



State of California Water Conservation Grant Program Report

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California Department of General Services

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EXECUTIVE SUMMARY

In the midst of the California drought of 2014-2017, the Department of General Services (DGS) managed a \$10 million State Water Conservation Grant program from 2015-2018 to reduce state facility water use. This program was managed by the Office of Sustainability and the estimated annual savings from these efforts is approximately 300 million gallons of water.

PROJECT SELECTION

The Water Conservation Grant was introduced to state agencies through California's Sustainable Building Working Group in June 2015 stating that all executive branch state agencies except DGS were eligible for the grant. Additionally, a solicitation was sent out to state agencies which included [project information forms](#), [application for funding forms](#), [water conservation project worksheets](#) and other resources to outline potential projects and estimate their annual water savings.

In July, 2015, \$37.8 million in project proposals were submitted by state agencies and were evaluated and screened based on estimated water savings per dollar invested (gallons/dollar), as well as consideration for locations in heavily drought-stricken areas. Departments were encouraged to take advantage of water efficiency [incentives from water districts and utilities](#), as well as contributing to project costs if possible.

In September 2015, 20 state departments and 10 District Agricultural Associations (DAAs) were awarded grants for 165 projects totaling approximately \$10 million. Due to a moratorium on landscaping projects at state facilities imposed by the governor during the drought, projects were not allowed to include any new landscaping.

SCOPE OF WORK

The selected projects included the replacement of numerous plumbing fixtures, irrigation controls and valves, water treatment equipment, and a number of other water-conserving projects.

The projects included the following:

- 8,036 toilets
- 983 urinals
- 11,457 faucet aerators
- 3,049 showerheads
- 276 irrigation controllers
- 122 irrigation valves
- Other items
 - 5 Water treatment systems for cooling towers
 - 11 large commercial dishwashers
 - 1 laundry water reclamation system
 - 6 efficient evaporative coolers
 - 6 mag meters for well pumps
 - Water reels for nighttime irrigation
 - Replaced walk-in refrigerator units
 - Water-line repairs

CONSTRUCTION/LABOR FORCE

State agencies and DAAs have a wide range of skills and abilities within their facilities professionals. Some agencies contract with other agencies or outside maintenance contractors to operate and maintain their facilities. Others have their own in-house facilities teams, complete with plumbers, electricians, landscaping crews, etc. State agencies completed projects utilizing the following labor resources:

- In-house labor force (plumbers, electricians, landscapers)
- Department of General Services
- California Conservation Corps (CCC)
 - Water Conservation Crews organized statewide teams of young corps members who were learning valuable skills while doing plumbing retrofits, replacing fixtures, irrigation valves, etc.
 - Successfully provided labor for number of state agencies helping them utilize grant funding to the fullest.
 - While funding for the program has expired, new funding could revive the program and provide more valuable training in the trades, as well as in landscaping, while providing a valuable labor resource for state agencies.
- Contracting out to local plumbing and landscape irrigation professionals. In some cases, even with in-house tradespeople, agencies contracted out to expedite construction efforts.



RECYCLING OLD FIXTURES



State agencies were provided with several links to companies that take and recycle old porcelain fixtures. One such facility in Galt crushed old toilets and urinals, and used the ground materials to add to road base.

PROJECT TYPES

TOILET REPLACEMENT (8,036)



Older, inefficient toilet replacement was one of the most common water conservation measures used by state agencies. Most of these older fixtures previously used 3.5 to 5 gallons or more of water per flush, and were replaced by new fixtures using 1.28 gallons per flush. This was particularly effective at reducing water use at high volume public facilities.



California Department of Corrections and Rehabilitation (CDCR) replaced 2,564 older toilets, including many in prison cells with new correctional grade toilets, some of which included valve controls to limit multiple frequency of flushing from inmates in rapid succession. Prisoners have historically overused plumbing fixtures for various reasons in protest, as communication, and other purposes ([up to 65 times/day](#)). CDCR installed some valves that allow them to determine the maximum flushing frequency, thus saving water and sewer.

URINAL REPLACEMENT (983)



Existing urinals in many state buildings used up to 2-3 gallons per flush, and were replaced with ultra-low water using urinals that used 0.125 gallons/flush (one pint). Most agencies opted against replacing with waterless urinals, due to complaints of potential maintenance issues (calcification in pipes), or smell.

FAUCET/AERATOR REPLACEMENT (11,457)



Lavatory faucet aerators are considered a very low cost (\$1- \$6), high water savings measure. Many existing faucet aerators, which control the flow of water from a water faucet, used between 1.5 to 2.5 gallons per minute. These were replaced with lavatory aerators using only 0.5 gallons per minute with substantial savings.

In some cases, departments replaced entire faucets, due to poor condition of existing fixtures. In some institutional settings, faucets were part of a combined fixtures including a toilet and lavatory. CDCR also installed push-button metered faucet controls that would shut off automatically after a determined time. This also helped reduce water use, avoiding faucets left running.

SHOWERHEAD REPLACEMENT (3,049)



Another low-cost water-saving upgrade that many facilities included was the replacement of older showerheads. Older fixtures used 2 to 3 gallons per minute and were replaced by new showerheads using only 1.5 gallons per minute. In some institutional settings tamperproof showerheads were needed, or showerheads that would not allow items to be tied to them. Showerheads used in institutional settings had high use, resulting in big savings, while employee showers in office buildings are used less.

NEW COMMERCIAL DISHWASHERS (11)



CDCR replaced eleven existing inefficient scullery dish washing machines with high efficiency machines. The dishwashers are utilized 8 hours per day, seven days a week, and the new machines reduced water use of each machine from 342 gallons per hour to 58 gallons per hour. These machines not only reduce water use for these machines by 83 percent, but also reduce sewage needing to be treated and energy use from reduced hot water use.

LAUNDRY WATER RECLAMATION SYSTEM (1)



The California Prison Industry Association (CALPIA) installed a water reclamation system at the California Institution for Men (CIM) in Chino. This system reduces water consumption by approximately 10.9 million gallons annually (about half of its laundry water use at the facility) and includes a water softener that reduces chemical usage. It utilizes a metal oxide filter (MOF) membrane system with channels and sub-micron

membranes that remove contaminants and allows water to be recycled back into laundry system.

This system reduces impacts on the central sewer treatment plant as well, saving energy. The system installed at the CALPIA facility cost ~\$500,000 and is estimated to save 10.9 million gallons of water each year, a savings of ~22 gallons of annual water use per dollar invested. CALPIA achieves 50-75 percent water savings at several laundry facility sites that use similar water reclamation systems. CALPIA originally applied for funding for this system at 6 of their 13 laundry facilities statewide that process laundry. The grant funded this one facility, but water savings could still be achieved at other facilities with additional funding.

IRRIGATION VALVE REPLACEMENT (122)



Some older irrigation systems had leaks or were manually operated, with higher risk of leaving on and wasting water. New automated and efficient irrigation valves replaced older systems allowing better zone control and reducing water use.

IRRIGATION CONTROLLER REPLACEMENT (276)



Some existing irrigation control systems are manually or mechanically operated for facility irrigation, often operating on the same schedule regardless of weather or actual site conditions. Many controllers were replaced with weather or satellite controlled controllers to reflect actual conditions, and allow water savings, while better providing irrigation needs and preserving landscapes. Controllers were installed at CalOES, CADA, DDS, CAL FIRE, DPR, and several DAAs.

OTHER IRRIGATION EQUIPMENT



The Yolo County Fair purchased water reels that automatically pull in a large sprinkler, replacing manual sprinklers. This system allows for evening watering without requiring staff to be present, or overtime work. This project saved about 13%, reducing evaporation due to over watering during the heat of the day.

However, staff did have difficulty logging into the system to get updates.

WATER TREATMENT SYSTEMS (5)



Large office buildings often utilize cooling towers and chillers to create chilled water for the cooling needs of the buildings. A cooling tower typically cycles water a number of times through the cooling towers, before mineral build-up begins to affect the equipment and cooling ability. This mineral-laden water referred to as “blow-down” is then typically sent into the sewer lines as waste, and new potable water is introduced into the system.

Technologies have been developed that treat water used in these cooling cycles without chemicals to greatly extend the number of cycles they can be used, and reduce water use. Dolphin WaterCare (now Evapco) is one manufacturer of these systems used at three Department of Justice (DOJ) and one DMV facility, saving 4.2 million gallons of annual water use.

Additionally, CAL PERS added a filtration system that allowed them to recapture 1.7 million gallons of water per year for landscape irrigation, window washing and other cleaning.

REPLACED EVAPORATIVE COOLING SYSTEMS (6)



The California Department of Food and Agriculture (CDFA) replaced six old, leaky swamp coolers at the Meadowview greenhouses to more efficient systems. The reported water use savings for 12 months following the work was 3,281,476 gallons of water.

INSTALLED NEW MAG METERS (6)



CalExpo installed Mag-meters at six wells providing water to the CalExpo facility. This allowed maintenance personnel to monitor how much water was flowing, and detect leaks and other problems quickly when not in use, and reduce water use. Less pumping also reduces energy use. The cost to install these six meters was estimated at \$140,000, and estimated annual water savings of at least 5 percent, or 9,680,000 gallons.

REPLACE WALK-IN COOLER UNITS



CalExpo replaced walk-in refrigerator units at their grandstand facility replacing a water cooled chiller which had constant running water with more efficient units using no water, saving 6,800,000 gallons of water annually, as well as energy use. The units cost \$76,000, returning approximately 89 gallons per dollar of investment.

WATER LINE REPAIRS



The Department of Parks and Recreation (DPR) replaced and repaired thousands of feet of antiquated, leaky waterlines at three facilities at a cost of \$135,000, saving an estimated 4,250,000 gallons of annual water previously wasted through leaky pipelines. These facilities included Salton Sea, Humboldt Redwoods, and Samuel P Taylor state parks. This helps DPR avoid undetected leaks and lengthy repairs avoiding park shutdown for frequent repairs. This saved an average of 31 gallons annually per dollar invested in the projects. DPR identified a number of additional leaky pipelines in need of repair that the program was not able to fund but could with additional funding.

PROJECT MANAGEMENT AND DURATION

All agencies were responsible to determine how their projects were managed, and account for progress. Initial agreements gave departments until June 30, 2016 to complete projects. Some departments completed projects by June 2016, while others required time extensions to complete their projects. Extensions were granted on several occasions, with some departments finishing by June 2018. In summer 2018, a survey was sent to all 30 grant recipients, and half responded to the survey and provided additional data.

During the department project efforts, some departments determined that they did not need the initial amounts awarded, and some needed more. Some new projects were developed and awarded among existing departments with agreements, and some contract amendments were made in an effort to best utilize budgeted funds. Some departments utilized more of their own funds to achieve even further water use reduction beyond their original proposals. Some departments ran into infrastructure limitations and were not able to complete as much of the proposed work with the funds provided.

Most proposed projects were completed, and some additional projects were able to be funded with unused portions of funding.

REPORTING REQUIREMENTS

All agencies receiving water conservation grants signed an agreement to the following:

1. Benchmark and track their water use beginning 2015 using the Energy Star Portfolio Manager, providing viewing access to the DGS Office of Sustainability.
2. Enter their water conservation project data into the [Drought Action Matrix](#), a state database developed during the 2014-2017 drought to track progress on water conservation projects. Update status of these projects in this database until completed.

PAYMENT STRUCTURE



In order to expedite immediate work on water conservation efforts during the drought, a payment structure provided departments a payment of 75 percent of their total grant funding upon initial signing of the agreement. Agencies submitted an invoice signed by one of their authorized representatives agreeing they would complete the work by the contract date. This signature was required to make sure agency management was aware of measures underway.

Upon completion of the projects, agencies submitted a final invoice for the remaining 25 percent of the grant amount. The DGS Office of Sustainability approved the payment requests and DGS processed the requests sending payments to the agencies.

PROJECT RESULTS

Total Payment and Water Savings

- \$9,527,714.41 – Total grant payments to agencies
- 300,432,121 gallons/year – Estimated annual water savings
 - Equivalent to water use of about 10,000 homes
- Additional energy savings from reduced hot water use, pumping, etc.

Agency Contributions and Rebates

- \$2,209,644.00 – Agency contributions to projects
- \$97,045.00 – Estimated total rebates received

Estimated Gallons Per Dollar

- 25.6 – Estimated average annual gallons saved per total dollar invested

LESSONS LEARNED

Below are comment summaries from the grant recipients' survey responses. The responses included some changes that would need to be addressed within the state department while some of the issues that arose were due to code, funding, or time constraints.

STATE SERVICES

CalOES found that DGS plumbers upgraded the faucets to their facility within 2-3 business days allowing for a seamless transition and low stress.

Several agencies and DAAs utilized CCC crews to perform minor plumbing upgrades and replacements with much success, which required some supervision, but provided valuable training to corps members.

PROJECT & TEAM MANAGEMENT

One suggestion to streamline the process was to write the contract in a manner that could be used department-wide rather than site specific.

A common statement was that management played a big role in the success of a project. Some comments are as follows:

- Projects could have been expanded by bringing the project to leadership earlier on in the process.
- Unforeseen conditions in fixtures and walls, including pipe deterioration, resulted in more expenses.
- Projects provided an opportunity for ownership and responsibility of water conservation to the department and the offices that were recipients of these measures.
- Continuity among those managing projects is helpful. When management changed mid-stream, this created challenges for smooth continuation and completion. It helps to have a sense of continuity in regard to the individuals managing the projects.
- Grant management took considerable staff time. Funding for a temporary position at DGS to administer the program would have been appropriate given the workload.

CHALLENGES

CODE COMPLIANCE

When installing a cooling tower recapture system for use in irrigation, start working with a hygienist and the local water jurisdiction early, as this type of system is not recognized by code, so there is not a clear path to compliance.

FUNDING

Responses raised issues of unforeseen expenses as well as not being able to utilize funding until the project was implemented.

- Unforeseen costs will arise and a system needs to be in place to deal with this.
- Unable to use the funding as the project was being implemented. If there was more time to thoroughly analyze needs, then another project could have been identified.
- Grant funding allowed for replacement/upgrade of fixtures and equipment not in department budgets.

CONTRACTUAL

Some departments had difficulty completing the project on schedule due to delays in obtaining service contracts. In some cases, where agencies did not contract with DGS as the contractor, some agencies had difficulties contracting with others for services early enough in the project to complete on time. It would be helpful in the future to have more contractual process and options available in the beginning.

LOWER FLOW AFFECTED SEWER DRAINAGE

Some agencies reported that low slope sewer lines (1/8" per foot or less) were somewhat affected by significant reductions in water flowing in sewer lines, which formerly helped convey waste through line. One location addressed this by inserting grinders in waste lines to better liquefy waste for easier flowing.

POTENTIAL NEW PROJECTS

A total of \$37.8 million of projects were requested in the initial applications for funding. \$10 million of this amount was assigned in grants, leaving \$27.8 million of remaining unfunded projects. Some of these projects were not included in the grants, due to large costs, even though some would have resulted in huge water savings. If additional funding became available, the following types of projects could be implemented to obtain further water conservation. Some were identified during the initial solicitation for these grant funds, and some were identified in the post-project surveys submitted.

LANDSCAPING

Many agencies requested more water efficient landscaping and associated irrigation controls to reduce water use. During this grant application, the governor had placed a moratorium on new landscaping, so these types of projects were not allowed in this grant, but the moratorium has since been lifted. Native and adaptive drought tolerant landscaping could replace turf and other high water use landscaping at many facilities, resulting in much additional water use. Most water use at many state facilities is used for irrigation, so landscaping retrofits are a large untapped source of potential savings. Additional co-benefits from thoughtfully designed landscaping projects include improved water quality, pollinator habitat, reduced heat island effect, neighborhood beautification and demonstrating best practices to other property owners in California.



- The California Department of Technology would like to install a gray water capture from cooling tower to irrigate their land. They estimate this project as saving between 500,000 and 750,000 gallons of water and fulfilling all of their irrigation needs.
- CALPERS would like to replace 63,000 square feet of turf with drought tolerant landscaping and irrigation.

MORE PLUMBING FIXTURE REPLACEMENTS



A number of agencies are interested in upgrading additional restrooms and kitchens for more state facilities. This includes water efficient toilets, urinals, aerators and showerheads in restrooms and commercial dishwashers in kitchens.

PLUMBING INFRASTRUCTURE UPGRADES AND REPAIRS



- Additional main water line replacements and repairs at state parks would greatly reduce leakage. A number of large projects were initially proposed, but were not funded due to adequate funds.
- CDFW would like to upgrade wells and pumps as well as fish raceway valves to reduce water use further.
- CDCR proposed to eliminate a central plant boiler and hydronic loop at Corcoran State Prison, installing a local heating plant. This would cost ~\$8 million, but reduce annual water over 17 million gallons and save energy as well.
- CAL FIRE requested funding to install water meters at a number of facilities to regulate water usage.
- State Hospitals proposed spending \$7.5 million to tap into a recycled water line that crosses their property in Napa, irrigating 81 acres with recycled water, reducing annual potable water use by 90 million gallons and reducing utility bills.

COOLING SYSTEMS



The Yolo County Fair would like to upgrade rooftop evaporating cooling systems to efficient heating, ventilation and air conditioning (HVAC) package units, costing approximately \$30,000, and eliminating water used for these older systems.

ADDITIONAL POTENTIAL PROJECT COSTS

If additional funding became available, a combination of previously submitted projects requested and new projects could easily range between \$25-40 million. If additional grant funding for projects were to again become available, it would be beneficial to also provide separate funding to the CCC to reactivate their water conservation corps program to again provide these valuable services to corps members.

CONCLUSION

The water conservation grant funding successfully provided numerous state agencies with funding to implement a wide range of measures. These measures replaced thousands of plumbing fixtures, upgraded irrigation systems, replaced equipment and included many other measures specific to government operations that most people didn't even consider. This resulted in 300 million gallons of annual water use reduction. It allowed agencies to "think outside the box" and come up with innovative measures. Some agencies were equipped to manage and run such conservation projects, while others relied on the services of others, or ran into other contracting or management challenges.

The average water savings of 25.6 gallons of annual water use for each dollar spent was a good investment, and side benefits of improved energy efficiency resulted from some measures as well, as well as newer systems with longer life before replacement. Landscaping measures, which were not allowed previously, could not be included, resulting in even more savings.

If future additional funding were to become available for more water conservation efforts at state facilities, these project experiences would help agencies identify even more savings opportunities not previously considered, and learn from these experiences to help the projects flow more smoothly and with fewer delays. It would be helpful to develop more contractual mechanisms in advance of such funding.

APPENDIX A – LIST OF 2015 GRANT RECIPIENTS

- Department of Housing and Community Development (HCD)
- California Governor’s Office of Emergency Services (CAL OES)
- California Highway Patrol (CHP)
- Department of Motor Vehicles (DMV)
- California Department of Veterans Affairs (CALVET)
- California Department of Corrections and Rehabilitation (CDCR)
- California Prison Industry Authority (CALPIA)
- California Department of Food and Agriculture (CDFA)
- California Military Department (CMD)
- California Department of Justice (DOJ)
- Capitol Area Development Authority (CADA)
- California Public Employees’ Retirement System (CALPERS)
- California Department of Technology (CDT)
- Department of Developmental Services (DDS)
- Department of Rehabilitation (DOR)
- Employment Development Department (EDD)
- Department of Forestry and Fire Protection (CAL FIRE)
- California Conservation Corps (CCC)
- California Department of Fish and Wildlife (CDFW)
- Department of Parks and Recreation (DPR)
- District Agricultural Associations (DAAs):
 - Amador Fair – 26th DAA
 - Big Fresno Fair – 21st DAA
 - CalExpo – 52nd DAA
 - Del Mar Fairgrounds – 22nd DAA
 - Kings County Fair – 24-A DAA
 - Shasta District Fair – 27th DAA
 - Silver Dollar Fair – 3rd DAA
 - Tulare County Fair -24th DAA
 - Ukiah – 12 DAA
 - Yolo County Fair – 40th DAA

APPENDIX B – RESOURCES

RESOURCES FOR AUDITING OR ESTIMATING POTENTIAL PROJECTS

- Water Conservation Project Worksheet(s): Optional worksheet templates provided, can be used to calculate potential water savings and summarize cost information.
- CA Water District Available Resources: Directory of many state water districts including links to information about available water efficiency incentives, rebates, and free audits available (based on 2015 research). Water districts not listed can be contacted directly to learn about available water audit and rebate programs available.
- Best Management Practices for Water Use in CA State Government Facilities: List of best practices and items that state facilities can do to conserve water. This may identify several areas for potential projects.
- Management Memo 14-02 - Water Efficiency and Conservation: State water efficiency policy issued 1/13/2014. Now published in the State Administrative Manual (SAM) Section 1835.
- Water Use Reduction Guidelines and Criteria: See Building Inventory Walk Through Checklist (Appendix B - Page 15).

PROJECT FORMS USED IN 2015 GRANT PROGRAM

- Project Information Form (WCGP 002): Form to describe each project requesting funding
- Application for Funding (WCGP 001): Form listing each project proposed by agency and identifying primary contacts. Includes grant application approval by director or designee.

WATER CONSERVATION WEBSITES

- DGS Water Conservation Efforts: Includes information about DGS and state actions toward water conservation and other links.
- WaterSense: Federal website managed by EPA that includes numerous tips for water efficient products, landscaping tips, and other guidance to conserve water.

FOR MORE INFORMATION

- Contact: Sustainability@DGS.CA.GOV

APPENDIX C – ACKNOWLEDGEMENTS

The following individuals and organizations were key in the California Water Conservation Grant Program and the development of the report:

- **Dan Burgoyne**, DGS Office of Sustainability (OS) – Program manager, developed solicitations, tools, forms and resources, screened and awarded projects, approved invoices, interagency correspondence, authored report
- **Matt Henigan**, Government Operations Agency – Agency representation of Water Grant Program and executive support, input and approval of processes and methods developed and used
- **Laura Frost**, DGS Office of Business and Acquisition Services (OBAS) – Developed interagency agreements, contracts, and contract amendments
- **Bruce Betts**, DGS OBAS – Issued contract amendments
- **Dan Hess**, DGS Office of Fiscal Services (OFS) – Processed approved payment requests and sent payments to agencies
- **Kwok (Eddie) Wan**, DGS OS – Conducted post-project survey & compiled results for use in generation of report
- **Janet Horsager**, DGS OS – Editing and formatting of report, adding graphics
- **Sue Lee**, CDFW (formerly DGS, OS) – Researched and developed a statewide list of available water conservation rebates for use by agencies
- **Numerous Department personnel** from 30 state agencies and DAA's, developed and managed the individual projects internally, purchased fixtures and equipment, contracted for or performed installation labor, and processed internal contracts and payments.