University of California, San Diego

Water Action Plan

December 20, 2013

Table of Contents

Executive Summary

UC San Diego, like many municipalities, operates commercial and residential buildings, a major utility plant, fueling stations, a vehicle fleet, hospitals, research laboratories, event and convention centers, public venues (aquarium, sports facilities, music hall, etc.), shipping facilities, small businesses, a pier, as well as police and transportation services. UC San Diego is responsible for the management of physical plants and all utilities associated with them, including the generation and maintenance of this infrastructure in compliance with local, state and federal regulations and codes. Functioning as a small city, UC San Diego is one of the largest water users in the City of San Diego. Therefore, it is critical that the campus commits to water conservation.

The objective of this report is to support, and remain in compliance with, University of California Office of the President (UCOP) Sustainability Water Systems Policy. In doing so, this Water Action Plan (WAP) summarizes past efforts and best practices that UC San Diego has implemented to reduce potable water usage including:

- Expanding the use of reclaimed water to offset potable water use
- Irrigation, building, and research equipment retrofits to reduce water use
- Building standards for new construction to improve water efficiency

Furthermore, with consideration of UC San Diego's unique regional conditions, this plan will outline future water reduction projects that have been designed and planned to best suit the University's water needs in the most efficient way possible. These projects will be implemented to reduce UC San Diego's potable water usage beyond 20% by the year 2020.

In addition to outlining UC San Diego's water usage and reduction strategies, the WAP also highlights the campus' education and outreach to students and staff on the importance of water conservation. UC San Diego has established a solid outreach platform which will grow over time that involves the staff, students and local community.

Finally, this report describes UC San Diego's efforts to minimize the discharge of storm water pollutants in compliance with storm water regulations and permits.

Introduction

California's Climate

California is home to a semi-arid, Mediterranean type climate. As such, the Golden State typically experiences warm, dry summers, mild winters, and regular drought events. Furthermore, in the face of climate change, it is estimated that by the end of the 21st century, "critically dry" water years could occur more frequently. Droughts are expected to increase by 8% in the Sacramento Valley region, and a substantial 32% in the San Joaquin Valley in comparison to the recorded period between years 1951 through 2000 [http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf].

During critically dry periods in California, it is extremely difficult to satisfy the state's water demands such as those necessary for important agricultural and environmental purposes. Water shortages threaten California's economy and local ecosystems. Thus, efforts to implement and exercise water conservation practices are critical for the future of our state.

San Diego Specific Regional Conditions

The University of California, San Diego (UC San Diego) is located in La Jolla, a small coastal community that sits adjacent to the Pacific Ocean within the City of San Diego. UC San Diego serves as both a major economic engine and an entrepreneurial powerhouse for the San Diego region and for the State of California. The 2000-acre campus has a daily population of over fifty thousand people, 54 acres of turf landscaping, and over 750 buildings and associated infrastructure. In order to maintain this population, landscaping, and infrastructure, UC San Diego is one of the largest water users in the city.

UC San Diego, along with the city as a whole, relies primarily on imported water and receives some of the most long distance water of anywhere in the world. The City of San Diego imports 80-90% of its water supply from either the Colorado River via a 242-mile long aqueduct from Lake Havasu, or from Northern California via the 444-mile long California Aqueduct. Regionally, San Diego lies within California's Mediterranean semi-arid climate and receives an average of only 12 inches of rain per year.

Regulatory Background

In response to severe drought conditions in California, Governor Schwarzenegger wrote to leadership of the California State Senate on February 28, 2008, outlining key elements of a comprehensive solution to problems in the Sacramento-San Joaquin Delta. The first element on the Governor's list was "a plan to achieve a 20 percent reduction in per capita water use statewide by 2020." In March 2008 the 20x2020 Agency Team was convened to develop a plan to achieve a 20 percent reduction in per capita urban water use statewide by 2020. The final 20x2020 Water Conservation Plan, dated February 2010, sets forth a statewide road map to

maximize the state's urban water efficiency and conservation opportunities between 2009 and 2020, and beyond.

The draft of this plan served as a basis for legislation that was enacted in November 2009 to incorporate into law (Senate Bill X7 7) the goal to achieve a 20 percent reduction in urban per capita water use in California by 2020.

In support of these regulations, the University of California, Office of the President (UCOP) has issued a UC Sustainable Water Systems Policy (Appendix E) that requires all University of California campuses to reduce their potable water use 20% by the year 2020 and to develop a Water Action Plan that outlines how they will achieve their water reductions.

Purpose of the Water Action Plan

In compliance with UCOP's UC Sustainable Water Systems Policy, UC San Diego has developed its Water Action Plan (WAP). The purpose of UC San Diego's WAP is to (1) identify the present and future measures the university will be implementing to reduce potable water use, (2) develop and implement a solid education and outreach platform that will grow with time, and (3) establish benchmark goals to go beyond the 20% reduction in potable water use.

These benchmarks include:

1) Strive for no net gain of potable water use based on the water usage from July 2009 – June 2012.
2) Implement projects aimed at reducing and supporting overall potable water use goals of the WAP.
3) Develop water standards for different types of building occupancy use (e.g., research, industrial, administrative).
4) Research and investigate conceptual projects and new technology for potential project development. Use the university as a "living laboratory" for water conservation innovation.

Water Action Plan Committee

The UC San Diego WAP is a collaborative document developed by the Water Action Plan Committee (WAPC), which includes representatives from the following departments:

- Capital Planning
- Environment, Health, and Safety (EH&S)
- Facilities Design and Construction (FD&C)
- Facilities Management (FM)
- Housing, Dining, and Hospitality (HDH)
- Physical and Community Planning (P&CP)
- Scripps Institution of Oceanography (SIO)
- Sports Facilities

- University Center

The WAP is a living document and will be reviewed by the WAPC on an annual basis, and updated every two years or as necessary.

Regional Scope of the Water Action Plan

The WAP boundaries are shown in Figure 1, below. The UC San Diego WAP includes the main campus, some off-campus housing, and Scripps Institution of Oceanography. The on-campus UC San Diego Health Systems will develop a separate WAP according to different UCOP guidelines. Leased facilities, Medical Center buildings associated with patient care, off-site facilities, and buildings outside operational control have been excluded from this plan and are described in more detail in Appendix B.

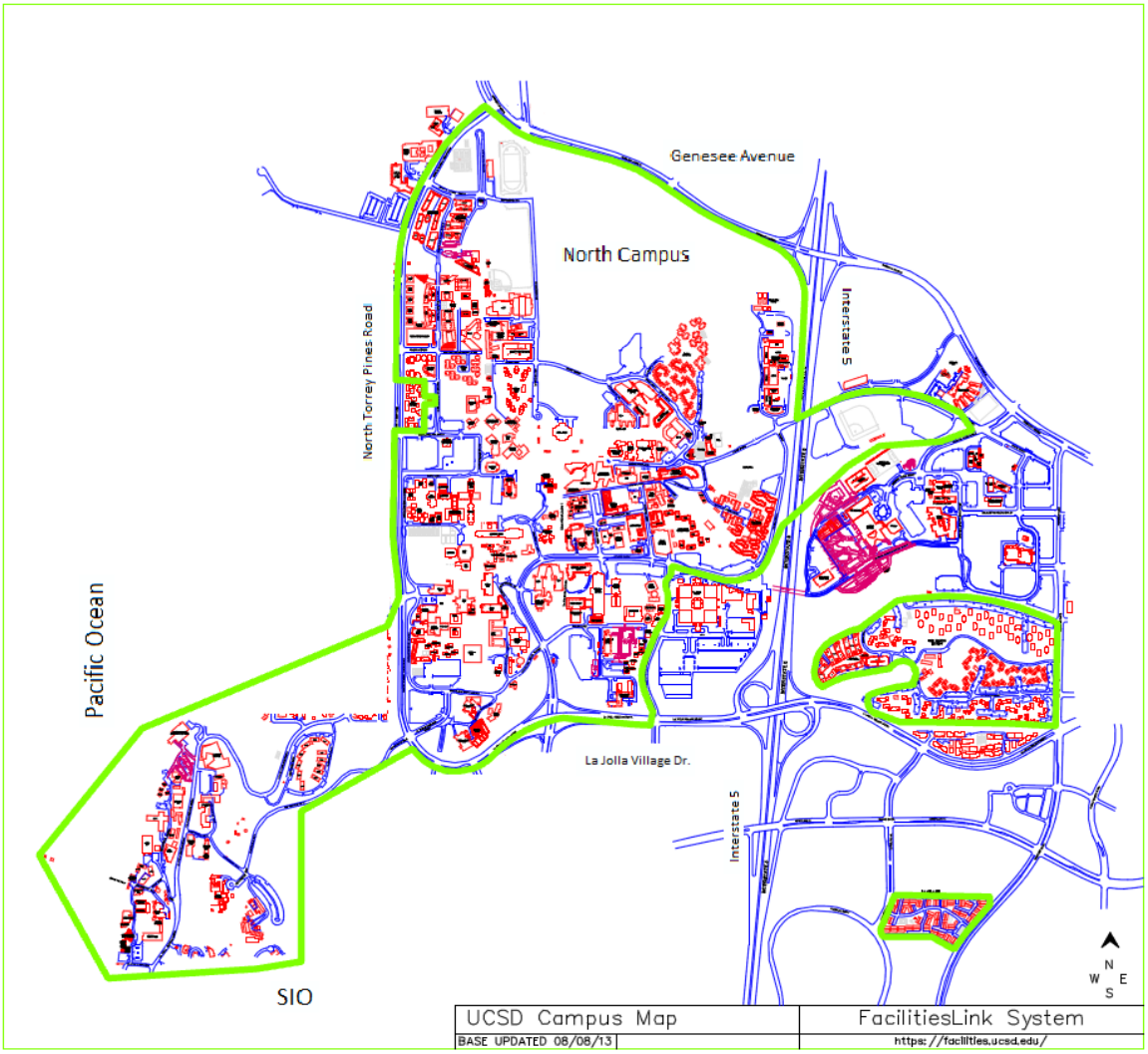

Figure 1: Water Action Plan Boundaries – Green Borders

Historical Progress in Water Reduction

Campus Irrigation and Landscaping

UC San Diego has remained in compliance with (and exceeded the expectations of) San Diego city restrictions to reduce water usage. The campus uses electronic controllers to efficiently irrigate the landscape in periods of only 4-6 minutes per cycle. The UC San Diego landscape staff is trained to identify signs of overwatering and water leaks in the irrigation system. In addition, the irrigation system itself tracks unusually high water use, which may signal a leak. In the event of a reported water leakage, UC San Diego's Facilities Management department responds with an irrigation maintenance crew.

Furthermore, before the drought alert, UC San Diego implemented several water saving strategies including the planting of native and drought-tolerant plants in 75% of the irrigated campus landscape. Meters that measure soil moisture that accurately target watering and a computer controlled irrigation system that tracks current weather data and adjusts watering based on temperature and humidity have been installed. Also, over 3,200 low-flow sprinkler heads have been installed and in the future it is anticipated to increase installation to 10,000.

Laboratory Autoclave Retrofits

As a major medical and research institution, UC San Diego houses many autoclaves. Typical cold-water flow autoclaves use between 50-100 gallons of continuous cold water per hour in order to cool the discharged water before it enters the municipal sewer system. In order to reduce this impact of water usage, UC San Diego has installed over 20 WATER-MIZER autoclave retrofits. These retrofits monitor the drain temperature and apply cold water to adjust the discharge only when needed. The installation of a single WATER-MIZER saves 75%-90% of the normal water flow rate of a single cold-water flow autoclave. This averages a water savings at UC San Diego of 1,000 gallons per day, per autoclave retrofit.

UC San Diego's Climate Action Plan

In the years leading up to 2008, the regions covered in this Water Action Plan used about 600 million gallons of water per year.

As part of the Climate Action Plan (CAP), UC San Diego set a baseline of water usage (using data from the years 2006-2008) with a goal to reduce potable water use by 4% per year from that baseline. Since 2008, the campus has met its goal, and reduced overall water use by at least 4% every year. In addition, last year UC San Diego met the UC Sustainable Water Systems policy requirement of reducing water by at least 20% below campus baseline water use.

Establishing a New Baseline

Under UC San Diego's CAP, the campus has met the UC Sustainable Water Systems Policy, reducing water by 20%. Continuing UC San Diego's commitment to water conservation, the WAP Committee has established a new baseline using the most recent available data from the years 2010-2012 (as shown in the figure below). This new baseline will be used to set a more stringent 20% reduction goal.

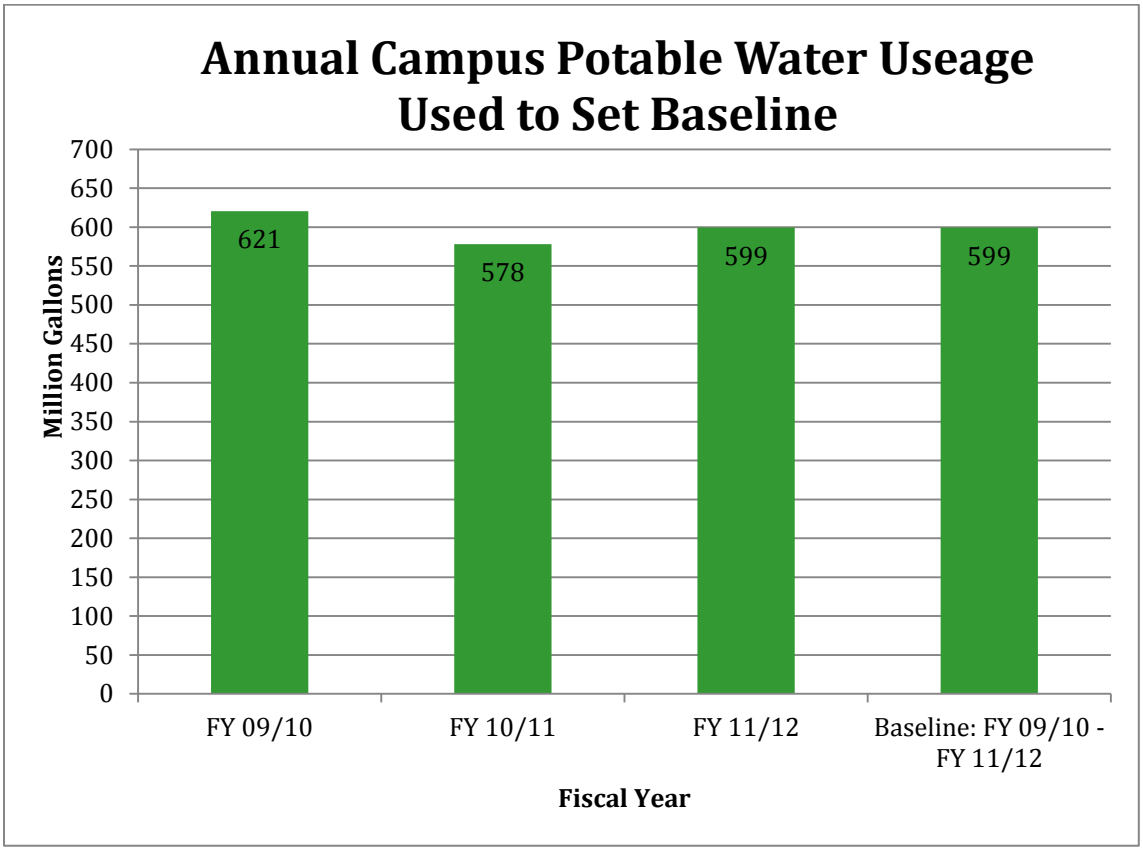

Figure 2: UC San Diego's Annual Campus Potable Water Use from 2009/2010 - 2011/2012

General Water Usage and Reduction

General Water Usage

The following charts display the breakdown of potable water use by end category for the fiscal years 2009/10, 2010/11, and 2011/12.

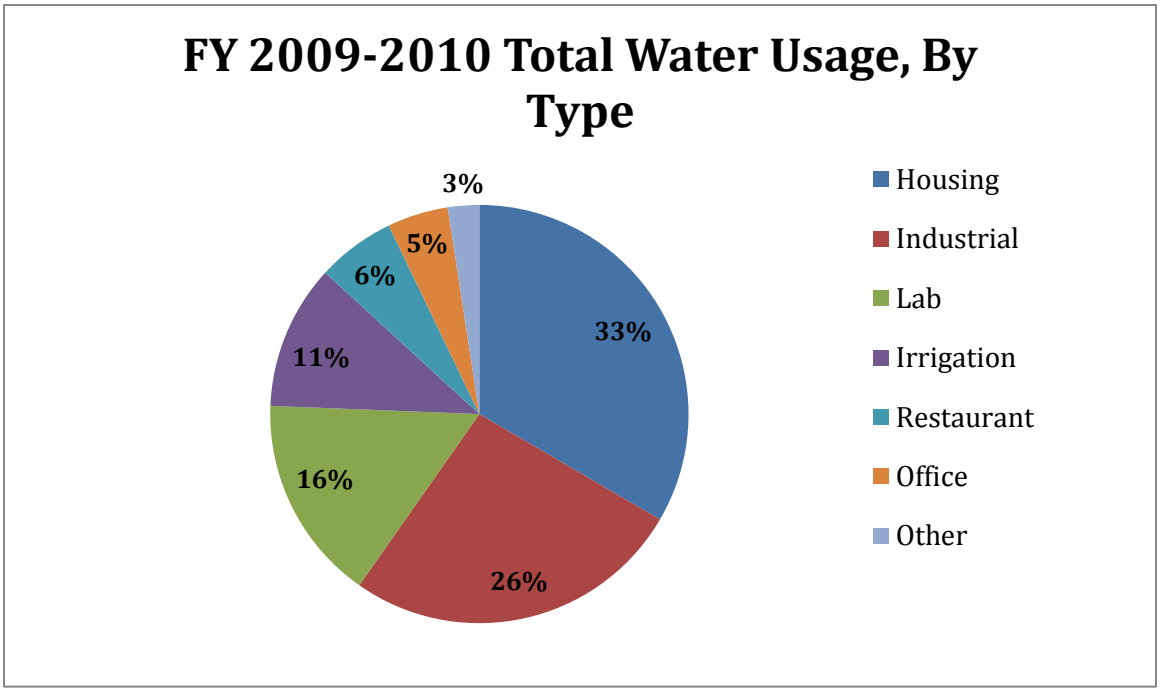

Figure 3: 2009-2010 Water Usage Breakdown for UC San Diego

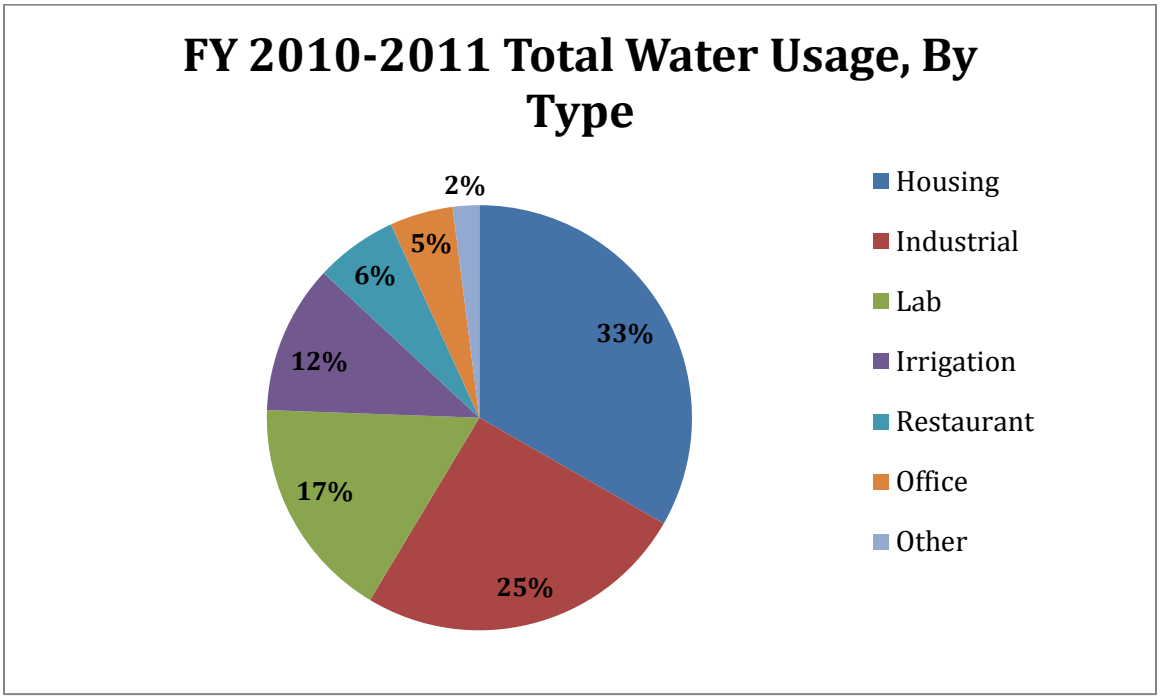

Figure 4: 2010-2011 Water Usage Breakdown for UC San Diego

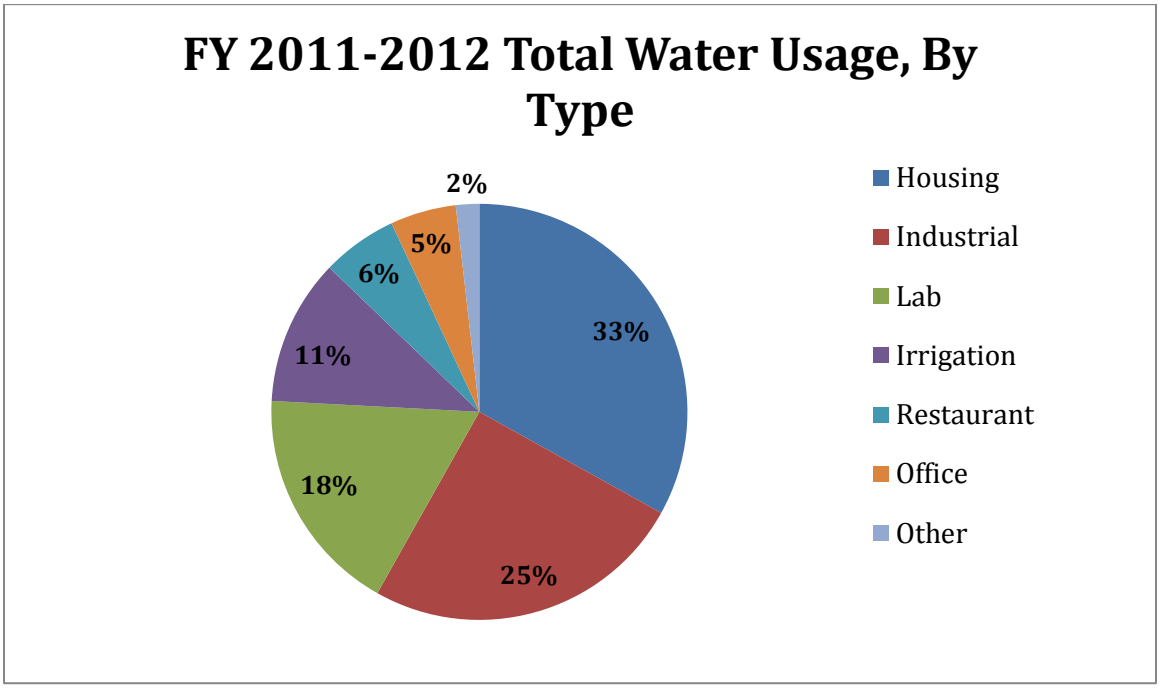

Figure 5: 2011-2012 Water Usage Breakdown for UC San Diego

General Water Reduction

Current and Best Practices

Expanding the Reclaimed Water System

UC San Diego currently uses reclaimed water for more than 25% of campus irrigation and is looking to expand the reclaimed water system for both irrigation and industrial use. In order to achieve this, UC San Diego is extending the reclaimed water line to the Central Utilities Plant for use in cooling towers as well as irrigation.

Water-Friendly Construction

UC San Diego has numerous Best Management Practices (BMPs) to help reduce water usage throughout the entire campus. In 2006, UC San Diego developed the *Clean Water Utility (CWU),* which takes a comprehensive "end to end" approach to water management that addresses all aspects of UC San Diego's water system, thereby supporting responsible water management from the time the water enters and leaves the campus. The CWU Working Group identifies specific projects on a regular basis that will reduce potable water use on campus.

The best practices initiated on the San Diego campus to reduce water usage come from varying categories in order to address the issue with a multi-faceted approach.

Innovative Technologies and Methods of Operations

To satisfy restrictions implemented by the City of San Diego for drought conditions, UC San Diego has employed innovative technologies and new methods of operation to comply with restrictions. Some of the new implementations are as follows:

I) Limited watering and equipment washing
II) Capture of fire-sprinkler and hydrant testing water for reuse in the Central Utilities Plant cooling towers
III) Irrigation control using campus central weather station data, such as temperature and relative humidity
IV) Investigating the reuse of condensate from mechanical systems (e.g. air handling equipment) for irrigation and/or indoor building use

Green Building

UC San Diego now requires new major construction projects to be planned, designed and built as resource efficient facilities. At a minimum, all future buildings will meet Leadership in Energy and Environmental Design (LEED) Silver or Gold Standards. LEED buildings consider the building site, water efficiency, energy efficiency and other environmental standards. An example is the Platinum rating of the new Charles David Keeling Apartments which is the first LEED Platinum student housing in the University of California system. For a full list of LEED certified buildings see Appendix C.

Retrofits

Retrofits include the replacement of current and outdated fixtures with new low-flow, efficient fixtures. Projects include:

I) Autoclave upgrades: Old, continuous cold flow steam sterilizers are upgraded with new, more efficient cooling systems.
II) Sprinkler head replacements: The new replacements have rotating heads that reduce water usage by 30%.
III) Plumbing system retrofits: New toilet valve mechanisms are reduced flow devices and reduce water usage, low flow urinals have been installed and faucet aerators have been added.

Future Water Reduction Projects

In order to continue UC San Diego's efforts to reduce water usage, future projects have been proposed. A summary of these scheduled projects to be implemented at UC San Diego are summarized in Appendix D.

Education and Outreach

Outreach, Collaboration & Education

UC San Diego has historically made an effort to involve the campus community in conserving water. Organizations such as the EcoNauts and the Sustainability Resource Center on campus contribute to day to day educational outreach to UC San Diego students and staff. Through these organizations, students are directly involved in campus outreach and education on the peer level.

Education and outreach strategies at UC San Diego and within the local communities include the following:

I) Water management through campus planning: UC San Diego promotes water conservation through planning projects using drought tolerant vegetation and native plants to aid in water reduction.

II) Partnerships with local water agencies: UC San Diego partners with the San Diego County Municipal Water Authority and the City of San Diego Public Utilities Department Long Range Planning and Water Resources Division to expand the campus recycled water system and to collaborate with on campus outreach events.

III) Education opportunities: water conservation is included as part of the curriculum in the "Environmental Stewardship Class" taught by EH&S that is required in the Safety Coordinator certificate program. In addition, Muir College's Environmental Studies minor educates students on the importance of water quality and conservation.

IV) Outreach to the campus community: In addition to various sustainability groups UC San Diego staff and students have developed a water conservation education and outreach group called AQUAholics Anonymous. This group performs outreach to the campus community on water conservation and provides resources that can be used by student, staff, and faculty groups.

To encourage behavior change, UC San Diego students, staff, and faculty formed the collaborative "AQUAholics Anonymous" in 2009. The purpose of this group is to develop water conservation outreach materials with a unified theme that the campus community will remember. These resources are available to any group or

department that is working on water conservation. AQUAholics Anonymous developed a "12-Step Recovery Program" to reduce water waste and uses this as the theme for outreach materials. To educate students, staff, and faculty on the 12-Step Recovery Program, an online pledge was added to the AQUAholics Anonymous webpage to encourage people to reduce their daily water footprint.

http://aquaholics.ucsd.edu/

The AQUAholic Anonymous group distributes educational materials regarding water conservation at outreach events on campus, such as Earth Day, and has organized and implemented water conservation activities and programs, including Residence Hall Water Savings Competitions and a Combat AQUAholism Film and Art Competition.

Storm Water Management

UC San Diego does not currently capture and reuse rain-water to offset potable water use. Opportunities to do so will be explored in the future. The UC San Diego Storm Water program is regulated by the following National Pollutant Discharge Elimination System (NDPES) permits: (1) Phase II Small MS4 General Permit; (2) General Permit for Storm Water Discharges Associated with Construction Activity; (3) General Permit for Industrial Storm Water Discharges; and (4) Waste Discharge Permit for SIO. Each of these is described below.

Phase II Small MS4 General Permit

All of the University of California campuses are regulated under the Phase II Small MS4 General permit, which requires each campus to develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants "to the maximum extent possible." Minimum control measures include public education and participation, elimination of illicit discharges, construction site storm water runoff control, post-construction site storm water management, and pollution prevention for municipal operations.

The Phase II program includes water quality objectives pertaining to campus operations and all construction. In addition, post construction guidelines are required to maintain the quality of storm water emanating from all project sites after completion and occupancy. Opportunities for capturing and re-using storm water will be evaluated to meet post construction design requirements.

UC San Diego's Storm Water Management Program is summarized on the webpage: http://stormwater.ucsd.edu

Construction General Permit

Construction projects that disturb one acre or larger must comply with the state construction storm water program requirements identified in the General Permit including developing and implementing a site specific Storm Water Pollution Prevention Plan (SWPPP) which emphasizes the use of appropriately selected, correctly installed and maintained pollution reduction BMPs that will prevent construction pollutants from contacting storm water and leaving the project site. The SWPPP must:

A. Identify pollutant sources associated with construction activities that may affect the quality of storm water discharges.

B. Identify and prevent non-storm water discharges.

C. Identify, construct, and implement storm water pollution prevention measures (BMPs) to reduce or eliminate pollutants in storm water discharges from the construction site, both during construction and after construction is completed.

Storm water runoff from the construction site must be monitored and analyzed based on the calculated risk level of the project.

Throughout the construction period, project sites are inspected to confirm compliance with the SWPPP. These inspections include weekly and quarterly site inspections, maintenance inspections, and inspections before, during, and after a rain event.

Opportunities to capture and reuse storm water to off-set potable water use and meet post-construction design requirements will be evaluated for projects subject to the Construction General Permit.

Industrial Storm Water Permit

The UC San Diego Nimitz Marine Facility in Point Loma and the main campus' Fleet Services at the Campus Service Complex are each regulated by an NPDES Industrial Storm Water Permit that requires Storm Water Pollution Prevention Plans (SWPPPs) to be implemented at each facility. These SWPPPs include BMPs for outdoor work activities to keep pollutants such as sediment, metals, oil and grease, out of the storm water system. Storm water samples are collected at these locations to verify that the BMPs are effective at reducing/removing pollutants in runoff.

NPDES Waste Discharge Permit

Seawater from Scripps Institution of Oceanography (SIO) and storm water runoff from the western portion of campus discharges into the ocean, into a marine area that has been designated by the State Water Resources Control Board as an "Area of Special Biological Significance" (ASBS). There are 34 ASBS along the coastline in California, two of which are in San Diego.

The NPDES Waste Discharge permit for these coastal discharges requires monitoring of seawater effluent and storm water runoff from several outfall pipes that drain onto the beach, this monitoring includes analysis of constituents in the California Ocean Plan and bacterial indicators and toxicity. The results are compared to water quality objectives in the permit. The campus must implement source controls and treatment controls to reduce the discharge of pollutants that exceed these water quality objectives. The permit also specifically prohibits anything other than storm water from going into the storm water conveyance system.

Appendix A

Definitions

Definitions

Gross Square Foot: Pursuant to the definition in the Facilities Inventory Guide[1], gross square footage is the Outside Gross Area, or OGSF50, and equals the sum of Basic Gross Area (the sum of all areas, finished and unfinished, on all floors of an enclosed structure, for all stories or areas which have floor surfaces) + 50% Covered Unenclosed Gross Area (the sum of all covered or roofed areas of a building located outside of the enclosed structure). OGSF50 is also known as "California Gross."

Industrial Water: Water provided for specific industrial applications such as heating, cooling, or lubricating equipment.

Purified Water: Water that is free of impurities such as microorganisms, particulate matter, and trace elements and chemical compounds responsible for electrical conductivity; primarily used in biological and engineering labs for research purposes.

Non-Potable Water: Water not suitable for human consumption because it contains objectionable pollution, contamination minerals or infective agents, including:

> **Wastewater**: A blend of graywater and blackwater.
>
> > **Graywater**: Wastewater originating from clothes washers, bathtubs, showers, bathroom sinks, or any other source that has a low likelihood of fecal contamination. Graywater may be treated or untreated prior to reuse.
> >
> > **Blackwater**: Wastewater originating from sources that have a high likelihood of fecal contamination (e.g., toilets).

Potable Water: Water that meets state water quality standards for human consumption.

Reclaimed or Recycled Water: Wastewater treated with the intention of reuse, including:

> **Direct Potable Reuse**: Treated wastewater reused for human consumption
>
> **Indirect Potable Reuse**: Treated wastewater blended with natural water sources reused as potable or non-potable water.
>
> **Non-Potable Reuse**: Treated wastewater reused for purposes other than human consumption, such as irrigation, fire suppression, and industrial processes.

[1] Facilities Inventory Guide, Attachment 8, Appendix C, pages 13-15.

Storm Water: Water that originates during precipitation events.

Sterilized Water: Water that has been cleaned to remove, deactivate, or kill microorganisms present that may be harmful to humans; primarily used in medical facilities.

Sustainable Water Systems: Water systems or processes that maximize water use conservation or efficiency, optimize water resource management, protect resources in the context of the local watershed, and enhance economic, social and environmental sustainability while meeting operational objectives.

Weighted Campus User: (1 × number of on-campus residents) + (0.75 × number of non-residential or commuter full-time students, faculty, and staff members) + (0.5 × number of non-residential or commuter part-time students, faculty, and staff members) as defined by Association for the Advancement of Sustainability in Higher Education (AASHE). When using Weighted Campus User, state whether fall-quarter/semester headcount, three quarter/two semester average headcount, or another measure was used in the Weighted Campus User calculation.

Watershed: In the context of this policy, a watershed is the area of land that drains to a common waterway, such as a stream, lake, estuary, wetland, aquifer, bay, or ocean.

Appendix B

Facility and Building Exclusions from Water Action Plan

Facility and Building Exclusions from Water Action Plan

Some buildings and offices were excluded from the Water Action Plan because they use water separately from the rest of the UC San Diego Main Campus. All buildings, offices, and clinics in the East Campus Medical Center were excluded from main campus totals; these Medical Center buildings include the Multi-Specialty Clinic, Retina Glaucoma Center, Shiley Eye Center, the Radiation Oncology Department, Moore's Cancer Center, La Jolla Institute for Allergy & Immunology, Perlman Medical Offices, Thornton Hospital, and Sulpizio Cardiovascular Center. Other buildings and structures associated with East Campus and the Medical Center were also excluded, including the East Campus Parking Structure and the East Campus Utility Plant. Finally, independent schools that are associated with UC San Diego and that are located on UC San Diego campus (namely the Preuss School and University Extension) were excluded from main campus water totals.

East Campus Medical Center buildings were excluded from main campus water totals at the request of the UC Office of the President based on per capita reduction; while UC San Diego main campus determines per capita water use based on a weighted campus user count, the Medical Center's per capita use is based on adjusted patient day. These two metrics cannot be mixed, so the Medical Center will total its water usage and create its own Water Action Plan separately from the rest of the campus.

Buildings located on the East Campus area of UC San Diego campus were omitted from campus totals because they primarily serve the excluded Medical Center buildings; the East Campus Parking Lot serves as guest and employee parking for the Medical Center, and the East Campus Utility Plant provides energy for Medical Center buildings. Mesa Housing water use totals were omitted because the Mesa Housing complex is not fed by the main campus meters, which are used to determine total campus water use. In addition, Mesa Housing residents are not included in the total weighted campus user formula and therefore should not be included in total campus per capita calculations.

The Preuss School and University Extension were excluded from total campus water use calculations because students that attend these schools are not matriculated at UC San Diego and therefore should not be included in the final total main campus per capita use total. In addition, University Extension buildings are not fed by the main campus water meters.

The table below lists the excluded building names and associated meter numbers:

Building Name	Meter Numbers
1. Multi-Specialty Clinic	W1034 W1033I
2. Retina Glaucoma Center	W7005
3. Shiley Eye Center	W7001
4. Radiation Oncology Department	W7060
5. Moore's Cancer Center	W7025
6. La Jolla Institute for Allergy & Immunology (LIAI)	W7053 W7054 W7055
7. Perlman Medical Offices	W7020
8. Thornton Hospital	W7010 W7011
9. Sulpizio Cardiovascular Center	W7110I
10. East Campus Parking Structure	W7120 W7120I
11. East Campus Utility Plant	W4220
12. Preuss School	W3701 W3702 W3703 W3704 W3705 W3706 W3707 W3708
13. University Extension Complex	N/A

Appendix C

LEED Certified Buildings on Campus

LEED Certified Buildings on Campus

Project Name	Rating System	Achieved Rating
Revelle College Housing	NC	LEED Platinum
Housing and Dining Administration Building	NC	LEED Silver
Muir College Housing	NC	LEED Gold
Rady School of Management School Phase 2	NC	LEED Gold
North Campus Housing, Phase 2	NC	LEED Gold
Telemedicine & PRIME-Heq	NC	LEED Gold
Health Sciences Graduate Housing	NC	LEED Gold
Sulpizio Family Cardiovascular Center	NC	LEED Gold
East Campus Parking Structure	NC	LEED Silver
Torrey Pines Center North	NC	LEED Silver
Stewart Commons	CI	LEED Gold
Goody's Place and Market	CI	LEED Silver
Sustainability Resource Center	CI	LEED Gold
Mesa Childhood Center	CI	LEED Gold
The Zone	CI	LEED Certified
San Diego Supercomputer East Expansion	EBOM	LEED Gold
Campus Services Complex	EBOM	LEED Silver
Mission Bay Aquatic Center	EBOM	LEED Platinum

Water Saving Project List

Water Saving Project List

*Water: Low = <10,000 gallons/year; Medium = 10000 gallons/year - 1,000,000 gallons/year; High = > 1,000,000 gallons/year
**Cost: Low = <$100,000; Medium= $100,000 - $1,000,000; High = > $1,000,000
***Savings: Low = <$3,333.33/year; Medium= $3,333.33/year - $33,333.33/year; High = $33,333.33/year
****Indirect Energy Savings: Low = < 1,300 kWh/year; Medium = 1,300 kWh/year - 13,000 kWh/year; High = > 13,000 kWh/year

Project Title	Location	Lead	Water Savings (gallons/yr)*	Project Cost ($)**	Water Savings ($)***	Indirect Energy Savings[1] ****	Project Start Year	Project Completion Year	Notes
Reclaimed Water									
Extension of Reclaimed Water on Main Campus	Main Campus Central Plant	FD&C	High	High	High	Med	2013	2015	Bring 10" reclaimed water line to Central Plant for use in cooling towers and irrigation. Retrofit Central Plant to use reclaimed water.
Extension of Reclaimed Water Line on East Campus	East Campus non-OSHPD Central Plant	FM	High	Medium	Low	Med	2014	2015	Bring 10" reclaimed water line to EC Central Plant for use in cooling towers. Retrofit Central Plant to use reclaimed water.
LS West	Irrigation retrofit and scheduling/monitoring new sprinklers to insure run times are correct	FM	Med	High	Low	Medium	2014	2014	Replace Hunter Spray sprinklers with Toro Precision water efficient spray nozzle sprinklers. Hunter Sprinklers use approx. 1.26 gallons per minutes, Toro Precision sprinklers/nozzles use 0.70 gallon per minute a resulting in a savings of 0.56 gallon per minute.
Potable									
Irrigation Retrofits-SIO	SIO	FM	High	High	Med	Medium	2012	2014	Replace out dated controllers with weather based central controls and replace standard spray heads with low water use heads.
Irrigation Retrofits-Housing	Mesa Graduate Housing	FM	Med	Medium	Low	Low	2013	2014	Capping of Hunter I-20s and institutional sprays and conversion of 31,185square feet of turf to mulch.

Water Saving Project List

*Water: Low = <10,000 gallons/year; Medium = 10000 gallons/year - 1,000,000 gallons/year; High = > 1,000,000 gallons/year
**Cost: Low = <$100,000; Medium= $100,000 - $1,000,000; High = > $1,000,000
***Savings: Low = <$3,333.33/year; Medium= $3,333.33/year - $33,333.33/year; High = $33,333.33/year
****Indirect Energy Savings: Low = < 1,300 kWh/year; Medium = 1,300 kWh/year - 13,000 kWh/year; High = > 13,000 kWh/year

Project Title	Location	Lead	Water Savings (gallons/yr)*	Project Cost ($)**	Water Savings ($)***	Indirect Energy Savings[1] ****	Project Start Year	Project Completion Year	Notes
Toilet Retrofits	RIMAC- restrooms	SF	Medium	Low	Med	Med	2014	2014	Replace existing urinal flush valves with reducing flow valves. Existing Urinals: 1.0 gpf (gallon per flush). New urinals: 0.5 gpf. 50% consumption savings when each toilet is flushed*.
Toilet Retrofits	Main Campus Academic Restrooms	FM	High	High	Medium	Med	2014	2015	Replace existing urinal and toilet flush valves with low flow water reducing valves and/or replace fixtures with high efficiency models
ERC Water Conservation	ERC Resident Hall Bathrooms	HDH	Med	Low	Low	Med	2013	2014	Installed bathroom Flow Control Valve (FCV) under each bathroom sink
WATER-MIZER	Throughout the campus	FM	High	Low	High	Med	2014	2015	Installation of WATER-MIZER tempering device in order to reduce cold water flow used to cool discharge water. *average water savings is 75%-90% of water flow when WATER-MIZER. Return of investment <1 year. Calculate savings at http://www.rpiparts.com/water-mizer/calculator.htm

Water Saving Project List

*Water: Low = <10,000 gallons/year; Medium = 10000 gallons/year - 1,000,000 gallons/year; High = > 1,000,000 gallons/year
**Cost: Low = <$100,000; Medium= $100,000 - $1,000,000; High = > $1,000,000
***Savings: Low = <$3,333.33/year; Medium= $3,333.33/year - $33,333.33/year; High = $33,333.33/year
****Indirect Energy Savings: Low = < 1,300 kWh/year; Medium = 1,300 kWh/year - 13,000 kWh/year; High = > 13,000 kWh/year

Project Title	Location	Lead	Water Savings (gallons/yr)*	Project Cost ($)**	Water Savings ($)***	Indirect Energy Savings[1] ****	Project Start Year	Project Completion Year	Notes
Reclaimed & Potable									
Metering	Throughout the campus	FM	Unknown* Not Yet Scheduled						Installation of metering throughout the campus in order to automate readings and have real-time remote monitoring of water consumption.* Estimates of water leakage in typical municipal systems is as high as 25%.
Project Type									
Completed									
Irrigation Retrofits-Main Campus	Gilman Drive/Eucalyptus Grove Lane to Gilman Drive/Mandeville Lane	FM	Low	Low	Low	Low	2010	2010	The project required capping of Hunter I-20s and institutional sprays.. 7,284 square feet of turf that was converted to mulched area, by a combination of spraying herbicide and capping existing sprinkler heads.
Air Handler/HVAC Condensation Re-use	New Health Science Facility II	FD&C	Med	Med	Low	Med	2011	2014	Condensation from building air handers is captured and used to flush urinals.

Water Saving Project List

*Water: Low = <10,000 gallons/year; Medium = 10000 gallons/year - 1,000,000 gallons/year; High = > 1,000,000 gallons/year
**Cost: Low = <$100,000; Medium= $100,000 - $1,000,000; High = > $1,000,000
***Savings: Low = <$3,333.33/year; Medium= $3,333.33/year - $33,333.33/year; High = $33,333.33/year
****Indirect Energy Savings: Low = < 1,300 kWh/year; Medium = 1,300 kWh/year - 13,000 kWh/year; High = > 13,000 kWh/year

Project Title	Location	Lead	Water Savings (gallons/yr)*	Project Cost ($)**	Water Savings ($)***	Indirect Energy Savings[1] ****	Project Start Year	Project Completion Year	Notes
Air Handler/HVAC Condensation Re-use	Structural Engineering Building	FD&C	Med	Med	Low	Med	Completed	Completed	Condensation from building air handers is captured and used for irrigation.
Future Projects (wish list)									
Air Handler/HVAC Condensation Re-use	Across Campus	FM	High	High	Med	High	2014	2016	Condensation from building air handers is captured and used for irrigation.

[1]The factors for determining indirect energy savings (embedded energy) for the project list is **13,000 kWh/MG for Indoor water efficiencies and 11,100 kWh/MG for outdoor water efficiencies.** The embedded energy reference/information for Southern California is on page 10 of the WECalc Data and Assumptions document: http://wecalc.org/WECalc_data_and_assumptions.pdf

Appendix E

UC Sustainable Water Systems Policy

Accepted by the
Systemwide Sustainability
Committee 9/24/12

II. Definitions

Adjusted Patient Day: Inpatient Days x (Gross Patient Revenue/Inpatient Revenue) where Gross Patient Revenue is Outpatient Revenue + Newborn Revenue + Inpatient Revenue.

Domestic Water: Potable and non-potable water provided for domestic indoor (e.g., toilets, urinals, showers, and faucets) and outdoor (e.g., landscape irrigation) use.

Gross Square Foot: Pursuant to the definition in the Facilities Inventory Guide[1], gross square footage is the Outside Gross Area, or OGSF50, and equals the sum of Basic Gross Area (the sum of all areas, finished and unfinished, on all floors of an enclosed structure, for all stories or areas which have floor surfaces) + 50% Covered Unenclosed Gross Area (the sum of all covered or roofed areas of a building located outside of the enclosed structure). OGSF50 is also known as "California Gross."

Industrial Water: Water provided for specific industrial applications such as heating, cooling, or lubricating equipment.

Purified Water: Water that is free of impurities such as microorganisms, particulate matter, and trace elements and chemical compounds responsible for electrical conductivity; primarily used in biological and engineering labs for research purposes.

Non-Potable Water: Water not suitable for human consumption because it contains objectionable pollution, contamination minerals or infective agents, including:

- Wastewater: A blend of graywater and blackwater.
    - Graywater – Wastewater originating from clothes washers, bathtubs, showers, bathroom sinks, or any other source that has a low likelihood of fecal contamination. Graywater may be treated or untreated prior to reuse.
    - Blackwater – Wastewater originating from sources that have a high likelihood of fecal contamination (e.g., toilets).

Potable Water: Water that meets state water quality standards for human consumption.

Reclaimed or Recycled Water: Wastewater treated with the intention of reuse, including:

- Direct Potable Reuse: Treated wastewater reused for human consumption
- Indirect Potable Reuse: Treated wastewater blended with natural water sources reused as potable or non-potable water.
- Non-Potable Reuse: Treated wastewater reused for purposes other than human consumption, such as irrigation, fire suppression, and industrial processes.

[1] Facilities Inventory Guide, Attachment 8, Appendix C, pages 13-15.

Stormwater: Water that originates during precipitation events.

Sterilized Water: Water that has been cleaned to remove, deactivate, or kill microorganisms present that may be harmful to humans; primarily used in medical facilities.

Sustainable Water Systems: Water systems or processes that maximize water use conservation or efficiency, optimize water resource management, protect resources in the context of the local watershed, and enhance economic, social and environmental sustainability while meeting operational objectives.

Weighted Campus User: (1 × number of on-campus residents) + (0.75 × number of non-residential or commuter full-time students, faculty, and staff members) + (0.5 × number of non-residential or commuter part-time students, faculty, and staff members) as defined by Association for the Advancement of Sustainability in Higher Education (AASHE). When using Weighted Campus User, state whether fall-quarter/semester headcount, three quarter/two semester average headcount, or another measure was used in the Weighted Campus User calculation.

Watershed: In the context of this policy, a watershed is the area of land that drains to a common waterway, such as a stream, lake, estuary, wetland, aquifer, bay, or ocean.

III. Policy Text

I. Sustainable Water Systems[2]

With the overall intent of achieving sustainable water systems and demonstrating leadership in the area of sustainable water systems, the University has set the following goals applicable to all campuses including medical centers:

1. In line with the State of California's law establishing a goal to reduce per capita potable water consumption by 20%[3], each campus will strive to reduce potable water consumption adjusted for population growth by 20% by the year 2020. This target will be re-evaluated and recommendations for adjustments will be made as necessary by the Sustainable Water Systems Working Group. Campuses that have already achieved this target are encouraged to set more stringent goals to further reduce campus potable water consumption.

2. Each campus will develop and maintain a Water Action Plan that identifies the campus' long term strategies for achieving sustainable water systems.

[2] Related sections: Green Building Design policy III.A. 5, Green Building Design procedure V.A.4, and Sustainable Purchasing procedures V.G.10.e, V.G.15, V.G.16, and V.G.17.

[3] For more information on this goal, see http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/

V. Procedures

I. Sustainable Water Systems

1. Reporting Methods

a. Explicitly identify the geographic and operational areas comprising the scope of campus water usage (e.g., the campus as defined by its Long Range Development Plan boundary, excluding third-party operated facilities).

b. Campuses with medical centers may choose to report medical center data and progress toward the target separately from the main campus and may select a different baseline than the main campus.

c. All campuses shall report water usage in a tabular format using the following methods:
   i. Measure per capita water consumption by Weighted Campus User (WCU) for main campuses and Adjusted Patient Day (APD) for medical centers. If necessary, WCU and APD may be combined using the following calculation: [(APD/360)* 1.5] + WCU;
   ii. Potable water usage for a baseline period selected by the campus that is three consecutive fiscal years between FY 1995/96 and FY 2010/11:
      a) Total campus potable water usage, in gallons, for each of the three years comprising the baseline period,
      b) WCU, or APD, for each of the three years comprising the baseline period
      c) Baseline Potable Water Usage: calculate the baseline metric as follows: Step 1: Divide each years' total water use in gallons by that years' WCU or APD population. Step 2: Average the three gallons/population calculations to derive the Baseline Potable Water Usage for the campus,
      d) Multiply the Baseline Potable Water Usage figure by 0.80 to derive the campus 2020 Potable Water Usage Target, and
      e) Unless impracticable, provide average gallons of potable water usage per baseline year per gross square foot of campus built space for which potable water consumption is being reported, mirroring (c)above;
   iii. Potable water usage for the most recent fiscal year[4]:
      a) If using an average of the three most current fiscal years, which is allowed but not required, follow the method described above for deriving the baseline, but substitute the three most current fiscal years for the three baseline years,
      b) If using only the most recent fiscal year, and not an average, list in the table the following:
         1. Total campus potable water usage, in gallons, for the most recent fiscal year,
         2. WCU or APD for the most recent fiscal year,
         3. Divide the gallons by the WCU or APD to derive the Current Potable Water Usage; and

[4] An average of the three most current fiscal years is allowed but not required.

c) If feasible, provide average gallons of potable water usage per gross square feet for either the three most current fiscal years, if that is the method adopted, or for the single most current fiscal year, again using the methodology described above;

iv. Total campus non-potable water usage, in gallons, for the most recent fiscal year[4].

v. Report, or estimate if metered data is not available, water usage in the following use categories at a minimum: campus buildings, landscape, and central plant including cooling towers, identifying the quantities of potable and non-potable used for these purposes;

2. Reporting Schedule

a. Each campus will prepare a campus Water Action Plan as specified below and submit it to the Office of the President by December 2013. Each campus will share its draft plan with the Working Group by July 2013 in order to ensure collaboration on development of final plans.

b. Beginning the following year, each campus will provide an annual progress report on implementing its Water Action Plan to include progress on its water usage reduction.

3. Water Action Plans

a. Each campus' Water Action Plan and the water conservation and water efficiency strategies it contains will take into account relevant regional conditions and regulatory requirements, will recognize historical progress, and will acknowledge current campus best practices being implemented.

b. Each campus Water Action Plan will include a section on Water Usage and Reduction Strategies that:

i. Describes the applicable types of water comprising campus water systems, including but not limited to potable water, non-potable water, industrial water, sterilized water, reclaimed water, stormwater, and wastewater;

ii. Reports water usage in accordance with the methods set forth in these procedures;

iii. Considers setting more stringent potable water reduction goals if the campus has already achieved a 20% below baseline reduction in per capital potable water consumption;

iv. Outlines campus-specific strategies for achieving the target for reduced potable water consumption;

v. Encourages implementation of innovative water-efficient technologies as part of campus capital projects and renovations (e.g., installation of WaterSense certified fixtures and appliances, graywater reuse, rainwater harvesting, and watershed restoration);

vi. Addresses campus use of non-potable water sources, and how those sources factor into the campus' overall sustainable water systems strategy;

vii. Analyzes the identified water use reduction strategies using a full cost approach by considering:

a) Projected costs and savings of the identified water use strategies,

b) Indirect costs and savings associated with reduced energy consumption due to the energy use embodied in water use,

c) Savings associated with reduced or avoided infrastructure costs, and

d) Other avoided costs; and

viii. Sets a timeline for the strategies being implemented to reach the water usage reduction target.

c. Each campus Water Action Plan will include a section on Stormwater Management developed in conjunction with the campus stormwater regulatory specialist that:

i. Addresses campus stormwater management from a watershed perspective in a campus-wide, comprehensive way that recognizes stormwater as a resource and aims to protect and restore the integrity of the local watershed(s);
ii. References the campus' best management practices for preventing stormwater pollution from activities on campus that have the potential to pollute the watershed (e.g., construction; trenching; storage of outdoor equipment, materials, and waste; landscaping maintenance; outdoor cleaning practices; vehicle parking);
iii. Encourages stormwater quality elements such as appropriate source control, site design (low impact development), and stormwater treatment measures to be considered during the planning stages of campus projects in order to most efficiently incorporate measures to protect stormwater quality;
iv. If feasible, cites relevant and current campus stormwater-related plans and permits in an appendix or reference list accompanying the Water Action Plan; and
v. Includes, to the extent feasible, full cost evaluation of stormwater management initiatives similar to the approach in the Water Usage and Reduction Strategies section above.

d. Each campus Water Action Plan will include a section on Education and Outreach that:

i. Presents potential opportunities for the campus to serve as a living laboratory for sustainable water projects;
ii. Supports the campus community (students, faculty, and staff) in efforts to implement sustainable water systems on campus;
iii. Identifies opportunities for pilot projects that illustrate the University's commitment to sustainable water practices through teaching, research, and service; and
iv. Identifies opportunities for new campus practices that could create behavior change across the campus population with regard to water use and watershed management.