

# INSTRUCTIONS FOR COMPLETING THE DISTRICT WATER AUDIT FORM

## INTRODUCTION

All consumptive use permit applicants that are requesting water for public supply type use must complete a water audit using the District's Water Audit Form pursuant to section 12.2.5.1(a) of the Applicant's Handbook: Consumptive Uses of Water, Month, 1998. The purpose of this document is to supply instructions regarding completion of the water audit form. If the applicant should have any questions as to the completion of the water audit form, please contact the staff of the District's Division of Water Use Regulation, located at the appropriate District Service Center.

Please note, the District will require submittal of documentation supporting the applicant's water audit form when necessary.

## TASK 1: TREATMENT SYSTEM

Task 1 of the water audit is designed to identify water losses in the water treatment system. Systems not monitoring raw water production will be unable to complete this section.

### ***1A Raw Water Produced***

Include the total volume of ground and/or surface water from withdrawal points owned and operated by you and that are used to supply your distribution system. This volume should be derived from meters located at each source prior to the water entering the treatment system.

### ***1B Raw Water Purchased***

Include the total volume of ground and/or surface water purchased from withdrawal points not owned or operated by you and that are used to supply or supplement your distribution system. This volume should be obtained from metered interconnections with other utilities or suppliers prior to the water entering the treatment system.

### ***1C Finished Water Purchased***

Include the total volume of purchased treated water that is used to supply or supplement your distribution system. This volume may be obtained from metered interconnections with other utilities or suppliers placed into the system prior to the plant master meter.

### ***1D Total Water Produced and Purchased***

Sum of the lines 1A through 1C.

### ***1E Metered Uses in Treatment***

This is metered water used during the treatment process. As an example this may include use in membrane treatment or equipment washdown.

**1F *Unmetered but Known Uses in Treatment***

This is unmetered, but monitored water use during the treatment process. An example is water placed into tanker trucks.

**1G *Total Water Used in Treatment***

Sum of lines 1E and 1F.

**1H *Total Water produced and Purchased for Distribution***

This is the amount of water produced and purchased minus the amount of water used in treatment.

**1I *Metered Finished Water Entering the Distribution System***

This is the volume of treated water entering the distribution system. This is typically read from the water treatment plant master meter.

**1J *Change in Reservoir and Tank Storage***

If source meters are located up-distribution of reservoirs, storage tanks, or underground storage facilities (ASR), then the stored water must be accounted for in the audit.

**NOTE:**

**- If the reservoirs have more water at the end of the study period than at the beginning, then the increased storage was measured by source meters, but not delivered to customers. These increases in storage must be subtracted from the metered supply.**

**- If there is a net reduction in storage, the decreased amount of stored water must be added to the metered supply.**

**1K *Total Water Unaccounted for in the Treatment Process***

This is the total unaccounted for water lost during treatment. Can be either a positive or negative amount.

## **TASK 2: DISTRIBUTION SYSTEM - Metered Uses**

Task 2 is designed to account for water uses from the distribution system as determined by metered sales records.

**2A**     *Small and Medium Meter Use (5/8 inch - 3 inches)*

Record monthly totals for entire study period for all meter sizes within the 5/8 - 3 inch range. Calculate total water sold for this size range of meters.

**2B**     *Large Meter Use (greater than 3 inches)*

Record monthly totals for entire study period for all meter sizes greater than 3 inches. Calculate total water sold for this size range of meters.

**2C**     *Adjustments due to Meter Lag Time*

Corrections should be made to metered use data when the source-meter reading dates and the customer-meter reading dates do not coincide with the beginning and ending dates of the audit study period.

Example: Adjusting for one meter route

A utility is studying one calendar year, 1/1 - 12/31.

Source meters are read on the 1st day of each month

Customers' meters are read on the tenth day of each month

Calculate the amount of water supplied and consumed for the calendar year

Source Meters. - no correction is made for source meters because their reading usually occurs on the days that the study period begins and ends. If the last reading (12/31 was a day late (1/1), the water supplied for 1/1 should be subtracted from the total water used.

Customer Meters. - since the readings do not coincide neatly with the study period, a correction must be made. To account for changes in the number of customers and in use patterns is to prorate the water use for the first and last billing periods within the study period.

**2D**     *Sum of Lines 2A-2C*

Total of metered sales for audit period.

## **TASK 3: DISTRIBUTION SYSTEM - Metered Uses Not Covered in TASK 2 and Unmetered Uses**

Task 3 documents miscellaneous system uses not addressed in Task 2. Items 3A-3K list common miscellaneous uses found in a typical public supply system. Item 3K provides spaces for additional uses not listed. Items 3A-3K may represent a very small component in the overall water use or records documenting the use may not be available to estimate use. In these instances, including an estimate of use may not be useful and the negligible box should be checked.

It is recommended that all uses be metered to improve accountability even if the customer is not billed for the use.

If the water use in items 3A-3K represents a significant portion of the overall use and can be reasonably documented, provide an estimate and indicate how the estimate was determined. No method is more accurate than direct metering, however, the following are common procedures for estimating usage:

### ***3A - 3J Miscellaneous Water Uses - Procedures for Estimating Usage***

#### **1. Batch Procedure**

When water is transported in a tank truck or container of some sort, use the batch procedure.

- Multiply the volume of the tank or other container by the number of times it is filled from the distribution system. This yields the volume of water delivered from the distribution system. For future estimating, it is essential that you provide reporting forms and procedures to your known batch users (ie, fire depts., construction or road crews etc.).

Examples:

#### **Fire fighting and Training**

To estimate this use, check fire department records on training, flushing, and fire suppression. Many fire departments use more water for training and hydrant flushing than for fighting fires. Fire Departments should keep records of hydrant flushing (flow rate and duration), fire calls (duration of fire), tanker fills.

In preparation for future audits, all fire departments should be supplied with adequate water use recording forms and meters for hydrant flushing.

#### **Street Cleaning**

Water used to clean roadways, parking lots, boat ramps, bus stops and bike paths.

- Use the batch method

1. Find out the number of trucks or other equipment used daily and each vehicles water holding capacity.
2. Calculate number of days used during study period
3. Calculate number of times filled/day
4.  $\text{Volume/vehicle/year} = \text{Vehicle Capacity} \times \text{No. Refills/day} \times \text{No. days used}$
5. Total the water use for each vehicle per year

## 2. Discharge Procedure

When water is applied directly from a pipe, as in a sprinkler system or line flushing, use the discharge procedure. This method might be used to estimate sewer or construction flushing.

- Multiply the rate of water discharged (gpm) by the total time water flows (# minutes). This yields the volume of water delivered from the distribution system.

Caution - The discharge rate may vary and the application period may vary in length and frequency. Careful record keeping of each instance is necessary to obtain accurate estimates.

Examples:

### Main Flushing

Water lost from the distribution system due to contaminant and debris cleaning, chlorine residual maintenance, storm drain flushing etc.

- To estimate the volume used for each location flushed, multiply the flow rate by the discharge duration.

In preparation for future audits, all personnel in charge of main flushing should be equipped with water use recording forms.

### Irrigation

- Use of the Discharge Method  
 $\text{Discharge rate to each irrigated area} \times \text{Total time water applied to area}$   
 Ex:  $20,000 \text{ gpd} \times 100 \text{ days/yr} = 2.0 \text{ mgy}$

## 3. Comparison Procedure

If metered similar facilities such as schools, construction sites, golf courses, parks, pools etc. exist, then estimates can be made for unmetered similar sites. Of course, the sites must be alike in size, number of students, irrigated acreage, irrigation methodologies and most other details. Any differences must be accounted for.

Examples:

Irrigation

- Use of the Comparison Method

Site A is a 20 acre sports complex irrigating 15 acres of turf and 5 acres of landscape. Site B is a city park irrigating 5 acres of turfgrass. Site A is metered and using 18 mgy. By comparison, site B should use about 1/4 the amount as site A or an estimated 4.5 mgy.

Construction Sites

Water delivered, primarily through hydrants, to trucks for controlling road dust, site preparation, landscaping, temporary domestic use, and materials processing.

- Use the *comparison* procedure. Estimate use by taking data from similar metered construction sites.

It is recommended that all contractors be required to use a portable meter in the future.

**3L** *Sums up the miscellaneous uses.*

This is the sum of all the miscellaneous uses.

## **TASK 4: Summary of Water Use**

Task 4 summarizes the utilities water use and losses associated with both the treatment and distribution systems.

- 4A**      *Total Water From Distribution System*  
This is a summary of all water uses within the distribution system.
- 4B**      *Total Finished Water Pumped into the Distribution System*  
Water pumped into the distribution system as recorded by the plant master meter.
- 4C**      *Finished Water Purchased after water treatment plant master meter*  
This is the total volume of purchased treated water that enters your distribution system **after** the plant master meter. This volume may be obtained from metered interconnections with other utilities or suppliers and is not previously accounted for in Tasks 1, 2, and 3.
- 4D**      *Sum of Finished Water going into the Distribution System.*  
This is the sum of all water placed into the distribution system from the water treatment plant.
- 4E**      *Total Unaccounted for Water loss from Distribution System*  
This represents the amount of water that is not accounted for in distribution.
- 4F**      *Total Unaccounted for Water From Treatment and Distribution Systems*  
Represents the total difference between what was pumped and what was distributed to customers.
- 4G**      *Percentage Total Unaccounted for Water From Treatment and Distribution Systems*  
Shows line 4F as percentage of the total water produced and purchased.

## **TASK 5: Meter Survey**

A correction to account for meter error is required if the initial unaccounted for water result (in line 4F) is greater than 10% (see attached water audit form). The applicant must perform a meter survey and use the information to correct the amounts listed in Task 2. The purpose of this survey is to determine a potential correction factor for metered water use by testing a representative sampling of meters of various ages. The survey also helps to determine the appropriateness for a meter change-out program. The permit applicant is required to randomly test 5% or 100 meters, whichever is less. The sampling must be a selection of meters representing an even distribution of type and age or cumulative lifetime flow. This requirement may be replaced by a documented meter change-out program that can provide an estimate of the overall meter accuracy. This survey will likely be less productive if greater than 80% of the small/medium meters are less than 5 years in age.

## **TASK 6: Leak Detection Evaluation**

If the total unaccounted for loss of the system from line 4F is 10% or greater, the applicant is required to evaluate the feasibility of completing the leak detection survey found on the water audit form. The applicant has the option to perform the leak detection immediately or to propose a one year program to improve water use accountability to below 10% and then to repeat the audit. If the second audit shows unaccounted-for water loss above 10%, the permittee must implement the leak detection program where feasible.

For the purpose of the leak detection evaluation, it is assumed that 50% of the unaccounted-for water may be recovered. The cost of the leak detection survey can be estimated from past surveys or calculated from estimates. It is suggested the smaller systems check with the Florida Rural Water Association for guidance on cost estimates.

- 6A**      *Potential Water System Leakage*  
This is the potential system leakage shown as the total unaccounted for water as calculated in Task 4 (4F).
- 6B**      *Annual Potential System Leakage*  
This is the potential system leakage shown as the total unaccounted for water as calculated in Task 4 (4F) modified to reflect an annual basis.
- 6C**      *Recoverable Leakage*  
Assumes 50% of the amount shown in 6C is recoverable.
- 6D**      *Production Cost per Million Gallons*  
Your cost to produce water per million gallons.
- 6E**      *Recoverable Savings*  
The costs that can be achieved if the lost water is recovered.
- 6F**      *Estimated Cost of Leak Detection Survey*  
Cost to perform a leak detection survey.
- 6G**      *Estimated Recovery Period*  
How many years it would take to recover the cost of performing a leak detection survey based on the amount of water cost recovered.

# WATER AUDIT FORM

Utility Name: \_\_\_\_\_  
Audit Study Period (Beginning and ending day/month): \_\_\_\_\_  
Consumptive Use Permit Application No. \_\_\_\_\_

The water audit is designed to provide assurances of water accountability within the treatment and water distribution systems. The information provided below must reflect volumes covering a period of at least 12 consecutive months within the three year period preceding the application submittal.

## **TASK 1: Treatment System**

1A	Raw water produced	_____	Mgals
1B	Raw water purchased	_____	Mgals
1C	Finished water purchased	_____	Mgals
1D	Total Water Produced and Purchased (Sum of lines 1A - 1C)	_____	Mgals
1E	Metered uses in treatment	_____	Mgals
1F	Unmetered but known uses in treatment	_____	Mgals
1G	Total water used in treatment (line 1E plus line 1F)	_____	Mgals
1H	Total water produced and purchased for distribution (line 1D minus line 1G)	_____	Mgals
1I	Metered Finished Water entering distribution system (from plant master meter)	_____	Mgals
1J	Change in reservoir and tank storage *(If increase: subtract) *(If decrease: add)	_____	Mgals
1K	<b>Total water unaccounted for in the treatment process</b> (line 1H minus line 1I, plus/minus line 1J: Can be either + or -)	_____	<b>Mgals</b>

## **TASK 2: Distribution System - Metered Uses\***

- 2A Small and Medium Meter Use \_\_\_\_\_ Mgals
- 2B Large Meter Use \_\_\_\_\_ Mgals
- 2C Adjustments due to meter lag time \_\_\_\_\_ Mgals
- 2D Sum of lines 2A - 2C \_\_\_\_\_ Mgals

\*The applicant must perform a meter survey (see instructions and the attached survey form) if the initial unaccounted for water loss is 6% or greater (as listed in line 4F). When a meter survey is performed, the information submitted in Task 2 must be corrected pursuant to the meter survey.

**TASK 3: Distribution System - Metered uses not covered in TASK 2 and unmetered uses**

				(Please check)	
				*Documented	*Negligible/ Undocumented
3A	Irrigation	_____	Mgals	?	?
3B	Swimming Pools	_____	Mgals	?	?
3C	Sewer Cleaning	_____	Mgals	?	?
3D	Water Quality Flushing	_____	Mgals	?	?
3E	Fire Fighting	_____	Mgals	?	?
3F	Construction flushing	_____	Mgals	?	?
3G	Main Breaks	_____	Mgals	?	?
3H	Schools	_____	Mgals	?	?
3I	Decorative Fountains	_____	Mgals	?	?
3J	Allowable Line Loss	_____	Mgals	?	?
3K	Other Uses (Attach list):			?	?
3L	Total:	_____	Mgals		
	(sum of lines 3A - 3K)				

\* Negligible/Undocumented - Check if you feel the amount represents a very small part of the overall total water use **or** if the amount is not documented.

\* Documented - Check if the water use estimate is documented. Only documented use estimates will be accepted for items 3A-3K. Documentation must take the form of metered reports, journal entries or other records.

## **TASK 4: Summary of Water Use**

- 4A Total water from distribution system \_\_\_\_\_ Mgals  
(line 2D plus line 3L)
- 4B Total finished water pumped into distribution system \_\_\_\_\_ Mgals  
(line 1I)
- 4C Finished water purchased after WTP Master Meter \_\_\_\_\_ Mgals  
(i.e. not previously accounted for in TASK 1)
- 4D Sum of finished water going into the distribution System \_\_\_\_\_ Mgals  
(sum of 4B and 4C)
- 4E Total unaccounted for water loss from distribution \_\_\_\_\_ Mgals  
(line 4D minus line 4A)
- 4F Total unaccounted for water from treatment \_\_\_\_\_ Mgals  
and distribution systems (sum of lines 1K plus line 4E)**
- 4G Percentage total unaccounted for loss from treatment \_\_\_\_\_ %  
and distribution systems (divided line 4F by  
the sum of lines 4C plus 1H, then multiply by 100)**

## **TASK 5: Meter Survey**

A correction to account for meter error is required if the initial unaccounted for water result (in line 4F) is greater than 10% (see attached water audit form). The applicant must perform a meter survey and use the information to correct the amounts listed in Task 2. The purpose of this survey is to determine a potential correction factor for metered water use by testing a representative sampling of meters of various ages. The survey also helps to determine the appropriateness for a meter change-out program. The permit applicant is required to randomly test 5% or 100 meters, whichever is less. The sampling must be a selection of meters representing an even distribution of type and age or cumulative lifetime flow. This requirement may be replaced by a documented meter change-out program that can provide an estimate of the overall meter accuracy. This survey will likely be less productive if greater than 80% of the small/medium meters are less than 5 years in age.

Provide the following supplemental information:

### **Small and Medium Meter Survey (Choose Method 1 or Method 2)**

Small - 1 inch or less Medium - 1 to 3 inches

#### **Method 1 - Meter Age**

The purpose of this survey is to determine a potential correction factor for small and medium meter water use found on line 2A of the audit form by testing a representative sampling of meters of various ages. The survey also helps to determine the appropriateness for a meter change-out program. The permit applicant is required to randomly test 5% or 100 meters, whichever is less. The sampling must be a selection of meters representing an even distribution of type and age or cumulative lifetime flow. This requirement may be replaced by a documented meter change-out program that can provide an estimate of the overall meter accuracy. This survey will likely be less productive if greater than 80% of the small/medium meters are less than 5 years in age.

List age and type of small/medium sized meters in system.

< 5 years	_____ (#)	_____ % of system
between 5 and 10 years	_____	_____ % of system
between 10 and 15 years	_____	_____ % of system
> 15 years	_____	_____ % of system
total # of meters	_____	_____ % of system

Estimated error of meters (average)

< 5 years \_\_\_\_\_ (%)

between 5 and 10 years \_\_\_\_\_

between 10 and 15 years \_\_\_\_\_

> 15 years \_\_\_\_\_

Total adjustment for meter survey \_\_\_\_\_ Mgals or \_\_\_\_\_ %

### **Method 2 - Cumulative Lifetime Flow**

#### **Small Meters**

No. of meters whose cumulative lifetime flow exceeds .75 mgals \_\_\_\_\_

Percent of all small meters \_\_\_\_\_ %

Estimated error from testing sample (average or mean) \_\_\_\_\_ %

Total small meter adjustment for lifetime flow survey \_\_\_\_\_ mgals or \_\_\_\_\_ %

#### **Medium Meters**

No. of meters whose cumulative lifetime flow exceeds 44.8 mgals \_\_\_\_\_

Percent of all small meters in system \_\_\_\_\_ %

Estimated error from testing sample (average or mean) \_\_\_\_\_ %

Total small meter adjustment for lifetime flow survey \_\_\_\_\_ mgals or \_\_\_\_\_ %

#### **Large Meter Adjustments**

A survey of all large meter (larger than 3-inches in size) must be completed. An average of the meter error or a cumulative gallon change is utilized to make this adjustment. Summarize the following:

# of meters surveyed \_\_\_\_\_

Average determined error \_\_\_\_\_ %

Cumulative gallon correction \_\_\_\_\_mgals.

**Total Meter Adjustments**

Small and Medium \_\_\_\_\_ mgals (line 2A)

Large \_\_\_\_\_ mgals (line 2B)

Total (small, medium + large) \_\_\_\_\_ mgals

**TASK 6: Leak detection Evaluation (determination required if final unaccounted for water is >10% as listed in line 4F)**

- 6A Potential water system leakage \_\_\_\_\_ Mgals  
(total from line 4F)
- 6B Annual potential water system leakage \_\_\_\_\_ Mgals  
(divide line 6A by the number of years of record  
used in the audit, i.e. 6A divided by 1.5 if  
18 months of record in audit)
- 6C Recoverable leakage (multiply line 6B by 0.5) \_\_\_\_\_ Mgals
- 6D Annual production cost per million gallons \$ \_\_\_\_\_  
(includes O&M and production costs)
- 6E Annual recoverable savings \$ \_\_\_\_\_  
(multiply line 6C and 6D)
- 6F Estimated cost of leak detection survey\* \$ \_\_\_\_\_
- 6G Estimated recovery period \_\_\_\_\_ yrs  
(line 6E divided by line 6F)

\*Submit documentation describing how this cost was estimated.

**Prepared by:**

**Name:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Date:** \_\_\_\_\_