Bishop Paiute Tribe

Achieving Sustainability Through a Preventative Maintenance Program

The Bishop Paiute Public Works Department (PWD) built a successful preventative maintenance program over a ten-year period. PWD believes the program is a key aspect for a sustainable water and sewer system. The preventative maintenance program goes beyond routine operations and maintenance of infrastructure assets and includes tracking assets through GIS mapping, continually assessing assets and adequately training operators to perform the necessary preventative maintenance duties.

Implementing a successful preventative maintenance program helped Bishop Paiute PWD strengthen their technical capacity. PWD has a written operations and maintenance plan. PWD maintains an infrastructure asset inventory that identifies each asset's location, age, condition and replacement cost. It maintains checklists of activities including sanitary deficiencies identified during a sanitary survey to correct in a timely fashion. The Department also maintains an up-to-date GIS mapping system and performs long-term maintenance activities such as exercising valves, flushing dead-end mains, and inspecting and cleaning storage tanks. The preventative maintenance program allows PWD to provide safe and affordable drinking water and reliable sewer service to customers now and into the future.

Benefits

- Improved maintenance of the water system helps avoid costly catastrophic failures through affordable preventative maintenance actions.
- Better understanding and management of system assets and their expected life spans by developing an asset management plan and identifying maintenance activities based on the expected life, historical knowledge and records of the assets.
- Increased involvement in system maintenance by all staff and improved communications between staff.
- Broader customer communication and increased community trust in the quality of the water.

Background

The Bishop Paiute Tribe, located at the base of the Eastern Sierra Nevada Mountains in Owens Valley, is the fifth largest Tribe in California and home to 2,000 members. The Tribe is a self-governing sovereign nation with a deep appreciation for the natural resources – land, water and air. The Bishop Paiute PWD is responsible for the operations and maintenance of the community water and sewer systems, as well as irrigation, the solid waste system and tribal roads on the reservation. The department serves approximately 2,800 customers including transient customers (e.g. vacationing mobile homes).

Figure 1. Location of the Bishop Paiute Tribe.

The staff at the Bishop Paiute PWD consist of a public works director, an administrative assistant, two operators, a technician and temporary labor assistance. The water system consists of 6 domestic wells with a total capacity of 3.2 million gallons per day (MGD), pumping stations with variable frequency drives for every 2 wells, 4 storage tanks with a total capacity of 1.23 million gallons, 15.4 miles of water mains, and a chlorination system. PWD also maintains the wastewater collection system, which consists of sewer mains and service lines. The treatment plant, constructed by the Eastern Sierra Community Sewer District (ESCSD), treats the system's collected wastewater. The Tribe assisted in funding the treatment plant through an agreement with Inyo County. With the agreement, the Tribe has ownership of one-third of the capacity of the treatment plant (0.315 MGD) and they pay $24,000 per month for capacity rights, however, PWD does not have operations and maintenance responsibilities for the plant. PWD also maintains an irrigation system designed in the 1930's by the Bureau of Reclamation and the Army Corps of Engineers.

The Preventative Maintenance Program

History and Current Activities

The inception of the preventative maintenance program for Bishop Paiute PWD occurred around 2006. However, with staff changes over the years, necessary activities were not being performed. In 2015, an operator was hired and began to restore the program to what it is today.

Daily, weekly and monthly checklists were established for various activities to ensure they are completed and equipment is properly maintained. Operators and technicians are assigned preventative maintenance activities on a rotating basis. Each operator and technician is assigned a specific day for performing the activities. Any changes or modifications to the procedure are documented to communicate the information to the next operator who inspects or maintains the asset. Operators also have weekly meetings to discuss preventative maintenance activities.

Aside from daily operations and system checks such as measuring chlorine levels and recording results, preventative maintenance activities performed on a quarterly, semi-annually or yearly basis include:

- Exercising valves,
- Flushing dead-ends using system hydrants,
- Fluctuating storage levels in the winter months to prevent freezing,
- Inspecting and cleaning storage tanks,
- Greasing bearings on booster pumps, and
- Replacing mains to address leaks and breaks and reduce water loss.

The Cost of Water and Sewer Service

It is important for customers to know the true cost to operate and maintain a water and sewer system. Both systems require well trained staff and the necessary supplies and equipment for operations and maintenance. In 2015, PWD charged $35 per month per household for water and sewer service. Approximate annual costs to operate and maintain the system were:

- *$111,000 for water*
- *$269,000 for sewer*

PWD has done their due diligence to ensure customers receive the best service at the lowest cost. An example is the cost to operate and maintain the sewer system (which includes a $24,000 per month payment to ESCSD). If PWD were to build their own wastewater treatment plant, IHS determined the annual cost to maintain the plant would be $1,000,000 per year.

Daily maintenance activities are performed primarily by PWD staff. In addition, PWD also has access to a contract operator or a "mobile mechanic." The operator has extensive technical expertise and can be called to work on equipment as needed.

Successful Implementation of the Program

PWD hired a consultant to set up a Geographic Information System (GIS) database. The purpose of the database is to input and track assets (date installed, maintenance activities, etc.) as part of developing an asset management plan. To enhance this tool, the Indian Health Service (IHS) provided funding to PWD to purchase an asset locator. It is used to locate buried infrastructure such as mains and valves and to provide position coordinates for above-ground infrastructure such as tanks, wells, pumps stations and hydrants. This tool will allow PWD to accurately map the assets in their water and sewer systems and to continue to input data into the GIS database.

Collaborative Nature of the Program

All PWD staff are involved in the preventative maintenance program. New staff are trained by experienced operators to correctly perform daily preventative maintenance activities. In addition, all staff obtain additional training, typically through technical assistance providers serving the area. Classes related to distribution systems often focus on preventative maintenance activities, backflow prevention testing, and operating and maintaining altitude valves.

PWD also collaborates extensively with IHS in the Reno, NV area. IHS assisted PWD in obtaining a supervisory control and data acquisition[1] (SCADA) supplier to install their SCADA system. The supplier provided extensive training and continued phone support for PWD staff on how to operate the SCADA system and use the data.

Community Outreach

A PWD operator developed an Instagram account (@tribal_irrigator) as a means of educating and informing consumers about preventative maintenance and other PWD-related activities. The operator posts PWD information to communicate PWD public meeting dates, water restriction effective dates, and pictures of operators performing maintenance activities.

Program Successes

The Bishop Paiute PWD has had many successes from implementing the preventative maintenance program. Some of the successes include:

- Obtaining high IHS scores for preventative maintenance activities for both water and sewer, which contributes to ranking the system for funding of capital projects (see inset),

Sanitation Deficiency System (SDS) O&M Capability Scoring

The Bishop Paiute PWD receives the highest scores from IHS for preventative maintenance-related activities for water and wastewater systems. Those activities include:

- *maintaining a written schedule and records of completion for preventative maintenance tasks,*
- *maintaining records on daily operations (meter readings, pump hours, chlorine analysis, etc.),*
- *keeping sufficient spare parts and supplies on hand to replace failing equipment or to make necessary repairs,*
- *maintaining as-builts and system maps, and*
- *achieving at least 10 hours per year of training for each operator.*

This score is a factor in obtaining funding for capital projects.

- Developing and implementing processes that promote clear communication and strong recordkeeping to easily rotate activities between operators,
- Enhancing professional development opportunities for staff through training and providing leadership opportunities for experienced staff,
- Addressing findings from sanitary surveys in a timely fashion, which enables PWD to maintain compliance with applicable regulations, and
- Using social media for community outreach to increase buy-in and improve communication with customers.

Overcoming Challenges

With every program, utilities must overcome challenges to maintain their success. PWD anticipates growth in their customer base and increased future water and sewer system demands. This requires proactive planning by PWD as maintenance of existing assets becomes even more critical to ensure continued reliable service to customers.

PWD also acknowledges the limitations of the program. While preventative maintenance and asset management helps prevent or minimize potential system failures, utilities still need to anticipate some large infrastructure maintenance and replacement projects over time. Also, having enough staff to conduct routine maintenance and perform more in-depth maintenance projects is a constant struggle due to limited budgets and staff turnover.

Figure 2. Replacing an old gate valve that had been leaking.
Photo Credit: David Weaver from Bishop Paiute Tribe

Lessons Learned and Looking to the Future

The Bishop Paiute PWD has developed a robust, effective preventative maintenance program that save money now and into the future by preventing catastrophic infrastructure failures and improving routine operations. Performing maintenance activities on a regular basis ensures the water and sewer systems are proactively maintained. Developing the GIS database to track and manage assets will provide PWD with additional knowledge of their systems' components. It also provides the data to help identify historical trends and anticipate infrastructure end-of-useful-life timeframes. PWD has learned that accurate and complete documentation is critical to a successful program. In addition, implementation of a strong records management plan and maintaining digital records has streamlined the data evaluation process and makes data collection on infrastructure assets more effective.

Figure 3. Torqueing the flange fitting to prevent future leaks.
Photo Credit: David Weaver from Bishop Paiute Tribe

United States Environmental Protection Agency

EPA 810-R-20-007

MARCH 2019