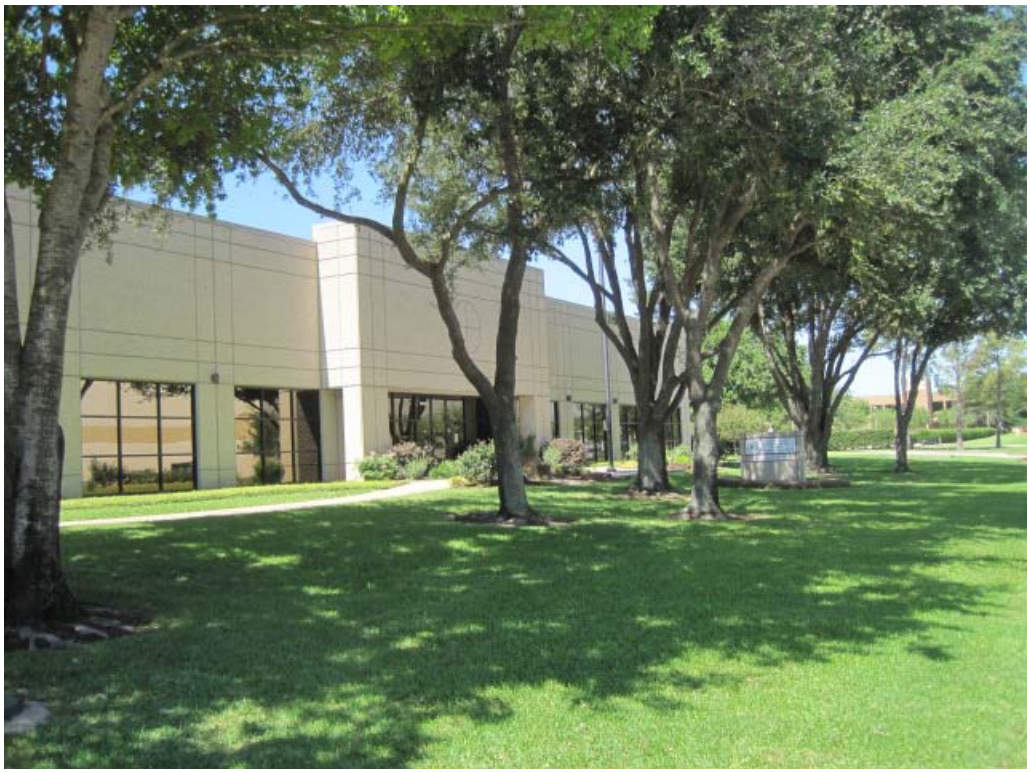
Water Management Plan

Revision 1

United States Environmental Protection Agency
Region 6 Environmental Services Branch

Houston Laboratory
10625 Fallstone Road
Houston, Texas 77099



December 15, 2011

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EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 6 ENVIRONMENTAL SERVICES BRANCH
HOUSTON LABORATORY
HOUSTON, TEXAS

WATER MANAGEMENT PLAN, REVISION 1

Approved by:

Mr. Stephen Reese, Facilities Manager — Date: 10/20/2011

Mr. David Neleigh, Director — Date: 10/21/2011

Mr. Nghia Nguyen, EMS Coordinator — Date: 10/21/2011

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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 Region 6 Environmental Services Branch (ESB) Laboratory in Houston, Texas. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines.

2.0 FACILITY DESCRIPTION

The Houston laboratory is staffed by ESB, which is part of Region 6's Management Division. ESB provides scientific and laboratory analytical support to Region 6 programs. It provides quality-assured analytical support using state-of-the-art techniques and methodology for organic, inorganic, and biological analyses. ESB also performs technical audits of environmental monitoring laboratories and public water supply laboratories, and manages the regional contract laboratory program, including sample scheduling, sample routing, and data verification, validation, and usability. Other Region 6 functions located at the laboratory include an enforcement and compliance assurance surveillance team, an air monitoring coordinator, and Superfund Division on-scene coordinators.

The laboratory is housed in a leased facility, completed and first occupied by EPA in 1990. The 20-year lease expired in 2010, and EPA signed a five-year lease extension through the U.S. General Services Administration to remain in the building through 2015. The facility is owned by DC Investments, and managed by Dienna Nelson Augustine Company. Located in a light industrial development, it consists of a 3.43-acre parcel with a single-story laboratory building containing 39,408 square feet of conditioned space. A chemical storage building on the south side of the laboratory contains 1,108 square feet conditioned space, for a total 40,516 square feet.

3.0 FACILITY WATER MANAGEMENT GOALS

The Houston laboratory achieves its resource conservation goals by implementing a facility-specific Environmental Management System (EMS) program. The Water Conservation Environmental Management Program (EMP) within the EMS sets objectives and targets related to water use.

The primary objectives of the October 2010 Water Conservation EMP are to reduce water use intensity by 2 percent per year compared to a fiscal year (FY) 2007 baseline, establish laboratory procedures to ensure that lab equipment is operated in a manner that minimizes water consumption, and increase employee awareness and involvement regarding policies and procedures used to optimize the use of water. Targets established under these objectives call for:

- Establishing a mechanism for reviewing water consumption in conjunction with changes to heating, ventilation, and air conditioning (HVAC) management.

- Implementing routine laboratory operations to ensure that the least water-intensive approach is used to accomplish the task at hand. Examples include using solid phase extraction and/or accelerated one-step liquid-liquid sample preparation techniques when possible.

- Ensuring that standard operating procedures exist that specify how to use autoclaves, deionization (DI) water system, and other laboratory equipment with minimal water consumption.

- Maintaining and promoting awareness and involvement from field operations staff regarding the impacts related to water consumption through annual reports, staff meetings, email, and posting information.

- Reducing water used for irrigation and lawn maintenance.

The EMP also states some of the Houston laboratory's achievements related to water conservation, including installing flow-restrictive aerators on faucets used for hand washing and installing a rain sensor on the irrigation system.

Although not expressly stated in the EMP, the Houston laboratory has a goal of achieving a 26 percent potable water reduction by the end of 2020, compared to a 2007 baseline.

The Houston laboratory's FY 2007 potable water intensity baseline is 80.68 gallons per gross square foot.

To continue progress toward meeting federal requirements and EMS goals, the Houston laboratory will implement site-specific water conservation projects geared toward achieving the facility ConservW target (set annually by EPA's Sustainable Facilities Practices Branch). In addition, the Houston laboratory will plot water use data, including readings from submeters located at various end-use locations within the facility, and evaluate trends in water consumption and savings to ensure that goals are met.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service are provided by:

City of Houston
Public Works and Engineering Department
4200 Leland
Houston, TX 77023
713-371-1400

Water Rate Schedule

The Houston laboratory is billed for water use associated with a 2-inch irrigation meter that services lawn irrigation needs and a 3-inch commercial meter that provides all other facility water needs. As of April 1, 2011, water rates for each meter type are as follows:

- The irrigation meter carries a flat fee of $105.19 per month, and water use is billed at $2.65 per 1,000 gallons up to 16,000 gallons, and $6.12 per 1,000 gallons for all uses over 16,000 gallons.

- The commercial meter carries a flat fee of $26.86 per month and water use is billed at $3.62 per 1,000 gallons of water used.

- In addition, the Houston laboratory pays a monthly fee of $10.14 for fire water service.

Sewer Rate Structure

Sewer service is billed based on water use from the commercial meter only. As of April 1, 2011, sewer service carries a flat fee of $18.36 and is billed at $5.13 per 1,000 gallons. The facility receives a sewer use credit for water evaporated from the cooling tower; sewer charges are not applied to this water. The evaporated quantity is calculated as the difference between the cooling tower make-up quantity and blow-down quantity. Cooling tower make-up and blow-down quantities are metered, and the building engineer provides monthly readings to the Houston Public Works and Engineering Department.

Payment Office

Research Triangle Park Finance Center (RTP-FC)

(Pouch and Regular Mail)
Environmental Protection Agency
Mail Code D143-02
Research Triangle Park, NC 27711

(FEDEX)
Environmental Protection Agency
Mail Code D143-02
4930 Page Road
Research Triangle Park, NC 27711

The fax number for RTP-FC is 919-541-4975. The point of contact is Kim Poteat (919-541-1468).

5.0 FACILITY WATER USE INFORMATION

The Region 6 Laboratory contains a mixed use of office and laboratory space. Offices occupy approximately 40 percent of the building and laboratories the remaining 60 percent. The laboratory space is configured to conduct bench-scale analyses of environmental samples for organic, inorganic, and biological constituents. The facility uses water for landscape irrigation, mechanical systems, sanitary needs, and laboratory processes. The following sections provide additional details on facility water use.

Potable Water Use

Average potable water use in FY 2010 by major process is shown in Table 1.

Table 1. Major Potable Water Using Processes, Houston Laboratory

Major Process	FY 2010 Annual Consumption (gallons)	Percent of Total Houston Laboratory Water Use	Supporting Calculations and Source Documentation
Irrigation	636,000	17.1	Metered total from account #2078-9036.
Cooling tower make-up water	2,889,600	77.7	Metered total from readings taken on 10/6/2009 and 10/8/2010. 22,656,800 gallons (reading on 10/8/2010) - 19,767,200 gallons (reading on 10/6/2009) = 2,889,600 gallons / year.
Centralized DI water system	6,330	0.2	Metered total from readings taken on 11/18/2009 and 11/16/2010. 510,293 gallons (reading on 11/16/2010) - 503,963 gallons (reading on 11/18/2009) = 6,330 gallons / year.
Sanitary and miscellaneous laboratory use (steam sterilizers, glassware washers, water softeners, etc.)	189,070	5.1	Calculated by difference from the other water uses.
Total Water Use	**3,721,000**	**100.0**	**FY 2010 metered total.**

Appendix A provides estimated monthly total water use in FY 2010 and a historical water use trend from FY 2007 through the middle of FY 2011.

Industrial, Landscaping, and Agricultural Water Use

The Houston laboratory does not use any non-potable water for ILA purposes.

Measurement Devices

Incoming city water is supplied through two separate meters. The "Lawn Meter" (account number 4327-2078-9036) measures water supplied for outdoor irrigation. The "Commercial" meter (account number 4327-0780-2026) measures all other water supplied for facility use. Both meters are located in meter boxes in the front lawn of the facility.

Flow totalizing meters are also installed on the make-up water lines to the heating water and cooling water recycle loops and the cooling tower make-up and blow-down lines. Totals from these meters are recorded monthly by the building engineer. Unexpected changes in any of these usage rates are investigated and resolved. A flow totalizer is also installed on the air handler condensate recovery system; under this plan, the building engineer will record totals from this meter each month. A water meter is installed on the DI water supply system, and water usage is recorded in a DI system log whenever maintenance is performed on the DI system.

Under this plan, the facilities manager will track water use from all meters and submeters. The facilities manager will evaluate water use trends, and unanticipated usage trends will be investigated and resolved.

Shut-off Valves

The shut-off valve for the commercial building water supply is located in the mechanical room, room 224. The shut-off for the irrigation system is located in the below grade meter box.

Occupancy and Operating Schedules

The Houston laboratory is occupied by approximately 60 personnel. Typical operating hours are from 6:30 a.m. to 6:30 p.m. Monday through Friday, with occasional use during nights and weekends.

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 potable 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. It also calls for reducing ILA water use (including non-potable water use) by 2 percent annually through the end of FY 2020, for a total reduction of 20 percent. Facilities should implement best management practices (BMPs) related to water use, taking life-cycle cost-effectiveness into consideration, to achieve these water reduction goals. FEMP has identified BMPs in 14 areas to help facilities identify and target water use reductions. The Houston laboratory has adopted BMPs in nine of the areas, designated by checkmarks in the list below. Two other areas are deemed inapplicable for the Houston laboratory, designated by "NA" in the list below. The status of each BMP at the Houston laboratory 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
☑ Other Water Use
☑ Alternate Water Sources

Information and Education Programs

All staff members are required to take EMS awareness training twice annually. Water conservation goals, as defined within the annually updated Water Conservation EMP, are covered during the training. Periodically, an EMS newsletter or other email communication is sent out to staff and pertinent water conservation updates are included. In addition, any pertinent communication regarding water use is announced at weekly staff meetings.

Signs are posted to remind facility staff to shut off the faucet after to use and to conserve water in general. A phone number is listed on the signs for facility staff to call if they detect a leak.

In association with Earth Day, facility staff conduct outreach events at local schools to educate students on the water cycle. Students are taught about runoff, water pollution, and stormwater management.

The Houston laboratory 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 directly to the building engineer, and he addresses any reported problems immediately. In addition, the building engineer visually inspects the building mechanical room and corridors each day.

A screening-level system review was conducted in April 2011. Known water uses account for over 90 percent of water consumption.

Under this plan, the facilities manager will monitor trends in monthly water use for all available meters and submeters. Changes that are not understood or expected will be investigated and resolved.

The Houston laboratory has achieved BMP status in this area.

Water-Efficient Landscaping

The Houston laboratory maintains 1.15 acres of irrigated landscape, primarily covered with St. Augustine grass. Planted beds of Asian jasmine and other ground cover are used to landscape the front and sides of the building. Wildflowers and natural grass are being introduced in the back of the facility and will survive on limited irrigation once they are established.

BMP credit is not claimed in this area at this time. BMP status can be achieved by installing a landscape that can survive on limited to no supplemental irrigation.

Water-Efficient Irrigation

In 2008, a WaterSense® irrigation partner audited the Houston laboratory's irrigation system. Using the audit's findings, the Houston laboratory hired an irrigation contractor to design a new, water-efficient irrigation system and control scheme. The new system, installed during the summer of 2011, includes nine separate watering zones. The system includes the following water-efficient features:

- Matched precipitation nozzles and multi-spray, multi-trajectory rotary nozzles, which provide for more uniform water distribution which reduces that need for over-watering to meet plant needs.

- Raised head which were sunken, re-spaced heads where necessary, and additional heads where necessary, all of which provide better coverage and distribution uniformity.

- A drip irrigation zone on plant beds in the front of the facility to apply water directly to the roots and eliminate drift loss.

- A weather-based irrigation controller, which will adjust the irrigation schedule by accounting for rain, wind, and other weather factors. The controller is equipped with a rain sensor and a flow sensor to discontinue irrigation during rain events or when there is unauthorized flow, respectively.

The Houston laboratory has achieved BMP status in this area. To further reduce irrigation water use, the Houston laboratory could consider discontinuing supplemental water use in zone 8, the back lawn, once recently-planted native grasses and wildflowers are established.

Toilets and Urinals

One toilet is compliant with 1992 Energy Policy Act (EPAct 1992) water efficiency requirements (1.6 gallons per flush [gpf]), but the rest are older, higher-flush-volume models. All of the urinals flush at volumes higher than the EPAct 1992 requirement for urinals of 1.0 gpf. Table 2 provides an inventory of sanitary fixtures.

Table 2. Houston Laboratory Inventory of Sanitary Fixtures

Fixture Type	Flow Rate	Total Number
Toilets	4.5 gpf	9
	1.6 gpf	1
Urinals	1.5 gpf	3
Lavatory faucets	0.5 gallons per minute (gpm)	11
Showers	Unknown	5

Janitorial staff and employees are trained to report leaks or other maintenance problems directly to the facilities manager. Leaks or other problems are immediately corrected.

To obtain BMP status in this area, the Houston laboratory will consider upgrading toilets to dual-flush models and urinals to WaterSense labeled models that exceed EPAct 1992 requirements.

Faucets and Showerheads

Table 2 provides an inventory of faucets and showerheads installed at the Houston laboratory. Faucet fixtures are water efficient, flowing at 0.5 gpm. This flow rate is lower than the EPAct 1992 standard for faucets and is compliant with the American Society of Mechanical Engineers (ASME) standard for lavatory faucets in public use (captured in ASME A112.18.1). This flow rate is sufficient for hand washing and is considered a best practice for lavatory sinks in public settings.

Older-style showerheads, not marked with a flow rate and likely not compliant with EPAct 1992, are installed in all shower stalls available for use.

System pressure is 40 to 45 psi, within the range required for efficient operation.

Janitorial staff and employees are trained to report leaks or other maintenance problems directly to the facilities manager. Leaks or other problems are immediately corrected.

To obtain BMP status in this area, the Houston laboratory will consider installing WaterSense labeled showerheads to replace the older, higher-flowing models.

Boiler/Steam Systems

Boilers produce recirculating 165 degree Fahrenheit hot water rather than steam. No steam is used for building or domestic hot water heating. BMP status is not applicable in this area.

Single-Pass Cooling Equipment

The facility does not use single-pass cooling. All laboratory equipment cooling needs are supplied by point of use, air-cooled chiller units.

The Houston laboratory has achieved BMP status in this area.

Cooling Tower Management

In January 2011, a new two-cell cooling tower was installed. Each cell has a rated 300 tons of capacity, for a total cooling capacity of 600 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 corrosion. A Sonoxide™ microbiologic control system is used to kill bacteria and algae with ultrasonic waves, so chemical biocide addition is not needed. A conductivity meter set at 2,750 microSiemens per centimeter is used to control blow-down. This set point results in efficient water use, as the facility achieves between four and seven cycles of concentration in the cooling tower.

Cooling tower make-up water and blow-down quantities are metered and recorded monthly by the building engineer. These data are provided to Houston Department of Public Works and Engineering, and the facility receives a sewer use credit for the water consumed by evaporation and, therefore, not sewered. In addition, the Houston laboratory has the ability to use air handler condensate as make-up water to the cooling tower.

The Houston laboratory has achieved BMP status in this area.

Commercial Kitchen Equipment

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

Laboratory/Medical Equipment

Purified water for laboratory use is generated through a multi-step process consisting of DI and multi-media filtration. The system recirculates throughout the laboratories and generates water only when needed.

The Houston laboratory is equipped with automatic glassware washers and one steam sterilizer with a temperature-activated control valve that only allows tempering water to flow when it is operating.

Previously, water was used to dilute acid rinse water prior to discharge. When approximately 50 to 100 gallons of acid rinse water accumulated, it was pumped to a dilution tank where approximately 2,000 gallons of dilution water was added prior to discharge through a lime pit to the sanitary sewer system. The system was recently taken offline.

The Houston laboratory has achieved BMP status in this area.

Other Water Use

The Houston laboratory has two water softeners, which operate alternatively and regenerate every 20,000 gallons. When one softener is regenerating, the other is put in use. Softened water is only provided to end uses as appropriate. For example, it is provided as cooling tower make-up to maintain the tower's water chemistry. It is also provided to eye washes throughout the laboratory.

The Houston laboratory has achieved BMP status in this area.

Alternative Water Sources

The Houston laboratory is equipped with an air handler recovery system, designed and installed by the building engineer. Condensate that forms on coiling coils in the laboratory air handlers flows by gravity to a 300-gallon underground tank outside the building, adjacent to the air handler room. The tank is equipped with low-level and high-level float switches. When the high-level switch is activated, a pump transfer recovered condensate to the cooling tower basin. When the discharge pump is energized, sodium hypochlorite biocide is added to the condensate collection tank through a metering pump. The discharge pump is turned off when the low-level float switch is activated. When the system is operating properly, a meter tracks the amount of air handler condensate supplied to the cooling tower as make-up water.

During the water assessment in April 2011, the system was not operational due to fault with the float switches. As a result, air handler condensate was not being used to offset the potable make-up water in the cooling tower. This system was fixed in August 2011 and is now fully functional.

The Houston laboratory has achieved BMP status in this area.

7.0 DROUGHT CONTINGENCY PLAN

Information on drought and water resource monitoring in Texas can be reviewed on the Texas Commission on Environmental Quality website at: http://www.tceq.texas.gov/response/drought.

In the event of a drought or other water supply shortage, the Houston laboratory will follow the water use recommendations and restrictions of the City of Houston. As required, the building engineer, in consultation with the facilities manager, will implement the facility response to City of Houston water use restrictions.

8.0 COMPREHENSIVE PLANNING

The facilities manager will ensure that 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. The Houston laboratory will also consider these factors before purchasing and installing any equipment that would measurably change facility water consumption. Where available, the Houston laboratory will purchase or specify WaterSense labeled products and use WaterSense irrigation partners (see http://www.epa.gov/watersense for more information about WaterSense).

9.0 GUIDING PRINCIPLES FOR FEDERAL LEADERSHIP IN HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS

The Interagency Sustainability Working Group (ISWG), formed as a subcommittee of the EO 13423 Steering Committee, established the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles)* to assist agencies in meeting the high performance and sustainable buildings goals of EO 13423, section 2(f). The December 1, 2008, version of the ISWG's *Guiding Principles for Sustainable Existing Buildings,* a subset of the *Guiding Principles* targeting existing buildings, established six supporting principles for protecting and conserving water. Table 3 documents the Houston laboratory's progress toward achieving the supporting principles for protecting and conserving water at existing buildings.

Table 3. Status of Guiding Principles to Protect and Conserve Water, Houston Laboratory

Guiding Principles	Houston Laboratory's Status
Indoor Water Two options can be used to measure indoor potable water use performance: • Option 1: Reduce potable water use by 20% compared to a water baseline calculated for the building. The water baseline, for buildings with plumbing fixtures installed in 1994 or later, is 120% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements. The water baseline for plumbing fixtures older than 1994 is 160% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements, or • Option 2: Reduce building measured potable water use by 20% compared to building water use in 2003 or a year thereafter with quality water data.	Based on the plumbing fixtures the Houston laboratory currently has installed, the *Guiding Principles* Indoor Water Option 1 can be calculated. Using this option, the Houston laboratory's potable water use has increased by 32 percent from the baseline. Based on currently available data, the *Guiding Principles* Indoor Water Option 2 can be evaluated for the Houston laboratory. Water consumption data show that the Houston laboratory increased water use intensity by 20.8 percent between FY 2003 and FY 2010.
Outdoor Water Three options can be used to measure outdoor potable water use performance: • Option 1: Reduce potable irrigation water use by 50% compared to conventional methods, or • Option 2: Reduce building related potable irrigation water use by 50% compared to measured irrigation water use in 2003 or a year thereafter with quality water data, or • Option 3: Use no potable irrigation water.	The Houston laboratory installed a new irrigation system for facility grounds based on the recommendations of an irrigation system audit performed in 2008. The irrigation system incorporates an evapotranspiration control system that takes into account local weather, including rain and wind, to turn the system on or off in relation to the underlying base schedule. It also includes water-efficient sprinkler heads and an efficient system design. The Houston laboratory is considering discontinuing supplemental irrigation on the back lawn, where natural grass and wildflowers are being introduced. The Houston laboratory decreased total irrigation water use by 31.3 percent between FY 2003 and FY 2010.
Water Metering The installation of water meters for building sites with significant indoor and outdoor water use is encouraged. If only one meter is installed, reduce potable water use (indoor and outdoor combined) by at least 20% compared to building water use in 2003 or a year thereafter with quality water data.	Two city meters are used to measure potable water for the Houston laboratory and the irrigation system. Additional water meters are installed on process and laboratory equipment, including the make-up water lines on the heating water and cooling water recycle loops, the cooling tower make-up and blow-down lines, the air handler condensate recovery system, and the DI water supply system.

Table 3. Status of Guiding Principles to Protect and Conserve Water, Houston Laboratory

Guiding Principles	Houston Laboratory's Status
Stormwater Management Employ strategies that reduce storm water runoff and discharges of polluted water offsite. Per EISA Section 438, where redevelopment affects site hydrology, use site planning, design, construction, and maintenance strategies to maintain hydrologic conditions during development, or to restore hydrologic conditions following development, to the maximum extent that is technically feasible.	Stormwater at the Houston laboratory flows down roof drains on the side of the building directly into the landscape. The back lawn area is graded to allow for appropriate stormwater infiltration. Curbs are not installed on the hardscape nearby the back lawn to allow for proper drainage into the landscape. The parking lot areas have dedicated drains where stormwater flows. Curb cutting has not been done in the parking lot areas to allow for drainage into the landscape. The Houston laboratory does not collect any stormwater for reuse.
Process Water Per EPAct 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.	The Houston laboratory does not use potable water to improve its energy efficiency at the expense of water efficiency.
Water-efficient Products Where available, use EPA's WaterSense-labeled products or other water conserving products. Choose irrigation contractors who are certified through a WaterSense-labeled program.	Most toilets, all urinals, and all showerheads in the Houston laboratory are older-style fixtures (e.g., 4.5 gpf toilets, 3.0 gpf urinals, and showerheads with unknown flow rates) and have not been updated. The Houston laboratory installed 0.5 gpm faucet aerators throughout the facility and replaced one toilet with a 1.6 gpf fixture. The Water Conservation EMP does not include installing water-efficient products as an objective or target. In FY 2008, a WaterSense irrigation partner conducted an irrigation audit of the Houston laboratory's irrigation system. The recommendations from that audit are being used to update the facility's irrigation system.

10.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

The Houston laboratory is pursuing the following projects to achieve additional reductions in water use:

1) **Repair the air handler condensate recovery system.** In April 2011, the air handler condensate recovery system was not pumping the air handler condensate collected in the 300-gallon storage tank to the cooling tower. The Houston laboratory fixed the system in the August 2011 to allow for 100 percent condensate reuse. An estimated 750,000 gallons per year of condensate will be used to offset the need for potable water make-up, which could save approximately $2,600 per year in water costs.

2) **Install the new irrigation system.** The Houston laboratory worked with Lawn Management Company, Inc. (LMC) to install a new, water-efficient irrigation system. The new system was installed consistent with the base bid design, provided in LMC's detailed optimization plan. After installation and before the end of the contract period with LMC, LMC conducted an irrigation audit of the new system to ensure that it is achieving a distribution uniformity in the lower quarter near 70 percent (the average distribution uniformity was 62 percent). Since the system was installed properly, the Houston laboratory is expected to save approximately 110,000 gallons of water per year with the new system. The irrigation system installation and follow-up audit of the new

system cost $24,000. This will result in a water use cost savings of approximately $700 per year, with a simple payback of approximately 36 years.

3) **Discontinue irrigation on the back lawn (zone 8).** Since native grasses and wildflowers are being introduced to the back lawn and since the back lawn cannot be seen from the street view, once the plantings are established, the Houston laboratory will consider discontinuing supplemental watering of this zone (zone 8). This will save the Houston laboratory an additional 57,000 gallons of water per year, on top of the savings seen from the new system under project 2. This is a no cost project with immediate payback and water use cost savings of approximately $350 per year.

4) **Install WaterSense labeled showerheads.** The Houston laboratory will consider installing WaterSense labeled showerheads in all five shower stalls. WaterSense labeled showerheads cost approximately $50 each, for a total project cost of approximately $250. This project will save the Houston laboratory an estimated 3,000 gallons of water per year and 560 kilowatt hours of electricity per year due to reduced need for water heating. The result will be a total utility cost savings of $100 per year, for a simple payback of approximately three years.

5) **Replace higher-flowing toilets with dual-flush models and retrofit the 1.6 gpf toilet with a dual-flush retrofit kit.** The Houston laboratory will consider replacing toilets with flush volumes of 4.5 gpf with fixtures that have dual-flush handles flushing at 1.6 gpf or 1.1 gpf. Replacing the nine higher-flushing toilets would cost approximately $7,200, and could save approximately 109,000 gallons of water and $950 per year, for a payback period of approximately eight years. In addition, the Houston laboratory will consider installing a dual-flush retrofit kit on the 1.6 gpf flushometer toilet in the containment area. Dual-flush retrofit kits offer 1.6 gpf and 1.1 gpf flushing options. Each retrofit costs approximately $150. Annual savings this retrofit is projected to be 2,300 gallons of water and $20 in water and sewer costs, for a simple payback period of eight years.

6) **Replace urinals with high-efficiency models.** The Houston laboratory will consider replacing all three urinals with WaterSense labeled urinals that use 0.25 gpf or less. Each replacement fixture costs approximately $1,000, for a total project cost of approximately $3,000. Total annual savings from urinal replacements are projected to be 28,000 gallons and $250, resulting in a simple payback of approximately 12 years.

Appendix A

HISTORICAL WATER USE

Table A-1. Monthly Water Use in FY 2010, Houston Laboratory

Month	Commercial Water Use (gallons)	Cooling Tower Water Use (gallons)	Irrigation Water Use (gallons)	Total Water Use (gallons)
October 2009	408,000	210,300	66,000	474,000
November 2009	196,000	123,300	62,000	258,000
December 2009	128,000	66,700	33,000	161,000
January 2010	49,000	79,400	4,000	53,000
February 2010	71,000	47,400	13,000	84,000
March 2010	37,000	114,400	4,000	41,000
April 2010	97,000	262,600	48,000	145,000
May 2010	214,000	372,300	79,000	293,000
June 2010	420,000	474,900	98,000	518,000
July 2010	423,000	355,600	79,000	502,000
August 2010	543,000	490,000	68,000	611,000
September 2010	499,000	292,700	82,000	581,000
Total	**3,085,000**	**2,889,600**	**636,000**	**3,721,000**

Figure A-1. Water Use from FY 2007 through 2nd Quarter FY 2011, Houston Laboratory