

SBC Leak Detection Team

As water resources become more valuable and drought conditions become more severe, California is placing increased emphasis on the water energy nexus. The water energy nexus is the relationship between water needed to produce energy and energy needed to clean, move, store, and dispose of water. When water is wasted, energy is also wasted.

The Sierra Business Council (SBC) conducted a water energy nexus study of five water agencies (listed in chart below) in the Sierra Nevada foothills to understand what water agencies need in order to reduce water and energy loss. The study revealed that there are several important elements to reducing energy and water loss including adhering to best management practices, optimizing operating pressures, ensuring water meters are accurate, and performing regularly scheduled pump efficiency tests and retrofits, but the most important action a water agency can take to reduce water loss and energy use is to proactively detect and repair leaks in the agency's water system.

Proposed Leak Detection Program

Most water agencies in the Sierra Foothills, and in other regions, do not have the resourced needed to maintain an effective leak loss detection program. The agencies have neither the trained staff, nor the equipment needed to proactively detect leaks. The Sierra Business Council (SBC) proposes to develop a leak detection program that will allow Sierra Foothill water agencies to implement effective leak loss detection programs. SBC will purchase state-of-the art leak detection equipment, become trained in how to use the equipment while also training one large water agency located in Auburn, Placer County Water Agency (PCWA). After performing a leak detection survey for PCWA, the SBC Leak Detection Team will be prepared to perform leak detection surveys and training for other water agencies at a dramatically reduced rate from what a private, for profit, leak detection company would charge. This resource and service will enable water agencies of all sizes to greatly reduce their water loss and energy use. The four additional water agencies that participated in SBC's water energy nexus study (listed below) will be offered the leak detection survey/training before other agencies because SBC has data on their system needs. The chart below shows the expect savings through leak detection surveys at the five Sierra region foothill water agencies.

	Total Miles of Main Pipe	Miles to Survey	Expected Water Conserved in Millions of Gallons	Expected KWh of Energy Conserved	Expected GHG Reductions in kgCO2e	Value of Water and Energy Conserved
El Dorado Irrigation District	1200	40	750	300,244	67,957.95	\$141,453
Placer County Water Agency	600	40	750	300,244	67,957.95	\$141,453
Nevada Irrigation District	300	40	750	300,244	67,957.95	\$141,453
Georgetown Divide PUD	40	20	375	150,122	33,978.97	\$70,727
Grizzly Flats Community Services District	30	20	375	150,122	33,978.97	\$70,727
Total	2,170	160	3,000	1,200,976	271,831.80	\$565,813

The expected savings were extrapolated from saving that occurred from leaks that surfaced and were repaired at PCWA during 2013. The gallons per minute of each leak was recorded, and the annual leakage was determined based on what would have occurred had the leaks not been repaired for a year. The predicted energy and dollar savings is based on actual energy usage and the cost to produce water at PCWA. Participation in the leak surveys requires each water agency to repair all leaks that are detected. SBC will provide a financial valuation of the millions of gallons of water loss and energy use averted by the leak detection surveys and associated repairs

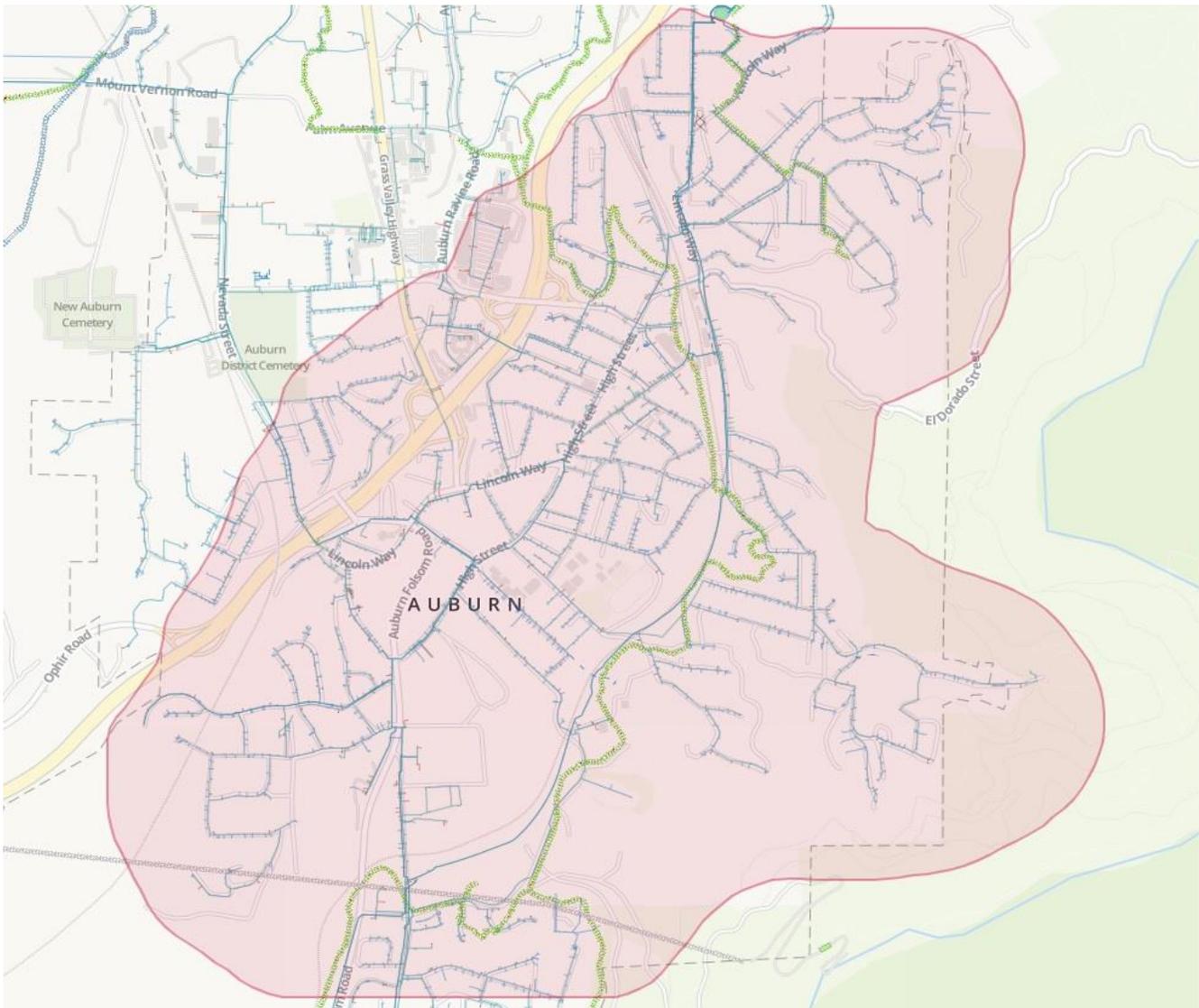
[Leak Detection Survey and Training for Placer County Water Agency](#)

Placer County Water Agency Water Management Specialist, Randy Cox, has identified 40 miles of mixed water mains (cast iron, ductile iron, steel, PVC, asbestos concrete) and associated laterals that are located in a region of PCWA's water system that have a very high likelihood of leaks. The 40 miles of pipe are located in the area highlighted in pink on the map below. The area was chosen for several reasons:

- A new reservoir was installed in 2013 which raised the pressure in several sections of the distribution system. When the pressure is raised, more water will leak out of the same size hole in the pipe, resulting in a greater water loss.
- The soils in this area readily adsorb water; therefore, PCWA suspects there are existing leaks that are not surfacing.
- This area has older metal water mains which often leak.

PCWA has a total of approximately 650 miles of water mains in its service area, therefore the 40 miles included in the leak detection survey are 6% of the total system. PCWA will have a future need for additional leak detection which will be accomplished with the agency's staff that will be trained by Sierra Business Council's proposed program.

**Map below is part of the Auburn/Bowman service area served by the Electric Street reservoir.
All 40 miles of the proposed leak detection area are included within the pink highlighted area.**



Between January 1, 2014 and November 21, 2014, PCWA repaired 63 main and service lateral leaks that had surfaced within the highlighted region. These may have been underground for a long period of time before finally surfacing. If these leaks were not repaired, approximately 2300 acre feet (750 million gallons) of water would have been lost annually; consuming additional energy and water supply resources while potentially damaging property.

Of the 2300 acre feet conserved by repairing the leaks, approximately 65% (1,513 acre feet) would have come from PCWA's Bowman treatment plant and 787 acre feet from the Auburn treatment plant. Water produced at the Bowman treatment plant requires 58 kilowatt hours to produce one acre foot of treated water, where the Auburn treatment plant requires 270 kilowatt hours to produce one acre foot of treated water. The Bowman treatment plant relies on gravity to move the water through a conventional treatment process, whereas the Auburn treatment plant utilizes a more energy intensive treatment method that requires an increased use of pumps and motors

The amount of energy used to produce 2300 acre feet of water from these two PCWA water treatment plants is 300,244 kilowatt hours per year. At an E19 rate of .184 cents per kWh, PCWA pays \$60,953 for the electricity to produce 2,300 acre feet of water. PCWA also purchases raw water from PG&E, which is an additional \$80,500 for 2300 acre feet. Costs for water delivery and operation and maintenance of the treated water distribution system are real costs as well, but are not included in this analysis. In summary, by repairing 63 main and service lateral leaks during 2014, PCWA saved over 300,000 kWh hours and over \$141,453. The payback on repairing water leaks is good. The problem is finding the

upfront resources to locate the leaks before the surface and those leaks that remain undetected due to the porosity of the surrounding soils. The Sierra Business Council Leak Detection Team can solve that problem.

SBC Leak Detection Team Equipment and Training

The SBC Leak Detection Team will use a leak detection company to train SBC staff and PCWA staff on the use of the leak detection equipment purchased by the company. PCWA has 12 staff members that are Treated Water Distribution Maintenance personnel. Three members of the PCWA staff will rotate through 10 days of training with the leak detection company. Two SBC staff members will also be trained over the 10 day period. The leak survey of the 40 miles of PCWA pipe will take one month assuming normal circumstances. This survey cost is included in the training costs listed in the chart below. The private company providing the leak survey will have two personnel working eight hours per day, five days per week for one month.

Without outside funding, PCWA can only provide staff for leak detection during low points in their seasonal work load during late fall and early spring; therefore, leak detection usually only happens when leaks occur, rather than on a preventative basis. Soils expand and contract as the seasons change, leading to increases in the number of leaks occurring in the early spring and late fall; therefore, there is a constant need for leak detection and repair.

Project Monitoring

A monitoring report will estimate gallons per minute lost at the time all leaks were repaired. PCWA staff extrapolate annual water savings from the repairs. PCWA will continue with periodic spot leak surveys and will provide quarterly reports to SBC to track every water leak detected and repaired within the project area. The monitoring report will include the date fixed, size of leak, estimated leakage rate in gallons per minute and PCWA's cost to fix each leak.

Leak Detection Equipment and Training Costs

The acoustic leak detection equipment and training costs below were provided by Utility Services Associates, a full service leak detection company that sells detection equipment and trains on the use of the equipment.

Need	Description and Purpose	Unit and Quantity	Estimated Cost including Tax
Fluid Conservation Systems S-30 Leak Noise Survey Tool	Ground microphone and sensor to lower underground on a cable with a magnet to attach to a pipe. More sensitive than a ground microphone. Used for listening to pipeline appurtenances (fire hydrants, water meters, etc.)	1 equipment set	\$5,150
Subsurface Leak Detection LD12 Ground Microphone	For listening on the surface of the ground such as on pavement or concrete	1 equipment set	\$4,990
Subsurface Leak Detection LC 2500 with PVC pipe sensor	Used to pin point leaks on a pipeline	1 equipment set	\$25,300
Field Tools	Various water system tools needed for accessing water mains, meters, etc. (picks, shovels, water meter keys, curb stop keys, valve keys)	1 equipment set	\$2,500
Subsurface instrument ML1	Magnetic metal locator/detector to find metal valves in ditches covered with debris, etc.	1 instrument	\$1,500
Leak detection survey from a leak detection services company over a	Need minimum of 10 days for basic training for PCWA and SBC staff. Telephone support provided at no additional charge. Leak detection survey cost	10 days training \$1,650 per day	\$16,500

one month period which includes 10 days of training during the leak survey	included. Cost reduced because equipment purchased from leak detection company.		
Additional training for SBC staff for one year after initial training	Annual refresher training per year for SBC's 2 person staff for 5 days. Includes company travel expenses	1 training	\$7,411
Leak Detection Training Company travel expenses	Company expenses (hotel, food) to travel to Auburn and hotel stay per work week. \$661 for a 5 day work week. Need 10 days for PCWA leak survey and training of PCWA and SBC staff.	2 weeks expenses at \$661 per week	\$1,322
SBC Program Administration	Project Manage coordination between detection company and PCWA and ongoing leak monitoring for 1 year.	75 hours at \$95 per hour	\$7,125
SBC Equipment Loan Administration	Manage equipment loan program and transfer of equipment between additional water agencies for one year.	15 hours per month for 11 months at \$95 per hour	\$15,675
Leak detection survey and training for additional Sierra Nevada foothill region water agencies	SBC leak detection survey and training: 40 miles El Dorado Irrigation District \$14,000 40 miles Nevada Irrigation District \$14,000 20 miles Georgetown Divide PUD \$7,000 20 miles Grizzly Flats Community Services District \$7,000	\$350 per mile for leak detection surveys and water agency staff training	\$42,000
		Subtotal:	\$129,473
		10% Contingency:	\$12,947
		Total Program Cost for 2015-2016:	\$142,420

In conclusion, the Sierra Business Council Leak Detection Team will provide a cost effective solution for waterline leak detection and help water agencies in the Sierra Nevada region meet their water and energy conservation mandates. The Sierra Business Council will pilot this program with Placer County Water Agency in 2015. Once the program is established, the Sierra Business Council will provide additional water agencies with this service during 2015 and beyond. This effort is intended to persuade water agencies to allocate funding to purchase their own in-house equipment that will be used by their newly trained staff on an ongoing basis into the future.