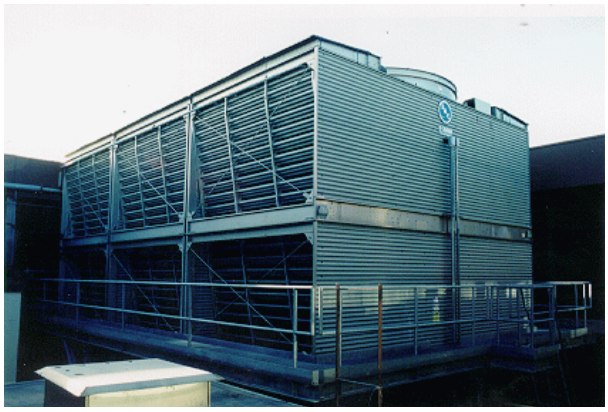
Water Management Plan

Revision 1

United States Environmental Protection Agency
Region III & Office of Pesticide Programs
Environmental Science Center
701 Mapes Road
Fort Meade, Maryland 20255-5350



21 August 2009

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EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 3
ENVIRONMENTAL SCIENCE CENTER

WATER MANAGEMENT PLAN

Approved by:

Frederick Dreisch, Facility Manager — 9/10/09 Date

Joseph F. Smith, Branch Chief, Facilities Management & Services Branch — 9-9-09 Date

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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 sources must be sustainable and renewable. Sound water resource management, which emphasizes wise, 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 prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy. As municipalities and regions deal with chronic drinking water shortages due to drought and changes in climate patterns, water conservation becomes even more important to the sustainability of our mission.

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 (EO) 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 U.S. EPA Environmental Science Center Laboratory in Fort Meade, Maryland. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines.

2.0 FACILITY DESCRIPTION

The Environmental Science Center (ESC) occupies a 162,799 gross square foot building situated on approximately 24 acres at the U.S. Army’s Fort George G. Meade. The facility is EPA-owned and -operated under a 25 year land use agreement granted by the Army in 1996. EPA has the option to renew the land use agreement for an additional 25 years. The building, which was dedicated and occupied in 1999, includes 75 laboratories with 94 fumehoods and 12 Biological Safety Cabinets. EPA Region III occupants of the ESC include the Office of Analytical Services and Quality Assurance (OASQA), the Field Inspection Program, and the Office of Policy and Management. The EPA Headquarters Office of Pesticide Programs Analytical Chemistry Laboratory, Microarray Research Laboratory, and Microbiology Laboratory are located at ESC. The Office of Criminal Enforcement is also housed in ESC. ESC building operations and environmental compliance activities are managed by Region III Facilities Management and Services Branch onsite staff.

3.0 FACILITY WATER MANAGEMENT GOALS

The water management goals of the ESC are achieved through the implementation of the ESC's Environmental Management System (EMS). The EMS has been established and is implemented consistent with the ESC's environmental management policy. The ESC environmental management policy statement (March 2005), and the EMS aspects and targets (May 2008) related to water management are provided in the following sections.

Environmental Management Policy

It is the Environmental Science Center's policy to integrate environmental stewardship into our operations. We will manage our organizations and our programs in a manner that protects the environment, the safety of our employees, and public health.

In support of this policy, the ESC organizations make the following pledge:

To comply fully with the letter and spirit of all Federal, State, and local environmental laws and regulations.

- *We have persons specifically designated as the facility's manager; the facility safety, health and environmental manager; and the coordinator for the EMS. These staff will remain current and will assure compliance with applicable laws and regulations for the entire facility.*
- *We will assure that all appropriate staff members will remain current on all applicable laws and regulations.*

To consider environmental factors when making planning, purchasing, and operating decisions.

- *We will adopt cost-effective practices that eliminate, minimize or mitigate environmental impacts and we will use environmentally preferred materials if those materials meet technical specifications.*

To work continuously to improve the effectiveness of our environmental management programs.

- *We will establish appropriate environmental objectives and performance indicators to guide these efforts and measure our progress.*

To provide appropriate training and educate employees to be environmentally responsible on the job.

- *We will use a variety of training and communication tools to educate our employees about this EMS and how to apply its policies and principles to our everyday work.*

To monitor our environmental performance regularly through rigorous evaluations.

- *We will conduct annual environmental performance reviews with top management. We will conduct other environmental reviews periodically as suggested by the EMS Team.*

To seek to prevent pollution before it is produced, reduce the amount of waste at our facility, re-use and recycle whenever possible, and support pollution prevention by our customers and suppliers.

- *We will participate in pollution prevention programs and develop related reports that can be shared within our facility and with others.*

To maintain and improve the grounds of the ESC in an environmentally sensitive manner including land, water, wildlife and natural resources.

- *We will continue to use such concepts as beneficial landscaping as we seek to enhance our surroundings and manage our environment.*

To use energy efficiently throughout our operations, and support the efficient use of gas and electricity in our facility.

- *We will use the building automation system to measure and manage our energy usage in the facility.*

To work cooperatively with the local community and other stakeholders to further common environmental objectives.

- *We will participate in Fort Meade and other community environmental activities, seeking out ways to share our environmental stewardship message.*

To communicate and reinforce this policy throughout our organizations.

- *We will develop communications strategies that are designed to ensure that employees and others who use our facilities have an appropriate understanding of the environmental management policy.*
- *We will share our environmental management successes and progress with all organizations at the ESC.*

Environmental Management System Aspects, Objectives and Targets

The Environmental Science Center has identified water consumption as a significant environmental aspect, in view of EO 13423 requirement that federal agencies reduce their overall water use intensity, measured on a gallon per square foot basis, by two percent per year compared to an FY 2007 baseline, for a total of 16 percent reduction by FY 2015. ESC has established an objective of upgrading/modifying sanitary fixtures to reduce non-laboratory water use. Three specific targets under this objective have been established:

- Target 1: Replace aerators with pressure-compensating high-efficiency attachments in bathroom sinks.

- Target 2: Install dual position valves for toilet fixtures. The dual position uses less for liquid wastes and more for solid material.

- Target 3: Recover air handler condensate. Investigate the feasibility of re-piping air handler condensate from the air handling units to feed cooling tower evaporative water rather than draining the condensate into the sewer system.

4.0 UTILITY INFORMATION

Contact Information

Water and sewer utilities are provided by:

Fort Meade Directorate of Public Works (DPW)

Operations Division
ANME-PWO (5115)
2212 Chisholm Ave.
Fort George G. Meade, MD 20755-5115
Attn: Lois Schweitzer (301-677-5815)

Rate Schedule

As of May 2009, ESC was charged at a rate of $4.64 per 1,000 gallons for water supply, and $6.81 per 1,000 gallons for sewer service. The fee for sewer service is calculated based on the total water supplied minus the quantity consumed for cooling tower make-up.

Payment Office

DFAS-Indianapolis

Nikki Fitzgerald-Jarrett
(317-510-1743)

5.0 FACILITY WATER USE INFORMATION

The ESC includes a mix of office and laboratory space. Laboratory activities are primarily analytical in nature and can require potable water or high purity de-ionized water for laboratory purposes. Water is also used as cooling tower make-up water, boiler feed water, and for sanitary requirements. The facility uses natural landscaping; therefore, virtually no water is used for landscape irrigation.

Major Water-Using Processes

Average water use in FY 2008 by major process is shown in Table 1.

Table 1. Major Water Using Processes

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Sanitary	350,000	6.3	Engineering estimate
Cooling tower make-up	2,730,147	49.4	Metered
Boiler feed water	301,698	5.5	Metered
Humidification	620,000	11.2	Engineering estimate
Reverse osmosis reject water	110,000	2.0	Metered
Steam sterilizer continuous cooling water	260,000	4.7	Engineering estimate
Laboratory and other uses	1,152,155	20.9	Calculated by difference
TOTAL	**5,524,000**	**100.0**	**Metered**

Because a large component of total water use is for cooling tower consumption, water use varies seasonally. A chart showing FY 2008 water use on a weekly basis is provided in Appendix A.

Measurement Devices

Flow totalizing water meters are installed on the water main that supplies all water to the facility, on the water line that supplies cooling tower make-up water, on the water line that supplies boiler feed water, and on reverse osmosis reject water routed to boiler make-up. Metered water uses are recorded weekly and tracked to monitor consumption trends.

Shut-off Valves

Building water supply shut-off valves are located in the basement. The water inlet skid is to the left corner after passing the central plant office. The entire building water supply valve is located in the grassy area to the right of the entrance-way across from the facility flag pole.

Occupancy and Operating Schedules

Approximately 177 employees work at the ESC. The ESC operates on a flex time schedule and is typically occupied between 6 a.m. and 6:30 p.m., Monday through Friday.

6.0 BEST MANAGEMENT PRACTICES SUMMARY AND STATUS

Former President Bush established water reduction goals under EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*. Under the EO, Agencies must establish a FY 2007 water use baseline, and then reduce water use intensity by two percent annually through the end of FY 2015, for a total reduction of 16 percent. This goal is incorporated into the ESC EMS, as noted above. 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 ESC has adopted BMPs in 12 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
NA Commercial Kitchen Equipment
☑ Laboratory/Medical Equipment
NA Other Water Use
☑ Alternate Water Sources

Key:
☑ — BMP has been adopted.
NA – BMP is not applicable.

Information and Education Programs

Reduction of non-laboratory water use has been established as an objective under the facility EMS. Implementation of specific projects, such as retrofits to bathroom faucets and toilet flush valves, are identified as specific targets under the EMS. These targets are communicated to employees through training and intranet postings. In addition, facility performance data, including water consumption, are tracked weekly and posted on the intranet for employee information. During drought conditions, periodic e-mails are sent to onsite staff reminding them of the importance of water conservation measures. Use of the EMS program and other methods to educate employees and communicate progress toward water conservation objectives and targets is considered a BMP and credit is claimed in this area.

Distribution System Audits, Leak Detection and Repair

A screening level system audit was conducted in April 2009 and known water uses account for greater than 90 percent of water consumption.

Facility staff are trained to report leaks and malfunctioning water-using equipment to a facility maintenance help desk. Reported problems are assigned a work order, which is completed by the facility operation and maintenance (O&M) contractor. Each work order is tracked to completion, including a survey of the person who reported the problem to verify they are satisfied with the corrective action. BMP status has been achieved in this area.

Water-Efficient Landscaping

Native trees and shrubs were used in facility landscaping so that an irrigation system is not required. BMP status has been achieved in this area.

Water-Efficient Irrigation

The facility is not equipped with an automated irrigation system. A rain garden has been established adjacent to the front entrance, with a rain barrel used to capture rain and supply some supplemental water to the garden during dry periods. Grassy areas are allowed to brown out during dry periods. Drip irrigation bags are used in spot applications to provide supplemental water to plants in distress. BMP status has been achieved in this area.

Toilets and Urinals

Toilets have been retrofit with dual flush handles, allowing users to select a full flush of 1.6 gallons per flush (gpf) for solid waste or 1.1 gpf for liquid waste. Urinals are compliant with the 1992 Energy Policy Act (EPAct) water efficiency requirements (1.0 gpf). An inventory of sanitary fixtures is provided in Table 2.

Table 2. ESC Inventory of Sanitary Fixtures

Fixture Type	Flow Rate	Total Number
Toilets	Dual flush: 1.6/1.1 gpf	18
Urinals	1.0 gpf	12
Lavatory faucets	0.5 gallons per minute (gpm)	18
Showers	2.5 gpm	6

Leaking or malfunctioning toilets and urinals are reported to the facility maintenance help desk. Reported problems are assigned a work order, which is completed by the facility O&M contractor. Each work order is tracked to completion, including a survey of the person who reported the problem to verify they are satisfied with the corrective action. BMP status has been achieved in this area.

Faucets and Showerheads

High-efficiency faucets with a maximum flow rate of 0.5 gallons per minute and showerheads with a maximum flow rate of 2.5 gpm are used throughout the facility. System pressure is maintained between 20 to 80 pounds per square inch. An inventory of sanitary fixtures is provided in Table 2.

Leaking or malfunctioning faucets and showerheads are reported to the facility maintenance help desk. Reported problems are assigned a work order, which is completed by the facility O&M contractor. Each work order is tracked to completion, including a survey of the person who reported the problem to verify they are satisfied with the corrective action. BMP status has been achieved in this area.

Boiler/Steam System

The facility is equipped with three 400 horsepower main boilers and one 60 horsepower summer boiler. The boiler water system is monitored and maintained under a service contract to prevent system corrosion and optimize condensate reuse. Boiler water quality parameters such as conductivity, alkalinity, sulfite concentration, and phosphate concentration are monitored and

controlled through periodic testing and chemical treatment provided by a service contractor. Boiler feed water is softened and the feed water is metered and checked for hardness and conductivity. Approximately 85 percent of steam condensate is captured and returned to the boiler system. BMP status has been achieved in this area.

Single-Pass Cooling Systems

Use of single-pass cooling has been eliminated from laboratory processes. Point-of-use, closed-loop chillers are used in individual laboratories where water cooling is required. BMP status has been achieved in this area.

Cooling Tower Systems

Condenser water is cooled in a three-cell cooling tower with 2,400 tons of total capacity. Cooling tower make-up water is metered and consumption trends are tracked weekly. Unusual consumption trends are investigated and resolved. Cooling tower consumption is subtracted from total water use when sewer use charges are calculated.

A cooling tower system quality and performance review is conducted two times per month by a cooling tower maintenance contractor. A conductivity meter is used to automatically control cooling tower blow down; the conductivity meter is regularly maintained by the cooling tower maintenance contractor. The blow down controller is set at approximately 700 *u*s/cm and achieves between eight and nine cycles of concentration within the cooling tower. Chemical treatment is provided to control scale and corrosion. BMP status has been achieved in this area.

Commercial Kitchen Equipment

The ESC does not operate commercial kitchen equipment. BMP status is not applicable in this area.

Laboratory/Medical Equipment

Deionzied (DI) water is generated for laboratory use through a multi-step process consisting of multimedia filtration, water softening, carbon adsorption, and reverse osmosis (RO). Treated water from the RO unit is used as feed water to the DI water recirculating loop. The DI water is circulated through an ion exchange bed, ultraviolet disinfection unit, and ultra filtration unit. The rejected water from the RO unit is routed to a condensate collector and is ultimately reused in the boiler system, where it offsets some boiler make-up demand.

The laboratory is equipped with nine steam sterilizers, listed in Table 3. Prior to July 2009, the Steris/Amsco 3021 unit in Room H104 had a continuous flow of tempering water to drain, estimated to be 0.5 gpm at all times. In July 2009 a retrofit kit was installed to eliminate this flow except for times when condensate is being discharged above 140^{o}F. This retrofit is discussed further in Section 9.0. The other steam sterilizers are either not in service or are more modern units with integral control of tempering water so it is only used when needed.

Water is used as necessary in individual laboratories for bench-scale experimentation and glassware preparation.

Table 3. ESC Steam Sterilizers

Room	Model	Continuous Tempering Water Flow?
B202	Steris SG-120	No – Only when needed
B204	Steris	No – Only when needed
B206	Steris	No – Only when needed
B207	Steris	No – Only when needed
D122	Tuttnauer	No – Only when needed
G105	Steris/Amsco 2021	Not in service
H104	Steris/Amsco 3021	Yes
H104	Steris SG-120	No – Only when needed
H104	Steris SG-120	No – Only when needed

BMP status has been achieved in this area.

Other Water Use

Laboratory humidity is controlled in the winter months through direct injection of steam. The clean steam generator has capacity of 9,735 pounds per hour at 100 psig. No specific BMP credit is claimed in this area.

Alternate Water Sources

As described above, approximately 110,000 gallons per year of water rejected by the RO system are collected and routed to a steam condensate collector. This water ultimately is returned to the boiler, where it offsets the need for boiler make-up water.

In addition, condensate collectors were installed on the four main air handling units in June 2009. Air handler condensate is routed directly to the cooling tower basin, where it offsets the need for cooling tower make-up water. This system was installed in FY 2009, and the impact is not reflected in the water balance presented in Table 1.

BMP status has been achieved in this area.

7.0 DROUGHT CONTINGENCY PLAN

The ESC will follow the water use recommendations and requirements of the Maryland Department of the Environment, which coordinates the drought response within the State of Maryland. General information on drought conditions and information on associated water use restrictions are posted at the Maryland drought information web page: <http://www.mde.state.md.us/Water/Drought/index.asp>.

As matter of general operating practice, the ESC already follows most of the water conservation approaches that could be required under drought conditions. Water is not used for irrigation, decorative fountains, maintenance of paved surfaces, or washing of mobile equipment.

In the event that voluntary or mandatory water consumption reductions are instituted by Maryland Department of the Environment, the ESC will form a task force of facility and operating personnel to identify and implement modifications to facility operations to achieve additional specified reductions in water consumption.

8.0 COMPREHENSIVE PLANNING

Water supply, wastewater generation, stormwater management, and water efficiency BMPs will be 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. Where available, WaterSense labeled products (www.epa.gov/watersense) will be purchased or specified.

9.0 STATUS UNDER GUIDING PRINCIPLES FOR HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS

The Interagency Sustainability Working Group (ISWG), formed as subcommittee of the Executive Order (EO) 13423 Steering Committee, has established guiding principles to assist agencies in meeting the high performance and sustainable buildings goals of EO 13423, section 2(f). In the December 1, 2008 Guiding Principles for Sustainable Existing Buildings, ISWG established six supporting principles for protecting and conserving water. The status of the ESC facility with respect to the supporting principles for protecting and conserving water at existing buildings is documented in Table 4.

Table 4. Status of Guiding Principle to Protect and Conserve Water

Topic	Status
Indoor Water	Option 1: Comparison to 2006 Plumbing Codes: Use of dual flush toilets and 0.5 gpm lavatory flow controllers enables the facility to achieve a 24 percent reduction in its water use baseline (baseline established as 120 percent of 2006 Plumbing Codes) Option 2: Comparison to FY 2003 Historical Data: Potable water consumption increased 11 percent between FY 2003 and FY 2008 (4,957,000 gallons to 5,524,000 gallons).
Outdoor Water	The landscape is designed to be water-efficient, and the facility does not have an in-ground or permanent irrigation system. Grassy areas are allowed to brown during dry periods. Drip irrigation bags are used in spot applications for plants in distress.
Water Metering	A domestic water meter measures all onsite water use. Flow totalizing water meters are also installed to submeter the water line that supplies cooling tower make-up water, the water line that supplies boiler feed water, and reverse osmosis reject water routed to boiler make-up. Metered water uses are recorded weekly and tracked to monitor consumption trends.
Stormwater Management	The site incorporates low impact development strategies and has xeriscaping with native plant species. The landscaping requires no irrigation with potable water. There is a rain garden at the entrance of the ESC. Rain chains were installed to dissipate rooftop runoff. A rain barrel also collects rooftop runoff which is harvested for irrigation. Surface runoff sheet flows onto vegetated areas in some parts of the site. Other paved areas have traditional curb and gutter to storm drains. The storm drains outfall into a detention pond.

Table 4. Status of Guiding Principle to Protect and Conserve Water

Topic	Status
Process Water	Potable water is not used to improve the facility's energy efficiency at the expense of water efficiency.
Water Efficient Products	The Environmentally Preferable Purchasing procedure does not incorporate water-efficient products. There is a water consumption environmental management program which contains an objective of reducing non-laboratory water use by upgrading or modifying sanitary fixtures, including pressure compensating high-efficiency attachments for bathroom sinks and dual position valves for all toilets. These upgrades have been achieved. Purchase of WaterSense labeled products, where available, is included as part of this plan.

10.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

ESC is pursuing three projects to achieve additional reductions in water use:

1) **Install Water Conservation Kit for Steam Sterilizer Trap Cooling.** The steam sterilizer in room H104 (Steris/Amsco 3021) discharged a constant steam of cooling water to drain. In July 2009, ESC installed a retrofit kit for approximately $3,000 that will significantly reduce the use of this tempering water by controlling the application of tempering water to only those times when condensate is being discharged to drain at above 140^{o}F. This modification is estimated to save approximately 240,000 gallons and $2,700 per year. The payback period for this retrofit is estimated to be approximately one to two years.

2) **Capture and Reuse Air Handler Condensate.** ESC completed a project in June 2009 to capture air handler condensate and route it to the cooling tower. The total project cost was $5,500. Initial engineering evaluation indicates that it may be possible to capture up to 660,000 gallons per year. This water will significantly offset the consumption of potable water for cooling tower make-up, and result in savings of approximately $7,500 per year, offering a payback of less than one year.

3) **Replace Urinals with High Efficiency Urinals.** Existing 1.0 gpf urinals could be replaced with high-efficiency models that flush at 0.25 gpf or less. Projected water savings are 50,000 gallons per year, with a capital cost of $12,000. Annual cost savings from reduced water use is estimated to be $500.

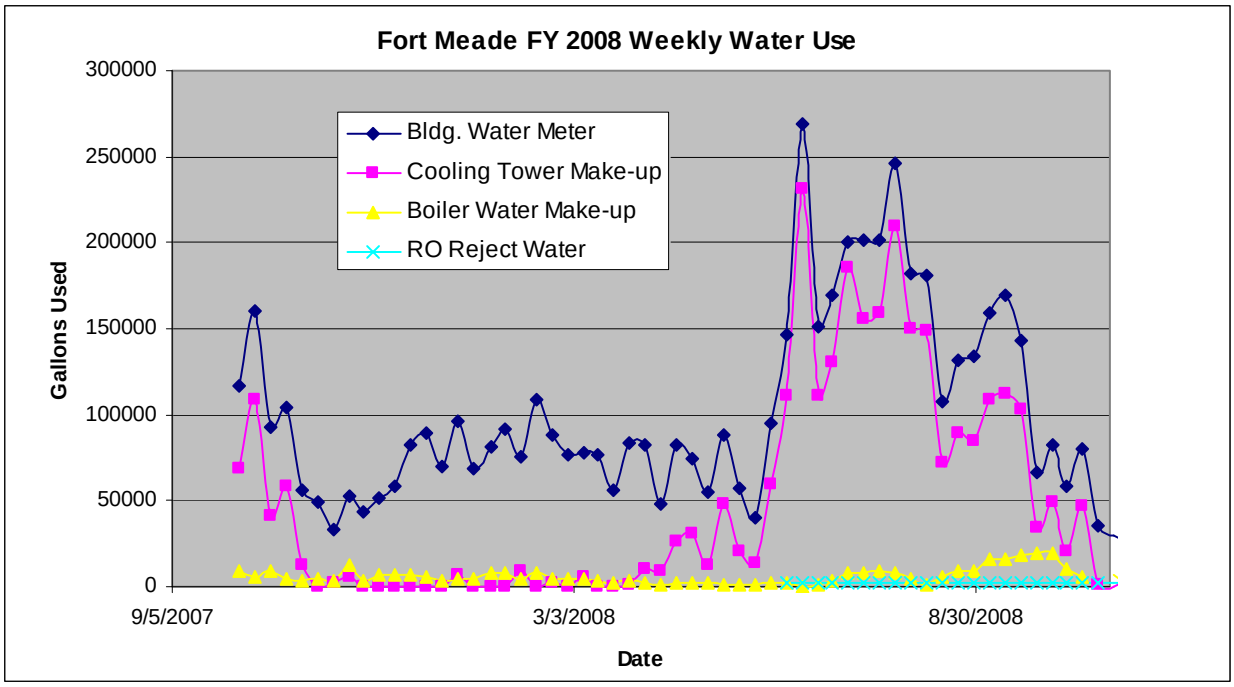
Complete urinal replacement has a long payback period, and may not be considered cost effective. As an alternate, low cost solution, the diaphragm valve inserts on the existing urinals could be replaced with 0.5 gpf rated valves. This approach may degrade urinal performance, so should be tried only on a limited number of urinals first to determine if the results are satisfactory. If satisfactory and implemented on all urinals, this retrofit is estimated to save 33,000 gallons and $300 per year.

Appendix A

WATER USE – SUPPORTING INFORMATION

Water Balance Supporting Calculations – FY 2008
Environmental Science Center
Fort Meade, Maryland

Major Process	Annual Consumption (gallons)	Supporting Calculations
Sanitary	350,000	Estimated based on eight gallons per person per day. Accounts for faucet flow controllers and dual flush handles on toilets. 8 gallons per person per day × 177 people × 250 days = 354,000 gallons
Cooling tower make-up	2,730,147	Metered total
Boiler feed water	301,698	Metered total
Humidification	620,000	Estimated as 36,000 gallons per week for one third of the year (December to March), based on seasonal facility water use pattern. 36,000 × 52/3 = 624,000
Reverse osmosis reject water	110,000	Based on metered total of 35,490 for 17 weeks. 35,490 × 52/17 = 108,558
Steam sterilizer continuous cooling water	260,000	Estimated based on 0.5 gallon/minute × 60 minutes/hour × 24 hours/day × 365 days/year = 262,800
Laboratory and other uses.	1,152,155	Engineering estimate, by difference: 5,524,000 – 350,000 – 2,730,147 – 301,698 – 620,000 – 110,000 – 260,000 = 1,152,155
TOTAL	**5,524,000**	**Based on metered potable water use in FY 2008: 5,524,000 gallons**


Fort Meade FY 2008 Weekly Water Use
300000
250000
200000
150000
100000
50000
0
Gallons Used
Bldg. Water Meter
Cooling Tower Make-up
Boiler Water Make-up
RO Reject Water
9/5/2007
3/3/2008
8/30/2008
Date