



Kirtland AFB team won the Federal Energy and Water Management, Water Conservation Award to Small Groups

Distribution System Audits, Leak Detection, and Repair

Kirtland Air Force Base – Leak Detection and Repair Program

Overview

Kirtland Air Force Base (AFB) performed an award winning leak detection and repair program in 2006. The results of the project are saving Kirtland AFB 179 million gallons each year, which is over 16% of the total water use at the base. Kirtland AFB is located on 52,000 acres, southeast and adjacent to Albuquerque, New Mexico. The area is a high altitude desert, only receiving about 8 inches of rain each year. Kirtland AFB draws water from an underground aquifer via seven production wells throughout the base. The base also has access to water from the City of Albuquerque. The underground water supply is declining, which has spurred Kirtland AFB to develop a water conservation program, including the leak detection and repair program featured in this case study.



Figure 1: Photo of the largest leak found during the survey (joint offset) with a water loss rate of 150 gallons per minute

Project Summary

Two leak detection approaches were considered by Kirtland AFB prior to commencing the project – passive survey and active survey. These two methods are described below:

1) Passive Survey:

- Method: Listening devices are installed on water lines at ¼ mile spacing to record the acoustic signatures that are used to identify leaks; if leaks are identified, additional equipment is required to find the specific leak locations.

- Best Application: Passive surveys are best suited for a permanent installation and long term monitoring of water lines
- Benefits: Accurate leak location and size determination; good option for long-term monitoring of water lines
- Disadvantage: The survey equipment can only “hear” one leak at any given point in time; installation can be time consuming over long water lines

2) Active Survey:

- Method: Leak detection crews use acoustic listening devices, while walking each water line to find leaks
- Best Application: Active surveys are best suited for a large network of water lines in areas where multiple leaks are suspected
- Benefits: Active surveys allow for a relatively rapid survey of extensive water lines and provide exact leak locations as the survey progresses
- Disadvantage: This method gives a one-time snapshot of system leaks; this does not provide on-going leak detection options.

After considering these two methods, Kirtland AFB decided that the active survey was most appropriate for their situation. Kirtland’s goal was to pinpoint leaks quickly, estimate the size and volume of leaks, and develop a prioritization for repairs. An active survey met these goals best. In addition to the quick location and repair, the site also wanted to be able to track the costs associated with location and repair so that a cost-per-gallon-saved metric could be developed. The active survey method allowed Kirtland AFB to track costs in this way because as the leaks were found, they were repaired. Kirtland AFB contracted the work through the Air Force Civil Engineer Support Agency (AFCESA). This allowed a quick avenue to access experienced leak detection



Figure 2: Photo of a secondary leak found during the survey, which was losing water at a rate of 30 gallons per minute.

and repair contractors, which were pre-qualified through AFCESA.

In total, 108 miles of water distribution lines were investigated in the survey; this represents about 90% of the water distribution lines on the base. Through the survey, site staff determined that nearly 16% of the base's water use was lost through the water distribution system leakage. A total of 31 leaks were identified with an estimated water loss of 333 gallons per minute. The site found that major leaks were primarily caused by offset joints (i.e., joints that are misaligned), while smaller leaks were caused by corrosion of the pipe material.

The largest leak that was found was in a 30 inch supply line in a remote, undetected area of the base, which flowed at about 150 gallons per minute at the time of discovery. This leak was caused by an offset joint and is shown in Figure 1. A smaller leak identified and estimated at 30 gallons per minute is shown in Figure 2. All repairs took place in a three-month window, with the largest leaks repaired first.

Cost and Savings Summary

The cost of the leak detection survey was approximately \$75,000 (or roughly \$695 per mile) and the repairs cost an additional \$514,000. The survey and repairs saved the site over 179 million gallons annually, representing over 16% of the base's total water use. This savings, valued at more than \$330,000 annually at a water rate of \$1.88/Kgal, provided a 1.75 year payback.

Including the survey and repairs, the project cost Kirtland AFB \$3 per thousand gallons of water saved. In other words, for every thousand gallons of water Kirtland was losing, it will roughly cost only \$3 to repair the leaks.

As a result of this project, the Kirtland AFB team won the 2007 Federal Energy and Water Management, Water Conservation Award to Small Groups. The Kirtland AFB team, proudly holding their awards, is shown in Figure 3.



Figure 3: Award recipients of the Federal Energy and Water Management, Water Conservation Award to Small Groups (from left to right): Lawrence "Ski" Karbowski, Clifford "Cliff" Richardson, William "Kellis" Jones, Patrick "Pat" Montano, and Mark Plumley.

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