.

PAGE 1: INSTRUCTIONS FOR WATER AUDIT WORKSHEET

WORKSHEET PAGE 1: HEADER INFORMATION

Name of Permittee: Enter the name as it appears on the Water Use Permit (e.g., City of Tampa, Orange Lake Utilities, etc.).

Water Use Permit #: Enter the number on the Water Use Permit.

Report Date: Enter the date that the water audit is required (e.g., January 1993).

Audit Period: Indicate the time period over which data for the audit was compiled. Ideally, this should be the most recent 12-month period.

Permitting Office: Indicate the District office responsible for issuing the water use permit.

WORKSHEET PAGE 1: WATER AUDIT SUMMARY

Unit of Measure Used to Complete Worksheet: Indicate the unit of measure used in completing the water audit. Some commonly used units of measure are gallons, millions of gallons, or 1000s of cubic feet. Units of measurement must be consistent throughout the worksheet.

Note: Complete Pages 2 and 3 of the Water Audit Worksheet, and FORM 5 (if appropriate) before making entries on Lines 1 through 4.

LINE 1: TOTAL WATER SUPPLY: Enter the quantity from Line 5c, Page 2. This is the total water supply, adjusted to compensate for over- or under-registration, determined by testing the source meter(s).

LINE 2: TOTAL CONSUMPTION: Enter the quantity from Line 8, Page 3. This is the total water consumption, adjusted to compensate for service meter inaccuracy and estimated unmetered use.

LINE 3: TOTAL UNACCOUNTED-FOR WATER: Unaccounted-for water is water that is "lost" after entering the distribution system. Subtract Line 2 from Line 1. Enter the difference on Line 3.

LINE 4: PERCENTAGE OF UNACCOUNTED-FOR WATER: Divide Line 3 (total unaccounted-for water) by Line 1 (total water supply). Since Line 3 will always be smaller than Line 1, the result will be less than one (a decimal number). Convert to a percentage by multiplying by 100. If unaccounted-for water exceeds 12%, a plan and schedule of remedial action must be forwarded with the water audit worksheet to the District's Permit Data Section.

PAGE 2: INSTRUCTIONS FOR WATER AUDIT WORKSHEET

WORKSHEET PAGE 2: ADJUSTMENTS FOR SOURCE METER INACCURACY

LINE 5: Source Meter (Production) Accuracy Adjustments:

Note: Utilities with more than one (1) Source Meter leave Lines 5a through 5e blank, and use FORM 5: "Source Meter (Production) Accuracy Adjustments" to document data for this section. Instructions for completing FORM 5 are on Page 1 of FORM 5. Utilities with a single Source Meter will record data on Lines 5a through 5e, Page 2, Water Audit Worksheet, in accordance with the following instructions.

LINE 5a: Meter Brand/Serial Number: Record the Brand (e.g., Rockwell, Badger, Precision, etc.) and the manufacturer's serial number. The serial number is most often, but not always, stamped on the lid which protects the glass covering the dial, or face, of the meter.

LINE 5b: Final Meter Reading: The final meter reading is the reading at the conclusion of the audit period. If the audit period is for the twelve (12) month period from January through December, this entry would be the last source meter reading in December (e.g., December 31st).

LINE 5c: Preliminary Meter Reading: The preliminary meter reading is the reading at the beginning of the audit period. If the audit period is for the twelve (12) month period from January through December, this entry would be the first source meter reading in January (e.g., January 1st).

LINE 5d: Uncorrected Total Water Supply (Entering System): The uncorrected total includes all water entering the distribution system during the entire audit period, whether pumped or purchased, as determined from meter readings. Subtract Line 5c (Preliminary Meter Reading) from Line 5b (Final Meter Reading) and enter the difference on Line 5d.

LINE 5e: Corrected Total Water Supply (Entering System): Calculate the corrected total water supply, adjusted for over- or under-registration of the source meter, verified by testing. If the source meter tests 94% accurate (under-registration), the uncorrected total water supply (Line 5d) must be adjusted upward by 6% to reflect 100% accuracy. If the source meter tests 108% accurate (over-registration), the uncorrected total water supply (Line 5d) must be adjusted downward by 8%. If the source meter tests 100% accurate, no adjustment is necessary and the corrected total water supply is the same as the uncorrected total water supply. Enter the result on Line 5e. Submit documentation explaining the procedures used to test the source meter, and include test data for the meter.

PAGE 3: INSTRUCTIONS FOR WATER AUDIT WORKSHEET

WORKSHEET PAGE 2: ADJUSTMENTS FOR SERVICE METER INACCURACY

LINE 6: Service Meter (Consumption) Accuracy Adjustments:

LINE 6a: Uncorrected Total Metered Water Consumption: The uncorrected total includes all water leaving the distribution system through service meters during the audit period. This entry is a total of all metered consumption through the entire audit period. This information is usually obtained from billing data or from meter reader records.

LINE 6b: Accuracy Rate Based on Random Testing: Test a representative sample of service meters. The meters tested should be selected randomly. Determine the average accuracy rate, and enter on Line 6b as a percentage. For example, 20 meters are tested; 16 are found to be 100% accurate. The other four are found to be 91%, 82%, 66%, and 41% accurate. Calculate the average accuracy for all meters tested. In this example, the projected meter accuracy, system wide, is 94% ($1600+91+82+66+41=1880$ divided by $20=94$). Submit documentation explaining the procedures used to test service meter(s), and include test data for each meter tested.

LINE 6c: Percentage of Consumption Adjustment: Subtract the percentage on Line 6b from 100%, and enter the difference on Line 6c.

LINE 6d: Adjustment for Service Meter Inaccuracy: Convert the percentage from Line 6c to a quantity (multiply the decimal equivalent of the percentage times the uncorrected total metered consumption on Line 6a), and enter the quantity on Line 6d.

LINE 6e: Corrected Total Metered Consumption: Add Line 6d to Line 6a and enter the total on Line 6e.

WORKSHEET PAGE 3: CORRECTIONS TO TOTAL WATER CONSUMPTION

LINE 7: Authorized Unmetered Water Uses: Nearly all water distribution systems have some authorized unmetered water uses. It should be noted that entries in Line 7 rely on accurate estimation of usage. In some cases, quantities must be requested from individuals who do not work in the distribution system, such as the fire chief. These entries are self explanatory. Submit calculations and frequency, i.e., a schedule of use, as appropriate for each category used to adjust total water consumption.

LINE 7z: Total Authorized Unmetered Uses: Add Lines 7a through 7m and enter the total on Line 7z.

LINE 8: Total (Adjusted) Consumption: Add Line 6e to Line 7z. Enter the sum on Line 8. Since service meters, especially as they age, have a tendency to under-register, and almost all distribution systems have some authorized unmetered uses, consumption figures almost always will be adjusted upward.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

WATER AUDIT WORKSHEET
PAGE 1

Name of Permittee: _____

Water Use Permit #: _____ Report Date: _____

Audit Period (e.g., Jan 92-Dec 92): _____

Permitting Office: _____
(Brooksville, Bartow, Tampa, Venice)

WATER AUDIT SUMMARY

NOTE: COMPLETE WORKSHEET PAGES 2 and 3 BEFORE COMPLETING THE REST OF THIS PAGE.

Unit of Measure Used Throughout Worksheet (Gallons, 1000s Cubic Feet, etc.) : * _____

<u>LINE</u>	<u>ITEM</u>	<u>QUANTITY</u> *
1.	TOTAL (CORRECTED) WATER SUPPLY: (From Line 5e, Page 2 <u>OR</u> from Line F5(a) if using FORM 5.)	_____
2.	TOTAL (CORRECTED) CONSUMPTION: (From Line 8, Page 3)	_____
3.	TOTAL UNACCOUNTED-FOR WATER: (Subtract Line 2 from Line 1)	_____
4.	PERCENTAGE OF UNACCOUNTED-FOR WATER: (Divide Line 3 by Line 1 and Convert to %)	_____ %

IF UNACCOUNTED-FOR WATER EXCEEDS 12%, THEN A PLAN AND SCHEDULE OF REMEDIAL ACTIONS MUST BE FORWARDED TO THE DISTRICT'S PERMIT DATA SECTION AT THE BROOKSVILLE OFFICE ALONG WITH THIS WATER AUDIT WORKSHEET.

* Units of measurement must be consistent throughout worksheet.

**WATER AUDIT WORKSHEET
PAGE 2**

ADJUSTMENTS FOR SOURCE (PRODUCTION) METER INACCURACY:

<u>LINE</u>	<u>ITEM</u>	<u>QUANTITY *</u>
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5. **Source Meter (Production) Accuracy Adjustments:** Utilities with more than one (1) Source Meter leave Lines 5a through 5e blank, and use FORM 5: "Source Meter (Production) Accuracy Adjustments" to document data for this section. Utilities with a single Source Meter will record data below.

a. Meter Brand/Serial Number: _____

b. Final Meter Reading (At End of Audit Period): _____

c. Preliminary Meter Reading (At Start of Audit Period): _____

d. Uncorrected Total Water Supply (Subtract Line 5c from Line 5b): _____

e. Corrected Total Water Supply (*Enter on Line 1, Page 1*): _____

ADJUSTMENTS FOR SERVICE (CONSUMPTION) METER INACCURACY:

6. **Service Meter (Consumption) Accuracy Adjustments:**

a. Uncorrected Total Metered Consumption: _____

b. Accuracy Rate Based on Random Testing:
(Attach Test Data for Each Meter Tested) _____

c. Percentage of Consumption Adjustment: _____ %

d. Adjustment for Service Meter Inaccuracy: _____

e. Corrected Total Metered Consumption: _____

* Units of measurement must be consistent throughout worksheet.

**WATER AUDIT WORKSHEET
PAGE 3**

CORRECTIONS TO TOTAL WATER CONSUMPTION:

<u>LINE</u>	<u>ITEM</u>	<u>QUANTITY *</u>
7.	<u>Authorized Unmetered Water Uses</u> (Submit calculations and frequency, i.e., schedule of use, for each category used.)	
a.	Firefighting and Firefighting Training, Flow Testing:	_____
b.	Main Flushing:	_____
c.	Storm Drain Flushing:	_____
d.	Sewer Flushing:	_____
e.	Street Cleaning:	_____
f.	Bulk Water Sales: **	_____
g.	Storage Tank Drainage:	_____
h.	Public Area Irrigation/Sanitary Use: ** (Parks, Golf Courses, Cemeteries, Highway Medians, Playgrounds, etc.)	_____
i.	Water Plant Uses (chemical mix, filter wash, etc.):	_____
j.	Well Purging:	_____
k.	Water Quality Testing:	_____
l.	Repaired Distribution System Leaks:	_____
m.	Other Unmetered Uses (Specify):	_____
z.	Total Authorized <u>Unmetered Uses</u>: (add Lines 7a through 7m)	_____
8.	<u>Total (Adjusted) Consumption</u>: (Add Lines 6e & 7z; <u>Enter on Line 2, Page 1</u>)	_____

* Units of measurement must be consistent throughout worksheet.

** Bulk sale points and public areas should be metered for water accounting purposes.

FORM 5. Source Meter (Production) Accuracy Adjustments

INSTRUCTIONS FOR FORM 5

For use when more than one (1) Source Meter will be tested. Reproduce Page 2 (FORM 5 Continued) as needed, based on total number of meters tested.

LINE F5(a): Corrected Total Water Supply: The total corrected water supply produced through ALL source meters tested. Complete a section, i.e., Lines F5(b) through F5(f), for each source meter before calculating the entry on line F5(a). Calculate the sum of the entries on all Lines F5(f).

LINE F5(b): Meter Brand/Serial Number: Record the Brand (e.g., Rockwell, Badger, Precision, etc.) and the manufacturer's serial number. The serial number is most often, but not always, stamped on the lid which protects the glass covering the dial, or face, of the meter.

LINE F5(c): Final Meter Reading: The final meter reading is the reading at the conclusion of the audit period. If the audit period is for the twelve (12) month period from January through December, this entry would be the last source meter reading in December (e.g., December 31st).

LINE F5(d): Preliminary Meter Reading: The preliminary meter reading is the reading at the beginning of the audit period. If the audit period is for the twelve (12) month period from January through December, this entry would be the first source meter reading in January (e.g., January 1st).

LINE F5(e): Uncorrected Total Production for Meter: The uncorrected total production for the meter includes all water recorded by the meter during the entire audit period, whether pumped or purchased, as determined from the meter reading. Subtract Line F5(d), Preliminary Meter Reading, from Line F5(c), Final Meter Reading, and enter the difference on Line F5(e).

LINE F5(f): Corrected Total Production for Meter: Calculate the corrected total production for the meter, adjusted for over- or under-registration of the source meter, verified by testing. If the source meter tests 94% accurate (under-registration), the uncorrected total water supply from Line F5(e) must be adjusted upward by 6% to reflect 100% accuracy. If the source meter tests 108% accurate (over-registration), the uncorrected total water supply from Line F5(e) must be adjusted downward by 8%. If the source meter tests 100% accurate, no adjustment is necessary and the corrected total water supply is the same as the uncorrected total water supply. Enter the result on Line F5(f). Submit documentation explaining the procedures used to test the source meter, and include test data for the meter.

<u>LINE</u>	<u>ITEM</u>	<u>QUANTITY *</u>
F5(a).	Corrected Total Water Supply: (Sum/Total of <u>ALL</u> Lines F5(f), from <u>ALL</u> pages of FORM 5 used. <i><u>Enter on Line 1, Page 1, Water Audit Worksheet</u></i>	_____

* Units of measurement must be consistent throughout worksheet.

