Water Management Plan

Revision 1

U.S. Environmental Protection Agency

Research Triangle Park Main Campus
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EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK (RTP) MAIN CAMPUS
RESEARCH TRIANGLE PARK, NORTH CAROLINA

WATER MANAGEMENT PLAN, REVISION 1

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 IDENTIFIED WATER CONSERVATION OPPORTUNITIES

A water use and conservation assessment was conducted at the U.S. Environmental Protection Agency's (EPA's) Research Triangle Park (RTP) Main Campus in Research Triangle Park, North Carolina, in May 2013. Under this Water Management Plan, the RTP Main Campus will consider implementing the potential water conservation opportunities identified during the water assessment, which are summarized in Table 1.

This Water Management Plan describes the facility's water reduction goals, water use trends, end uses of water, and drought contingency 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 on a gallons per gross square foot (gsf) basis.

The July 10, 2013 implementing 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.[1]

In addition to the potable water use reduction requirements in EO 13514, the Order requires that agencies 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 (even if it is from nonpotable 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 each year (covered facilities are those that account for 75 percent of total energy use), implement cost-effective measures identified through life-cycle analyses, and measure and verify water savings.

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

This facility-specific Water Management Plan has been developed to document and promote the efficient use of water at EPA's RTP Main Campus, so that the facility can contribute to meeting these Agency-wide objectives.

[1] For further information, see http://www.whitehouse.gov/sites/default/files/water_implementing_instructions.pdf.

Table 1. Potential Water Conservation Opportunities, RTP Main Campus

Suggested Priority	Project Description	Estimated Project Cost	Potential Water Savings (gallons)	Potential Energy Savings (MMBtus)	Potential Utility Cost Savings*	Potential Payback (years)
RTP Main Building						
1	Improve operation of the High Bay cooling tower pending its elimination (see Suggested Priority 8). This includes adoption of a water chemistry monitoring protocol. The protocol should include use of a conductivity controller to control cooling tower blowdown. Water use should also be tracked on the existing meter that is currently bypassed.	No additional cost. Should be included in existing operations and maintenance (O&M) costs.	250,000	0	$2,900	Immediate
2	Replace urinal diaphragm inserts with units rated at 0.5 gallons per flush (gpf). A pilot project replacing a limited number of diaphragm inserts should be implemented to assess the impact of on drainline and urinal performance.	No additional cost.	240,000	0	$2,700	Immediate
3	Replace existing 2.5 gallons per minute (gpm) showerheads with WaterSense labeled models rated at 1.5 gpm.	$390	231,000	151	$3,700	<1
4	Replace existing 1.42 gpm pre-rinse spray valves (PRSVs) in the cafeteria with models rated at 1.0 gpm.	$240	13,000	11	$220	1
5	Retrofit the steam sterilizer in Room A580 with a control module to only apply tempering water when condensate from sterilizer operation is flowing to the drain.	$4,000	90,000	0	$1,000	4
6	Utilize recovered Building B, D, and E air handler unit condensate for makeup water to the steam generators in the main mechanical room.	$75,000	600,000	-2	$6,900	11
7	Eliminate the use of the High Bay cooling tower by replacing the cooling towers with a heat exchange system tied into the Main Building chilled water loop.	$140,000	500,000	0	$5,700	25
8	Utilize recovered Building A air handler unit condensate for back-up boiler makeup water.	$75,000	160,000	-1	$1,800	42

Table 1. Potential Water Conservation Opportunities, RTP Main Campus

Suggested Priority	Project Description	Estimated Project Cost	Potential Water Savings (gallons)	Potential Energy Savings (MMBtus)	Potential Utility Cost Savings*	Potential Payback (years)
9	Install water meters to monitor quantity of water being used as boiler feed and reverse osmosis (RO) system make-up water. Investigate and resolve any unexpected trends. This project allows tracking and optimization of significant laboratory water use.	$6,000	No water savings associated. This is a best practice that should improve operations.	0	0	N/A
National Computer Center (NCC)						
1	Replace urinal diaphragm inserts with units rated at 0.5 gpf. A pilot project replacing a limited number of diaphragm inserts should be implemented to assess the impact of on drainline and urinal performance.	No additional cost.	47,000	0	$540	Immediate
2	Replace existing 2.5 gpm showerheads with WaterSense labeled models rated at 1.5.	$60	32,000	21	$530	<1
First Environments Early Learning Center (FEELC)						
1	Convert all bathroom faucets, except those used at the diaper changing stations, to 0.5 gpm faucet aerators.	$240	62,000	39	$990	<1
2	Replace existing 2.5 gpm showerheads with WaterSense labeled models rated at 1.5 gpm.	$90	7,500	5	$130	<1
3	Replace existing 1.42 gpm PRSV in the cafeteria with a model rated at 1.0 gpm.	$80	6,300	6	$110	<1
4	Install a temporary meter on the connection between the potable water supply and garden irrigation system for one growing season to quantify irrigation water use.	$200	No immediate savings but may indicate other opportunities	0	0	N/A
5	Connect FEELC water meter to the ION system to improve consistency and frequency of data collection	TBD	No specific water savings calculated. Should improve operations	0	0	N/A

*Utility cost savings are calculated using the most current water, sewer, electricity, and natural gas rates available. As of March 2013, the RTP Main Campus' water costs $7.67 per 1,000 gallons. Sewer fees are $3.76 per 1,000 gallons. In the first and second quarters of FY 2013, the natural gas and electricity rates were $0.758 per hundred cubic feet and $0.068 per kilowatt hour (kWh), respectively.

3.0 FACILITY INFORMATION

RTP Main Campus is EPA's largest operation outside of Washington, D.C. in terms of people, buildings, and laboratories. It is the Agency's major center for air pollution research and regulation and health and environmental effects research. The campus includes an office tower (Building C), four research wings housing more than 400 laboratories (Buildings A, B, D, and E), and a High Bay research building. Collectively, Buildings A through E and the High Bay are referred to as the Main Building and include 1,042,611 square feet of conditioned space. The RTP Main Campus also includes the 95,322-square-foot National Computer Center (NCC) and the 25,400-square-foot First Environments Early Learning Center (FEELC).

The RTP Main Campus facilities are EPA-owned and EPA-operated. Facilities operate on a flex time schedule, one shift per day, Monday through Friday. An estimate of building occupancy is provided in Table 2.

Table 2. RTP Main Campus Building Occupancy

Facility	Number of Occupants
Main Building	1,849
NCC	257
FEELC	60 adults, 208 children

EPA also operates two other facilities in the RTP area, the Chapel Hill Laboratory (Chapel Hill) in Chapel Hill, North Carolina and the Reproductive Toxicology Facility (RTF) in Durham, North Carolina. Water use and conservation at Chapel Hill is addressed in a separate water management plan. As part of EPA's consolidation efforts, RTF is currently in the process of being closed, as EPA's lease on the facility ends in 2015. EPA constructed a new Office Building, adjacent to existing Building A, to provide additional space to house personnel and activities as a result of RTF consolidation. The A Office Building was occupied in September 2014.

EPA shares the Main Campus with the National Institute of Health (NIH). The Main Building obtains high temperature hot water (HTHW) and chilled water from a central utility plant (CUP), which is operated by NIH. NCC also obtains chilled water from the CUP. Because EPA does not have control over water use at the CUP, information regarding operations and water use at the CUP is not discussed in this Water Management Plan.

4.0 WATER MANAGEMENT GOALS

RTP Main Campus achieves its resource conservation goals by implementing a facility-specific Environmental Management System (EMS) program. Within the EMS and otherwise, RTP Main Campus water management goals include:

- Reduce potable water use by 2 percent annually through the end of FY 2020 or 26 percent by the end of FY 2020 for all of EPA's RTP facilities (aggregate of Main Building, NCC, FEELC, RTF, and Chapel Hill).

- Reduce ILA water use by 2 percent annually or 20 percent by FY 2020.

- Develop a comprehensive Stormwater Management Plan for the RTP Main Campus as a best management practice.

5.0 Water Use Information

RTP Main Campus water use has decreased since the last water use assessment in 2008. The facility has implemented effective changes such as modifying the vacuum pumps purge schedule, installing air-cooled point-of-use chillers instead of single-pass cooling systems where possible, eliminating unnecessary tempering water flow in steam sterilizers, and adjusting the operation of cage-and-rack washers to make them more efficient.

RTP Main Campus uses potable water for mechanical systems, sanitary needs, laboratory processes, and FEELC garden watering.

RTP Main Campus uses a limited amount of non-potable irrigation water for spot watering of new or stressed vegetation. This water use is reported with EPA's annual ILA total.

The following sections provide additional details on facility water use.

5.1 Water Supply

RTP Main Campus' potable water is supplied by the City of Durham. Nonpotable water is obtained from the lake adjacent to the EPA facilities. All nonpotable water is used for landscape irrigation.

5.2 Meters and Submeters

The Main Building is supplied by two water mains that enter in the Building B basement and Building D first floor. Each supply main is equipped with a meter; metered flow is recorded every 15 minutes in a central data management system (ION system provided by Duke Power). Both mains tie together within the facility to supply the entire Main Building. In addition, the cooling tower in the High Bay is equipped with a flow totalizing meter on the make-up line. This meter was recently replaced and has not yet been put into service, but this plan calls for the meter to be put into service. The new A Office Building will be equipped with a submeter to track water used in that building.

NCC is equipped with a meter located where the water supply main enters the building in the mechanical room. Metered flow is recorded every 15 minutes in the ION system.

FEELC is equipped with a meter where the water supply main enters the building in the mechanical room. The meter is manually monitored, and the information is reported to the Energy Manager on a monthly basis. This meter should be connected to the ION system to automate and consolidate the collection of campus water use data.

Duke Power is responsible for calibrating the ION system meters. Water use reported in this plan and tracked under EO 13514 is based on the ION system meters and the manual readings from the FEELC meter.

Total water use supplying the campus shared by EPA and NIH is measured by meters at the two locations where the campus distribution system connects to the City of Durham system. One meter is located on TW Alexander Drive and the other on Hobson Road. These two meters are calibrated by the City of Durham every 2 years.

Note that given the configuration of the campus water distribution system, water consumed during testing or flushing of the campus fire hydrants is registered on the City of Durham supply meters, but is not registered on the building meters used to track EPA water use.

Under this Water Management Plan, EPA will consider installing submeters on the makeup water line for the RO system in the Building A penthouse supplying the clean steam humidifiers, on the water softener system supplying the back-up boiler in Building A, and on the water softener system supplying water to the steam generator in the Building D pump room.

In addition, EPA will consider installing a temporary meter to characterize the portion of potable. water use at the FEELC attributed to outdoor garden water use.

5.3 Historical Water Use

During a previous water use assessment conducted in 2008, it was determined that the RTP Main Campus used 23,899,338 gallons of water in 2007. In FY 2012, RTP Main Campus used 11,143,423 gallons of water — a reduction of approximately 53 percent since the last assessment.

Note that total main building water consumption quantities presented in this plan are subject to a significant degree of uncertainty because of data scaling and transmission errors in the ION system that were not discovered and corrected until 2014.

Per the requirements of EO 13423, EPA established water use intensity baselines for the buildings within the RTP Main Campus. RTP Main Campus' FY 2007 water use intensity baseline is 20.90 gallons per gsf. In FY 2012, water use intensity was down to 9.58 gallons per gsf—a reduction of 54.2 percent compared to the FY 2007 baseline (note that there were no changes in building square feet over this timeframe). Table 3 summarizes the building specific water intensity changes since the baseline water intensity was established in 2007.

Figure 1 provides a graph of RTP Main Campus' water use from FY 2007 through FY 2012.

Table 3. RTP Main Campus Water Intensity

Facility	Gross Square Feet	FY 2007 Intensity (gallons per gsf)	FY 2012 Intensity (gallons per gsf)	Percent Change
Main Building	1,042,611	22.37*	10.69*	- 52.2
NCC	95,322	4.89	3.53	- 27.8
FEELC	25,400	20.44	29.00	+ 41.9
Main Campus Total	1,163,333	20.90	9.58	- 54.2

*Subject to uncertainty because of data scaling and transmission errors in the ION system, subsequently corrected.

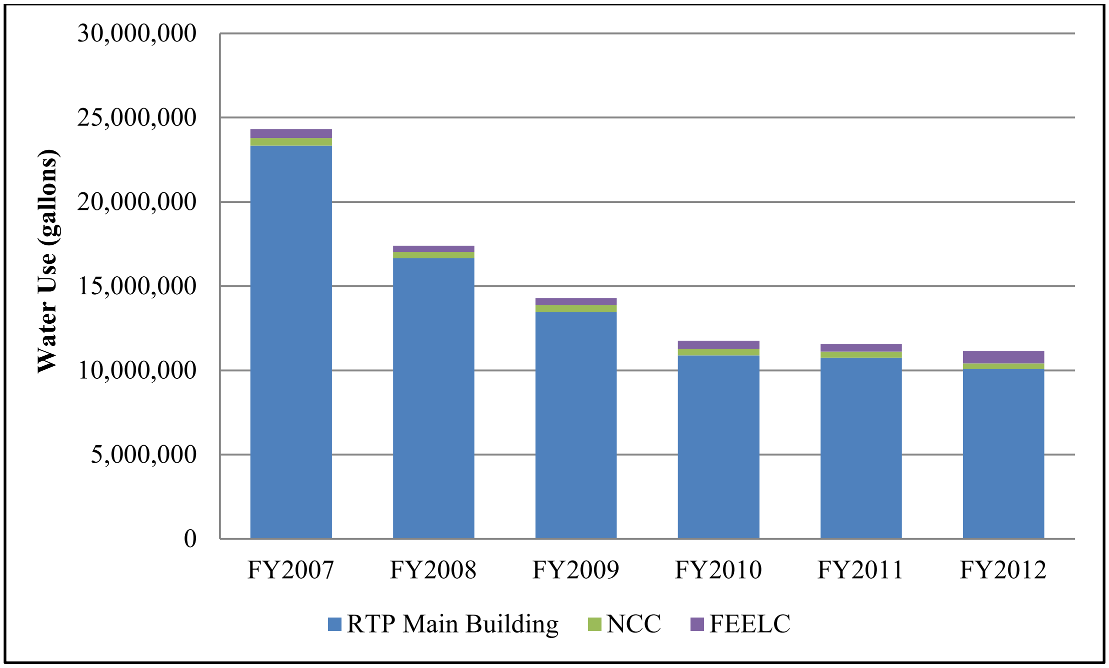

Figure 1. Water Use by Building, RTP Main Campus, FY 2007 Through FY 2012

Per the requirements of EO 13514, the RTP Main Campus' FY 2010 ILA water use baseline is 195,000 gallons per year. In FY 2012, ILA water use was down to 77,000 gallons—a reduction of 60.5 percent compared to the FY 2010 baseline. Figure 2 provides a graph of RTP Main Campus' ILA water use from FY 2010 through FY 2012.

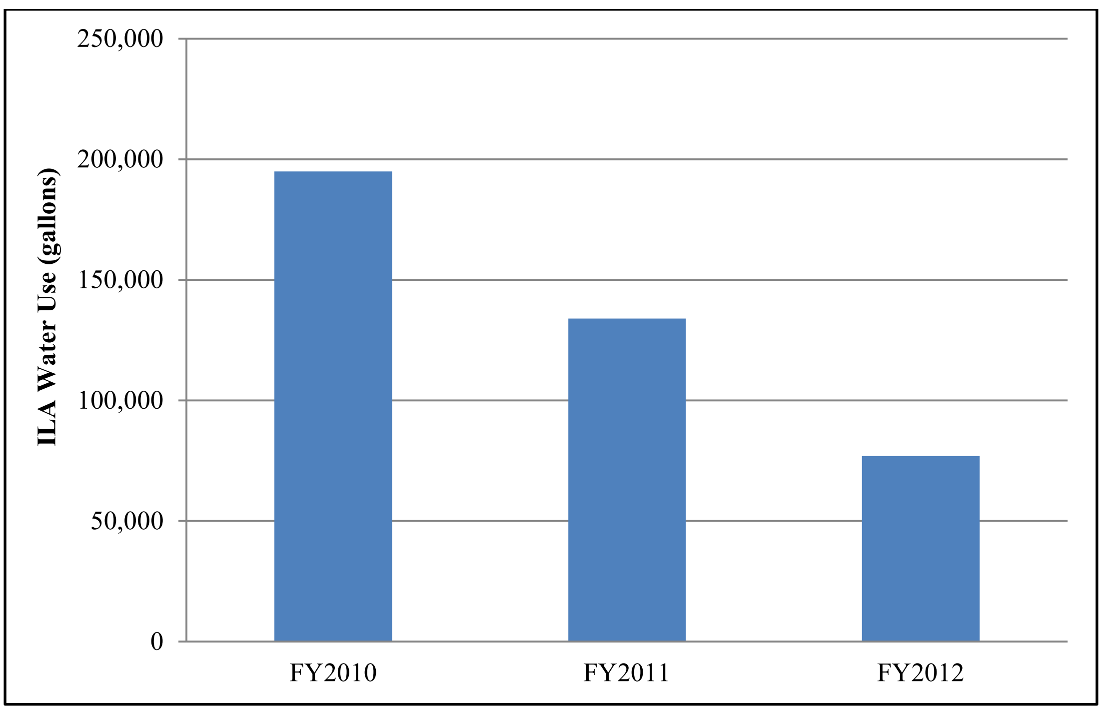

Figure 2. ILA Water Use, RTP Main Campus, FY 2010 Through FY 2012

5.4 End Uses of Potable Water

Table 4 quantifies the major potable water uses in RTP Main Campus, broken out by building. Figure 3 and Figure 4 illustrate the end uses of water for the Main Building and FEELC, respectively. NCC's water use is assumed to be entirely sanitary. The uses are described in more detail below. Potential projects discussed in this section are summarized in Table 1.

Table 4. Major Potable Water Uses, RTP Main Campus, FY 2012

Major Process	FY 2012 Annual Consumption (gallons)	Percent of Total Water Use	Supporting Calculations and Source Documentation
RTP Main Building			
Softened water for boiler make-up and humidification	3,400,000	33.8	Determined based on daily log book readings from the three water softener systems kept in the Main Building. Water readings were read from May 2012 to May 2013 to provide a year's estimate for water use associated with the boiler make-up water.
Sanitary water	2,800,000	27.8	Assume 6 gallons per person per day, informed by NCC per person water use. Since fixtures are similar to those at the Main Building, sanitary use is expected to be proportional to the employee count. There are approximately 1,849 employees working in the Main Building (Buildings A through E) and 250 working days per year. = 6.0 gallons/person/day x 1,849 people x 250 days/year
Building A, cage-and-rack washing	1,800,000	17.9	Engineering estimate based on pattern analysis performed on water meter data for the month of February 2013. Based on this analysis, it is estimated that the Building A cage-and-rack washers use approximately 23 gpm. The cage-and-rack washers are used approximately 5 hours per day for all operating days (260 days). = 23 gpm * 60 minutes/hour * 5 hours/day * 260 days/year
Building A, animal watering daily flush	800,000	7.9	Laboratory personnel estimate daily animal watering flush is for 6 minutes per day with 3.0 gpm used. There are 118 animal watering units. = 6 minutes/day * 3.0 gpm * 118 units * 365 days/year
High Bay cooling tower blowdown and splashout	500,000	5.0	Engineering estimate. Assumed 1.0 gpm is lost via blowdown and splashout. =1.0 gpm * 60 minute/hour * 24 hours/day * 365 days/year
Vacuum pump seal water	340,000	3.4	Based on flow measurements taken from all three pumps, the overall average constant flow was calculated to be approximately 0.65 gpm. = 0.65 gpm * 60 minute/hour * 24 hours/day * 365 days/year
Miscellaneous laboratory use	220,021	2.2	Calculated by difference from the FY 2012 metered total and the other metered/estimated water uses.

Table 4. Major Potable Water Uses, RTP Main Campus, FY 2012

Major Process	FY 2012 Annual Consumption (gallons)	Percent of Total Water Use	Supporting Calculations and Source Documentation
Steam sterilizer tempering water, Room A580	150,000	1.5	Steam sterilizer in Room A580 had a constant flow of tempering water at about 0.5 gpm. According to O&M staff, the sterilizer program cycle is set to start at 6:00 a.m. and shut off at 8:00 p.m. (approximately). = One sterilizer * 0.5 gpm * 60 minutes/hour * 14 hours/day * 365 days
Cafeteria dishwashing and PRSV use	60,000	0.6	Engineering estimate based on equipment information and assumptions. In the cafeteria, there are three PRSVs rated at 1.42 gpm. Employees in the cafeteria estimated that the three PRSVs are used for 2 hours per day, serving breakfast and lunch. Assume 250 working days per year. PRSV water use: = 1.42 gpm * 60 minutes/hour * 2 hours/day * 250 days/year An ENERGY STAR qualified single-tank, conveyor-type dishwasher (Hobart Model# CLPS86e) uses 0.39 gallons per rack. The ENERGY STAR Commercial Kitchen Equipment Calculator assumes a single-tank, conveyor-type machine runs approximately 400 racks per day. Because the cafeteria does not serve dinner, this number was cut in half. Dishwasher water use: = 0.39 gallons/rack * 200 racks/day * 250 days/year Total water use for dishwashing:= 42,600 gallons/year + 19,500 gallons/year = 62,100 gallons/year
RTP Main Total	**10,070,021***		**Metered total for FY 2012.**
National Computer Center (NCC)			
Direct meter (primarily sanitary)	336,902	100	Metered total for FY 2012. Water use at the NCC is almost entirely sanitary use.
NCC Total	**336,902**		**Metered total for FY 2012.**
First Environments Early Learning Center (FEELC)			
Sanitary use and garden watering	637,500	86.6	Calculated by difference from the sum of building metered totals and the other estimated and metered water uses.
Laundry	68,000	9.2	Based on input from the staff, the washers are run for a total of 12 loads per day. Washers are ENERGY STAR qualified models from GE (Model # WCVH6400JWW), which have a capacity of 3.8 cubic feet. = 12 load/day * 250 days/year * 3.8 ft^3/load * 6 gallons/ft^3

Table 4. Major Potable Water Uses, RTP Main Campus, FY 2012

Major Process	FY 2012 Annual Consumption (gallons)	Percent of Total Water Use	Supporting Calculations and Source Documentation
Kitchen dishwashing and PRSV use	31,000	4.2	Engineering estimate based on equipment information and assumptions. FEELC uses one PRSV rated at 1.6 gpm. An employee in the kitchen estimated that the PRSV was used for an estimated total 1 hour per day. Assume 250 working days per year. PRSV water use: = 1.6 gpm * 60 minutes/hour * 1 hours/day x 250 days/year In addition, there was an ENERGY STAR qualified front-loading dishwasher in the kitchen (Hobart Model# LXIH), which uses 0.740 gallons per rack. The employee in the kitchen estimated approximately 36 loads were run per day. Dishwasher use: = 0.740 gallons/rack * 36 racks/day * 250 days/year Total water use for dishwashing: = 24,000 gallons/year + 6,660 gallons/year = 30,660 gallons/year
FEELC Total	**736,500**		**Metered total for FY 2012.**
Total Water Use	**11,143,423**		**Sum of all building FY 2012 metered totals.**

* Total RTP main building water use quantity is subject to uncertainty because of data scaling and transmission errors in the ION system, subsequently corrected.

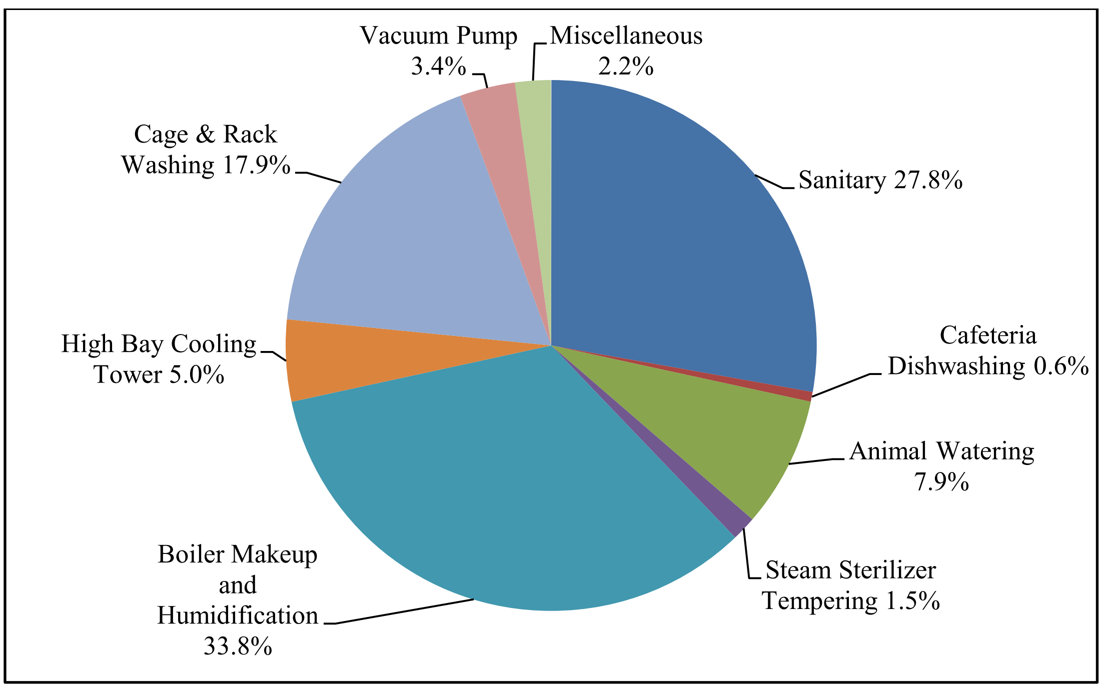

Figure 3. Percentage of Potable Water End Uses, RTP Main Building, FY 2012

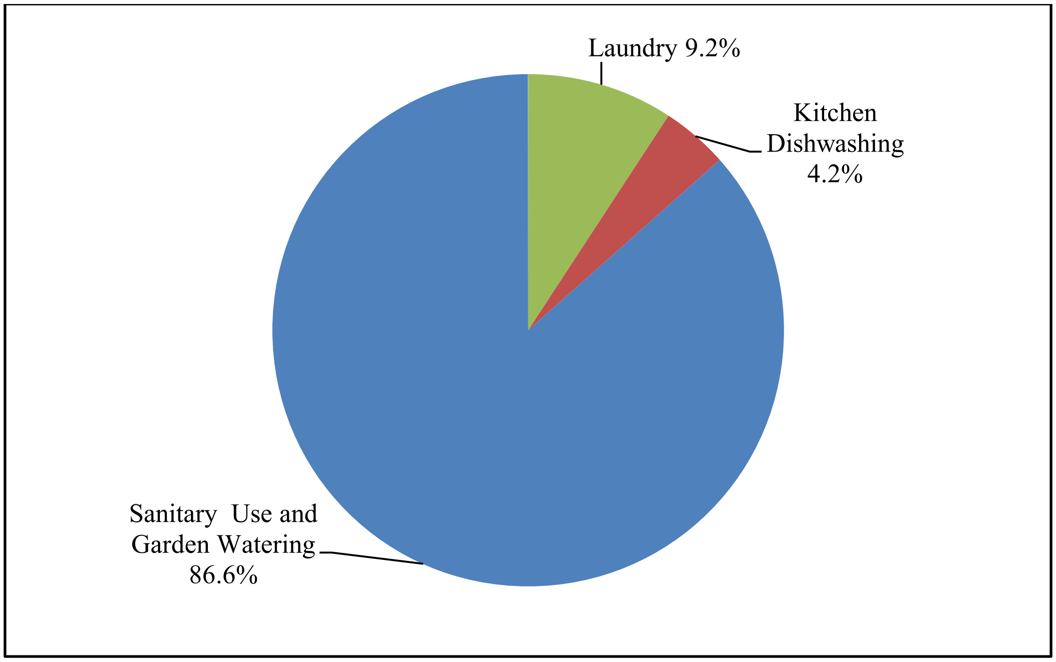

Figure 4. Percentage of Potable Water End Uses, FEELC, FY 2012

Steam Boilers and Humidification

HTHW is used to generate 70-pound process steam in two steam generators located in Building D. This process steam is used in the High Bay, animal rooms, cage-and-rack washers, and steam sterilizers. Process steam condensate is captured and returned to the boilers via a deaerator tank. The steam generators are blown down manually two times per day, with several short bottom blows of 5 to 10 seconds each. The boiler blowdown is routed to a flash tank, equipped with a temperature-activated tempering water flow. Tempered blowdown flows to drain. Softened water is used to supply the steam generators with make-up water.

A gas-fired steam boiler is maintained in standby mode in Building A, ready to supply process steam in back-up capacity if the HTHW system is not operational. Steam condensate from this boiler is also recovered. Softened water is used to supply steam boiler make-up.

Clean steam is generated in the Building B penthouse, used for direct injection humidification in the seven Building A air handlers. The clean steam generators are supplied with deionized water generated through a reverse osmosis process. Excess condensate from the injection system in each air handler is routed through a condensate cooler, equipped with a temperature activated cooling water flow (softened water is used for tempering). Cooled condensate flows to drain. Periodic blowdown from the steam generator is routed to a flash tank, equipped with a temperature activated tempering water flow. Tempered blowdown flows to drain.

Routine preventive maintenance of steam traps and other components of the condensate recovery system will continue. In addition, routine inspection and maintenance of the temperature-activated tempering water flows to the boiler blowdown coolers in the Building D basement (Room D-175) and Building B penthouse will continue, to ensure that tempering water only flows when blowdown is occurring.

HTHW is supplied to heat exchangers to make 170°F water for building heat and domestic hot water. No condensate is generated from these operations.

Humidification is provided in A Building to maintain between 40 and 60 percent relative humidity in the animal rooms. Humidification is provided by directly injecting steam from a clean steam boiler into the Building A air handlers. Clean steam is provided by a steam boiler supplied by a skid-mounted RO system. RO reject water is routed through the clean steam generator blowdown flash tank, to provide some residual cooling on its way to the drain. A second RO system is available in the Building D/E penthouse, to provide direct injection humidification for Buildings D and E; however, this system is typically not used.

Sanitary Fixtures

Toilets and urinals throughout RTP Main Campus are compliant with 1992 Energy Policy Act (EPAct) water efficiency requirements (1.6 gpf for toilets and 1.0 gpf for urinals). In addition, non-water-using urinals have been installed in high traffic location on the ground floor of Building C, and the sixth floor of Building C. An inventory of toilet and urinal fixtures is provided in Table 5.

Table 5. RTP Main Campus Inventory of Sanitary Fixtures

Fixture Type	Flow Rate	Main Building	NCC	FEELC	New A Office Building
Toilets	1.6 gpf	217	24	28	-
	1.28 gpf	-	-	-	9
Urinals	1.0 gpf	58	5	-	-
	Non-water	7	-	-	3
Lavatory Faucets	0.5 gpm	191	22	2	6
	1.5 or 2.2 gpm	-	-	22	-
Showers	2.5 gpm	13	2	3	-

To reduce water use in the restrooms, EPA could replace existing urinal diaphragm inserts rated at 1.0 gpf with inserts rated at 0.5 gpf. A pilot project can be implemented in a limited area to determine the effect this change may have on plumbing fixture and drainline performance. If no performance concerns arise during the pilot testing, all existing urinal inserts could be replaced with 0.5 gpf. This project could save an estimated 290,000 gallons of water per year.

Faucets are also compliant with 1992 EPAct water efficiency requirements (2.2 gpm for faucets). An inventory of faucets is provided in Table 5. However, the American Society of Mechanical Engineers (ASME) has established a standard 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. The lavatory faucets in the Main Building and NCC have a flow rate of 0.5 gpm. The lavatory faucets at FEELC mainly have flows of 1.5 gpm; however, there were a few faucets with aerators allowing flows of 2.2 gpm and 0.5 gpm. All restroom faucets with aerators allowing flows greater than 0.5 gpm could be replaced with aerators having a maximum flow rate of 0.5 gpm. Diaper changing stations and craft sinks were not included in this inventory.[2]

There are 18 showerheads at RTP Main Campus that currently flow at 2.5 gpm. Showerheads could be replaced with WaterSense labeled models that flow at 1.5 gpm.

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

Cage-and-Rack Washing and Animal Watering

Building A houses a vivarium animal care operation. Animal cages are washed in two Basil 6000 tunnel washers. Racks are washed in two Basil 4600 walk-in rack washers. Under this plan, the operating schedule and operating sequence of the washers will be optimized to minimize the consumption of water. A second significant use of water associated with the animal care operation is the twice per day purge of the animal watering system. The system is purged to ensure that stagnant water does not accumulate in the system.

Cooling Towers

The High Bay is equipped with two, two-cell cooling towers, in parallel, to cool a process water loop for experimental equipment. One of the cooling towers is in service and the other is in standby. Each cooling tower is equipped with a conductivity controller to control blowdown. However, the control systems are not used; instead, a continuous bleed from the tower in service is maintained by opening the drain line valve. This approach causes the towers to operate at less than two cycles of concentration, which is not efficient water use. In addition, the towers are not maintained regularly. In order to save additional water, EPA could consider substantially upgrading tower operation, or relying on an alternate source for process cooling water in the High Bay. Improved operations would include adoption of a water chemistry monitoring protocol, which would include use of the conductivity controller to control cooling tower blowdown. For a more long term water savings solution, the cooling tower within the High Bay could be replaced with a heat exchange system tied into the Main Building chilled water loop. This would save approximately 500,000 gallons of water per year.

All other chilled water needs in the Main Building and NCC are supplied from the federal complex chilled water loop, which originates at the CUP that is operated by NIH.

Vacuum Pumps

Central laboratory vacuuming is provided by three liquid ring vacuum pumps operated in parallel. On each pump, seal water is recirculated through a tank and heat exchanger. The heat exchanger is cooled with process chilled water to prevent excess heat build-up. Make-up water is periodically added to each recirculation tank through a solenoid valve activated using an automatic timer, to make-up for any water lost in the vacuum discharge, and to maintain water quality. This control timer sequence was adjusted in November 2007 to minimize water use by reducing the water supply by two thirds.

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[2] Diaper changing station sinks and craft sinks were not included in this inventory due to the potential advantages of allowing a higher flow rate for cleaning activities.

Miscellaneous Laboratory Water

Water is used within individual laboratories for bench scale experiments and glassware washing during everyday operations. To optimize water efficiency, laboratory glassware washers should only be run when they are full.

Steam Sterilizers

Seven steam sterilizers are located throughout the Main Building, as indicated in Table 6. In room A580, as indicated in the table, condensate tempering water flows continuously, even when the sterilizer is not operating.

Water use reductions can be achieved by equipping the sterilizer in room A580 with a tempering water valve that only provides tempering water when hot condensate is flowing to the drain.

Table 6. RTP Main Campus Steam Sterilizers

Room	Model	Continuous Water Flow (approximate rate)
E386	Amsco Century (SV-120)	No
A390E	Steris Eagle 3012	No
A490E	Steris Eagle 3012	No
A580	Amsco Steris 3000SL	Yes–0.5 gpm
B478A	Amsco Evolution L (LV669-430)	No
B367	Amsco Evolution L (LV669-430)	No
B367	Amsco Evolution L (LV669-430)	No

Laundry

FEELC is furnished with two recently purchased ENERGY STAR clothes washers made by GE. The washers are used to clean cloths, towels, and bedding. Washers are run approximately twelve times per day.

Commercial Dishwashing

A full service cafeteria in Building C serves approximately 800 meals per day. Tableware is washed in an ENERGY STAR tunnel washer; the washer is configured to recycle wash water and use fresh water only for final rinsing. Pots and other large items are washed at three pot washing sinks, each equipped with a kitchen faucet and a PRSV. The PRSVs are equipped with nozzles rated at 1.42 gpm.

FEELC is equipped with a kitchen used to prepare lunchtime meals and snacks. Water using equipment includes a pot washing sink and an automatic dishwasher. The dishwasher was recently replaced with an ENERGY STAR qualified front-loading model. It is typically run only under full-load conditions. The PRSV is equipped with a high-efficiency nozzle rated at 1.42 gpm and is used for approximately 1 hour per day.

To improve water efficiency in the kitchen areas of the RTP Main Campus, EPA could consider replacing existing PRSVs with models flowing at 1.0 gpm.

Garden Watering

FEELC currently maintains an expansive vegetable garden that is an integral part of the learning environmental. To provide irrigation for the garden, two 1,550-gallon cisterns and three 75-gallon rain barrels were installed to collect and store rainwater dispersed from the roof. While the rainwater capture occurring at the FEELC does provide significant amounts of water for irrigation of the vegetable garden, supplemental potable water is used periodically as needed to maintain the garden's viability. Under this plan, EPA will further characterize the portion of potable water use at FEELC used for garden irrigation by installing a temporary meter for one growing season on the connection between the potable water supply and the irrigation system.

If EPA implements an existing proposed design to add gutters to the building, it would provide the opportunity to increase rainwater collection from a greater portion of the FEELC roof surface area, thereby reducing potable water used for irrigation.

Alternate Water Sources

The Main Building currently has an air handler condensate collection system in place, collecting condensate from air handlers within Buildings A, B, D, and E. The system was designed to supply the CUP with cooling tower makeup water; however, NIH has elected not to use this water.

As part of this Water Management Plan, potential uses within the RTP Main Campus were evaluated. During this assessment, the most viable option for condensate use was determined to be boiler blowdown water. Unfortunately, the effectiveness of this reuse is hampered because condensate is typically generated in the hot, humid summer months, when demand for boiler makeup water is low. However, supply and demand have the potential to coincide during spring and fall months, when temperatures and humidity tend to fluctuate. If this project is implemented for both the two steam generators located in Building D and the back-up steam boiler in Building A, approximately 750,000 gallons of condensate could be reused, accounting for approximately 22 percent of the RTP Main Campus' annual boiler blowdown consumption.

Hydrant Testing

Water is used for periodic fire hydrant testing. This water comes from the main potable water supply loop feeding the EPA-NIH campus and is not included in the metered building water totals provided in Table 4.

5.5 <u>End Uses of ILA Water</u>

ILA water use at the RTP Main Campus is limited to landscape irrigation. In FY 2012, the RTP Main Campus used 77,000 gallons of water, all withdrawn from the on campus reservoir.

Irrigation

The complex was designed to have minimal impact on the native woodland landscape. Those areas that were impacted by site development are landscaped with native or drought-tolerant plants, and no irrigation is required. Therefore, no potable water is currently used for landscaping irrigation. On occasion, when spot watering is required for newly planted trees or shrubs, or if there is risk of losing existing landscaping due to drought, water is transported in a small tank carrier from the nearby lake and applied via hand watering by a landscaping contractor.

The facility is equipped with a landscape irrigation system that is not currently used. The system consists of 4-inch distribution mains that run along one side of four of the campus roadways, fed from the 14-inch potable water main from two points. The 4-inch mains feed approximately 120 quick connect valves spaced approximately every 150 feet along the shoulders of both sides of the roads. The system is designed to supply up to 10 quick connect valves at a time for manual watering. Because of the dispersed nature of the system, it presents a high risk for developing leaks. This system is currently not in service and the system isolation valves should remain closed. If this system is used in the future full leak testing will be required and the 4-inch distribution mains should be equipped with totalizing flow meters. If used, these meters should be monitored at least monthly to track irrigation water use and check for leaks.

6.0 DROUGHT CONTINGENCY PLAN

Information on drought restrictions can be found on the City of Durham, North Carolina, water management website at:
http://durhamnc.gov/ich/op/dwm/Documents/Conservation%20PDF'S/Water%20Ordinance.pdf.

The ordinance establishes year round requirements, as well as four levels of water shortage response. Year round, baseline requirements include constraints on spray irrigation, a requirement to fix leaks within 30 days, and a prohibition on hydrant water use for other than fire suppression or hydrant testing. EPA RTP is compliant with these requirements. Further applicable requirements related to increasing levels of water shortage are summarized below.

- Stage 1 Water Shortage – users of more than 100,000 gallons a day (36.5 million gallons per year) shall attempt to reduce water consumption by 15 percent and shall document such efforts.

- Stage 2 Water Shortage – users of more than 100,000 gallons a day shall attempt to reduce water consumption from pre-declaration consumption by 30 percent and shall document such efforts.

- Stage 3 Water Shortage – the use of water for heating and/or cooling purposes shall be reduced in all but the most essential facilities to the extent practical in consideration of indoor air quality standards, weather conditions, and health and safety requirements. Users of more than 100,000 gallons a day shall attempt to reduce water consumption from pre-declaration consumption by 50 percent and shall document such efforts.

- Stage 4 Water Shortage – water uses will be limited to those necessary to meet minimum health and safety needs as determined by the city manager. Water service may be discontinued or reduced to designated users to preserve the availability of water for essential public health and safety requirements.

Under this and previous water management plans, EPA RTP has reduced its water use by over 50 percent compared to a 2007 baseline (see Figure 1). While EPA's direct water use is under the 100,000 gallon per day threshold discussed above, the water supplied to the combined EPA and NIH campus exceeds this threshold.

Under this plan, EPA will engage with the City of Durham to discuss whether this plan and existing conservation measures already taken satisfy the City's water conservation planning requirements.