

Water Management Plan

United States Environmental Protection Agency
Test & Evaluation Facility
National Risk Management Research Laboratory
1600 Gest Street
Cincinnati, Ohio 45204



16 March 2009

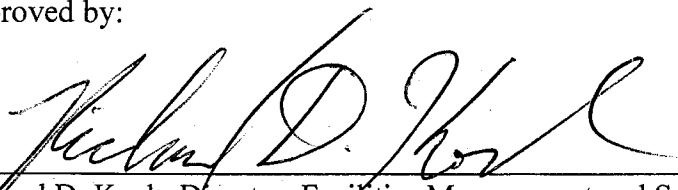
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
TEST & EVALUATION FACILITY
CINCINNATI, OHIO

WATER MANAGEMENT PLAN

Approved by:


Richard D. Koch, Director, Facilities Management and Services Division 3/26/09
Date


John C. Ireland, PhD, Manager, Test & Evaluation Facility 3/20/09
Date

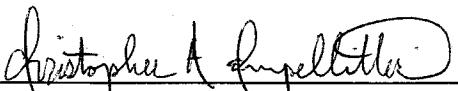

Christopher Impellitteri, (Acting) Branch Chief, Water Quality Management Branch 25MAR09
Date

TABLE OF CONTENTS

	Page
1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE	1
2.0 FACILITY DESCRIPTION.....	1
3.0 FACILITY WATER MANAGEMENT GOALS	2
4.0 UTILITY INFORMATION	3
5.0 FACILITY INFORMATION	4
6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS.....	5
7.0 DROUGHT CONTINGENCY PLAN.....	8
8.0 COMPREHENSIVE PLANNING	9
9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION	9

Appendix A: WATER BALANCE SUPPORTING CALCULATIONS

LIST OF TABLES

	Page
1 Water Use Fee Structure (effective January 2008).....	3
2 Sewer Use Fee Structure (effective January 2008).....	3
3 Major Water Using Processes, T&E Facility.....	4

1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can also prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.

This Water Management Plan has been established to document and promote the efficient use of water at the National Risk Management Research Laboratory Test & Evaluation Facility located in Cincinnati, Ohio. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13423.

2.0 FACILITY DESCRIPTION

The National Risk Management Research Laboratory's (NRMRL) Test & Evaluation (T&E) facility was constructed in 1979. The primary feature of the laboratory is a high bay area for both bench and pilot scale research, supported by laboratories, office space and chemical storage. Overall, the facility contains 36,101 square feet of conditioned space. EPA owns the building, which is located on leased land located on the grounds of Cincinnati's Mill Creek wastewater treatment plant. The current 20 year lease runs through 2019.

The facility's unique location on the grounds of the wastewater treatment plant allows it to tap domestic water supply, raw surface water from Mill Creek, and sources of partially and fully treated sanitary wastewater for scientific research on water supply and wastewater treatment technologies. The high bay is set up in a modular design; domestic water, surface water, and wastewater can be routed to any of 16 experimental research stations. Current research is primarily focused on water supply monitoring, treatment and distribution studies; municipal wastewater and hazardous waste treatment research; and pervaporation studies.

3.0 FACILITY WATER MANAGEMENT GOALS

The water management goals of the T&E facility are achieved through the implementation of an Environmental Management System (EMS). The EMS has been established and is being implemented consistent with EPA's Office of Administration and Resources Management environmental management policy for EPA-Cincinnati. The environmental policy statement and EMS aspects and targets related to water management are included in the following sections.

Environmental Policy Statement

The Mission of the U.S. Environmental Protection Agency (EPA) is to protect human health and environment. The Agency accomplishes this mission by developing and enforcing regulations, implementing environmental laws enacted by Congress, providing assistance to others charged with reducing and preventing pollution, and by conducting environmental research.

In support of this mission, EPA Cincinnati is committed to Environmental Stewardship. To accomplish this we must properly manage the environmental impacts of our own operations and facilities.

EPA Cincinnati is one of the Agency's largest research operations. Accordingly, we recognize our obligation and opportunity to provide leadership in protecting the environment, addressing emerging environmental issues, advancing science and technology of risk assessment and risk management, and promoting environmental education.

EPA Cincinnati is committed to reducing the environmental impacts of our operations and limiting our natural resource consumption. Our Environmental Management System (EMS) will address the following goals:

- Maintain a collaborative EMS that covers the EPA organizations in Cincinnati;
- Ensure compliance by meeting or exceeding all relevant environmental requirements to which we subscribe;
- Seek to continually reduce the environmental footprint of EPA Cincinnati;
- Consider environmental impacts in planning, constructing and operating facilities;
- Incorporate source reduction and pollution prevention into research activities;
- Establish, track and review environmental performance goals; and
- Share information about our EMS with interested parties.

EMS Water Management Objectives and Targets

In view of this environmental policy, EPA-Cincinnati has identified water consumption as a significant environmental aspect and has established the reduction of potable water consumption as an objective under the EMS. As a specific target, EPA-Cincinnati will reduce potable water consumption by an average of 2% per year over eight years (Fiscal Years 2008 to 2015) for a total of 16%, using Fiscal Year 2007 as a baseline.

4.0 UTILITY INFORMATION

Contact Information

The T&E facility is collocated at the City of Cincinnati Metropolitan Sewer District treatment facility on Gest Street. Both water and sewer service is provided by the Sewer District, which bills EPA for its use at the prevailing rates.

Potable water and sewer service is provided by:

Metropolitan Sewer District of Greater Cincinnati
1600 Gest Street
Cincinnati, OH 45204

Phone: 513-352-4900

Rate Schedule

Monthly water billing is based on a tiered rate structure, provided in Table 1.

**Table 1. Water Use Fee Structure
(effective January 2008)**

Quarterly amount	Rate per 100 cubic feet (ccf)
0 to 60 ccf	\$1.78
60 to 975 ccf	\$1.42
Over 1,035 ccf	\$1.26

The utility also charges the T&E facility a fixed rate of \$59.78 per quarter for the water meter on the two inch diameter water supply line. The monthly billing for sewer use is also on a tiered rate structure, provided in Table 2.

**Table 2. Sewer Use Fee Structure
(effective January 2008)**

Quarterly amount	Rate per 100 cubic feet (ccf)
0 to 9 ccf	Flat fee of \$291.88/quarter
9 to 150 ccf	\$3.44
Over 150 ccf	\$2.75

Payment Office

Research Triangle Park Finance Center (RTP-FC)

(Pouch and Regular Mail)

Environmental Protection Agency

Mail Code - D143-02

Research Triangle Park, NC 27711

(FEDEX)

Environmental Protection Agency

Mail Code - D143-02

4930 Page Road

Research Triangle Park, NC 27711

The fax number for RTP-FC is: 919-541-4975

5.0 FACILITY INFORMATION

The primary feature of the T&E facility is the high bay test area. The high bay is designed to be a versatile research space, where modular bench or pilot scale test apparatus can be installed in any of 16 test stations. All stations are serviced by overhead pipe loops that can supply domestic water, surface water from Mill Creek, or partially or fully treated sewage from the Cincinnati wastewater treatment plant. A floor drain system connects all stations to the city sewer system.

Major Water Using Processes

Estimates of water consumption by major use area are provided in Table 3. This data reflects an average water use during FY 2007. Note that this plan focuses solely on the use of domestic water supplied by the city. Sewage that is obtained from and returned to the Mill Creek wastewater treatment plant is not addressed by this plan.

Table 3. Major Water Using Processes, T&E Facility

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Sanitary	94,000	0.8	Engineering estimate
Aquatic culture water	240,000	2.0	Instantaneous measurement extrapolated to full year
Single pass cooling water	2,500,000	21.1	Engineering estimate
Research on water distribution, monitoring, and other miscellaneous activities	9,014,876	76.1	Engineering estimate, calculated by remaining difference
TOTAL	11,848,876	100	Metered total city supply

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

Measurement Devices

Incoming city water supply is metered and recorded quarterly.

Flow totalizing meters are also installed on the water supply to the aquatic culture unit, deionized water supply to the chemistry laboratory, the once through system used for water distribution studies, the loop recirculation system used for water distribution studies, and the single pass cooling water supplied to the chiller used to cool the loop recirculation system. Flow data from these systems have not been historically recorded, but will be recorded and tracked monthly under this plan by the researchers responsible for each system.

Shut-off Valves

City water supply line shutoffs are located in the boiler room.

Occupancy and Operating Schedules

Approximately 15 employees work at the T&E facility. The facility operates on a flex time schedule and is typically occupied between 7:00 a.m. and 6:00 p.m., Monday through Friday.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

The President has established Water Reduction Goals under Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management. Under the Executive Order, Agencies must establish a FY 2007 water use baseline, and then reduce water use intensity by 2 percent annually through the end of FY 2015, for a total reduction of 16 percent. Facilities should implement Best Management Practices (BMPs) related to water use, considering life-cycle cost effectiveness, to achieve these water reduction goals. The Federal Energy Management Program (FEMP) has identified BMPs in 14 possible areas to help facilities identify and target water use reductions. The T&E facility has adopted BMPs in four of the areas, as checked below:

- Water Management Planning
- Information and Education Programs
- Distribution System Audits, Leak Detection and Repair
- Water Efficient Landscaping
- Water Efficient Irrigation
- Toilets and Urinals
- Faucets and Showerheads
- Boiler/Steam Systems
- Single-Pass Cooling Equipment
- Cooling Tower Management
- Commercial Kitchen Equipment
- Laboratory/Medical Equipment
- Other Water Use
- Alternate Water Sources

Water Management Planning

This plan addresses the recommended elements of a water management plan and satisfies best management practice related to water management planning.

Information and Education Programs

The T&E facility promotes water conservation and awareness through the implementation of the EMS for EPA-Cincinnati. Because such a large component of the water use at this facility is for continuous water flow through experimental equipment, it is vitally important the research scientists operating the equipment be aware of the water conservation goals stated in this plan. Best management practice status will be achieved when researchers are made aware of the goals established under this plan.

Distribution System Audits, Leak Detection and Repair

A screening level system audit was conducted in December 2008 and known water uses account for greater than 90 percent of water consumption.

Water supply piping within the facility is exposed and accessible. Facility staff are trained to report leaks and malfunctioning water using equipment to a facility maintenance trouble desk. Reported problems are assigned a work order, which is completed by the facility operation and maintenance (O&M) contractor.

Water Efficient Landscape

The immediate area surrounding the T&E facility is maintained by EPA and is landscaped with grass and small shrubs. No irrigation is applied; turf areas are allowed to brown out during dry periods and are naturally restored when precipitation occurs.

Water Efficient Irrigation

Not applicable, no irrigation water is utilized.

Toilets and Urinals

Toilets and urinals are primarily those installed during original construction in the late 1970s. As such, they are the older, higher flow design, with flow rates estimated to be approximately 5 gallons per flush (gpf). BMP status can be achieved in this area by upgrading the older style toilets and urinals to water-efficient models (1.6 gpf toilets and 0.5 gpf urinals). The building contains five toilets and two urinals

Janitorial staff and employees are trained to report leaks or other maintenance problems, which are immediately corrected by the O&M contractor.

Faucets and Showerheads

Faucets and showerheads are primarily those installed during original construction in the late 1970s. As such, they are the older, higher flow design, with flow rates estimated to exceed

current water efficiency standards of 0.5 gallons per minute (gpm) for lavatory faucets and 2.5 gpm for showerheads. BMP status can be achieved in this area by upgrading the older style faucets and showerheads to water-efficient models. The building contains four lavatory sinks and three showers.

System pressure is maintained between 20 to 80 pounds per square inch, within the range recommended for optimum system performance. Janitorial staff and employees are trained to report leaks or other maintenance problems, which are immediately corrected by the O&M contractor.

Boiler/Steam Systems

Boilers produce recirculating hot water, rather than steam. Since no steam condensate is generated, this criteria is not currently applicable and no BMP credit is claimed.

Single Pass Equipment Cooling

Single pass water is used to cool a chiller used to maintain temperature control on the water distribution study apparatus. Water flow is controlled through a solenoid valve and is activated when the chiller runs, estimated to be about 50 percent of the time. Water flow when the solenoid is open is between 9 and 10 gallons per minute. In addition, there is a water source heat pump used to cool air supplied to Room 109. Potable water is supplied to the heat pump as the heat sink. The use of single pass water for cooling in these two applications will need to be eliminated to claim BMP credit in this area. Alternatives to single pass cooling include use of a cooling tower to provide recirculated cooling water, or conversion to air cooled chiller units.

Cooling Tower Management

The T&E facility is not equipped with a cooling tower. This criteria is not currently applicable; therefore, no BMP credit is claimed.

Commercial Kitchen Equipment

The T&E facility is not equipped with a commercial kitchen. This criteria is not currently applicable; therefore, no BMP credit is claimed.

Laboratory/Medical Equipment

Use of domestic water is integral to the water supply quality monitoring and water distribution studies conducted at the T&E facility. These research requirements account for a significant portion of the water use at the T&E facility. No BMP credit is claimed in this area, as water use is driven by specific research requirements. However, water use should be metered and monitored monthly by researchers, and water conservation or reduction measures instituted where practical in the context of the research being conducted.

The laboratory is equipped with a relatively new Consolidated Stills and Sterilizers steam sterilizer. Tempering water only flows when the sterilizer is discharging condensate.

Other Water Use

Approximately 240,000 gallons per year is used for fish culturing. BMP status is not claimed in this area.

Alternate Water Sources

No alternate water sources have been identified. BMP status is not claimed in this area.

7.0 DROUGHT CONTINGENCY PLAN

The City of Cincinnati does not have a water management plan specifically for droughts. However, as conditions warrant, the T&E facility is prepared to follow the water use recommendations and restrictions outlined under the State of Ohio Drought Response Plan. Key recommendations of this plan are summarized below. Ohio has defined four levels of drought response: normal phase, alert phase, conservation phase, and emergency phase.

Normal Phase

In this phase, water supplies are adequate and climatological conditions are normal. Recommended action is to develop water conservation measures and a water recycling program. Appropriate conservation and recycling measures at the T&E facility are being addressed under this plan.

Alert Phase

Climatological data indicates above normal temperatures and below normal precipitation for an extended period. Streamflow, reservoir levels, and/or groundwater levels are below normal over an extended period of time. Recommended action is to activate conservation measures and reduce water for nonessential uses, such as fountains, landscape watering, and washing of motor vehicles.

Conservation Phase

Climatological conditions worsen and water levels continue to decline. Water conservation measures are increased and all nonessential uses are eliminated.

The T&E facility strives to operate at a level consistent with the conservation phase as part of its routine operating practice. Water is not used for nonessential purposes such as landscape irrigation, decorative fountains, and motor vehicle washing.

Emergency Phase

Climatological conditions continue to worsen and water levels continue to diminish. Conservation measures have to be more stringent to ensure adequate water supply for health and sanitary purposes. Recommended action is to reduce operational levels so that a water use reduction goal of 30 percent can be achieved.

If a conservation phase drought is declared in the greater Cincinnati water management district, the Director of the Facilities Management and Services Division will convene a meeting with the Directors of the research programs operating at the T&E facility to identify modifications to facility operations that could be implemented to achieve emergency phase reductions. Operational changes will be implemented as necessary to meet declared emergency phase water use restrictions.

Additional information on the Ohio Drought Response Plan can be found at:

<http://www.epa.state.oh.us/ddagw/Documents/droughtactions.pdf>

8.0 COMPREHENSIVE PLANNING

The Director of the Facilities Management and Services Division will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption. Research project proposals will include a section that discusses water use requirements, and identifies and evaluates any associated water conservation opportunities. These proposals will be reviewed and approved by the Chief of the Water Quality Management Branch; cost effective and practical conservation opportunities will be implemented.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

The T&E facility is pursuing the following projects to achieve additional reductions in water use:

1. **Eliminate Single Pass Cooling.** Single pass cooling is currently applied to the chiller for the water distribution study apparatus, and to a water source heat pump used to condition air in Room 109. An engineering study will be undertaken to evaluate the year-round cooling loads for the T&E facility, and identify sources of cooling other than single pass domestic water. Potential alternatives include using a cooling tower to supply recirculated cooling water, or providing either centralized or individual point of use air cooled process chillers. Potential water and sewer savings from eliminating single pass cooling are 2,500,000 gallons and \$13,000 per year.
2. **Install Water Efficient Toilets and Urinals.** The T&E facility will consider replacing originally installed toilets and urinals with water efficient models. Five toilets and two urinals could be upgraded. At an installed cost of \$700 per fixture, simple payback on each fixture upgraded is approximately 20 years, at current water and sewer rates. Total annual savings are projected to be 47,000 gallons and \$250.
3. **Retrofit Faucets with 0.5 gpm Flow Controllers.** Faucets can be retrofit with 0.5 gpm flow controllers at a nominal cost of \$10 to \$15 each. Resulting water savings are estimated to be 4,000 gallons and \$20 per year.

4. **Record and Monitor Quantity of Water Used in Research.** Data from the existing flow meters installed on water supply lines to experimental equipment (e.g. water supply to the aquatic culture unit, deionized water supply to the chemistry laboratory, the once through system used for water distribution studies, the loop recirculation system used for distribution studies, and chiller unit on the loop recirculation system) will be recorded and tracked monthly, by the Facility Manager. In coordination with the research staff, opportunities to conserve or reuse this water will be evaluated as these data are developed over time.

Appendix A

WATER BALANCE SUPPORTING CALCULATIONS

T&E Facility, Cincinnati, Ohio

Major Process	Annual Consumption (gallons)	Supporting Calculations
Sanitary	94,000	Engineering estimate. Based on 25 gallons per person per day. Assume 15 people and 250 operating days. $(15 \text{ people} \times 25 \text{ gal/person-day} \times 250 \text{ days/year}) = 93,750 \text{ gallons}$
Aquatic culture water	240,000	Based on instantaneous measurement of 40 gal/86 min on 12/11/08 projected to full year $(40 \text{ gal/86 min} \times 60 \text{ min/hr} \times 24 \text{ hr/day} \times 365 \text{ day/yr} = 244,465 \text{ gallons})$
Single pass cooling water	2,500,000	Based on instantaneous measurement of 1 cubic foot in 48 seconds on 12/11/08. Flow is intermittent and was observe to flow approximately one half time during a brief observation period. Projecting to a full year: $1 \text{ cu. ft.} / 48 \text{ seconds} \times 7.48 \text{ gal/cu. ft.} \times 60 \text{ seconds/min} \times 60 \text{ min/hr} \times 12 \text{ hr/day} \times 365 \text{ days/year} = 2,457,180 \text{ gallons.}$
Continuous water flow related to research on water distribution, monitoring, and other miscellaneous activities	9,014,876	Engineering estimate calculated as remaining difference of TOTAL - (sanitary + aquatic culture + single pass cooling)
TOTAL	11,848,876	Metered total