

WATER LOSS CONTROL PROGRAMS

EPD Guidance Document
August 2007

TABLE OF CONTENTS

<i>PART 1: Overview of Water Loss Control Programs</i> _____	3
SUMMARY _____	3
BASIC DATA AND INFRASTRUCTURE REQUIREMENTS _____	3
ACTIVITIES TO REDUCE WATER LOSSES _____	4
MANAGEMENT STRATEGIES TO REDUCE WATER LOSS _____	5
ADDITIONAL RESOURCES _____	5
<i>Part 2: Main Elements Of A Water Loss Prevention Program</i> _____	6
<i>Part 3: Water Loss Control Program Annual Reporting Form</i> _____	7

Georgia Environmental Protection Division
Watershed Protection Branch

Guidance Document

Water Loss Control Programs

Developed by the Georgia Environmental Protection Division (EPD)
To support the “Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion”

August 2007

This guidance document is intended for entities in the 24-county area of Georgia’s coast addressed in the “Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion”, located in Sub-Regions 1, 2 and 3, that are:

- Public Community Water Systems (CWS) with Water Withdrawal and/or Operating Permits;
- Governmentally Owned or Operated Public Drinking Water Systems with an Operating Permit; or
- Governmentally Owned or Operated Transient Non-Community (TNCWS) or Non-Transient Non-Community Public Water Systems (NTNCWS) with either an Operating Permit and/or a Withdrawal Permit.

It is designed to guide the development and implementation of a water loss control program. Two other EPD Guidance Documents, “Leak Detection and Repair Programs” and “Water Audits”, available on line at <http://www.gadnr.org/cws/> , are recommended as additional resources in developing water loss control programs.

When to use this guidance document: For permittees described above using water derived from the Upper Floridan aquifer in the coastal counties of Georgia, a special condition of all new or modified withdrawal or operating permits will be development and implementation of a water loss control program. The permittee must submit a detailed description of that program to the Georgia Environmental Protection Division’s District Office for concurrence no later than 12 months from the permit issue date. The program must be updated at intervals determined by EPD.

How to use this guidance document: This guidance document is organized into 3 parts: Part 1: – Provides an overview of water loss control programs, including management strategies and activities to reduce water loss. Part 2: Description of the Program – Provides a detailed discussion of the main elements of the program and related compliance requirements. Part 3: – Provides a Water Loss Control Program Annual Reporting Form annual reporting form for water systems to use in tracking annual water loss and thus gage compliance with the permit conditions.

EPD Contact: If you have any questions, or require additional information, please contact the EPD Drinking Water Program, at 404-656-4807. As the July 2006 Coastal Permitting Plan is implemented, EPD will welcome feedback from permittees regarding this guidance document.

PART 1: Overview of Water Loss Control Programs

SUMMARY

Water loss from a water distribution system is a significant factor affecting water delivery to customers. Water loss can be either: (a) the **apparent losses** due to meter inaccuracies or unauthorized consumption, or (b) **real losses** due to leakage at water service lines, breaks or leakage on mains and hydrants/laterals or at storage facilities. By using loss prevention methods such as the new International Water Association (IWA) Performance Indicator Methods, or other standard methods, Georgia will be able to promote a more thorough assessment of water loss among water utilities.

This guidance document relies on The Manual of Water Supply Practices: “Water Audits and Leak Detection” (American Water Works Association, 1999) and Standard Components of Water Balance for Transmission or Distribution Systems (International Water Association, 2001). Further information on these documents can be obtained from <http://www.awwa.org/> and <http://www.iawq.org.uk/>. See “Additional Resources” below in this Guidance Document for additional information and examples of water loss control programs.

BASIC DATA AND INFRASTRUCTURE REQUIREMENTS

Awareness that water loss is occurring in a water system is the first step in identifying leaks and making repairs. Once water loss has been documented and identified, a water system operator can then determine whether the water loss is a real loss or an unavoidable loss. The first step in accounting for water used and lost in a water distribution system is appropriate data collection, especially from water meters. Important data needed to assess water use and loss in a system include:

A) Information relating to the water system infrastructure:

- production water meters (quantity, age, diameter, type, location, accuracy);
- water mains (age, material, diameter, length, location, depth, condition);
- water service lines (quantity, material, diameter, location, depth, length);
- valves (quantity, age, diameter, type, location);
- fire hydrants (quantity, age, type, location);
- customer water meters (quantity, age, diameter, type, location, accuracy);
- storage reservoirs (volume, location, type);
- bulk metering of water imported and water exported (quantity, age, diameter, type, location, accuracy).

B) The quantity of potable water supplied to the water distribution system including water imported and existing system sources, such as:

- surface water delivered via a water purification/treatment plant;
- groundwater from wells delivered via a water purification/treatment plant; and
- purchased water (water imported)

C) The quantity of water metered or consumed and non-revenue water lost within the distribution system; and

D) Operations and maintenance activities within the water distribution system, such as:

- 1) continuous water system pressure readings;
- 2) maintenance activities related to water mains (e.g. number of water main breaks/repairs each year, blow-offs for water quality or freezing concerns, water main replacement or rehabilitation programs, water main flushing/swabbing/pigging programs, discharges at pressure relief valves, etc.);
- 3) hydrant use or maintenance activities (e.g. physical inspection, fire flow testing, pool filling, temporary water services from hydrants, tanker truck filling, sewer cleaning, leaks on hydrants, etc.);
- 4) valve maintenance activities (boundary valve between two different pressure zones, pressure-reducing valves within the water distribution system, maintenance on valve stems, seats, leaks on valves, check valve maintenance and inspection);
- 5) water service and curb box inspection and maintenance (leaks on service connections);
- 6) active leak detection programs; and
- 7) reservoir use (filling/emptying throughout the day, cleaning, leakage, etc.)

ACTIVITIES TO REDUCE WATER LOSSES

Most water loss can be prevented by effective and pro-active infrastructure management. The following infrastructure management activities will help reduce real water losses:

- Distribution system operation and maintenance to prevent breakdowns in equipment and the associated leakage (valves, hydrants, etc.)
- Material and construction standards to assure quality of future infrastructure installation
- Maintain proper inventory to repair all sizes of main breaks or leaks
- Inspection of new water mains; observance of pressure and leakage tests
- GIS mapping of system components in order to quickly find valves to isolate main breaks
- Report leaks, repairs, complaints, theft, vandalism, etc, by geographic location to concentrate future leakage activities
- Increased surveillance in areas with aging infrastructure or reported leaks
- Periodically checking proper operation and control of pumps used to fill storage tanks
- Leak detection surveys/studies and leak repair
- Water main rehabilitation and replacement
- Pressure management

The following activities will help reduce apparent water losses:

- Metering of all source inputs, water exports or sales, and customer accounts (includes both billed, authorized use and non-billed authorized)
- If not going to meter hydrant usage, accurately estimate and record the water used for fire fighting or flushing
- Billing practices designed to detect potential problems or inconsistencies
 - Obtain consistent customer readings near the same day each month
 - Eliminate or reduce human error by installing automated meter readers
 - Account for non-billed authorized usage (such as hydrants)

- Deterrence of theft or illegal usage by maintaining a visible presence, aggressively prosecuting those caught, and soliciting public involvement in reporting such crimes
- Accounting and record keeping practices to improve reliability and accuracy of the water balance; more easily pinpoint areas with water losses

MANAGEMENT STRATEGIES TO REDUCE WATER LOSS

There are numerous ways to reduce the loss of water. Deciding which program to use will depend on the condition of the local water infrastructure and the areas where water loss is occurring. Municipalities should consider one or all of the following programs to help in the reduction of water loss in their distribution system:

- metering;
- leak detection and repair for both public and private water systems;
- water efficiency/conservation (reduces apparent loss);
- valve maintenance;
- pressure management including surge suppression;
- infrastructure renewal;
- conservation-oriented pricing (reduces apparent loss);
- speed and quality of repairs;
- design standards for construction methods and pipe material;
- nighttime flow analysis (reduces apparent loss).

A municipality applying these strategies and activities will benefit through reduced water loss and reduced costs to the utility. The importance of prioritizing active leak control practices and procedures in the identification of water loss and the corresponding strategies to reduce leakage cannot be understated. The municipality will not only increase revenues, but will also benefit through the extension of sustainable water supplies, reduced operating costs, improved system hydraulics and utility efficiency, and improved environmental stewardship.

ADDITIONAL RESOURCES

Many additional resources on water loss control programs are available on-line, or from the organizations and researchers listed below.

Thorton, Julian, 2002, Water Loss Control Manual. First edition. McGraw-Hill. New York, NY.

Waldron T. (2005) Managing and reducing losses from water distribution systems. Manual 10, Executive Summary. ISBN 0 7242 9498 8

AWWA, 1999, American Water Works Association Manual M36 , “Water Audits and Leak Detection,” The Manual of Water Supply Practices, AWWA, Denver.

AWWA, 2003, Applying Worldwide BMP’s in Water Loss Control , AWWA Water Loss Control Committee.

Lambert, A., Hirner W., 2000, Losses From Water Supply Systems; Standard Terminology and Recommended Performance measures, International Water Association.

Part 2: Main Elements of a Water Loss Prevention Program

Implementation of the comprehensive water loss control program submitted to EPD must consist of at least the following actions:

- 1) The permittee must adopt standard leak detection and loss recovery methods, such as those recommended by IWA, AWWA or other accredited organizations and submit an implementation schedule to EPD no later than 12 months from the permit issue date.
- 2) The permittee must determine its current volume of apparent and real water loss, and its volume of economically recoverable apparent and real losses. This must be completed annually by the utility recorded on the forms in Part 3 of this document.
- 3) Permittees may take up to three years to develop a validated data set for all entries of their water balance. The goal should be for 95 percent of all data to be validated at the end of the first three years of implementation. This could be done using approaches such as:
 - Testing source meter accuracy;
 - Testing customer meter accuracy (see EPD Guidance Document “Water Meter Calibration, Repair, and Replacement”, available at <http://www.gadnr.org/cws/>);
 - Component Analysis to identify background losses, and reported or unreported leaks;
 - Establishment of “District Metering Areas” to monitor and quantify real losses for portions of its distribution system, such as:
 - o Locations with a known history of leakage;
 - o Locations which may assist in quantifying the losses from other portions of the system where it may be difficult to directly apply district metering techniques;
 - o Locations that are being newly designed and constructed.

Recommended milestones for validation are:

- a) Year 1: audit to include validated values for the largest production or import meter supplying the system.
 - b) Year 2: audit to include (i) validated values for all production and import meters; (ii) validated values for all customer meters sized 4 inches or more; and, (iii) validated values for distribution system pressure for at least 50% of the distribution system.
 - c) Year 3: audit to include (i) validated values for all customer meters sized 2 inches or more, and a statistically valid sample of all remaining customer meters, i.e., those less than 2 inches; and (ii) validated values for distribution system pressure for the entire distribution system.
- 5) Corrective Actions. The utility must implement intervention measures that yield apparent and real water savings. Leak detection and repair must be a continuous effort.

The utility must reduce system leakage to an economic minimum and repair reported leaks when reported and cost-effective to repair. In addition to repairing all reported leaks, the utility should consider the following intervention measures to reduce components of un-reported leakage and background leakage:

- i. Sonic Leak detection surveys;
- ii. Installation of acoustic data loggers;
- iii. Accelerated repair of reported leaks;
- iv. Regular measurement of District Metered Area flows;
- v. Replacement of leaky water mains and laterals; and
- vi. Pressure management.

Part 3: Water Loss Control Program Annual Reporting Form

All volumes should be entered as annual volumes. Where possible, metered values should be used. This form should be returned to EPD with your detailed Water Loss Control Program Report no later than 12 months after the permit issuance date.

I. GENERAL SYSTEM INFORMATION

Reporting Year	
Water System Operating Permit No.	
Water Withdrawal Permit No.	
Water System Name	
Water System Address	
Contact Person Name	
Contact Person Phone No.	

II. SYSTEM DATA

A	Length of water mains, (miles)	miles
B	Total active and inactive service connections	
C	Total Length of customer service lines (miles) (Average length of customer service line measured in feet x B) / 5280 ft/miles	miles
D	Average Distribution System Operating Pressure, (psi)	psi

III. VOLUME OF WATER SUPPLIED TO THE SYSTEM

E	Total volume of water produced from own sources (million gallons per year)	MG/yr
F	Total volume of water purchased from other systems (million gallons per year)	MG/yr
G	Master meter error adjustment (under-registered million gallons per year)	MG/yr
H	Total volume of water sold to other systems (million gallons per year)	MG/yr
I	NET VOLUME OF WATER SUPPLIED, (E + F - G - H)	MG/yr

IV. VOLUME OF WATER AUTHORIZED FOR CONSUMPTION

J	Billed metered (million gallons per year)	MG/yr
K	Billed unmetered (million gallons per year)	MG/yr
L	Unbilled metered (million gallons per year)	MG/yr
M	Unbilled unmetered (million gallons per year), <i>estimate if applicable</i>	MG/yr
N	TOTAL VOLUME AUTHORIZED FOR CONSUMPTION, (J + K + L + M)	MG/yr

V. ANNUAL WATER LOSSES

O	Water Losses = Water Supplied - Authorized Consumption, (I - N)	MG/yr
P	Apparent Losses:	
Q	Unauthorized Consumption (million gallons per year)	MG/yr
R	Customer metering inaccuracies, <i>estimate</i> (million gallons per year)	MG/yr
S	Data handling errors (million gallons per year)	MG/yr
T	Apparent Losses, (Q + R + S)	MG/yr
U	Real Losses:	
V	Real Losses = Water Losses - Apparent Losses, (O - T)	MG/yr
W	Volume of NON-REVENUE water, (O + L + M)	MG/yr

VI. CERTIFICATION OF WATER LEAK DETECTION AND REPAIR PROGRAM:

To be signed by the owner or official of the water system operating this water system. I hereby certify that the information provided on this form is true and accurate to the best of my knowledge and belief.

Date: _____ Signature: _____

Title: _____