Water Management Plan

Revision 1

U.S. Environmental Protection Agency
National Health and Environmental Effects Research Laboratory
Gulf Ecology Division
1 Sabine Island Drive
Gulf Breeze, FL 32561

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Point of Contact:
Mr. Clay Peacher, Facility Manager
850-934-9239

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH LABORATORY
GULF ECOLOGY DIVISION
GULF BREEZE, FLORIDA

WATER MANAGEMENT PLAN

Approved by:

Clay Peacher — 8/17/10

Mr. Clay Peacher, Facility Manager — Date

William H. Benson — 8.17.10

Dr. William Benson, Director — Date

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

To meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water resources 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 the country faces 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 EPA's 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,* and EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance.*

This Water Management Plan has been established to document and promote the efficient use of water at EPA's National Health and Environmental Effects Laboratory, Gulf Ecology Division (GED) located in Gulf Breeze, Florida. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines.

2.0 FACILITY DESCRIPTION

GED is located on Sabine Island in Gulf Breeze, Florida, eight miles southeast of Pensacola, Florida. The GED campus is owned and managed by EPA and has 34 buildings with 78,006 gross square feet (GSF) of conditioned facility space. The 34 buildings include three laboratory buildings, eight office buildings, a library, a fitness facility, a greenhouse, a shop facility, and several small storage and utility buildings. In addition, the campus has four seawater piers, a boathouse, and a seawater delivery system. One of GED's newest buildings, the Computational and Geospatial Sciences Building (Building 67), received U.S Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED®) for New Construction Silver-level certification in April 2009.

Sabine Island is a 17-acre, manmade island formed from ballast brought by sailing ships from 1876 to 1903. Once stabilized, Sabine Island was initially developed as a quarantine station. It was converted to an oyster research laboratory for the Bureau of Fisheries, then to a fisheries research laboratory for the Fish and Wildlife Service. The oldest structure was built in 1902. Several buildings were built between 1932 and 1942, but the majority of structures were built since 1977. Table 1 lists major buildings, their functions, and their dates of construction. The

facility has been owned and operated by as an environmental research laboratory by EPA since 1970.

The mission of GED is to provide credible scientific approaches to assess ecological conditions, determine effects and causes of ecosystem impairments, predict risks to plant and animal populations and ecosystems, and support development of criteria to enhance and protect coastal systems of the Gulf of Mexico and the southeastern United States. GED pursues research under three distinct branches: the Ecosystem Assessment Branch (EAB), the Biological Effects and Population Response Branch (BEPRB), and the Ecosystem Dynamics and Effects Branch (EDEB). Laboratory functions include wet chemistry, marine culture and toxicity testing, and computer modeling.

Table 1. Major GED Laboratory Buildings

Building Number	Function	Year Built
1	EAB Offices	1902
10	Shop Facility	1997
20	Marine Toxicology and Chemistry Laboratory	1979
34	BEPRB Offices	1932
38	EDEB Offices	1932
42	Library	1932
45	Marine Environmental Assessment Laboratory	1980
47/49	Marine Ecology Laboratory	1986/1992
65	Support Office/ Conference Center	2002
67	Computational and Geospatial Sciences Building	2008

3.0 FACILITY WATER MANAGEMENT GOALS

The resource conservation goals of GED are achieved through the implementation of an Environmental Management System (EMS). GED's Environmental Management Policy (signed 21 August 2002) and July 2009 water conservation goals are provided below.

EMS Implementation Policy

EPA's Office of Research and Development's (ORD's) mission is to perform state-of-the-art research to identify, understand, and solve current and future environmental problems, provide responsive technical support to EPA's mission, integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academia), provide leadership in addressing emerging environmental issues, and advance the science and technology of risk assessment and risk management.

ORD continues to encourage and set an example of research and development activities which use effective EMS that focus on regulatory compliance, pollution prevention, resource preservation, and public outreach. With this policy, the National Health and Environmental Effects Research Laboratory – GED joins other ORD sites in committing to implement EMS for

our own employees, operations, and facilities. Collectively, ORD will become a leader in executing a model environmental management system within the Agency.
At GED, we commit to reduce the environmental impacts and consumption of natural resources from our facility operations and comply with all legal and applicable requirements. Our environmental management system will be designed to meet the following goals:

Ensure compliance by meeting or exceeding all applicable environmental requirements while conducting research activities;

Strive to continuously improve environmental performance;

Integrate source reduction and other pollution prevention approaches into day-to-day research activities;

Consider the environment when making all planning, purchasing and operating decisions;

Establish, track and review specific environmental performance goals and employee awareness; and

Share performance information with our research partners and other interested parties.

EMS Aspects, Objectives and Targets

In view of this environmental management policy, GED has reviewed its water consumption. In July 2009, GED identified water consumption as a significant environmental aspect. Through the Water Management Environmental Management Program (EMP), GED established an objective to support the Agency's effort to reduce water consumption from a fiscal year (FY) 2007 baseline.

To meet this objective, GED established a goal of reducing water use by approximately 2 percent compared to an FY 2007 baseline annually through the end of FY 2015, for a 16 percent total reduction. GED plans to focus on cooling tower operation, the use of miscellaneous equipment (such as ensuring that low-flow appliances are installed during repairs, improvements, and new construction), the use of dishwashers, and the use of autoclaves. More information on these is provided below:

Cooling Towers. GED's Facility Manager maintains cooling towers in optimal operational conditions in accordance with GED's equipment maintenance protocol. The Facility Manager ensures cooling tower water is recharged when the highest ionic concentration recommended by the manufacturer is reached.

Miscellaneous Equipment. Low-flow appliances will be installed during repairs, improvements, and new construction. Building Coordinators inspect and report leakage and other loss to the Facility Manager. Building (Lab) Coordinators periodically examine water overflow valves and other water-loss prevention devices to ensure they work.

Dishwashers. Dishwashers will only operate when they are approximately 75 percent full.

Autoclaves. Autoclaves will be turned on only when in use. Glassware and other material will be consolidated to fill the autoclave to approximately 75 percent before use.

GED has established a Water Consumption Advisory Committee that will meet annually to discuss progress toward meeting water consumption objectives and targets and identify other opportunities to conserve water. EMPs, objectives, targets, and tasks are reviewed annually as part of the EMS goal of continual improvement. During the next annual review, GED will consider incorporating new EO 13514 requirements in the appropriate EMPs.

Under this plan, facility staff will consider WaterSense® labeled products when making purchases.

EO 13423 and EO 13514 Goals and ConservW Targets

GED complies with the requirements of applicable EOs, including requirements set in EO 13423 and EO 13415. Through these EOs, GED will reduce its water use intensity (in gallons per gross square foot (gal/GSF)) by 2 percent per year from an FY 2007 baseline through FY 2020, for a total reduction in water use intensity of 26 percent. GED's FY 2007 baseline is 85.87 gal/GSF, based on 6,822,061 gallons and on 79,450 gross square feet.

To continue its progress toward meeting these requirements, GED will strive to meet annual facility-specific goals set by EPA's Sustainable Facilities Practices Branch under its ConservW program. These ConservW goals are calculated for each EPA facility based on the facility's previous water use reduction and its potential identified projects.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service are provided by:

Emerald Coast Utilities Authority (ECUA)
Ellyson Industrial Park
9255 Sturdevant Avenue
P.O. Box 18870
Pensacola, FL 32523-8870

850-476-0480

Rate Schedule

For water service, GED pays a monthly minimum charge of $334.71 for the first 80,000 gallons and a per unit charge of $3.16 per 1,000 gallons thereafter.

The utility also assesses a monthly sewer improvement fee of $300 per month, a monthly minimum charge for sewer service of $306.42 for the first 40,000 gallons, and a per unit charge of $5.32 per 1,000 gallons thereafter.

Water and sewer fees described above became effective on 1 October 2009.

Payment Office

Lisa Rogers
Finance Office
US EPA, Gulf Ecology Division
1 Sabine Island Drive
Gulf Breeze, FL 32561

850-934-9391

5.0 FACILITY WATER USE INFORMATION

The GED campus consists of 34 buildings dedicated to research laboratory activities, office space, storage space, or other support functions. The primary buildings and their functions are listed in Section 2.0. The laboratory space is configured to conduct bench-scale research on chemicals and their impact on the environment. Some of the laboratory space is equipped with a seawater delivery system that can deliver seawater with varying salinity for marine life culturing or toxicity testing. The salinity is controlled within this system by blending seawater and fresh (potable) water to achieve the desired concentration. Potable water is used for mechanical systems, sanitary needs, laboratory processes, and fire protection. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Table 2 provides estimates of potable water consumption by major use area. These data reflect average facility water use from FY 2009.

Seawater Use and Sewer Discharge

Seawater is used for research purposes in GED's marine toxicology laboratory, treated through a sand and charcoal filter system, and then discharged into the sanitary sewer. ECUA does not charge GED for the seawater contributed to the sanitary sewer, and GED does not currently receive a sewer fee deduction for cooling tower evaporation.

Measurement Devices

Incoming water is supplied by ECUA through a single supply line equipped with a compound high flow/low flow meter. The meter is located in a below grade meter pit at the intersection of Narvaez Drive and Sabine Drive.

Two of the five cooling towers (cooling towers for Building 47/49) are equipped with meters on the make-up water lines. Under this plan, GED will consider installing make-up water meters on the remaining three cooling towers (cooling towers for buildings 20, 45, and 65) and will consider installing blowdown water meters on all five cooling towers so water lost to evaporation can be deducted from GED's sewer charges. Flow data from these meters will be recorded and tracked on a monthly basis.

The potable water supply line to the outside seawater system is equipped with a flow totalizing meter. This supply line provides fresh water for salinity control and weekly washdown of the exterior surfaces of the seawater system. Under this plan, flow data from these meters will be recorded and tracked on a monthly basis. The Facility Manager will use these data to monitor trends in water consumption and investigate and resolve unexpected changes.

Shut-off Valves

Main shut-off valves are located in the main meter pit and at the south side of Building 42.

Occupancy and Operating Schedules

Approximately 140 people work at GED. The facility operates on a flex time schedule, one shift per day from 6 a.m. to 6 p.m., Monday through Friday.

Table 2. Major Water Using Processes, GED

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Wet lab – marine culture and marine toxicity testing water (potable water)	70,000	1.2	Engineering estimate
Seawater system washdown	70,000	1.2	Engineering estimate
Fire control system testing	60,000	1.0	Engineering estimate
Sanitary water	525,000	8.7	Engineering estimate
Cooling tower make-up	4,714,000	78.0	Engineering estimate extrapolated from meter readings from two of five cooling towers
Water-cooled ice maker in Building 47/49	19,000	0.3	Engineering estimate
Miscellaneous laboratory water use	588,899	9.7	Calculated by difference from metered total
TOTAL	**6,046,899** [a]	**100**	**FY 2009 total water use**

[a] The reported FY 2009 water use was corrected to reflect actual water use. See Appendix B for more information.

Additional details on assumptions and calculations supporting these water use estimates are provided in Appendix A. Monthly water use in FY 2009 is provided in Appendix B.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, signed in January 2007, calls for federal agencies to reduce water use intensity by 2 percent per year between FY 2007 and FY 2015, for a total reduction of 16 percent. This goal was extended by EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, signed in October 2009. EO 13514 calls for reducing potable water consumption intensity by 2 percent annually through the end of FY 2020, for a total reduction of 26 percent. Facilities should implement best management practices (BMPs) related to water use, considering life-cycle

cost effectiveness, to achieve this water reduction goal. FEMP has identified BMPs in 14 possible areas to help facilities identify and target water use reductions. GED has adopted BMPs in eight of the areas, designated by checkmarks in the list below. Three other areas are deemed inapplicable for GED, designated by "NA" in the list below. BMPs with no checkmark or NA have not been adopted by GED. The status of each BMP at GED is as follows:

☑ 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
NA Boiler/Steam Systems
☑ Single-Pass Cooling Equipment
☑ Cooling Tower Management
NA Commercial Kitchen Equipment
☑ Laboratory/Medical Equipment
NA Other Water Use
☐ Alternate Water Sources

Information and Education Programs

GED promotes water conservation and awareness through its laboratory EMS implementation. The Water Management EMP, as described in Section 3.0, establishes specific water conservation objectives and targets. Water use information is tracked and shared with the staff. Employees have been educated on water and other resource conservation topics through implementation of the EMS. Water conservation is addressed in the quarterly *Greening GED* newsletter, which highlights EMPs, projects, and general advice for employees. A Water Consumption Advisory Committee meets annually to discuss progress toward meeting water consumption objectives and targets and to identify additional opportunities to conserve water. Building 67's USGBC LEED for New Construction Silver-level certification in April 2009 was publicized in the local newspaper. Among other sustainable attributes, toilets and urinals in Building 67 are flushed with collected rainwater. GED has achieved BMP status in this area.

Distribution System Audits, Leak Detection and Repair

Facility staff are trained to report leaks and malfunctioning water-using equipment to the Facility Manager or to personally enter work requests into GED's equipment management system. Reported maintenance problems are assigned a work order, which is completed promptly by the operations and maintenance (O&M) staff. The Facility Manager tracks work orders until the job is completed and the work request closed out. In addition, O&M staff perform daily walk through to inspect the core building and mechanical spaces. Any leaks or other mechanical problems are corrected promptly. Janitors and security guards are also trained to report any observed problems to the Facility Manager or O&M staff.

A screening level system review was conducted in December 2009. Known water uses account for over 90 percent of GED's water consumption.

Trends in monthly water use are and will continue to be monitored by the Facility Manager and changes that are not understood or expected will be investigated and resolved. GED has achieved BMP status in this area.

Water-Efficient Landscaping

Grasses and shrubs are climate-appropriate and survive on natural rainfall. GED has achieved BMP status in this area.

Water-Efficient Irrigation

No landscape irrigation water is used at GED. GED has achieved BMP status in this area.

Toilets and Urinals

Energy Policy Act of 1992 (EPAct 1992)-compliant sanitary fixtures (1.6 gallons per flush (gpf) toilets and 1.0 gpf urinals) have been installed in approximately two-thirds of the GED campus restroom spaces. Older style toilets and urinals (estimated 3.5 gpf toilets and 1.5 gpf urinals), installed prior to 1992, are still in use in approximately one-third of restroom spaces. In total, 19 of 32 toilets and four of six urinals are EPAct 1992-compliant. A complete inventory of sanitary fixtures is provided in Table 3.

Table 3. Inventory of Sanitary Fixtures, GED

Fixture Type	Flow Rate	Total Number
Toilets	3.5 gpf	13
	1.6 gpf	16
	dual flush, 1.6 and 1.1 gpf	3
Urinals	1.5 gpf	2
	1.0 gpf	4
Lavatory faucets	2.0/2.2 gallons per minute (gpm)	30
	0.5 gpm	4
Showers	2.5 gpm	6

BMP status can be achieved in this area by upgrading the sanitary fixtures to more water-efficient models. Under this plan, GED will consider replacing older, higher-flowing sanitary fixtures with high-efficiency models (dual-flush toilets with 1.6 gpf and 1.1 gpf flushing options and WaterSense labeled urinals which use 0.125 gpf or less). GED will also consider retrofitting the current 1.6 gpf toilets equipped with flushing handles with dual-flush handles offering a 1.1 gpf flushing option.

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

Faucets and Showerheads

The American Society of Mechanical Engineers (ASME) has established a specification for lavatory faucets in public use (essentially all applications but domestic residences) with a maximum flow rate of 0.5 gpm (ASME A112.18.1) This flow rate is sufficient for hand washing and is considered a best practice for lavatory sinks in public settings. Lavatory faucets that meet this standard have been installed only in Building 67, where four of GED's 31 lavatory sinks flow at 0.5 gpm. GED can achieve BMP status in this area by retrofitting or replacing the remaining 27 lavatory faucets to flow at 0.5 gpm.

EPAct 1992-compliant showerheads, which flow at 2.5 gpm, are installed in all six shower stalls. System pressure is maintained between 20 to 80 pounds per square inch.

A complete inventory of faucets and showerheads can be found in Table 3.

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

Boiler/Steam Systems

GED does not operate a steam boiler. BMP status is not applicable in this area.

Single-Pass Cooling Equipment

Most equipment in laboratory and mechanical spaces has been replaced with air-cooled units. Where this not the case, cooling needs are supplied by point of use, air-cooled chiller units. The only remaining water-cooled device is an ice machine in Building 47/49. When this device reaches the end of its service life, it should be replaced with an air-cooled unit. It is not cost-effective to replace this unit based on water savings alone. GED has achieved BMP status in this area, as it has taken all cost-effective steps to reduce or eliminate single-pass cooling.

Cooling Tower Management

GED operates five cooling towers, listed in Table 4, with a total cooling capacity of 690 tons. A cooling tower maintenance contractor performs a monthly quality, performance, and water chemistry review of cooling tower operation. Chemical treatment is provided to control scale and corrosion; treatment chemical addition rates are controlled to be proportional to the quantity of water blowdown. Conductivity meters are set to maintain the towers at about 750 to 800 microSiemens per centimeter (*u*S/cm), which provides approximately 5 cycles of concentration and efficient cooling tower operation.

Table 4. GED Cooling Towers

Tower Location	Rating (tons)	Makeup Water Meter
Building 20	250	No
Building 45	200	No
Building 47/49 #1	100	Yes
Building 47/49 #2	100	Yes
Building 65	40	No

Two of the four cooling towers are equipped with make-up water meters. As noted in Section 5.0, under this plan, GED will consider installing make-up water meters on the remaining cooling towers and installing blowdown meters on all five cooling towers.

As a check on system performance, meter readings will be recorded on a monthly basis, and water use trends evaluated by the O&M contractor and Facility Manager. Unexpected trends in cooling tower water use will be investigated and resolved.

GED has achieved BMP status in this area.

Commercial Kitchen Equipment

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

Laboratory/Medical Equipment

GED conducts marine life toxicity testing along with associated marine life culturing activity. Testing is conducted across a range of salinities. Seawater is obtained from Pensacola Bay with approximately 30 parts per thousand (ppt) salinity. In general, the seawater is blended with potable, fresh water at approximately 0 ppt to achieve a mixed water with approximately 18 to 22 ppt salinity. This mixed water is used for experimental purposes. Fresh water use for this purpose is governed by experimental requirements.

GED operates three autoclaves (steam sterilizers). Two of the three have been replaced by new units that only apply tempering water when condensate is being discharged to the drain. The third is an older unit that discharges tempering water when the autoclave is turned on; however, operational controls have been instituted for this unit (as well as the others) so that the unit is only turned on when actually in use. All of the autoclaves are managed so that they sterilize loads at 75 percent capacity or greater.

GED briefly used a reverse osmosis system to generate laboratory grade water. However, the laboratory staff concluded that deionized (DI) water generated by ion exchange is more suitable and now uses that technology. The DI system does not have a wastewater (or reject) stream.

GED has achieved BMP status in this area, as laboratory water use is carefully controlled on an ongoing basis through implementation of the EMS.

Other Water Use

GED does not have any other significant water uses other than those described above. Facility staff wash boats using potable water periodically, but water use is not significant.

Alternative Water Sources

A rainwater capture and reuse system was installed as part of the initial building design for Building 67. Rainwater captured in a cistern is used for toilet and urinal flushing.

Air handler condensate could be collected from air handling units in buildings 20, 45, and 47/49 and used as cooling tower make-up water in each building's respective cooling tower(s). This source of alternative water will be evaluated for feasibility and cost-effectiveness under this plan.

BMP status can be achieved in this area by evaluating the use of air handler condensate as cooling tower make-up water and implementing it if it is cost-effective.

7.0 DROUGHT CONTINGENCY PLAN

In the event of a drought or other water supply shortage, GED will follow the water use recommendations and restrictions of the Northwest Florida Water Management District issued on their Web site at: http://www.nwfwmd.state.fl.us/

The District will issue a water shortage order when appropriate and will issue associated orders depending on the level of water shortage. ECUA can also post recommendations and restrictions separate from Northwest Florida Water Management District if they deem necessary.

In the event that voluntary or mandatory water consumption reductions are instituted by Northwest Florida Water Management District or ECUA, the Facility Manager and Director will jointly identify and implement modifications to facility operations to achieve the specified reductions in water consumption.

8.0 COMPREHENSIVE PLANNING

The Facility Manager will ensure the 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. Where available, GED will purchase or specify WaterSense labeled products (which can be found at www.epa.gov/watersense).

9.0 STATUS UNDER GUIDING PRINCIPLES FOR HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS

The Interagency Sustainability Working Group (ISWG), formed as a subcommittee of the 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). The 1 December 2008, version of the *Guiding Principles for Sustainable Existing Buildings*, ISWG established six supporting principles for protecting and conserving water. GED's status toward achieving the

supporting principles for protecting and conserving water at existing buildings is documented in Table 5.

Table 5. Status of Guiding Principle to Protect and Conserve Water

Topic	Status
Indoor Water	Approximately two-thirds of the facility is equipped with EPAct 1992-compliant toilets and urinals (1.6 gpf and 1.0 gpf, respectively), while the remainder of the facility has older, higher-flow sanitary fixtures. Faucets throughout the facility flow at 2.0 gallons per minute (gpm) or more. Water use intensity for FY 2003 is 80.0 gallons per GSF and for FY 2009 is 62.6 gallons per GSF. The FY 2009 reported water intensity may be revised due to a potential incorrect meter reading issue.
Outdoor Water	The facility does not have a permanent irrigation system. It does not use potable water for irrigation.
Water Metering	A single domestic water meter measures all city water use on site. The cooling towers at Building 47/49 are equipped with submeters on the make-up water lines. The potable water supply line to the outside seawater system is also equipped with a flow totalizing meter.
Stormwater Management	GED has two parking areas with porous pavers, two swales, and a 1,600-gallon rainwater cistern used to supply toilet and urinal flushing water in Building 67. The campus does not have any curbs, allowing rainfall on paved surfaces to sheet flow to adjacent vegetated areas.
Process Water	Potable water is not used to improve the facility's energy efficiency at the expense of water efficiency.
Water-Efficient Products	Approximately 40 percent of toilets have flush rates of 3.5 gpf, the remaining 60 percent are EPAct 1992-compliant with flush rates of 1.6 gpf or less. Urinals have flush rates of 1.5 or 1.0 gpf. Most of GED's faucets flow at 2.0 gpm or higher, with the exception of those in the Building 67.

10.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

GED is pursuing the following projects to achieve additional reductions in water use:

1) Replace toilets and urinals with high-efficiency models and retrofit applicable toilets to dual flush. GED will consider replacing originally-installed toilets with high-efficiency models such as dual-flush toilets (1.6 gpf and 1.1 gpf flushing options). Up to 13 toilets can be upgraded. Each replacement fixture costs approximately $1,000 each, for a total project cost of approximately $13,000. Total annual savings from toilet replacements are projected to be 78,000 gallons and $700, with an approximate payback period of approximately 19 years.

GED will also consider replacing originally-installed urinals with WaterSense labeled urinals which use 0.125 gpf or less. Up to six urinals can be upgraded. Each replacement fixture costs approximately $1,000 each, for a total project cost of approximately $6,000. Total annual savings from urinal replacements are projected to be 59,000 gallons and $500, with an approximate payback period of 12 years.

In addition, GED will consider retrofitting seven 1.6 gpf toilets equipped with flushing handles with dual-flush handles that offer a 1.1 gpf flushing option. Dual-flush handles are estimated at $75 each, for a total estimated project cost of $530. Total annual savings are projected to be 5,700 gallons and $50, with an approximate payback period of 11 years.

2) Retrofit faucets to high-efficiency. GED will consider replacing or retrofitting the remaining 27 2.0 gpm or higher faucets to flow at 0.5 gpm. Faucet aerator fittings are estimated to be $10 each, for a total project cost of approximately $300. This project could save 40,000 gallons and $700 per year, with a simple payback period of less than one year.

3) Install and monitor make-up and blow down flow meters on all cooling towers. The cooling towers are the most significant consumers of water at the GED laboratory. Make-up meters are currently installed on two of the five towers. Make-up water meters should also be installed on towers at buildings 20, 45, and 65. Cooling tower water utilization data should be recorded and evaluated monthly to ensure good cooling tower performance.

GED also should consider installing blow down water meters as this could allow the laboratory to pursue a sewer charge deduction from ECUA for cooling tower evaporation, which is the major cooling tower water use. The quantity of water evaporated can be calculated by subtracting the amount of blow down water from the amount of make-up water. Metering make-up water and blow down water would document this quantity for potential credit. Evaporated water is estimated to be about 3,500,000 gallons per year, for which GED is currently paying approximately $19,000 per year in sewer charges. This deduction might be offset by the utility asking the laboratory to pay sewer charges on the seawater used in the marine toxicology laboratory that is ultimately discharged to sewer. However, the seawater quantity is estimated to be between 100,000 to 200,000 gallons per year, a much smaller amount than the amount of evaporated water. Make-up and blowdown meters could be installed for approximately $500 each. Payback would be less than one year if a deduction in sewer use charges can be achieved.

4) Maximize cooling tower cycles of concentration. Coordinate with the cooling tower maintenance contractor to maintain cycles of concentration at 6 or above. Increasing cycles from 5 to 6 should reduce cooling tower water use by about 4 percent, or 190,000 gallons, resulting in $1,600 in water and sewer cost savings.

5) Capture and Reuse Air Handler Condensate. GED will evaluate capturing air handler condensate and routing it to the cooling towers. Air handler condensate can be collected from three air handling units in Building 20 and routed to the Building 20 cooling tower, from two air handling units in Building 45 and routed to the Building 45 cooling tower, and from two air handling units in Building 47/49 and routed to one of the Building 47/49 cooling towers. Initial engineering evaluation indicates that it may be possible to capture up to 960,000 gallons per year of condensate. This water will significantly offset the consumption of potable water for cooling tower make-up and result in savings of approximately $8,100 per year. This project is estimated to cost $30,000 to $50,000 for a four to six year payback.

Appendix A

WATER BALANCE SUPPORTING CALCULATIONS

Table A-1. Water Balance Supporting Calculations – FY 2009, GED, Gulf Breeze, Florida

Major Process	Annual Consumption (gallons)	Supporting Calculations and Source Documentation
Wet lab – marine culture and marine toxicity testing water (potable water)	70,000	Metered discharge for June 2006 to May 2007 was 104,156 gallons. This represents approximately half the total discharge, as discharge of fish culture water is not metered. Total discharge is 104,156 × 2 = 208,312 gallons. Based on salinity measures this total is approximately 2/3 seawater and 1/3 freshwater. 208,312 × 1/3 = 69,437 gallons / year.
Seawater system washdown	70,000	1 ½ inch fire hose estimated at 45 gpm × 30 minutes / week × 52 weeks per year = 70,200 gallons / year.
Fire control system testing	60,000	Fire hydrant testing: 6 hydrants × flow rate (710 gpm, 670 gpm, 690 gpm, 710 gpm, 730 gpm, 770 gpm) × 10 minutes / year = 42,800 gallons / year. Annual fire booster pump testing: Pump test is typically run for 2-3 minutes at four settings (static rate of 630 gpm, primary pump rate of 650 gpm, secondary pump rate of 750 gpm, static flow with hydrant open of 410 gpm) Pump at Building 1 only runs at three settings. Building 1 pump: 6,090 gallons / year. Building 39 pump: 7,320 gallons / year. Biweekly fire booster pump flushing: 3 risers × 50 gallons flushed / riser / week × 26 weeks / year = 3,900 gallons / year. Total: 42,800 + 6,090 + 7,320 + 3,900 = 60,110 gallons / year.
Sanitary water	525,000	Engineering estimate based on 140 people using 15 gallons/day, 250 days per year. 140 people × 15 gallons / person / day × 250 days / year = 525,000 gallons / year.
Cooling tower make-up	4,714,000	Engineering estimate based on metered water use from two cooling towers at Building 47/49, extrapolated to determine water use from other three cooling towers using tonnage ratios. Meter readings are available from cooling tower #1 and cooling tower #2 at Building 47/49. Meter readings for cooling tower #1 were 5,985,700 gallons (on 09/05/2007) and 7,304,700 gallons (on 08/11/2009) = 1,319,000 gallons / 23 months = 57,348 gallons / month × 12 months / year = 688,173 gallons / year. Meter readings for cooling tower #2 were 5,358,000 gallons (on 09/05/2007) and 6,659,000 gallons (on 08/11/2009) = 1,301,000 gallons / 23 months = 56,565 gallons / month × 12 months / year = 678,783 gallons / year. Therefore, a 100 ton cooling tower uses approximately 683,000 gallons / year. Building 20 cooling tower is 250 tons; therefore it uses 683,000 gallons × 2.5 (ton ratio) = 1,707,500 gallons / year. Building 45 cooling tower is 200 tons; therefore it uses 683,000 gallons × 2 (ton ratio) = 1,366,000 gallons / year. Building 65 cooling tower is 40 tons; therefore it uses 683,000 gallons × 0.4 (ton ratio) = 273,200 gallons / year. Total cooling tower use = 688,000 (cooling tower 1, Building 47/49) + 679,000 gallons (cooling tower 2, Building 47/49) + 1,708,000 gallons (Building 20) + 1,366,000 (Building 45) + 273,000 gallons (Building 65) = 4,714,000 gallons / year.

Table A-1. Water Balance Supporting Calculations – FY 2009, GED, Gulf Breeze, Florida

Major Process	Annual Consumption (gallons)	Supporting Calculations and Source Documentation
Water-cooled ice maker in Building 47/49	19,000	Engineering estimated based on the assumption that the small water-cooled under-counter unit generates 50 pounds (lbs) of ice per day. Assume 150 gallons of water used for each 100 lbs of ice, based Slide 18 in Charles Bohlig Presentation on Water Efficiency in Commercial Food Service, 7 February 2006. 50 lbs / day × 250 days × 150 gallons / 100 lbs = 18,750 gallons / year.
Miscellaneous laboratory water use	588,899	Calculated by difference from total FY 2009 water use and other estimated water uses.
Total water use	**6,046,899** [a]	**FY 2009 total water use**

[a] The reported FY 2009 water use was corrected to reflect actual water use. See Appendix B for more information.

Appendix B

MONTHLY WATER USE IN FY 2009

Table B-1. Monthly Water Use in FY 2009, GED, Gulf Breeze, Florida

Month Year	Billed High Flow Meter (gallons)	Corrected High Flow Meter (gallons) [a]	Billed Low Flow Meter (gallons)	Total Water Use (gallons) (Corrected High Flow Meter + Billed Low Flow Meter)
October 2008	246,856	246,856	342,233	589,089
November 2008	183,272	183,272	150,732	334,004
December 2008	172,051	172,051	170,555	342,606
January 2009	130,908	130,908	135,771	266,679
February 2009 [b]	95,750	136,892	92,458	229,350
March 2009 [c]	22,815	228,150	155,220	383,376
April 2009 [c]	11,968	119,680	415,916	535,596
May 2009 [c]	11,594	115,940	374,399	490,339
June 2009 [c]	22,815	228,150	594,326	822,476
July 2009 [c]	21,319	213,190	497,827	711,021
August 2009 [c]	17,205	172,050	488,851	660,903
September 2009 [c]	16,831	168,310	513,162	681,474
Total water use	**953,384**	**2,115,449**	**3,931,450**	**6,046,899**

[a] In February 2009, ECUA replaced the high flow water meter of the compound low flow/high flow water meter on the single supply line that feeds GED. During the FY 2010 water assessment, the assessment team noted that the billed high flow water use does not correspond with the high flow meter reading. The billed high flow water use appears to be different from the meter reading by a factor of 10 – the billed water use is in tens of cubic feet, but the meter is reading in hundreds of cubic feet. Throughout this Water Management Plan, reported gallons from February through September 2009 were adjusted to compensate for this difference.

[b] The corrected gallons for February 2009 are the billed water use after the meter replacement multiplied by 10 plus the billed water use prior to the meter replacement.

[a] The corrected gallons are equivalent to the billed water used multiplied by 10.

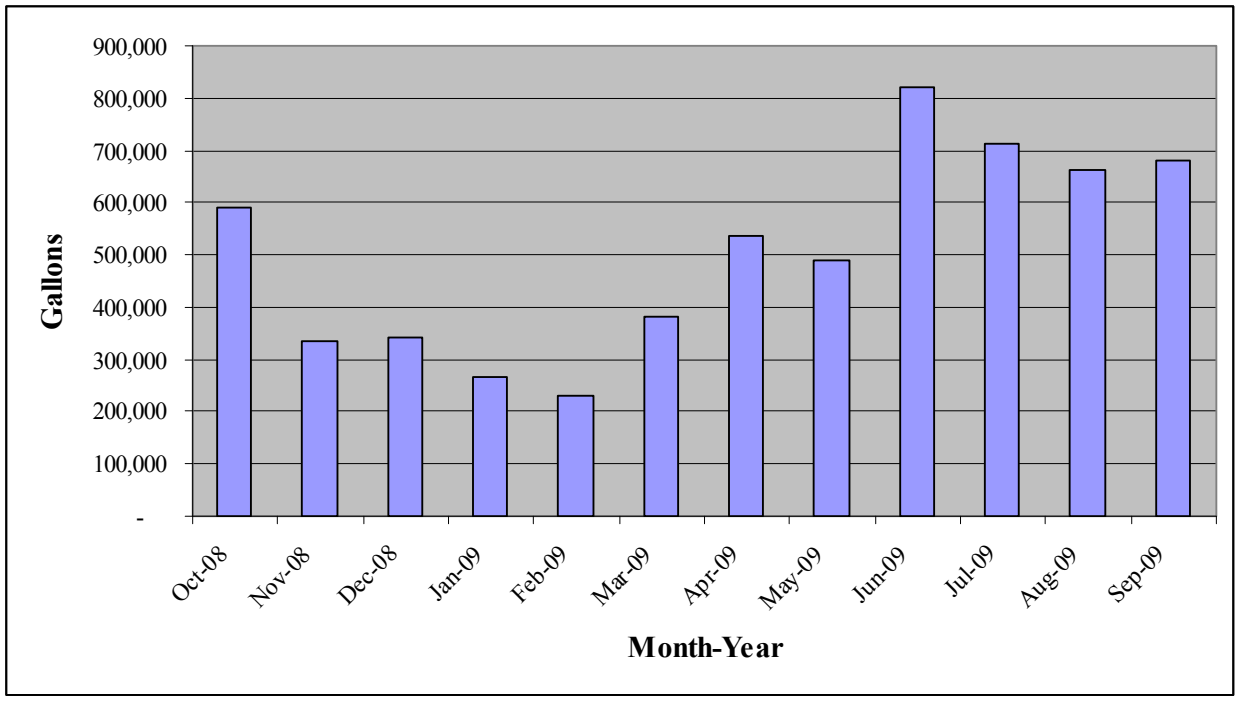

Figure B-1. Monthly Water Use in FY 2009, GED, Gulf Breeze, Florida