Water Management Plan

Revision 1

U.S. Environmental Protection Agency
National Health and Environmental Effects Research Laboratory
Western Ecology Division

Pacific Coastal Ecology Branch
2111 SE Marine Science Drive
Newport, Oregon 97365

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HEALTH AND ENVIRONMENTAL RESEARCH LABORATORY
WESTERN ECOLOGY DIVISION
PACIFIC COASTAL ECOLOGY BRANCH
NEWPORT, OREGON

WATER MANAGEMENT PLAN, REVISION 1

Approved by:

Mr. Primo Knight, Facilities Manager — Date 11-1-11

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TABLE OF CONTENTS

Page

LIST OF TABLES

Page

1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

To meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water resources must be sustainable and renewable. Sound water resource management, which emphasizes wise, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As the country faces increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy. As municipalities and regions deal with chronic drinking water shortages due to drought and changes in climate patterns, water conservation becomes even more important to EPA's mission.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy, and Transportation Management,* and EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance.*

This Water Management Plan has been established to document and promote the efficient use of water at EPA's National Health and Environmental Effects Research Laboratory (NHEERL) within its Office of Research and Development (ORD), at the Pacific Coastal Ecology Branch (PCEB) located in Newport, Oregon. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines.

2.0 FACILITY DESCRIPTION

PCEB is housed in a state-of-the-art laboratory complex on the Hatfield Marine Science Center (HMSC) campus, situated on the shore of Yaquina Bay in Newport, Oregon. The laboratory, owned and operated by EPA, was occupied in 1990 and is designed for marine and estuarine research. PCEB research is focused on the effects of human population-induced stresses on the habitats and species of the estuarine systems of the Pacific Northwest.

Wet labs are available for a variety of experiments, including tests with exotic species and chronic pollutant exposures. Analytical laboratory facilities provide for low-level analysis of organic pollutants, metals, and natural products. The complex includes laboratory and office facilities for PCEB, and a seawater pumping and storage system to supply both PCEB needs and those of the other non-EPA laboratories on the HMSC campus.

The complex occupies approximately 3.2 acres on the east side of the HMSC campus. The laboratory site is made up of approximately one acre of buildings and two acres of grounds. Most of the two acres of grounds is covered with natural vegetation. The main laboratory building has an inner courtyard of approximately 0.2 acres, which is landscaped with native vegetation.

Buildings in the complex consist of the main laboratory building, the seawater reservoir, a highbay building for carpentry and boat repair, and the hazardous waste storage building. Collectively, the buildings contain 38,851 gross square feet (GSF) of conditioned space, with the vast majority contained within the main laboratory building. The main laboratory building is divided into a laboratory wing that makes up about three-quarters of the facility, and an office wing that makes up the remainder.

3.0 FACILITY WATER MANAGEMENT GOALS

As of October 2010, PCEB's resource conservation goals are achieved through the implementation of the ORD-wide Environmental Management System (EMS) program. The Water Management Environmental Management Program (EMP) within ORD's EMS sets objectives and targets related to water use to reduce the facility's impact on natural resources by reducing the consumption of water by facility and laboratory operations and landscaping, industrial, and agricultural (ILA) activities, and by properly managing stormwater runoff.

The primary objective of the Water Management EMP is to improve water use efficiency and stormwater management. Targets established under this objective call for:

- Achieving annual facility-specific goals set by EPA's Sustainable Facilities Practices Branch (SFPB) under its ConservW program (these ConservW goals are calculated for each EPA facility based on the facility's previous water use reduction and its potential identified projects).

- Establishing an ORD fiscal year (FY) 2010 baseline for ILA water use by March 31, 2011.

- Evaluating the potential to improve stormwater management at each ORD facility by September 30, 2011.

Although not expressly stated, ORD's objectives and targets for water management imply a goal of achieving a 26 percent potable water reduction by the end of 2020, compared to a 2007 baseline, and of achieving a 20 percent ILA water reduction by the end of 2020, compared to a 2010 baseline, as set forth in EO 13514.

PCEB's FY 2007 potable water intensity baseline is 9.21 gallons per GSF.

To continue progress toward meeting federal requirements and EMS goals, ORD facilities are to implement site-specific water conservation projects geared towards achieving the facility ConservW target, and to investigate and install corrective actions to maintain cooling towers, restrooms, autoclaves, dishwashers, and other water-using equipment, among other tasks outlined under the Water Management EMP.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service is provided by:

City of Newport
169 SW Coast Hwy
Newport, OR 97365
541-574-0611

Rate Schedule

PCEB has one 4-inch potable water supply meter. Water and sewer use from this meter is billed at a fixed rate of $4.80 per 1,000 gallons of water used. In addition, PCEB is charged $299.20 in fixed fees each month for infrastructure, service, and base rates.

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.

5.0 FACILITY WATER USE INFORMATION

The predominant features of PCEB are the wet laboratory and mesocosm facilities where research is conducted on aquatic species and systems. These facilities are supplied with sea water from Yaquina Bay. The seawater system's 800,000-gallon storage reservoir is filled from two 10-inch diameter supply lines during a three-hour pumping cycle twice each day at high tide, when high salinity ocean water is present at the intake location. The seawater system is used to supply water to PCEB and other non-EPA research facilities on the HMSC campus.

The laboratory is equipped with two temperature-controlled marine phytoplankton culture chambers, and four laboratories are equipped with flow-through seawater systems for culture and experimentation with marine invertebrate (e.g. amphipods and polychaete worms) and vertebrate (fishes) organisms. The experimental chambers can by supplied with both filtered and unfiltered seawater. The seawater also can be tempered with closed loop electric heat pumps.

Seawater used within the laboratory, free from contact with non-indigenous species or chemical contamination, is routed to the seawater drain and returned to the estuary. Seawater contaminated in any fashion by experiments is routed to storage tanks, analyzed, treated as necessary to remove or detoxify contaminants, and then discharged to the City of Newport wastewater treatment facility. Seawater is not a fresh water use, so it is not the subject of this water management plan. Rather, the focus of this plan is on potable water used at PCEB.

Potable water is obtained from the local water utility and used as process water in some of the laboratories (e.g., as source water for purified water supply, glassware washing, or sterilization), equipment cooling, and sanitary supply. In some experimental set-ups, potable water is also combined with seawater to adjust salinity. The facility is also equipped with an irrigation system to water a landscaped central courtyard and another at the entrance to the main laboratory building.

Potable Water Use

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

Table 1. Major Potable Water Using Processes, PCEB

Major Process	FY 2010 Annual Consumption (gallons)	Percent of Total Water Use	Comments
Reverse osmosis (RO) permeate	520	0.2	Engineering estimate
RO reject	1,000	0.4	Engineering estimate
Sanitary	96,000	37.1	Engineering estimate
Miscellaneous process and other laboratory water	161,480	62.3	Calculated as remaining difference from metered total
Total Water Use at WRS	259,000	100.0	Metered

Additional details on assumptions and calculations supporting these water use estimates are provided in Appendix A. Estimated monthly total water use in FY 2010 is provided in Appendix B.

Industrial, Landscaping, and Agricultural Water Use

PCEB does not use any non-potable water for ILA purposes.

Measurement Devices

Incoming city water is metered through a 4-inch supply line.

Supply water to RO systems and permeate water from the RO systems is submetered.

Under this plan, water use on each meter will be recorded monthly. Water use trends will be evaluated by the facilities manager, and unanticipated usage trends will be investigated and resolved.

Shut-off Valves

The city water shut-off valve is located in Mechanical Room S-112.

Occupancy and Operating Schedules

PCEB is occupied by approximately 60 EPA employees and contractors. Typical operating hours are from 7:30 a.m. to 4:30 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 (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 this water reduction goal. FEMP has identified BMPs in 14 areas to help facilities identify and target water use reductions. PCEB has adopted BMPs in 10 of the areas, designated by checkmarks in the list below. Three areas are deemed inapplicable for PCEB, designated by "NA" in the list below. The status of each BMP at WRS 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
NA Cooling Tower Management
NA Commercial Kitchen Equipment
☐ Laboratory/Medical Equipment
☑ Other Water Use
☑ Alternate Water Sources

Information and Education Programs

PCEB currently tracks water use on a monthly basis. All staff members are required to undergo annual EMS awareness training. Water conservation goals, as defined within the annually updated Water Management EMP, are covered during the training.

PCEB promotes water conservation and awareness using the EPA laboratory "Every Drop Counts" water conservation poster series. Conservation posters are displayed in prominent locations within the laboratory.

PCEB has achieved BMP status in this area.

Distribution System Audits, Leak Detection and Repair

Facility staff submit maintenance requests through work order requests that are logged in the existing computerized management maintenance system (CMMS), based out of the Western Ecology Division laboratory in Corvallis, Oregon. The requests go to the facilities manager for approval before being directed to the operation and maintenance (O&M) contractor. Work order requests cover a broad range of tasks, including leaks and malfunctioning water-using equipment. The work order requests are tracked in the CMMS through to completion.

Any problems or leaks identified are addressed immediately. Janitors are trained to report any observed problems to the facilities manager.

A screening-level system review was conducted in November 2010. Known water uses account for over 90 percent of water consumption.

Under this plan, O&M contractor staff will make a daily walk-through inspection of all mechanical spaces. The facilities manager will monitor trends in monthly water use. Changes that are not understood or expected will be investigated and resolved.

PCEB has achieved BMP status in this area.

Water-Efficient Landscaping

PCEB occupies approximately 3.2 acres on the east side of the HMSC campus. The laboratory site is made up of approximately one acre of buildings and two acres of grounds. Most of the two acres of grounds is covered with natural vegetation.

The main laboratory building has an inner courtyard and entry courtyard totaling approximately 0.2 acres. The courtyard areas are landscaped with native vegetation.

PCEB has achieved BMP status in this area.

Water-Efficient Irrigation

PCEB's main two acres of grounds are not irrigated.

The entry courtyard is equipped with a drip irrigation system. It has not been operated in four years since new plantings became well established. The inner courtyard is equipped with both spray and drip irrigation, which also has not been operated in four years.

PCEB has achieved BMP status in this area.

Toilets and Urinals

Toilets are compliant with 1992 Energy Policy Act (EPAct 1992) water efficiency requirements (1.6 gallons per flush [gpf]). Urinals installed at PCEB exceed the EPAct 1992 requirement for urinals of 1.0 gpf, as they are non-water-using models. An inventory of sanitary fixtures is provided in Table 2.

Table 2. PCEB, Inventory of Sanitary Fixtures

Fixture Type	Flow Rate	Total Number
Toilets	1.6 gpf	8
Urinals	Non-water (0 gpf)	3
Lavatory faucets	0.5 gallons per minute (gpm)	8
Showers	2.5 gpm	3

Janitorial staff and employees are trained to report leaks or other maintenance problems in the CMMS or directly to the facilities manager or O&M contractor staff. Leaks or other problems are immediately corrected.

PCEB has achieved BMP status in this area.

Faucets and Showerheads

Table 2 provides an inventory of faucets and showerheads installed at PCEB. Faucets are compliant with the American Society of Mechanical Engineers (ASME) standard for lavatory faucets in public use (captured in ASME A112.18.1), which sets 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.

EPAct 1992-compliant showerheads (2.5 gpm) are installed in all shower stalls available for use.

System pressure is maintained between 20 to 80 pounds per square inch.

Janitorial staff and employees are trained to report leaks or other maintenance problems in the CMMS or directly to the facilities manager or O&M contractor staff. Leaks or other problems are immediately corrected.

PCEB has achieved BMP status in this area.

Boiler/Steam Systems

Heat is supplied by electric heat pumps. No steam is utilized for building or domestic hot water heating. A small steam generator supplies a glassware washer and an autoclave. These units are used infrequently and condensate is not recovered. BMP status is not applicable in this area.

Single-Pass Cooling Equipment

PCEB is equipped with an electric, air-cooled chiller that provides central closed-loop chilled water for almost all equipment cooling. An air compressor in the mechanical room is supplied

with city water for single-pass cooling; however, this air compressor is offline and is only used as a backup since a new, air-cooled system was installed approximately two years ago.

PCEB has achieved BMP status in this area.

Cooling Tower Management

Cooling water requirements are supplied by electric heat pumps; PCEB is not equipped with a cooling tower. BMP status is not applicable in this area.

Commercial Kitchen Equipment

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

Laboratory/Medical Equipment

PCEB has two steam sterilizers. The steam sterilizers only use tempering water when operating.

De-ionized (DI) water for laboratory use is generated through a multi-step process consisting of cartridge filtration, carbon adsorption, and reverse osmosis (RO). Product water from the RO unit is used as feed water to the DI water recirculating loop. The RO unit rejects 2.7 gallons of water for every 1.3 gallons of product water. The DI water is circulated from a holding tank through an ion exchange bed and ultraviolet disinfection unit and out to the laboratories through a header system. The circulated water that goes unused is returned to the holding tank.

PCEB recently purchased a new system to generate purified water through a multi-step process consisting of cartridge filtration, carbon adsorption, and RO. Under this plan, the new system will be installed to replace the less efficient system. The system is anticipated to reject approximately 1 to 1.5 gallons of water for every gallon of RO permeate produced.

PCEB will achieve BMP status in this area when the newly purchased water purification system is installed.

Other Water Use

In the past, PCEB mixed seawater with potable city water to control the seawater's salinity level for research, but this has not been done in recent years.

PCEB has achieved BMP status in this area.

Alternative Water Sources

PCEB recently installed three 1,250-gallon aboveground cisterns to store stormwater runoff from a portion of the roof. This water is used to wash boats.

PCEB has achieved BMP status in this area.

7.0 DROUGHT CONTINGENCY PLAN

Newport is supplied with water primarily from the Big Creek Reservoir, with additional supply available through water rights to the Siletz River. Newport has not imposed mandatory water restrictions, nor has a drought emergency been declared in Lincoln County, in recent years. The City of Newport does not have an official water management plan specifically for droughts, but the Oregon Water Resources Department (WRD) coordinates with municipalities to implement water conservation or curtailment plans when drought emergencies are declared.

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

Oregon drought information resources are available at the WRD website: http://www.oregon.gov/OWRD/WR/drought.shtml.

8.0 COMPREHENSIVE PLANNING

The facilities manager will ensure the water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption. Where available, PCEB will purchase or specify WaterSense® labeled products and use WaterSense irrigation partners (see <www.epa.gov/watersense> for more information about WaterSense).

9.0 STATUS UNDER 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. PCEB's status toward achieving the supporting principles for protecting and conserving water at existing buildings is documented in Table 3.

Table 3. Status of Guiding Principle to Protect and Conserve Water, PCEB

Topic	Status
Indoor Water	EPA Headquarters tracks quarterly and annual water usage and intensity for each of its reporting facilities. Annual water tracking data (water consumption in gallons per gsf per year) shows that PCEB decreased water use intensity by 79 percent between FY 2003 and FY 2010.
Outdoor Water	PCEB's site landscaping consists of native vegetation. Although a drip irrigation system is in place, it has not been used for four years, since new plantings became well-established.
Water Metering	PCEB meters water supplied by the city and submeters RO system supply and reject water. Under EPA's National Advanced Metering System, water utility meters will be tied into the advanced metering system.
Stormwater Management	The majority of the stormwater runoff at PCEB flows aboveground, over pavement and grassed areas to a stone channel that discharges to the bay. Some stormwater, including a portion of that from the roof and the center courtyard, is collected in a below-grade channel, which also discharges to the stone channel. All of the paved surfaces were constructed without curbs, allowing stormwater to sheet-flow onto adjacent vegetation before entering the discharge channel to the bay. A portion of the roof stormwater runoff is collected in three 1,250-gallon aboveground cisterns and used for boat washing.
Process Water	PCEB does not use potable water to improve the facility's energy efficiency at the expense of water efficiency.
Water-Efficient Products	The Sustainable Acquisitions EMP requires the purchase of water-efficient products. PCEB uses non-water urinals and low-flow (0.5 gpm) faucets. Toilets (1.6 gpf) and showerheads (2.5 gpm) present minor opportunities for fixture upgrades. The O&M and janitorial contracts do not refer to water-efficient products.

10.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

PCEB is pursuing the following projects to achieve reductions in potable water use:

1) **Install new RO system.** A new, more-efficient RO system is already purchased and ready for installation at PCEB. The system can improve the ratio of permeate to reject water from 2.7 gallons of reject for 1.3 gallons of permeate to approximately 1.25 gallons of reject for 1 gallon of permeate. This increased efficiency is anticipated to reduce reject water by 40 percent, and therefore the decrease the RO system's total water use. PCEB can save approximately 400 gallons per year by installing the already-purchased system.

2) **Install WaterSense labeled showerheads.** PCEB will consider installing WaterSense labeled showerheads in all three shower stalls. WaterSense labeled showerheads cost approximately $30, for a total project cost of approximately $90. This project may save PCEB an estimated 3,800 gallons of water per year and 2.44 thousand cubic feet (Mcf) of natural gas per year due to reduced need for water heating. This will result in a total utility cost savings of $40 per year, for a simple payback of approximately two years.

3) **Install dual-flush retrofit kits on flushometer valve toilets.** PCEB will consider installing dual-flush retrofit kits on all 1.6 gpf flushometer toilets. Dual flush retrofit kits offer 1.6 gpf and 1.1 gpf flushing options. Up to eight toilets can be upgraded. Each retrofit costs approximately $75, for a total project cost of approximately $600. Total annual savings from toilet retrofits are projected to be 11,000 gallons of water and $50 in water and sewer costs, with a payback period of approximately 11 years.

Appendix A

WATER BALANCE SUPPORTING CALCULATIONS

Table A-1. Water Balance Supporting Calculations – FY 2010, PCEB

Major Process	Annual Consumption (gallons)	Supporting Calculations and Source Documentation
RO permeate	520	Meter reading for RO supply water was 783 gallons on 11/4/2011 and RO reject was 522 gallons on 11/4/2011. The O&M contractor indicated that these meters had been in place for about six months. RO permeate = supply - reject = 783 gallons - 522 gallons = 261 gallons over six months. Extrapolate the amount used over six months to use over one year = 261 gallons / 6 months * 12 months / year = 522 gallons/year.
RO reject	1,000	Meter reading for RO reject was 522 gallons on 11/4/2011. The O&M contractor indicated that this meter had been in place for about six months. Extrapolate the amount used over six months to use over one year = 522 gallons / 6 months * 12 months / year = 1,044 gallons/year.
Sanitary	96,000	Engineering estimate based on 60 people using 6.375 gallons / day for 250 operating days / year. 60 people * 6.375 gallons / person / day * 250 days / year = 95,625 gallons / year.
Miscellaneous process and other laboratory water	161.480	Calculated by difference from the total and other water uses.
Total Water Use at PCEB	**259,000**	**Metered by the City**

Appendix B

MONTHLY WATER USE IN FY 2010

Table B-1. Monthly Water Use in FY 2010, PCEB

Month	Total Water Use (gallons)
October 2009	19,000
November 2009	15,000
December 2009	13,000
January 2010	16,000
February 2010	28,000
March 2010	16,000
April 2010	16,000
May 2010	17,000
June 2010	23,000
July 2010	33,000
August 2010	31,000
September 2010	32,000
Total	**259,000**

Table B-1. Water Use from FY 2010, PCEB