UCSB
WATER ACTION PLAN

PROJECT BRIEF

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ADVISOR: Derek Booth **CLIENT:** The University of California, Santa Barbara

The Water Action Plan provides the University of California, Santa Barbara (UCSB) with a comprehensive look at historical and current water use and highlights water conservation strategies for reducing future potable water consumption at UCSB.

MOTIVATION

The University of California, Office of the President (UCOP) has mandated that all UC campuses reduce growth-adjusted potable water use 20% by 2020. UCSB has met this water use reduction goal, but the expected growth of UCSB and increasing water costs in the coming years have motivated the University to further reduce potable water consumption. UCSB recognizes the importance of water planning and conservation as illustrated by their historical efforts and their future commitment to reduce potable water use.

THREE PRIMARY OBJECTIVES OF THE UCSB WATER ACTION PLAN

- Reconstruct historical and current water use to understand water use trends over time
- Identify possible water-reduction strategies
- Recommend suitable water-reduction strategies for UCSB

SCOPE

GEOGRAPHIC: *All UCSB-operated buildings.* The Plan's geographic scope includes all UCSB-operated buildings (see map). It does not include faculty housing (e.g., West Campus Family Housing) or off-campus UCSB properties, such as natural reserves and satellite campuses.

Above: Map of the UCSB Campus; all buildings shown are included in the WAP analysis minus faculty housing. Source: UCSB LRDP

TEMPORAL: *15-year historical; 15-year planning horizon.* The temporal scope considers a 15-year historical time frame, representing Fiscal Years (FY) 1996/97 to 2010/11. The WAP also encompasses a 15-year planning horizon chosen to align with growth projections from UCSB's Long Range Development Plan and Climate Action Pan.

WATER: *Potable and Recycled.* The water scope focuses on potable water (water suitable for human consumption) and discusses recycled water as a means to supplement potable water supplies.

DATA SOURCES

Three key data sources were utilized: water utility bills, restroom audits and in-situ testing, and extensive personal communication with stakeholders.

- **WATER UTILITY BILLS:** Aggregated data for a 15-year historical time frame.
- **CAMPUS RESTROOM AUDIT AND IN-SITU TESTING:** Inventory of restroom fixtures and testing of toilet flush volumes.
- **PERSONAL COMMUNICATION AND WATER SURVEY:** Information from interviews and tours with water stakeholders and from a campus community survey on water use habits and knowledge.

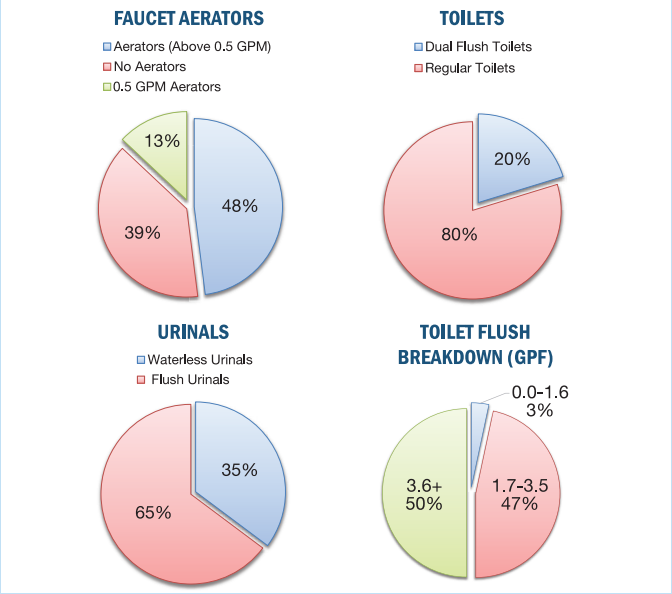
METHODOLOGY

The methodology used in crafting the Water Action Plan can be broken down into three categories:

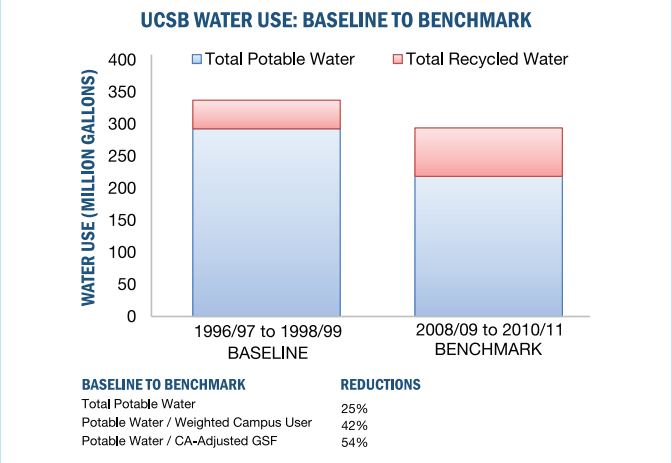
- **HISTORICAL UCSB WATER USE ANALYSIS:** A 3-year Baseline water usage period, from FY 1996/97 to 1998/99, was selected by UCSB to meet UCOP requirements and serve as a timeframe from which later potable water savings would be measured.
- **CREATION OF THREE-YEAR BENCHMARK PERIOD:** The Benchmark period, from FY 2008/09 to 2010/11, was introduced to determine past reductions and to define a water use period from which the University can measure future reductions. The Benchmark was chosen to reflect representative climate conditions, trends in campus growth, and recent infrastructure development.
- **ASSESSMENT OF POTENTIAL WATER CONSERVATION STRATEGIES:** Potential water conservation strategies were analyzed based on water savings and financial feasibility. For each water saving strategy, annual water savings were calculated and an economic assessment was conducted, which accounted for initial capital investments, operation and maintenance over time, and utilities cost savings attributable to water reductions.

HIGHLIGHTED RESULTS

The results of the analysis show average flow rates on campus for bathroom fixtures, the water savings potential of over twenty conservation and efficiency strategies, and water savings from the Baseline to the Benchmark.



Above: Results of the campus restroom audits showing the percentage of each type of fixture installed for faucet aerators, toilets, and urinals. Also shown are results of the in-situ toilet tests; the vast majority of toilets flush above the current regulatory requirement of 1.6 gpf.



Above: Potable and recycled water use during the Baseline and Benchmark periods; tabulation of reductions.

RECOMMENDATIONS

The Water Action Plan makes two types of recommendations: "Infrastructure Recommendations," targeting infrastructure improvements to reduce potable water use on campus, and "Management Recommendations," discussing administrative and management actions the University can implement to reduce potable water use on campus. Based on the results, over two dozen recommendations were made in the Water Action Plan.

INFRASTRUCTURE RECOMMENDATIONS

Of the potential water savings strategies evaluated, four are highlighted based on their initial cost, annual water and cost savings, pay back periods, and conservation potential. These four strategies represent a range of water use sectors including academic, residential, industrial, and irrigation.

HIGHLIGHTED RECOMMENDATION	INITIAL COST ($2012)	PAYBACK PERIOD	ANNUAL POTABLE WATER SAVINGS (GAL)	ANNUAL WATER COST SAVINGS ($2012)
Retrofit restrooms in academic and residential buildings	$173,500	<2 years	33.2 Million	$165,000
Plumb Sierra Madre and San Joaquin toilets with recycled water	$333,000	18 years	5.4 Million	$21,000
Increase concentration cycles for cooling towers	N/A	N/A	5.5 Million	$37,000
Expand weather-based irrigation control system	Variable	Variable	3.0 Million	$15,000

MANAGEMENT RECOMMENDATIONS

Of the recommended management strategies, four are highlighted based on their potential to support and inform water conservation activities on campus. Costs and water savings for the management recommendations were estimated to determine relative cost and impact.

HIGHLIGHTED RECOMMENDATION	DESCRIPTION
Install real-time meters in all buildings and new construction	▪ Facilitate quick and efficient data collection ▪ Identify leaks within the system ▪ Help incentivize campus water users to conserve
Create a living central database for water use and infrastructure	▪ Provide realistic monitoring trends allowing the University to better predict future water needs and adjust campus population growth accordingly ▪ Assist with the efficient pinpointing of the most inefficient areas on campus
Implement a campus-wide water conservation education program	▪ Increase students' perception of water conservation activities by providing students with the knowledge and motivation to reduce water usage ▪ Incorporate water conservation into academic curriculum
Create a "Water Manager" position	▪ Help with the effective and efficient implementation of the water conservation programs and strategies across campus

REFERENCES

"UCSB Long Range Development Plan." University of California, Santa Barbara; Office of Campus Planning & Design. 2010.

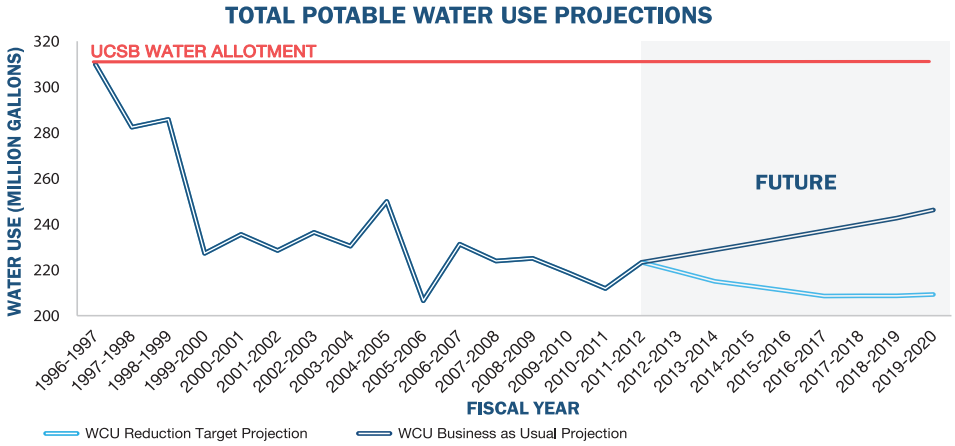
"UCSB Climate Action Plan." University of California, Santa Barbara; UCSB Utility & Energy Services; UCSB Sustainability. 2012.

A LIVING DOCUMENT

The Water Action Plan is a living document at UCSB and will be evaluated and adjusted in the coming years to reflect Campus developments, changes in technology, and new regulations and laws. In addition to annual reporting to UCOP, the document recommends that UCSB assess the Water Action Plan every five years to prioritize mitigation efforts and explore new technologies and conservation techniques as they emerge.

FUTURE WATER USE REDUCTION TARGETS

UCSB has achieved the UCOP mandate of a 20% reduction in potable water use. To encourage further water conservation, a second reduction target was established: reduce total potable water use 20% from the Benchmark to 2028, with a interim reduction target of 15% by 2020. These targets were established based on the water savings potential of all recommendations implementable within 2 years. This reduction in total potable water use will offset water use attributable to anticipated Campus population growth.



Left: Historical and projected weighted campus user potable water use. The dark blue line indicates historical water use and future water use assuming no conservation efforts. The light blue line shows projected potable water use, assuming the recommendations of the Water Action Plan are implemented and the anticipated outcome of a 15% reduction target is met by 2020.

IMPLEMENTATION

The UCSB Water Action Plan was approved by the Chancellor's Sustainability Committee and by the Budget Committee of the Academic Senate in March, 2013. It is now the guiding water management document for UCSB. This Plan is the first to be implemented in the UC system and is one of the first comprehensive water conservation plans for a university in the nation.

THE WATER ACTION PLAN TEAM

(Left to right) Derek Booth (advisor), Katie Cole, Jewel Snavely, Rebecca Dorsey, Briana Seapy, Matthew O'Carroll, Dane Johnson

ACKNOWLEDGEMENTS

Funding Sources: Bren School of Environmental Science & Management; James S. Bower Foundation; UCSB- The Green Initiative Fund (TGIF); Project Advisor: Derek Booth; Advisory Committee: Arturo Keller, Bob Wilkinson, Chris Rich, Jordan Sager; Client Representative: Mo Lovegreen

QUESTIONS? COMMENTS? VISIT OUR WEBSITE: is.gd/UCSBWAP