

# Water Management Plan

Revision 2

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



September 9, 2014

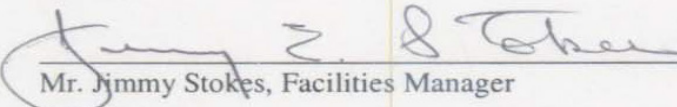

Point of Contact:  
Mr. Jimmy Stokes, Facilities Manager  
850-934-9250



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH LABORATORY  
GULF ECOLOGICAL DIVISION  
GULF BREEZE, FLORIDA

WATER MANAGEMENT PLAN, REVISION 2

Approved by:

	9-11-14
Mr. Jimmy Stokes, Facilities Manager	Date
	9/12/2014
Dr. William S. Fisher, Acting Director	Date

## TABLE OF CONTENTS

	<b>Page</b>
1.0 IDENTIFIED WATER CONSERVATION OPPORTUNITIES .....	3
2.0 BACKGROUND AND PURPOSE .....	3
3.0 FACILITY INFORMATION .....	4
4.0 WATER MANAGEMENT GOALS .....	5
5.0 WATER USE INFORMATION .....	5
5.1 Water Supply .....	6
5.2 Meters and Submeters .....	6
5.3 Historical Water Use .....	6
5.4 End Uses of Water .....	7
6.0 DROUGHT CONTINGENCY PLAN .....	13

## **1.0 IDENTIFIED WATER CONSERVATION OPPORTUNITIES**

A water use and conservation assessment was conducted at the U.S. Environmental Protection Agency's (EPA's) National Health and Environmental Effects Research Laboratory's (NHEERL's) Gulf Ecology Division (GED) in Gulf Breeze, Florida. The assessment occurred in April 2014. Under this Water Management Plan, GED will consider implementing the potential water conservation and management opportunities identified during the water assessment, which are summarized in Table 1.

The rest of this Water Management Plan describes GED's water reduction goals, water use trends, end uses of water, completed water efficiency projects, and drought management plans.

## **2.0 BACKGROUND AND PURPOSE**

In 2007, Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, called for federal agencies to reduce water use intensity by 2 percent per year between fiscal year (FY) 2007 and FY 2015 for a total reduction of 16 percent, compared to a FY 2007 baseline. This goal was revised and extended by EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*. EO 13514 calls for reducing potable water consumption intensity by 2 percent annually through FY 2020, relative to the FY 2007 baseline, for a 26 percent total reduction. Water use intensity is measured in gallons per gross square feet (gsf).

The implementation instructions for water efficiency and management provisions of EO 13514 direct that agencies replacing fixtures or other water-using products should purchase Federal Energy Management Program-designated or WaterSense® labeled products.

In addition to the potable water use reduction requirements, EO 13514 requires agencies to reduce industrial, landscaping, and agricultural (ILA) water consumption by 2 percent annually or 20 percent by the end of FY 2020, relative to an FY 2010 baseline (including non-potable sources). The EO also directs agencies to identify, promote, and implement water reuse strategies that reduce potable water consumption.

The Energy Independence and Security Act of 2007 directs agencies to complete comprehensive energy and water evaluations of 25 percent of covered facilities (i.e., those accounting for 75 percent of total energy use) each year; implement cost-effective measures identified through life cycle analyses; and measure and verify water savings.

In summary, existing EOs and federal law require substantial reductions in all forms of water use, as well as ongoing, regular assessments of facility water use to identify and implement saving opportunities.

This Water Management Plan has been developed to document and promote the efficient use of water at GED, so that the facility can contribute to meeting these Agency-wide objectives.

**Table 1. Potential Water Conservation Opportunities, GED**

<b>Suggested Priority</b>	<b>Project Description</b>	<b>Project Cost</b>	<b>Potential Water Savings (gallons)</b>	<b>Potential Energy Savings (MMBtus)</b>	<b>Potential Utility Cost Savings</b>	<b>Potential Payback (years)</b>
1	Monitor and record existing water meters on a monthly basis to establish water use trends.	N/A	Although this project will not result in direct water or utility cost savings, regularly reading and monitoring water meters may result in better water management and early leak detection, therefore saving water.			N/A
2	Install 0.5 gallon per minute (gpm) faucet aerators on 28 lavatory faucets.	\$280	87,000	38	\$1,900	0.1
3	Capture condensate from air handling units in Building 20 and route to the cooling tower at Building 20.	\$650	330,000	-1	\$3,500	0.2
4	Replace existing showerheads with WaterSense labeled models flowing at 1.75 gpm or less.	\$180	5,200	2	\$100	1.8
5a	Replace six existing urinals with WaterSense labeled models flushing at 0.125 gallons per flush (gpf).	\$6,000	42,000	N/A	\$430	14.0
5b	If urinal replacement is not feasible at this time, replace diaphragm inserts in the five urinals flushing at 1.0 gpf with new inserts rated at 0.5 gpf. Implement a pilot project in one restroom first to ensure adequate urinal performance and user satisfaction.	\$200	18,000	N/A	\$190	1.0
6	Replace 13 existing toilets flushing at 3.5 gpf or higher with WaterSense labeled tank-type toilets or high-efficiency flushometer-valve toilets flushing at 1.28 gpf.	\$11,000	64,000	N/A	\$670	16.4
7	Install make-up meters on cooling towers serving Buildings 20 and 65.	\$1,000	Although this project will not result in direct water or utility cost savings, installing and reading meters on cooling tower make-up lines is a best practice that may improve cooling tower management and result in early leak detection, therefore saving water.			N/A

### **3.0 FACILITY INFORMATION**

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 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. Table 2 provides a list of major buildings located at GED.

**Table 1. Major GED Buildings**

<b>Building Number</b>	<b>Function</b>	<b>Year Built</b>
1	Ecosystem Assessment Branch offices	1902
10	Shop facility	1997
20	Marine toxicology and chemistry laboratory	1979
34	Biological Effects and Population Response Branch offices	1932
38	Ecosystem Dynamics and Effects Branch offices	1932
42	Library	1932
45	Marine environmental assessment laboratory	1980
47/49	Marine ecology laboratory	1986/1992
65	Support office and conference center	2002
67	Computational and geospatial sciences building	2008

GED is occupied by approximately 117 employees. The facility operates on a flex time schedule, one shift per day from 6 a.m. to 6 p.m., Monday through Friday.

#### **4.0 WATER MANAGEMENT GOALS**

GED achieves its resource conservation goals by implementing EPA’s Office of Research and Development’s (ORD’s) Multi-Site Laboratory Environmental Management System (EMS) program. Within the EMS and otherwise, ORD’s collective water management goals include:

- Annually, achieve the Agency ConservW targets (set by EPA’s Sustainable Facilities Practices Branch) as a cumulative total of all seven ORD locations.
- By September 30, 2014, identify at least one water conservation project or stormwater management project for ORD to complete in FY 2015 and obtain funding.

#### **5.0 WATER USE INFORMATION**

GED uses potable water primarily for cooling tower make-up, research, and restroom use. Discussed further in Section 5.3, GED’s potable water use has decreased since the FY 2007 baseline year. The following sections provide additional details on GED’s water use.

## **5.1 Water Supply**

Emerald Coast Utility Authority (ECUA) provides GED's potable water and sewer service. GED does not use any sources of non-potable fresh water.

## **5.2 Meters and Submeters**

Incoming potable water supply is metered. Flow totalizing meters are also installed on many of the major subsystem flows. Meters and submeters include:

- Potable water supply meter to laboratory campus (City meter account #137837-85744)
- Building 47/49 cooling tower #1 make-up water submeter
- Building 47/49 cooling tower #2 make-up water submeter
- Building 47/49 recovered air handler condensate #1 submeter to cooling tower make-up
- Building 47/49 recovered air handler condensate #2 submeter to cooling tower make-up

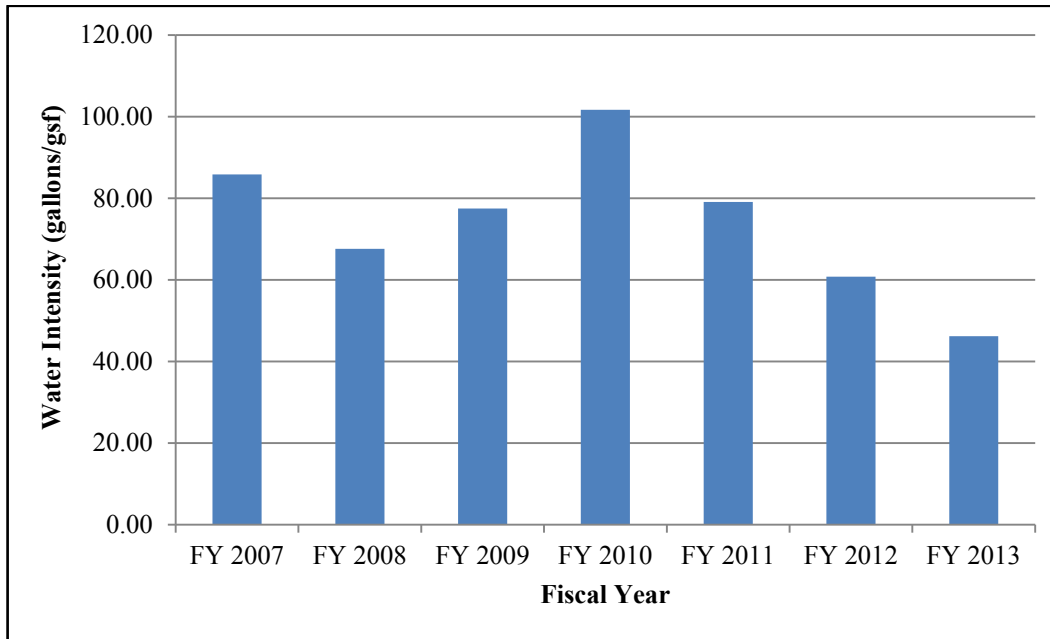
Under this Water Management Plan, water bills from ECUA will be monitored to establish laboratory campus water use trends. In addition, facilities management staff will record submeter readings at least once a month from the Building 47/49 cooling tower make-up lines and air handler condensate recovery lines and will report values to the Facilities Manager so that water use trends can be monitored on an ongoing basis and leaks or other malfunctions can be quickly identified. Any unexpected changes in water use will be investigated and resolved immediately.

## **5.3 Historical Water Use**

In response to EO 13423, GED set a FY 2007 potable water use intensity baseline of 85.87 gallons per gsf. In FY 2013, water use intensity had decreased to 46.19 gallons per gsf—a 46.2 percent reduction compared to the FY 2007 baseline. Figure 1 illustrates GED's potable water use intensity from FY 2007 to FY 2013.

As described in Table 3, GED completed two water efficiency projects since FY 2007 to contribute to its significant water use reduction.

**Figure 1. Annual Potable Water Use Intensity, GED, FY 2007–FY 2013**



**Table 3. Completed Water Efficiency Projects Since FY 2007, GED**

Project	Implementation Cost	Estimated Annual Water Savings (gallons)	Completion Year	Additional Notes
Air handler condensate recovery	\$40,000	400,000	FY 2011	GED captures condensate from the Building 49 air handlers and routes it to the Building 47/49 cooling towers as make-up water, reducing the amount of potable make-up water needed for the Building 47/49 cooling towers. In FY 2013, GED collected approximately 406,700 gallons of air handler condensate.
Cooling towers	NA	1,040,000	FY 2011	GED consolidated its operations and research from Building 45 into other laboratories, resulting in the elimination of water use by the Building 45 cooling tower.

#### **5.4 End Uses of Water**

Table 4 and Figure 2 describe the end uses of water at GED.

Figure 3 provides a graph of GED’s monthly potable water use in FY 2013, which illustrates GED’s seasonal water use pattern that can be attributed to higher cooling tower make-up water use in the summer months.

GED’s end uses of water are described in more detail in this section. Potential projects discussed in this section are summarized in Table 1.



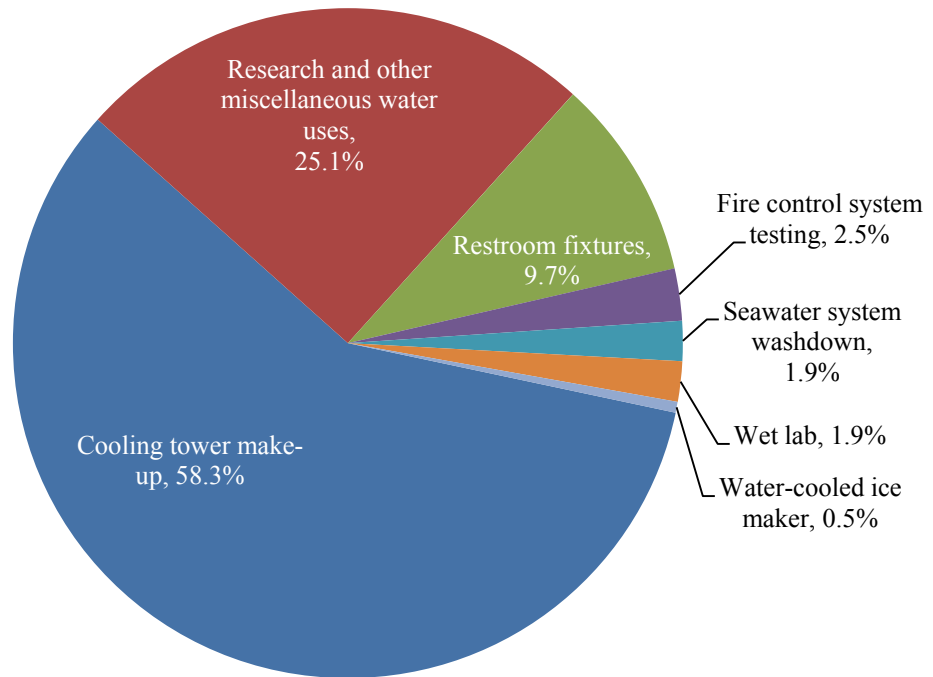
**Table 4. Major Water Uses, GED, FY 2013**

<b>Major Process</b>	<b>FY 2013 Annual Water Use (gallons)</b>	<b>Percent of Total Potable Water Use (%)</b>	<b>Estimated Utility Costs<sup>a</sup></b>	<b>Supporting Calculations and Source Documentation</b>
<b>Potable Water Use</b>				
Cooling tower make-up (potable water)	2,100,000	58.3	\$22,000	Engineering estimate based on metered water use from the two cooling towers at Building 47/49. The water use from these cooling towers was extrapolated to the cooling towers at Buildings 20 and 65 using the tonnage ratios.
Research and other miscellaneous water uses	904,349	25.1	\$9,400	Calculated by difference from known total water use and all other calculated water uses.
Restroom fixtures	350,000	9.7	\$3,600	Engineering estimate based on fixtures installed, occupancy, and daily usage factors.
Fire control system testing	90,000	2.5	\$900	Engineering estimate based on annual fire hydrant testing, annual fire booster pump testing, and weekly riser flushing.
Wet lab (marine culture and marine toxicology testing water)	70,000	1.9	\$700	Engineering estimate based on previous metered sewer discharges from wet lab.
Seawater system washdown	70,000	1.9	\$700	Engineering estimate based on a 1.5 inch fire hose using 45 gpm, 30 minutes per week, 52 weeks per year.
Water-cooled ice maker in Building 47/49	19,000	0.5	\$200	Engineering estimated based on an under-counter unit generating 50 pounds of ice per day, 250 days per year. Assumes 150 gallons of cooling water needed to produce 100 pounds of ice.
<b>Total Potable Water Use</b>	<b>3,603,349</b>	<b>100</b>	<b>\$37,400<sup>b</sup></b>	FY 2013 metered total.
<b>Onsite Alternative Water Use</b>				
Building 47/49 cooling tower make-up (air handler condensate)	406,700	-	-	Estimate based on metered total air handler condensate collected from July 2011 to April 2014 at the Building 47/49 air handling units. Total collected was 1,118,490 gallons over 33 months. This amount was extrapolated to determine an estimate for 12 months.

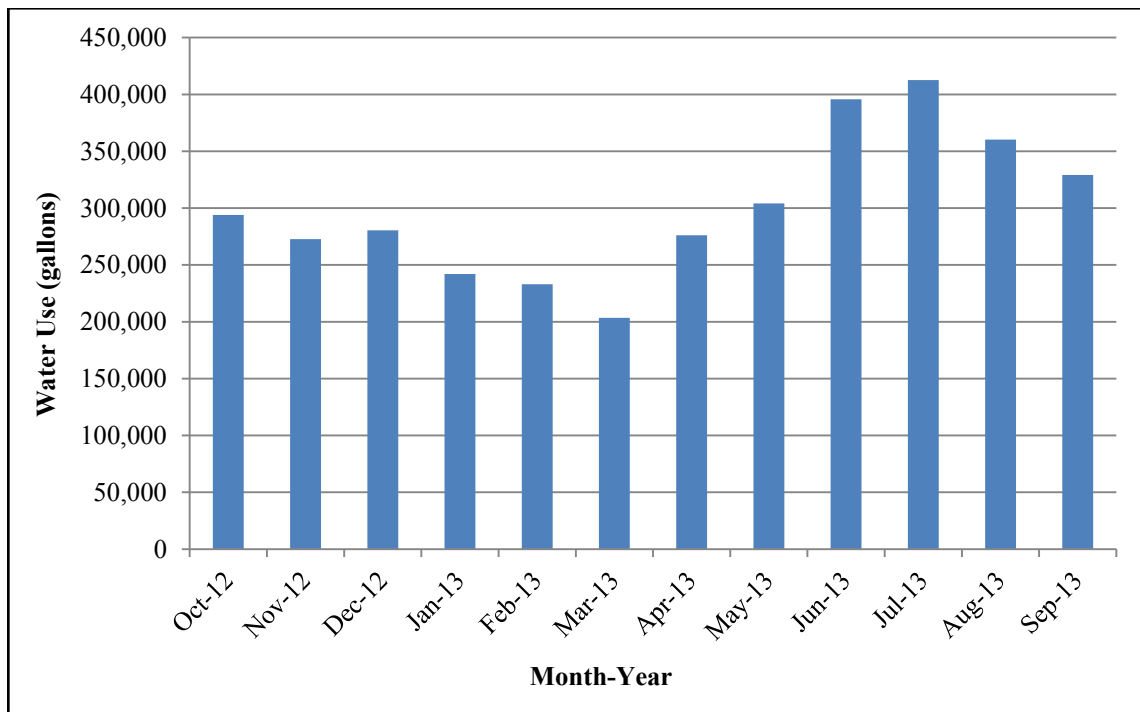
<sup>a</sup> Utility cost savings are calculated using the most current water and sewer rates available. Beginning in October 1, 2013, the incremental water rate applicable to GED is \$3.88 per 1,000 gallons. The incremental sewer rate applicable to GED is \$6.53 per 1,000 gallons.

<sup>b</sup> The total estimated utility cost accounts for the cost of water and sewer service per unit and does not include any fixed fees GED may have incurred in FY 2013.

**Figure 2. Percentage of Potable Water End Uses, GED, FY 2013**



**Figure 3. Monthly Water Use, GED, FY 2013**



## Cooling Tower Make-Up

The largest end use of water at GED is the cooling tower system, which accounts for 58 percent of its total potable water use annually. GED is equipped with five cooling towers, listed in Table 5, with a total cooling capacity of 690 tons. The cooling tower at Building 45 is currently offline while GED determines the future function of the laboratory. 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 blown down. Conductivity meters are set to maintain the towers between 800 and 1000 microSiemens per centimeter ( $\mu\text{S}/\text{cm}$ ), which provides approximately 5 cycles of concentration and efficient cooling tower operation.

Two of the five cooling towers are equipped with make-up water meters. Under this plan, GED will consider installing make-up water meters on the cooling towers at Building 20 and Building 65. GED will also monitor and record cooling tower make-up meter readings at least monthly. The operations and maintenance (O&M) contractor and Facilities Manager will evaluate water use trends in the cooling towers. They will investigate unexpected trends and resolve issues identified as soon as possible.

**Table 5. GED Cooling Towers**

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

GED collects condensate from air handling units in Building 49 and routes it to the Building 47/49 cooling towers as make-up water. The collected condensate is metered. Under this plan, GED will monitor and record recovered air handler condensate meter readings monthly. In FY 2013, GED collected approximately 406,700 gallons of air handler condensate and used it as cooling tower make-up water, reducing GED's need for potable make-up water by approximately 16 percent.

GED is currently in the process of assessing a project to collect air handler condensate from the air handling units in Building 20 to use as make-up water for the cooling tower at Building 20. Collection is feasible for two of the three air handling units. GED hopes to implement the air handler condensate recovery system in FY 2014 or FY 2015.

## Research and Other Miscellaneous Water Uses

Approximately 25 percent of GED's potable water is used for research purposes since GED does considerable research on aquatic life.

GED operates two steam sterilizers, listed in Table 6. For both sterilizers, tempering water is only applied when condensate is being discharged to the drain. Both are managed so that they sterilize loads at 75 percent capacity or greater.

**Table 6. GED Steam Sterilizers**

<b>Room</b>	<b>Model</b>	<b>Continuous Tempering Water Flow?</b>
Building 47/49, Room 8	Consolidated Stills & Sterilizers, SSR-3A-PB	No – Only when needed
Building 47/49, Room 11	Amsco 3021	No – Only when needed

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 reject stream.

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

**Restroom Fixtures**

Energy Policy Act of 1992 (EPAAct 1992)-compliant sanitary fixtures [1.6 gallons per flush (gpf) toilets and 1.0 gpf urinals] have been installed in approximately two-thirds of GED’s restrooms. 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 the restrooms. In total, 20 of 32 toilets and five of six urinals are EPAAct 1992-compliant.

The American Society of Mechanical Engineers and Canadian Standards Association (ASME/CSA) have established a standard for lavatory faucets in public use (essentially all applications except domestic residences) which specifies a maximum flow rate of 0.5 gpm. 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 (four of GED’s 32 lavatory sinks). The remaining 28 faucets flow at either 2.0 or 2.2 gpm.

EPAAct 1992-compliant showerheads, which flow at 2.5 gpm, are installed in all six shower stalls located at GED.

Table 7 provides a complete inventory of sanitary fixtures.

Water system pressure is maintained between 20 to 80 pounds per square inch, which is necessary for adequate restroom fixture performance. Janitorial staff and employees are trained to report leaks or other maintenance problems to the Facilities Manager or O&M staff. Leaks or other problems are immediately corrected.

Building 67 is equipped with a system to collect rain water from the building’s roof and use it for toilet and urinal flushing. The collection system is not fully functional as currently designed, as the system regularly clogs with debris. Based on an assessment of potential water and cost

savings from an operational system, it does not appear to be cost effective to retrofit or redesign the system at this time.

**Table 7. Restroom Fixtures Inventory, GED**

Fixture Type	Flow Rate	Total Number
Toilets	3.5 gpf	13
	1.6 gpf	17
	Dual flush (1.6/1.1 gpf)	3
Urinals	1.5 gpf	1
	1.0 gpf	5
Lavatory faucets	2.0 or 2.2 gpm	28
	0.5 gpm	4
Showers	2.5 gpm	9

To reduce water use in the restrooms, GED will consider replacing existing toilets flushing at 3.5 gpf or higher with WaterSense labeled tank-type toilets or high-efficiency flushometer-valve toilets flushing at 1.28 gpf. GED will also consider replacing urinals throughout the facility with WaterSense labeled models flushing at 0.125 gpf.

If urinal replacement is not immediately feasible, GED could consider replacing the diaphragm inserts on the urinals flushing at 1.0 gpf with inserts rated at 0.5 gpf. GED should first conduct a pilot project in one restroom to verify that performance and user satisfaction are maintained at the lower flush volume. If the pilot project is successful, GED could replace diaphragm inserts in all five of its urinals currently flushing at 1.0 gpf at a fairly low cost.

To further reduce restroom water use, GED will also consider installing 0.5 gpm faucet aerators on all lavatory faucets flowing at 2.0 gpm or higher. This project is very cost effective and will pay for itself in a matter of months. GED should also consider replacing its existing showerheads with WaterSense labeled models flowing at 1.75 gpm or less.

### **Fire Control System Testing**

GED uses approximately 90,000 gallons of water annually for periodic fire control system testing and flushing. Fire hydrant testing is conducted on six fire hydrants at GED once per year. The fire booster pumps are also tested annually. In addition to testing, the fire water risers are also flushed once per week to ensure fresh water is maintained within the fire control system.

### **Wet Lab (Marine Culture and Marine Toxicology Testing Water)**

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. The seawater is blended with potable water at approximately 0 ppt to achieve a mixed water with approximately 18 to 22 ppt salinity for

experimental purposes. Potable water use for this purpose is governed by experimental requirements.

### **Seawater System Washdown**

On a weekly basis, the seawater system that provides testing water for marine culture and toxicology testing is washed down. The exterior surfaces are washed to remove any dust, debris, or salt build-up that has accumulated over the past week. Washdown occurs for approximately 30 minutes per week.

### **Water-Cooled Ice Maker**

Most equipment in laboratory and mechanical spaces is air-cooled. At the time of the assessment, the only remaining water-cooled device was an ice maker in Building 47/49. The ice maker was a small unit that generates an estimated 50 pounds of ice per day. In August 2014, the ice maker reached the end of its service life and was replaced with an air-cooled model.

## **6.0 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 its website 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 it deems necessary.

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