

WATER WISE SURVEY

FINAL REPORT



Santa Barbara City College

August 21, 2013

Prepared By
City of Santa Barbara
Water Conservation Program



WATER WISE SURVEY OF SANTA BARBARA CITY COLLEGE

EXECUTIVE SUMMARY

A water wise survey of the Santa Barbara City College (SBCC) was performed in May 2013. The purpose of the survey was to identify ways in which the SBCC could save water, and save money on its water and sewer bills. It is estimated that the SBCC currently uses an average of 24,370 gallons per day of potable water. The irrigation system and the public restrooms that are on recycled water were not evaluated as part of this survey.

Based on a site visit plus subsequent calculations and follow-up by City of Santa Barbara, a number of water conservation projects were identified. Water savings, costs and paybacks were estimated. Based on that analysis a number of projects stood out as being very attractive. Projects include:

1. *Install Spray Valve in EBS 223*
2. *Replace 25 Faucet Aerators in Physics Labs*
3. *Replace Ice Machine in 2nd floor Physics*
4. *Replace Clothes Washer Machine in Physics (not recommended as payback too long)*
5. *Replace Toilets in Student Center*
6. *Replace Hand Wash Sink Aerators Admin + Health*
7. *Install Spray Valve in Student Pastry Kitchen Pot Washing Station*
8. *Install Spray Valve in Cafeteria Kitchen*
9. *Add Faucet Aerators in Kitchen Sinks Used for Hand Washing*
10. *Fix Leaking Valve on Dishwasher in Cafeteria Kitchen*
11. *Fix Leaking Faucets in Teaching Kitchen 108 & JSB Café*
12. *Replace Showerheads in Men's and Women's Locker Rooms*
13. *Add Spray Valve in JSB Café*
14. *Replace Faucet Aerators in Women's Locker Room*
15. *Fix Handheld Shower Nozzle in Women's Locker Room*
16. *Replace Clothes Washer Machine in Athletics*
17. *Replace Nozzles on Dishwasher in Cafeteria Kitchen*
18. *Adjust all restroom toilets to actually flush at the designed 1.6 gpf.*

Estimated savings from combined recommendations total 29% percent in water use, which amounts to an approximate current savings of **\$35,346** per year from lower water, sewer and energy bills. For all the recommended projects as a package, there is a total payback of approximately 5.4 months.

INTRODUCTION

Project Objectives

Maddaus Water Management (MWM) was retained by the City of Santa Barbara to assist City staff in performing the water wise survey and make water conservation recommendations for SBCC. The recommendations contained in this report are based on a payback analysis of the most cost-effective water conservation projects. Using prevailing water and sewer rates, conservation projects with a payback of less than four years have been identified.

Scope of the Investigation

City staff coordinated with SBCC staff and identified a list of the facilities to survey. The site survey was conducted and all identified end uses of water were evaluated. Estimates of daily water use were prepared while on site for the different end uses by taking measurements of flow rates and volumes, and by interviewing SBCC staff responsible for each significant end use. Sufficient data was collected from the site survey to identify potential water conservation projects and to enable a payback evaluation. Recommendations were formulated and prioritized based on the payback that each measure offers. The investigation focused on five indoor water use areas:

Indoor Use

- Domestic (sanitary) use (toilets, urinals, faucets, showers)
- Food Service including ice making, dishwasher, spray valve, food steamer
- Leaks
- Locker Rooms (toilets, showerheads, faucets)
- Laboratory Use (faucets, spray valves, clothes washer, ice machines)

Outdoor Use

- Not a significant potable water use
(The irrigation demand is recycled water on campus. Therefore, landscape water use was not analyzed in this report)

DESCRIPTION OF FACILITIES SURVEYED

Sanitary Fixtures

In 2012, SBCC retrofitted the majority of toilets and urinals to high efficiency models so as part of water use survey, only a few bathrooms were checked for a base sampling. As well as, a few of the bathrooms that SBCC staff knew had not been retrofitted.

Food Service

As a part of survey, all SBCC food service facilities were evaluated including: main cafeteria kitchen and dishwashing room, two teaching kitchens, pastry kitchen, JSB Café, Library Coffee Cart, East Campus Snack Bar, Business Communication Snack Shop, and kitchenette.



Photo - Main Cafeteria Dishwasher

Ice Machines

There were nine ice machines observed during the survey. Eight are air cooled and one is water cooled. The water cooled ice machine was purchased in approximately 1989 and is recommended to be upgraded.

Athletics

Athletics facilities evaluated during survey include: men's and women's locker rooms, laundry room, and physical therapy facility.



Photo – Showerhead in Women's Locker Room

Classrooms and Lab Rooms

Physics and Earth Biological Science lab and classrooms were evaluated as part of survey.



Photo: Laboratory room

Additional Observations

Automotive, nursing, ceramics and marine science facilities were also evaluated as part of survey.

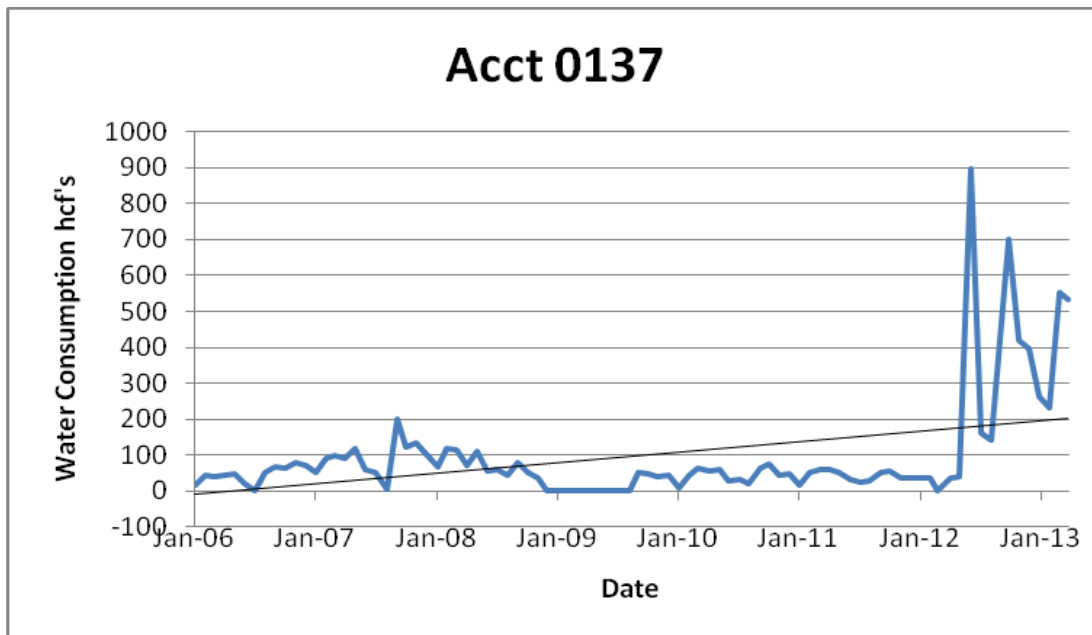
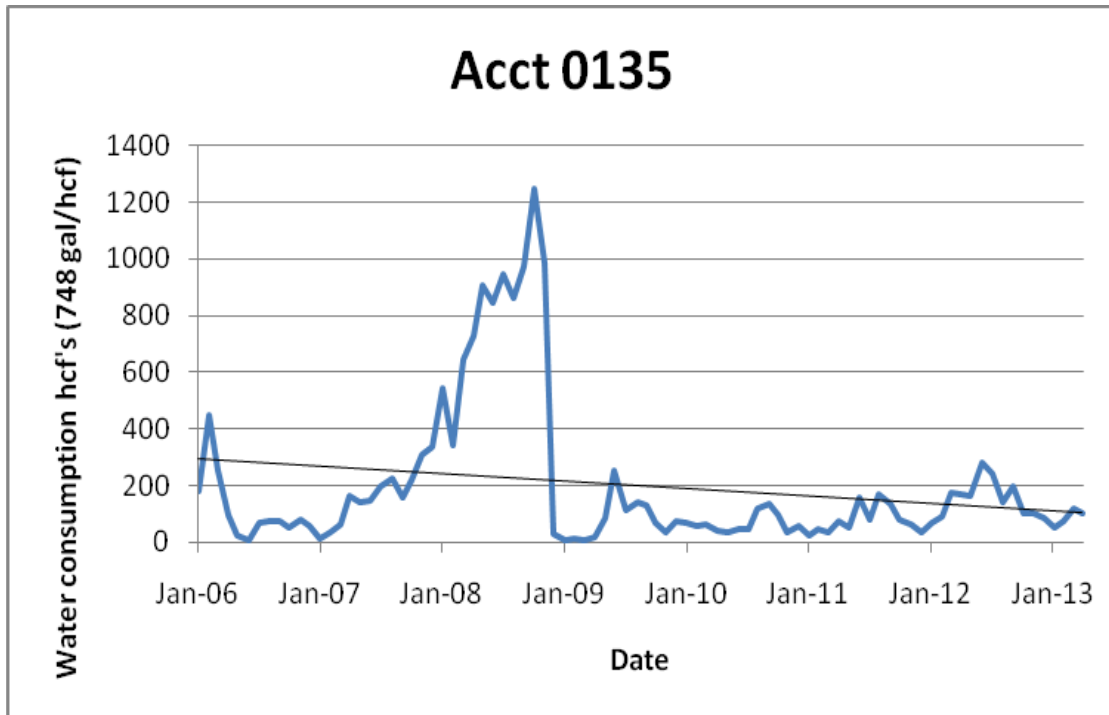


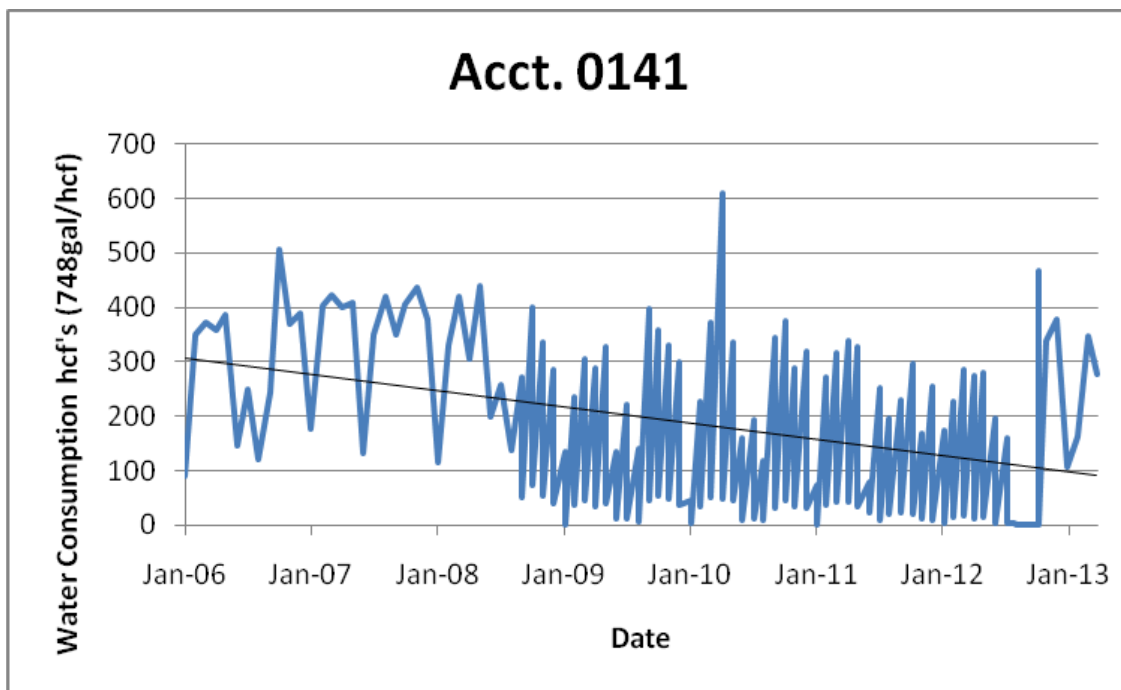
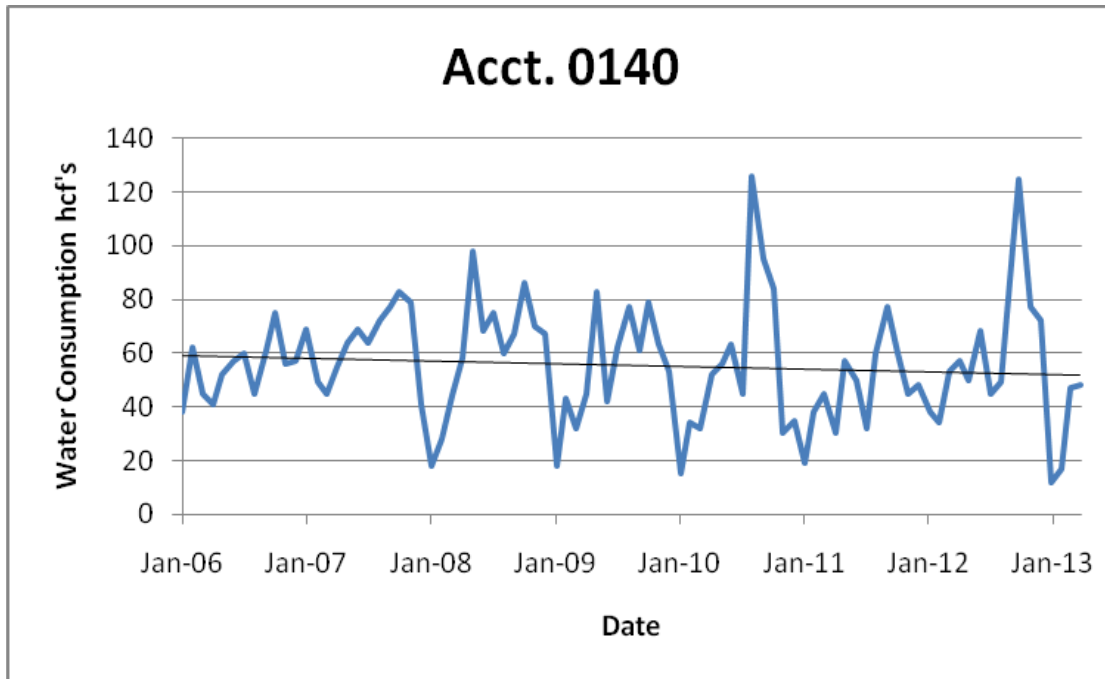
Photo: nursing training room

HISTORICAL WATER USE AT THE SBCC

Average daily *potable* water use is 24,370 gallons.

FIGURE 1 – Potable Water Consumption History for the SBCC





CONSERVATION OPPORTUNITIES

The following projects were identified to reduce water use further at the SBCC. A summary matrix of potential projects and costs, assuming contractor labor and retail prices, are described below:

1. *Install Spray Valve in EBS 223*

During the survey, flow rate of the faucet in Earth Biological Sciences was measured. The average flow rate of the faucet was measured to be very high at 7.5 GPM. During discussions with a SBCC staff member working nearby, it turns out the faucet is used for rinsing of salt water tanks after specimen collections from the ocean. The faucet used frequently and therefore, use a lot of water. The staff member said the main purpose was to clean the sand out of the tanks, and that a spray valve would be very helpful for efficient and easier cleaning. It is recommended that SBCC purchase and install a new, water efficient sprayer at 1.15 GPM. The total cost to purchase and installation one of the sprayers is \$85. The water savings from the installation of the new sprayer is estimated to be 211 gallons per day.



2. *Replace 25 Faucet Aerators in Physics Labs*

All the faucets seen during the site visit did not have a low flow 0.5 gpm restrictor installed. The goal would be to reduce the water flow from the faucet for hand washing, by placing a more efficient flow restrictor under the sink. When discussed with SBCC staff they were open to the suggestion to replace restroom aerators with a 0.5 gpm variety. Assume all 25 faucets receive new aerators at a cost of \$1 each, and an approximate install time of just less than 10 minutes, or a total of 8 hours of labor. The approximate Santa Barbara labor is \$100/hr, for a total labor cost of \$800. Total project cost is approximately \$850. Assume there are 2,500 hand washes per day (including men and women that can use a toilet or urinal). Each hand wash is approximately 15 seconds. Each hand wash will save 0.125 gallons, or a total of 310 gallons per day.

3. *Replace Ice Machine in 2nd floor Physics*

An old ice machine was observed on the 2nd Floor of the Physics building in the open air corridor near room 207. SBCC staff provided the original specification information for the machine which was estimated the age to be 1988. The machine is estimated to use 400 pounds of ice per day for experiments. New ice machine are much more water and energy efficient. It is assumed the labor cost would be 3 hours. The approximate Santa Barbara labor is \$100/hr, for a total labor cost of \$300. The assumed cost for the ice machine is \$3,000 for a 400 lb machine with a bin. Total project cost is approximately \$850. It is estimated the new ice machine will save a minimum of 493 gallons per day.

4. *Replace Clothes Washer Machine in Physics*

Not recommended as payback too long

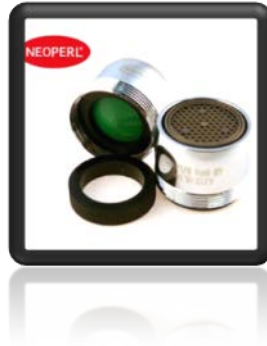
5. *Replace Toilets in Student Center*

Toilets at Student Center are the high flush type. It is recommended that these toilets be replaced with high efficiency toilets (1.28 gpf). Water savings resulting from a change-out of these toilets is estimated to be 116 gallons per day.



6. *Replace Hand Wash Sink Aerators Admin + Health*

Many of the hand wash faucets observed during the survey did not have flow restricting aerators installed (i.e., 0.5 GPM maximum flow). The water savings from the installation of aerators on all faucets would save approximately 41 gallons per day, as well as energy associated with warm water use.



7. *Install Spray Valve in Student Pastry Kitchen Pot Washing Station*

During the survey, flow rate of the kitchen faucets was measured. The average flow rate of the kitchen faucet is 1.7 GPM. SBCC has several water efficient kitchen spray valves but several of the kitchen sinks where dish rinsing was occurring did not have spray valves. These sprayers are used frequently in the kitchen and therefore, use a lot of water. It is recommended that SBCC purchase new, water efficient sprayers. The total cost to purchase and install one of the sprayers is \$85. The water savings from the installation of these new sprayers is estimated to be 64 gallons per day.

8. *Install Spray Valve in Cafeteria Kitchen*

See above #7

9. Add Faucet Aerators in Kitchen Sinks Used for Hand Washing

See above #6

10. Fix Leaking Valve on Dishwasher in Cafeteria Kitchen

During the survey it was noticed there was a continuous leak going into a red 5 gallon bucket at the end of the dishwasher. The continuous leak can add up to a significant volume as the dishwasher is in constant use due to the high number of covers served per day (yielding a high volume of dishes). It is recommended this leak is fixed. The cost of repair was estimated to be \$250 which includes \$50 for parts and 2 hours of labor at \$100 per hour.

11. Fix Leaking Faucets in Teaching Kitchen 108 & JSB Café

During the survey it was noticed there was a continuous leak in both the teaching kitchen 108 and the JSB cafe. It is recommended these leaks are fixed. The cost of repair for each leak was estimated to be \$250 which includes \$50 for parts and 2 hours of labor at \$100 per hour.

12. Replace Showerheads in Men's and Women's Locker Rooms

During the walk though, the team inspected Men's and Women's locker rooms and found a variety of high flow showerheads. The average flow rate was 3.3 gpm which doesn't comply with the current federal plumbing standard of 2.5 gpm. It is easy to change the shower head with a more efficient fixture for less than \$50 per shower. These fixtures are very cost effective as they save hot water. It is noted that some of the showerheads in the women's restroom were metal and attached to the steel walls. These may take a bit more work to replace. There were a total of 92 showerheads recommended for replacement at a cost of \$80 which includes installation. The total project cost is estimated at \$7,360 including installation and will save a minimum of 3,114 gallons per day.

13. Add Spray Valve in JSB Café

See above #7

14. Replace Faucet Aerators in Women's Locker Room

See above #6

15. Fix Leaking Handheld Shower Nozzle in Women's Locker Room

During the survey it was noticed there was a leak in the locked women's staff/coach locker room from the handheld shower nozzle. It is recommended this leak is fixed. The cost of repair for each leak was estimated to be \$80 which includes money for parts labor.

16. Replace Clothes Washer Machine in Athletics

The smaller Kenmore top loading washer in the athletics is at least 5 years old and very high use with a minimum of 1 load an hour 13 hours a day for 5-6 days per week according to SBCC staff. The new front load washing machines are not only more water efficient but are also more energy efficient. Older top loading washers can use approximately 40 gallons. The newer front loading models use approximately 15 gallons per load. Due to the decreased volume of water they also take less detergent and have been known to extend the life of towels due to the different washing techniques. The combination of water, energy, detergent and towel life make this an attractive project. It is assumed the washer and installation will cost \$1,150 and save a minimum of 100 gallons per day.

17. Replace Nozzles on Dishwasher in Cafeteria Kitchen

It is recommended to upgrade to more efficient nozzles on conveyor dishwasher in Main Cafeteria Kitchen. Current product offerings and technological advances show possibility of 57% savings in water and energy use with upgrading to latest efficient nozzles.

18. Adjust all restroom toilets to actually flush at the designed 1.28 gpf or 1.6 gpf.

One of the 14 toilets tested during the site visit did not flow 1.6 gpf as designed by the manufacturer. If the parts of a 1.6 gpf toilets are replaced with an older variety model, then the toilet can “revert” to a higher flow toilet. It is recommended that staff check all the flush valve diaphragms of the toilets and adjust them so they flow at 1.28 gpf or 1.6 gpf as designed.



Photo: Sloan low flush dual filtered diaphragm assembly. Low flush valves use 1.6 gallons per flush. For Sloan flush valves this is code number 3301070 and part number A-1101-A. For the Sloan flush valves, these can be purchased at any local plumbing supply store or even online for around \$45 each. The water savings for the 1.28 gpf type valves average over 2.2 gallons/flush compared to pre-1992 models.

Water Savings Paybacks

Table 1 shows the projected water savings and the associated paybacks. The payback is defined as the number of years for SBCC to recover its investment in conservation, based on projected water bill savings. The value of the saved water for all projects recommended is an estimated reduction in water costs of approximately \$18,392 per year. Including sewer and energy cost savings, the total estimated savings per year is \$35,346.

TABLE 1 - Annual Water Bill Savings and Paybacks for the SBCC

	Annual Water, Energy & Sewer Bill Savings, (\$/year)	Total Estimated Water Savings (gal/day)	Total Cost of Project (equip + labor)	Payback, Months	City Incentive Funds Available
1. Install Spray Valve in EBS 223	\$1,061	211 gpd	\$85	1.0	\$30
2. Replace 25 Faucet Aerators in Physics Labs	\$2,909	578 gpd	\$750	3.1	\$125
3. Replace Ice Machine in 2nd floor Physics	\$2,136	542 gpd	\$2,300	12.9	\$1000
4. Replace Clothes Washer Machine in Physics	Not recommended- payback too long				
5. Replace Toilets in Student Center	\$458	116 gpd	\$1,500	39.3	\$500
6. Replace Hand Wash Sink Aerators Admin + Health	\$206	41 gpd	\$210	12.2	\$35
7. Install Spray Valve in Student Pastry Kitchen Pot Washing Station	\$321	64 gpd	\$85	3.2	\$30
8. Install Spray Valve in Cafeteria Kitchen	\$1,415	281 gpd	\$85	0.7	\$30
9. Add Faucet Aerators in Kitchen Sinks Used for Hand Washing	\$326	65 gpd	\$90	3.3	\$15
10. Fix Leaking Valve on Dishwasher in Cafeteria Kitchen	\$52	13 gpd	\$250	57.2	\$11
11. Fix Leaking Faucets in Teaching Kitchen 108 & JSB Café	\$105	27 gpd	\$500	57.2	\$23
12. Replace Showerheads in Men's and Women's Locker Rooms	\$15,674	3,114 gpd	\$7,360	5.6	\$1380
13. Add Spray Valve in JSB Café	\$2,849	566 gpd	\$85	0.4	\$30
14. Replace Faucet Aerators in Women's Locker Room	\$3,770	749 gpd	\$60	0.2	\$10
15. Fix Handheld Shower Nozzle in Women's Locker Room	\$155	31 gpd	\$80	6.2	\$15
16. Replace Clothes Washer Machine in Athletics	\$853	170 gpd	\$1,150	16.2	\$500
17. Replace Nozzles on Dishwasher in Cafeteria Kitchen	\$2,968	589 gpd	\$1,100	4.4	\$400
18. Adjust all restroom toilets to actually flush at the designed 1.6 gpf.	\$86	22 gpd	\$140	19.6	\$18
Total	\$35,346	7,178 gpd	\$15,830	5.4 Months	\$4,152

Table 1 shows the annual savings that can be achieved by the completion of the recommended projects. In terms of priorities, projects should be implemented in the order of increasing payback. The total cost of the recommended project equipment is estimated to be \$8,304; total cost of the projects including outside labor costs is about \$15,830. The overall payback for these projects as a group is approximately 5.4 months. The cost estimates presented in this report are planning level costs, sufficiently accurate to identify projects with attractive paybacks. Payback analysis includes labor cost estimates and does not include City incentive amount. The exact price SBCC will pay for these projects depends on the specific number and type of fixtures and it is recommended to adjust the estimates contained herein based on estimates by plumbing contractors.

Savings from combined recommendations are a total 29% reduction in water use, which amounts to an approximate savings of \$18,392 per year. Including sewer and energy costs savings, total annual potential savings is approximately \$35,346.

FINANCIAL INCENTIVES

The City will provide **\$4,152** of financial incentives to SBCC to offset the costs of the recommended projects, the fully allowable amount. Incentive amount for each project is listed above in Table 1.

How Incentives Were Calculated

Incentive amounts are calculated for each proposed conservation measure based on:

1. Estimated water savings
2. \$1.40 per hcf per year of water saved. (\$600/acre foot avoided cost of water)
2. Estimated project life expectancy
3. Incentives will not exceed half the installed cost of an approved measure
4. Maximum total incentives per site is \$15,000

Incentive is calculated by following equation:

A = water savings rate in gallons per unit of time
B= amount of time equipment runs per day
C= number of days per year equipment runs
D = number of gallons per hundred cubic feet (hcf) = 748
E= # of years equipment water savings planned to last

$$\text{Annual hcf Savings} = \frac{(A) \times (B) \times (C)}{(D)}$$

$$\text{City CII Incentive Rebate} = \text{Annual hcf Savings} \times \$1.40 \text{ per hcf/yr} = \text{Annual Incentive Credit}$$

$$\text{Total Incentive Amount} = \text{Annual Incentive Credit} \times E$$

NEXT STEPS

1. Complete Water Wise Incentive Program Application Form
2. City reviews Water Wise Incentive Program Application Form. City will review application form and notification of incentive authorization will be given within 2 weeks. Projects must be completed within 6 months of notification to receive incentive.
3. Process for Incentive Payment: Notify City of work completion. City staff to complete final inspection to verify installation of equipment in conformance with approved Application Form within 2 weeks of notification of work completed. Once final inspection completed, City will process incentive payment.
4. City staff will track water usage after site upgrades to determine results of program.