

Cal Poly State University San Luis Obispo

2015 Drought Response Plan

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Executive Summary

Due to the ongoing multi-year drought in California, the Governor announced a drought emergency in early 2014, with direction to state agencies to reduce water usage 10% by 2016 and 20% by 2020. These goals were adopted as policy by the CSU with the passage of the 2014 CSU Sustainability Policy by the Board of Trustees in May 2014. In April 2015, the Governor issued Executive Order B-29-15 increasing the reduction goal to 25% and accelerating the targeted completion date to February 2016, using 2013 usage as a baseline. This document summarizes Cal Poly's water conservation efforts to date, the measures that were implemented immediately in response to the 2014 policy, and the projects that will be necessary to meet or exceed the new 25% goal. Opportunities for conservation were identified in three major areas:

- Building plumbing systems and process water use
- Campus core landscape irrigation
- Ag irrigation

Historically, Cal Poly has been an excellent steward of its water resources, having implemented hundreds of conservation measures over the years. Total water use from Whale Rock Reservoir averages approximately 1100 acre feet per year – well within the annual safe yield of the watershed that replenishes it. Buildings account for about 25% of usage, landscape and sports field irrigation 33%, and Ag Operations 42%. Total usage since 2003 has remained nearly flat despite a 60% growth in building square footage and 100% growth of on-campus residency over the same period. Cal Poly still maintains nearly 6 years of supply in Whale Rock Reservoir.

Immediate Water Usage Reductions

In response to the 2014 drought emergency, a number of low cost/fast payback measures were immediately implemented, or will be completed by December 2015 using CSU minor capital water conservation funding. Completed projects using existing operating budgets include:

- Installation of 954 low flow faucet aerators campus-wide
- Installation of 300 low flow shower heads throughout University Housing
- Replacement of kitchen equipment in Dining and Vista Grande
- Improved control of cooling towers and swimming pools
- Reduction of watering to campus landscape and sports fields
- Major improvements to irrigation systems and practices in Ag Operations

CSU funded projects in design or planning, scheduled for completion by December 2015 include:

- Installation of a new wireless landscape irrigation control system and mulching of planting beds
- Retrofit of restrooms in 8 state buildings and 1 Housing building with low flow plumbing fixtures

These efforts have already resulted in a reduction of total water use of 23% from Whale Rock and campus wells combined, which nearly satisfies the 2016 goal. These projects cost approximately \$420,000 to implement, and will save \$150,000 per year in utility expenses – a simple payback of 2.8 years.

Cal Poly's total 2014 water usage reduction included a 5% reduction in potable water use by buildings and campus landscape, and a 54% reduction in Ag water use for farm operations and Sports Complex irrigation. When the current wireless landscape irrigation control and building low flow plumbing retrofit projects are complete, another 3% reduction will be achieved. Due to the highly variable nature of weather and resultant irrigation needs, caution is warranted not to assume the reduction of Ag water use is permanent until data has been collected for at least another growing season.

Recommended Future Reductions

It is the recommendation of the Drought Planning Group, the Sustainability Advisory Committee, the Master Plan Natural Resources and Sustainability Subcommittee, the Executive Director of Facilities, and the VP of Admin and Finance that Cal Poly should strive to exceed the Governor's goal by reducing campus water usage as much as possible within the limitations of funding, technology, and programmatic needs. In order to meet or exceed the new 2016 goal of a 25% reduction and sustain those reductions, the following measures represent the major needs and opportunities remaining for water conservation:

- Retrofit of remaining state buildings with low flow plumbing fixtures - \$375,000. This measure should be budgeted at \$94,000 per year for the next 4 years (note: does not include ADA upgrades).
- Retrofit of remaining Housing buildings with low flow plumbing fixtures - \$425,000. This measure should be budgeted at \$106,000 per year for the next 4 years.
- Expansion of the wireless landscape irrigation control system to all zones - \$850,000. This should be budgeted at \$100,000 per year for the next 4 years to convert the largest water using zones first. The existing Landscape Services operating budget can support \$50,000 per year for these upgrades as maintenance, so an additional \$50,000 per year is needed.
- Eliminate 13.6 acres (28%) of irrigated turf areas - \$30,000 (these areas will eventually be replanted with native and drought tolerant plant species when rain returns – see attached map).
- Replacement of 8,000 feet of aging and failure prone Ag Operations 12" water main - \$1,000,000. This project will not generate an immediately quantifiable water savings, but reduces the likelihood of a significant water loss due to a large leak or blowout. This project should be included in Ag Ops capital planning.
- Audit and retrofit plumbing fixtures in CPC and ASI buildings that have not yet been studied: 15, 19, 82, 133
- Evaluate opportunities for use of recycled or reclaimed water in collaboration with other Whale Rock partners.
- Pursue additional sources of funding through grants and emerging state water bond programs.

The recommended course of action allows reductions to be monitored each year so that if a future goal is reached early, remaining funds can be used for other needs. Furthermore, an aggressive plan makes deeper water savings possible in the event the drought continues or worsens, and the state or CSU respond by setting even more challenging goals.

In addition to these proposed water conservation/maintenance/modernization projects, the following measures will be implemented to reduce visible use of water in day-to-day operations, and raise the awareness of the campus community to these issues:

- Shut down the car wash rack at Transportation Services and establish a contract with local car wash providers that use recycled water.
- Reduce frequency of screen, building, and walkway power washing by 50% in areas still performing power washing (Campus Dining, University Housing, ASI, and by department request).
- Limit power washing of patios and plazas only to that necessary for health and safety (cleanup of food or animal droppings).
- Incorporate specifications for high efficiency/high capacity washing machines in the next University Housing laundry contract.
- Work with Conference and Event Planning to reduce or eliminate washing of unused linens from events.
- Capture water discharged during fire hydrant flow testing using the Ag Ops tank truck, for disposal into one of Cal Poly's irrigation reservoirs.
- Develop and deploy signage and marketing materials for education and awareness.

Additional information about Cal Poly's water conservation efforts may be found in the 2014 Biennial Sustainability Report, available at:

http://afd.calpoly.edu/sustainability/docs/Metrics/2014_SustainabilityReport.pdf

Background and Overview

Cal Poly was a 33.71% partner in the development of Whale Rock Reservoir in 1960 along with the City of San Luis Obispo and the California Men's Colony. As such, Cal Poly owns its own water rights, source of supply, and storage capacity. As of March 2015, Cal Poly's share of water stored at Whale Rock is at 53% of capacity, enough to supply the campus for nearly 6 years with no rainfall whatsoever.

Cal Poly has been very active in water conservation measures for decades. The campus' building and landscape irrigation use has remained flat for the last 10 years and within the safe annual yield of Whale Rock, despite a 60% increase in building square footage and a 100% increase in on-campus housing. This has been accomplished through hundreds of ultra-low flow plumbing fixture retrofits, planting of native and drought tolerant plant species, use of micro emitter and drip irrigation, improved irrigation controls, and use of Cal Poly compost for mulch in planting beds and as cover when reseeding turf. Increased attention to turf management on the campus' largest turf areas has resulted in a 25% reduction in water usage compared to a ten year average, corrected for varying rainfall.

Since Cal Poly is not part of the City or County of San Luis Obispo, the university has not been subject to water use restrictions that may be implemented by the city or county. Instead, the campus is governed by policies issued by the CSU Chancellor's Office and Board of Trustees.

In response to the Governor's announcement of a statewide drought emergency in early 2014, the CSU Chancellor's Office directed campuses to develop Drought Contingency Plans targeting a 10% reduction in "personal" water use by 2016 and a 20% reduction by 2020. "Personal" was interpreted as targeting residential users primarily, and leaving more leeway for commercial, industrial and agricultural use. These goals were also included in the new CSU Sustainability Policy, passed by the Board of Trustees in May of 2014. To achieve these goals, a Drought Planning Group was convened including representatives from Facility Services, Facilities Planning, Environmental Health and Safety, University Housing, Associated Students Incorporated, the Cal Poly Corporation, and CAFES Ag Operations. The Drought Planning Group, with the consent of the Associate Vice President for Facilities, in order to be responsible stewards of this resource, chose to apply these goals to ALL water use on campus, including Ag Operations.

Upon review of 2014 use data and in response to the Governor's March 2015 Executive Order B-29-15 increasing the reduction goal to 25% of all "potable" water by February 2016, this Drought Response Plan was updated. Since Cal Poly's potable and Ag water supplies come from the same source, it was again decided to apply this goal to *all* campus water use. Three main operational areas were focused on – building plumbing systems, landscape irrigation, and agricultural operations. The following report details the audits and engineering studies that were performed to identify conservation opportunities, measures that have already been implemented, projects that have been approved and funded by the Chancellor's Office for funding, and projects that are proposed to meet or exceed the Governor's goal.

In addition to the conservation measures in the three main areas, a list of miscellaneous measures is included near the end of this report, as well as options being considered for use of reclaimed water. The final section explains the Drought Response Plan in effect for the City of San Luis Obispo.

Building Plumbing Systems

Plumbing fixtures and equipment within campus buildings account for about 25% of total water use or 270 acre feet per year. Cal Poly has been actively retrofitting these systems with ultra-low flow fixtures for many years, having won Sustainability Best Practice Awards for such efforts in 2007 and 2012. In addition to retrofit of existing buildings, all new construction has been specified with ultra-low flow plumbing fixtures in order to maximize the campus' water conservation efforts. There are still a number of fixtures in the existing buildings awaiting retrofit, and some process water uses that could be improved. The primary retrofit measures proposed by this Drought Contingency Plan are:

- Retrofit restroom plumbing fixtures with ultra-low flow fixtures.
- Retrofit or replace high water using process support and lab equipment.
- Minimize water use by cooling towers.
- Minimize water use by swimming pools.

Background

In response to the directive from the CSU Chancellor's Office to prepare a Drought Contingency Plan, WaterSavers LLC was retained in early 2014 to perform an investment grade audit of all state buildings for potential retrofit opportunities. Over summer of 2014, the main Campus Dining facility was audited by the Fisher-Nickel Food Services Technology Center (a free utility funded service) for energy and water efficiency opportunities. University Housing plumbing fixtures were previously audited by Chevron Energy Solutions in 2010.

State Building Water Audits

The audit of state buildings by WaterSavers (see attached report entitled "Cal Poly Proposal 3-26-14") identified opportunities to reduce total water usage by 25 acre feet per year, or 2.3% of total water use. The project would have a total cost of \$550,000, would generate \$128,000 per year in utility savings, with a simple payback of 4.3 years. The project scope recommended:

- Replacement of 390 remaining 3.5 gpf high flow toilets with 1.28 gpf toilets.
- Replacement of 189 1.6 and 1.0 gpf urinals with 0.125 gpf urinals.
- Replacement of 99 2.5 and 3.5 gpm showerheads with 1.5 gpm showerheads.
- Replacement of 460 2.2 gpm faucet aerators with 0.5 gpm aerators.
- Retrofit of 4 ice machines in Mott Gym.
- Retrofit of 16 5.0 gpm spray nozzles at the Meats Processing Center with 2.5 gpm sprayers.
- Replacement of 5 existing laundry machines at Mott Gym with High Efficiency units.
- Retrofit of 2 existing laundry machines at Mott Gym with ozone injection.
- Modification of cooling tower water treatment control parameters to reduce blowdown.
- Implementation of HeatSavr liquid pool covers at the Anderson Aquatic Center.

The measures from the WaterSavers audit that were determined to have the highest water savings, lowest cost, and were quickest to install were implemented immediately. All campus lavatory faucets in both state buildings and University Housing, 954 in total, were retrofitted with 0.5 gpm aerators, and 300 shower heads in University Housing were retrofit with 1.5 gpm units. These measures resulted in an immediate savings of 16 acre feet of water per year, or 1.5% of total water use. The measures cost \$21,000, were funded out of the Facility Services Plumbing Shop operating budget, and are generating \$27,000 per year in utility savings with a simple payback of 0.8 years.

In response to the CSU Chancellor's Office call for FY 14/15 Energy and Water Conservation Projects, with a total of \$5M in funding available for all 23 campuses, a scaled down version of the WaterSavers campus wide proposal was submitted by Cal Poly, targeting retrofit of plumbing fixtures in eight state buildings. The project would save 9 acre feet of water per year or 0.8% of total water use, have a capital cost of \$152,000, and generate \$44,000 in annual utility savings with a simple payback of 3.4 years.

Campus Dining (Building 19) Audit by PG&E Food Service Technology Center

PG&E offers a free energy and water efficiency consulting service through the Fisher-Nickel Food Service Technology Center in Oakland, Ca. This service was brought in by PowerSave Campus interns to perform an audit of all campus food service locations for conservation opportunities. The audit focused primarily on kitchen and food processing equipment, but also studied some lighting. Two water conservation recommendations were identified for Metro 19 – the largest facility on campus – these have already been implemented. Audit of the remainder of food service facilities is still pending from the FSTC.

- Replace two double compartment Vulcan steamers (two smaller steamers were also replaced at Vista Grande but are not quantified here).
- Use the existing high efficiency 1.15 gpm pre-rinse spray valve for the meat storage walk-in instead of the 4 gpm wash down hose.

These measures are saving 292,000 gallons or 0.9 acre feet of water per year – 0.1% of total water use. The measures had a cost of \$53,000 and are generating \$4,300 per year in utility savings, with a simple payback of 12.3 years. A similar steamer replacement project was also implemented at Vista Grande, but usage and savings data was not available for this report.

University Housing Audit by Chevron Energy Solutions

From the campus wide energy audit completed by Chevron Energy Solutions in 2010, opportunities to replace existing high flow plumbing fixtures throughout the Residence Halls were evaluated, and a scope of work and cost estimates were developed to retrofit to the current campus standard, as follows:

- Replace 170 3.5 gpf toilets in the South Mountain Halls with 1.28 gpf (Chevron ECM 106.14).
- Replace 82 1.6 gpf urinals in the South Mountain Halls with 0.125 gpf (Chevron ECM 106.17).
- Replace 60 2.5 gpf toilets in Yosemite Hall with 1.28 gpf (Chevron ECM 114.11).

This project would save 11 acre feet of water per year or 1.0% of total campus building water use, has a capital cost of \$480,000, and generate \$56,000 in annual utility savings with a simple payback of 9 years.

Housing is planning to retrofit one South Mountain (Red Brick) Hall per year starting with Trinity Hall in Summer of 2015. Retrofit of plumbing fixtures in Yosemite will be included with restroom remodels that have been done one tower at a time historically. The next Yosemite tower remodel has not yet been determined or scheduled.

Note: the original construction cost estimates for these ECM's from Chevron are believed to be overly conservative at approximately \$3,000 per fixture, and have been reduced to \$1,500 per fixture for this report.

Associated Students Incorporated Audit by Chevron Energy Solutions

As part of the 2010 Chevron campus wide energy audit, opportunities for water conservation were identified in the University Union and Children's Center. The proposed measures at the UU were implemented shortly thereafter as part of ADA restroom remodels. The Rec Center Expansion project, completed in 2011, replaced all restroom fixtures throughout the building with ultra-low flow and contributed to the building's LEED Gold Certification. The Chevron audit did not propose any measures for the ASI Children's Center – it is recommended that ASI survey this building for potential retrofit.

Cal Poly Corporation Audit by Chevron Energy Solutions

The 2010 Chevron campus wide energy audit proposed the following water conservation measures in the Vista Grande Building:

- Replace 7 3.5 gpf toilets with 1.28 gpf toilets (Chevron ECM 112.10 and 112.11).
- Replace 3 1.0 gpf urinals with 0.125 gpf urinals (Chevron ECM 112.13).
- Replace 8 2.2 gpm faucets with 0.5 gpm sensed faucets (Chevron ECM 112.12).

This project would save 47,000 gallons or 0.14 acre feet of water per year, 0.01% of total building water use. The project would cost \$17,000, and generate \$700 per year in utility savings, with a simple payback of 24 years. The Cal Poly Corporation is currently planning to demolish and replace the Vista Grande building concurrently with the Student Housing South project. The new building will incorporate the latest in water efficient fixtures.

The Chevron audit did not propose any water conservation measures for Buildings 15, 19, or 82. It is recommended that these buildings be surveyed for potential retrofit.

Process Water Use and Pool Operations

Cooling Tower Operations

In order to maintain scale and corrosion control, cooling towers are treated with chemicals, and undergo "blowdown". The process by which cooling towers operate depends on the evaporation of water to carry away the connected chiller's waste heat. As water evaporates, the minerals in the water become more concentrated. The concentration is kept below limits that could cause the buildup of mineral scale by draining a portion of the water off (blowdown) and replacing it with fresh water. The maximum hardness or

conductivity of the cooling tower water is a function of the raw or source water used for makeup, and the chemical treatment program and controls used.

The Central Plant and Refrigeration Shop worked closely with our current water treatment vendor, the Garratt Callahan Company, to implement improvements to Central Plant cooling tower operations to minimize water consumption. These measures are currently saving 530,000 gallons, or 1.6 acre feet of water per year – 0.15% of total building water use. This generates \$7,700 in annual utility savings at no cost, which is an instantaneous payback.

Swimming Pool Operations

ASI staff is already very diligent about installing the pool covers when the pool is not in use, between the hours of 11:00 pm and 6:00 am. At the Anderson Aquatic Center, it has been more difficult to ensure consistent use of pool covers due to use by multiple groups. Regular use is now being accomplished through collaboration between Athletics and Custodial Services, saving approximately 5,000 gallons of water per year.

The swimming pool at Poly Canyon Village has pool covers that are not used due to their tendency to blow off during periods of high wind. This issue has sometimes affected the Rec Center Pool, and Housing has been asked to work with Rec Center staff to adopt similar measures to restrain the covers and make them more usable. Use of covers at the PCV pool would save approximately 1,000 gallons of water per year.

Summary and Recommendations

Already Implemented: In response to the declaration of a drought emergency, the following building water conservation measures were immediately implemented and are saving water:

- Retrofit 954 lavatory faucets with 0.5 gpm aerators in state and University Housing buildings.
- Replaced 300 shower heads in University Housing Residence Halls.
- Replaced 4 cooking steamers at Campus Dining and Vista Grande.
- Switched to high efficiency spray nozzle at building 19 meat storage walk-in cooler.
- Reduced blowdown of Central Plant cooling towers.
- Reinstated use of pool covers at Anderson Aquatic Center.

These measures are already saving 18.5 acre feet of water per year, 1.7% of total building water use. The projects had a total cost of \$74,000, and are generating a savings of \$88,000 per year, with a simple payback of 0.8 years.

2015 Funding Approved from Chancellor's Office: In response to the CSU Chancellor's Office call for FY 14/15 Energy and Water Conservation Projects, with a total of \$5M in funding available for all 23 campuses, a scaled down version of the WaterSavers campus wide proposal was submitted by Cal Poly, targeting retrofit of plumbing fixtures in eight state buildings. The project will save 9 acre feet of water per year or 0.8% of total water use, have a capital cost of \$152,000, and generate \$44,000 in annual utility savings with a simple payback of 3.4 years. Funding was approved by the Chancellor's Office in March, 2015 and this

project is being delivered via change order to the \$4M energy conservation project already underway with PG&E and AECOM.

Recommended Projects Still in Need of Funding: It is recommended that all buildings that still have high flow toilets and urinals or other plumbing fixtures are retrofit to the latest ultra-low flow units. These projects were identified through 3 separate investment grade audits, are detailed in the sections above, and are summarized by funding source here, and will be necessary to meet or exceed the Governor’s goal of a 25% reduction in water use:

- State Buildings – retrofit toilets and urinals in numerous buildings - cost \$375,000
- Cal Poly Corporation – perform audits and make recommendations for buildings 15, 19, and 82 which have not yet been studied.
- ASI – perform audit and make recommendations for the Children’s Center, which has not yet been studied.

It must be noted that ADA issues will likely need to be addressed for restroom toilet and urinal retrofit projects to move forward. If it is determined that this work constitutes “maintenance” with like-for-like replacement of fixtures, ADA compliance may not be required. It is more likely that such projects would be considered upgrades, and additional improvements not included in this scope of work would be necessary to achieve ADA compliance. This would be determined by the Campus Building Official for minor capital projects (under \$634,000), and by the Chancellor’s Office for major capital projects (over \$634,000).

Landscape Irrigation

Landscape irrigation, and in particular turf irrigation, account for some of the largest water uses on campus – 33% of total water use, or 360 acre feet per year - and are thus a critical part of ongoing water conservation and emergency drought planning. Proposed drought contingency measures focus on three areas:

- Eliminate existing turf or convert to lower water use landscape plantings.
- Improve moisture retention in planting beds through soil amendment and mulching with compost or wood chips.
- Improve irrigation system performance through retrofit with more efficient irrigation equipment and weather based digital controls.

Background

Before discussing proposed measures going forward, it is important to note the current state of irrigation technology and the existing campus irrigation infrastructure, and the results of conservation efforts to date. The standard of practice in the landscape industry is to irrigate turf and plantings based on measured Evapotranspiration, or ET. This metric uses current weather conditions (solar intensity, temperature, wind speed, and humidity), soil conditions, and the metabolic water needs of plant materials to quantify the optimal amount of irrigation needed to offset losses due to atmospheric evaporation and plant transpiration.

Based on ET data published by the Cal Poly ITRC (Irrigation Training and Research Center), turf in San Luis Obispo should use an average of 39.18 inches of irrigation per year, or 4.25 acre feet of water per acre of land.¹ Digital ET based irrigation controls have the ability to automatically adjust irrigation run times on a daily basis to account for changes in ET, and to adjust for the contribution of rainfall. Cal Poly does not currently have the ability to measure ET in real time, or automatically reset or reprogram irrigation controllers as weather and ET change.

The staff time required to manually reprogram approximately 100 irrigation controllers (serving nearly 2,500 zones) for a change in weather or rain event is prohibitive, resulting in program settings that are overly conservative to maintain a green and healthy looking landscape. Furthermore, broken sprinkler heads or piping must be observed and reported by a person, or inferred when landscape starts to turn brown. A digital ET based control system would not only adjust watering schedules daily, but would detect and shut down any zone with a broken head or pipe based on measured flow, and generate an alarm notification to expedite repair. Flow measurement and tracking would also allow continuous improvement of landscape operations.

Turf Reduction

In 2007, the Cal Poly campus had 56.55 acres of irrigated turf requiring an average of 265 acre feet of irrigation per year. Since 2007, campus has reduced turf area by 8.18 acres, including conversion of three upper Sports Complex fields to synthetic turf, a net reduction in turf area of 14.5%.

In response to the current drought emergency, Facility Services has identified another 13.6 acres of lawn that could be removed with minimal impact to the campus esthetic or the most heavily used lawns, an additional 28% reduction from the current turf area (see attached drawing "Proposed Turf Reductions"). This would result in water savings of about 67 acre feet per year, or 6% of total water use.

Areas of removed turf will eventually require climate appropriate plantings, reducing water use significantly if planted in the fall, but will not eliminate the necessity for irrigation to those areas. In particular, drip irrigation will need to be supplied to existing trees that are currently surrounded by irrigated turf to prevent loss. If former turf areas are left bare the use of herbicides and erosion will increase, polluting storm water runoff and negatively affecting the campus esthetic. As a result, not all 67 acre feet can be claimed as a reduction. A more conservative estimate would be a net reduction of 60 acre feet, or 5.5% of total water use.

For immediate drought response, this report is focusing on the measures needed to achieve the water savings while protecting the campus from loss or damage. The scope of turf reduction includes spraying out lawns with herbicide, installing drip irrigation where necessary to protect existing trees, and spreading wood chips or mulch to provide cover and erosion control. The cost of implementation is estimated at \$30,000. Utility savings will equate to \$90,000 per year. In the long term, campus will replant these areas with water efficient native and drought tolerant plant species. These projects will need to go through the normal campus process for prioritization and funding, and are estimated to cost approximately \$25,000 per acre.

Soil Amendment and Mulching

Cal Poly currently has an active composting program, managed by CAFES Farm Operations with cooperation from Landscape Services. Approximately 7,000,000 pounds of animal manure and 2,500 cubic yards of green waste from Landscape Services are composted on campus, producing about 3,500 cubic yards of finished compost that has received the Seal of Testing Assurance from the US Composting Council. This material is already being used as a soil amendment and mulch in planting beds, and top dressing for turf reseeding operations.

It is estimated that mulching planting beds results in an average reduction in irrigation needs of approximately 25%². About 50% of the campus' planting beds are currently mulched, and it is estimated that planting beds account for approximately 30% of all landscape irrigation use or 105 acre feet per year. Expansion of mulching to all planting beds will result in utility savings of \$22,000 per year, and an annual water savings of approximately 13 acre feet, or 1.2% of total water use.

Irrigation Controls

In early 2014, Cal Poly retained the services of WaterSavers LLC to perform an investment grade audit of the campus' landscape irrigation systems. The resulting report (see attached "Cal Poly Irrigation Proposal 4-18-2014") presented an opportunity to reduce campus landscape irrigation use of potable water by 41% through installation of a central wireless ET based control system, all new zone controllers, flow meters and higher efficiency heads. The campus wide project would have a capital cost of \$1.6M, generate utility savings of \$142,000/year, and has a simple payback of 11.8 years.

In response to the CSU Chancellor's Office call for FY 14/15 Energy and Water Conservation Projects, with a total of \$5M in funding available for all 23 campuses, a scaled down version of this project was submitted by

Cal Poly. The project includes installation of a CalSense ET based central control system and conversion of the 15 irrigation controllers that are believed will result in the greatest water savings.

This project will result in a savings of 25 acre feet of water per year – 2.3% of total water use. Total project cost will be \$153,000, and will result in \$42,000 in annual utility savings with a simple payback of 3.7 years. Furthermore, it will create a base infrastructure that can be expanded using existing operating budgets at a cost of about \$10,000 per zone. The Chancellor’s Office approved and funded this project in March 2015, and it will be completed using in-house Landscape Services staff.

Summary and Recommendations

It is recommended that Cal Poly implement the three following landscape irrigation initiatives to meet or exceed the Governor’s reduction goal:

Turf Reduction: Eliminate 13.6 acres of irrigated lawn as shown on the drawing “Proposed Turf Reductions”. Immediate measures will require spraying out lawns with herbicide, implementing erosion control measures, and installing drip irrigation to protect existing trees. This measure will cost approximately \$30,000, and will save \$90,000 and 60 acre feet of water per year, or 5.5% of total water use.

Composting/Mulching: Expand the use of Cal Poly compost as soil amendment and mulch to all remaining planting beds. This measure will save 13 acre feet of water per year, or 1.2% of total water use. There is no cost for the compost from Farm Ops, and application is being performed by Landscape Services staff as part of regular maintenance.

Irrigation Controls: Install a CalSense central irrigation control system and convert the first 15 controllers with the greatest savings potential, with the ability to expand as time and funds allow. This measure will cost \$153,000 and save 25 acre feet of water per year, or 2.3% of total water use. This project was approved and funded by the Chancellor’s Office in March 2015 and will be performed in-house.

Water Savings: 98 acre feet per year, 2.3% of total water use

Project Cost: \$173,000

Annual Utility Savings: \$127,000/year

Simple Payback: 1.4 years

¹ Using ETo (0.62) Area (Crop Coefficient of 0.85)/Irrigation Efficiency @ 0.59

² Estimate from research by EarthKind <http://earthkind.tamu.edu>

Agricultural Operations

CAFES Ag Water is used on the campus farm for irrigation. The Whale Rock Reservoir annual allocation portion for agricultural use is 449 acre feet per year. The following measures were implemented in 2014 to reduce agricultural water use:

- Since January 2014, the crops unit has been strictly using well water for irrigation from the wells located in field 25 and field 28. This has reduced demand on the Whale Rock Ag water allocation by 118 acre feet when compared to the same time frame (January to June) last year. This has provided a 49% reduction so far this year when compared to the same time period from last year.
- Over Summer 2014, Agricultural Operations replaced all existing sprinkler head nozzles with 1/8 inch nozzles at the Crops Unit, Silage Production field, Beef pastures, Dairy pastures and Sheep pastures. The reduction in nozzle size provides a 33% reduction in water use associated with ALL sprinkler irrigation. Sprinkler irrigation is used on approximately 120 acres of irrigated pasture and row crops combined.
- At the Crops Unit and Mission Avocado orchard, micro-emitters have been installed to irrigate all of the orchard crops. ITRC has done efficiency testing on these systems over the past couple of years and has assisted through this testing in increasing the efficiency of these systems. Data on this can be supplied upon request from ITRC.

The following measures are still in progress:

- The Nelson Reservoir Pump Station is on scheduled to be completed by June 1, 2015. Once in operation, this pump station will provide for improved water management associated with agricultural irrigation by placing Mission Avocado solely on the use of the Stenner Creek Pump Station for their irrigation scheduling. This will eliminate pumping conflicts with the campus farm and vineyard, increasing the ability to more accurately monitor their water use. The Nelson pump station will provide water directly to the vineyard with a separate pump and VFD for their irrigation scheduling. The Nelson pump station will also provide a separate pump and VFD for irrigation water to the campus farm.

For monitoring of CAFES compliance with the internal campus allocation of a maximum of 449 acre feet per year for Ag use, Sports Complex water use is deducted from total campus Ag Water use. With flow metering and irrigation reservoir level monitoring in place, CAFES will continue to monitor water use on the farm. Annual reports on Ag Water Use will be prepared and submitted in January of each year, after the annual Whale Rock Report has been received.

As part of the Critical Infrastructure/Utility Master Plan assessment performed in 2014, it was determined that approximately 8,000 feet of 12" Ag water distribution piping main is in need of replacement to reduce or eliminate leaks and blowouts. The quantity of water being lost is very difficult to estimate. A line item was included in this study to replace main distribution water lines with a rough estimate of well over \$1M, but it is not likely that this particular need will be funded in the next few years due to the size of the project backlog.

Proposed Miscellaneous Measures

- Shut down car wash rack at Transportation Services and establish contract with local car wash providers that use recycled water.
- Reduce frequency of screen, building, and walkway power washing by 50% in areas still performing power washing (Campus Dining, University Housing, ASI, and by department request).
- Limit power washing of patios and plazas to only that necessary for health and safety (cleanup of food or animal droppings).
- Incorporate specifications for high efficiency and high capacity washing machines in the next University Housing laundry contract.
- Work with Conference and Event Planning to reduce or eliminate washing of unused linens from events.
- Capture water discharged during fire hydrant flow testing using the Ag Ops tank truck, for disposal into one of Cal Poly's irrigation reservoirs.

Awareness, Educational Outreach and Signage

Already in Effect:

- Signage has already been put up in ASI and University Housing areas.
- Water conservation and related signage is a focus of Green Campus Certified, which was completed by PowerSave Campus for all 11 departments within AFD, and several academic departments.
- PowerSave Campus has developed additional signage and is working with ASI, Campus Dining, and University Housing to display on digital displays and on University Housing Television.
- Water conservation is one of the primary functions of the annual Dorm Energy Competition run by PowerSave Campus every February, involving approximately 1,700 students.
- Water conservation is part of the message included in educational outreach and orientation programming for new students at Open House, SOAR, and WOW.
- Drinking water is only provided to Sage Restaurant customers upon request.

Proposed:

- Place articles in the Cal Poly Report, and advertisements in Mustang News.
- Support National Water Awareness Month in May, and incorporate into plans for Earth Day (April 22).

Use of Reclaimed/Recycled Water

Cal Poly does not have the infrastructure needed to make use of reclaimed water in the campus core, and construction of such infrastructure is cost prohibitive. However, Cal Poly already recycles about 15 acre feet per year of Ag water for washdown of the Dairy free stall barns and irrigation of silage crops, and has a new rainwater catchment system at the Escuela Ranch Bull Test site that can capture and store 0.8 acre feet per year. Facilities is evaluating potential use of reclaimed water from the California Men's Colony Waste Water Treatment Facility near Cuesta College for irrigation of Chorro Creek Ranch, and the possibility of partnering with the City of SLO on a reclaim water facility being considered at Santa Rosa Park.

City of SLO Drought Response Plan

The average residential per capita water usage in San Luis Obispo used to be 125 gpd but is now is about 115 gpd, primarily through education and conservation programs. The City puts less restriction on businesses because their use is less discretionary.

Based on a computer model that projects the storage and recharge of Whale Rock and Salinas Reservoirs, City of San Luis Obispo drought response plans are triggered if storage volumes for *either* Whale Rock or Salinas Reservoirs are projected to drop below the minimum safe pool size of 2000 acre feet (approx 5% for Whale Rock and 8% for Salinas). This lower limit is intended to protect fish stocks.

Three levels of emergency water conservation or restriction are triggered when the model predicts minimum pool size will be reached within 1, 2, or 3 years:

- **Stage I Emergency**
 - Projections show drop below minimum storage within 3 years
 - Awareness campaign and voluntary conservation
 - Per capita usage cap set at 115 gpd
- **Stage II Emergency**
 - Projections show drop below minimum storage levels within 2 years
 - More aggressive outreach, possible rate increases
 - Per capita usage cap set at 100 gpd
- **Stage III Emergency**
 - Projections show drop below minimum storage levels within 1 year
 - Mandatory conservation, possible ban on watering lawns and washing vehicles, fines
 - Per capita usage cap set at 85 gpd

Due to significant investments to procure additional sources of supply including Nacimiento and State Water, the City of SLO does not believe any emergency stages will be triggered, even in time of significant multi year drought. Staff feels that the city's water supply is adequate through full City Master Plan buildout. As good stewards of the environment, the City is continuing to promote conservation through educational outreach.

In response to the statewide water emergency, the City of SLO published the following water use restrictions from the California State Water Resources Board:

- No washing down driveways
- Excess irrigation runoff prohibited
- Shut-off nozzle required when washing vehicles
- Fountains must recirculate potable water
- Starting in October 2014, landscape irrigation was limited to 3 days per week

Information about the City of SLO's water conservation efforts and water use restrictions are available at: http://www.slocity.org/utilities/download/resource/resource_fall2014.pdf