

Saving Money as Pumping Requirements Increase

Fairfield Glade had massive infiltration and inflow (I&I) issues with a sewage collection system. Current pumps at the lift station could not keep up with high I&I events and sewage spills were likely during big rain events.



Instead of upgrading the submersible pumps in lift the stations, sound attenuated Pioneer Pump diesel engine-driven packages were installed at each station. The pump packages provided protection during rain events as well as redundancy in case of submersible pump failure or electrical outage.

Introduction

With championship golf courses, indoor and outdoor tennis facilities and numerous pristine lakes, Fairfield Glade was named a Top 50 Retirement Community in 2013 by “Where to Retire Magazine”. Home of the Tennessee Women’s Open, Tennessee Senior Men’s Open and the PGA Father-Son, Fairfield Glade offers single family dwellings as well as townhouses on its 12,000 acre property. Situated at 2000 feet above sea level, one might think that high influx and infiltration would not be a concern for the community.

Fairfield Glade offers multiple subdivisions with a wide range of home sizes, price ranges and views that include spectacular mountain, lake, golf and protected woodlands. Eleven lakes for boating or fishing, 90 holes of golf, award winning racquet sports facilities, multiple swimming pools, recreation & fitness complexes, miles of paved walking paths and hiking trails are all part of what attracts new residents every year.

Pumping Challenge

First developed in 1997, Fairfield Glade is now home to 6500 residents. Original infrastructure that was sized for a fraction of the current population and use was not adequate for current population and services.

Three years ago, problems in the collection system caused sanitary sewer overflows. Subsequent discussions with the Tennessee Department of Environmental Protection (TDEP) resulted in an ultimatum: invest in a permanent, long term solution that would prevent future overflow events or face costly TDEP fines.

Situation summary

The Public Works Administration is responsible for servicing not only the waste water and collections systems for properties that house residents and guests as well as a long list of amenities that add to the appeal of the community.

- 5 championship golf courses
- 12 tennis courts
- 11 lakes with 2 marinas
- 12 miles of walking trails
- 2 restaurants
- 4 swimming pools
- Recreation & fitness complexes

Governed by the HOA board, public works decisions are based on budget and needs of the HOA. As a private community that is promoted as “affordable resort living, with no state income tax and low property taxes,” the HOA board is committed to choosing the most cost effective, sustainable solutions for the community.

Funding for upgrades would need to come from increased HOA fees or utility fees, options that were not attractive to residents, some of whom were on fixed retirement incomes. The HOA board was committed to finding the most cost effective solution.

I&I events

The waste water system includes more than 14 lift stations. Prior to the development of Fairfield Glade, there was a smaller housing development with infrastructure that was sized for a fraction of the current population and use.

The sections of the force main that were installed in 1980, sized for much less usage, were no longer adequate. Smith and Loveless vacuum-assist, standard centrifugal pumps had been sized for far fewer homes and residents and could no longer keep up with seasonal infiltration and inflow.

Cost to upgrade existing

Public Works conducted initial investigations to study two possible approaches; upgrade the collections system or upgrade the pumping stations.

With miles upon miles of collection system pipes and no clear explanations for why the system had failed, they would have needed to conduct a full-scale study to determine root causes. The cost of an independent engineering firm would have been followed by a subsequent round of spending to upgrade the collections systems.

Alternatively, the pumping stations could be upgraded with submersibles that would be sized to handle peak flows during high infiltration events.

Equipment costs

To accommodate the intermittent increases in volume, equipment upgrades would need to be sized for peak flows. In addition to the cost of large submersible pumps, the existing 25 HP motors would need to be replaced with 75 HP motors. The Variable Frequency Drives (VFDs) would also need to be replaced to support larger pumps and motors.



From a service and maintenance perspective, this approach brought its own issues. Sizing the pump stations equipment for infiltration events that would only account for 10% of the actual run time meant the equipment would be running well below optimum capacity and efficiency with resultant higher operating costs.

Budgetary estimates for the control panel were between \$25K and \$30K. By the time the costs of new enclosures, new SCADA systems, higher gage wire and installation were totaled, this approach had become increasingly less attractive. After adding up the equipment costs, it was determined that upgrading to larger submersibles would have a first-cost close to \$30K more than sound attenuated diesel pump packages.

Alternatives to submersible pumps

Wascon Sales and Service out of Livingston, Tennessee was called in to evaluate the pumping requirements and propose alternative solutions. System requirements for several pump stations were assessed to determine suction and discharge head, friction losses and flow requirements.

Wascon determined that two pump models would cover the requirements of the various pump stations. Keeping the number of pump models to a minimum meant that the maintenance department would reduce the number of spare parts and the amount of service training needed for preventative maintenance.

Sound attenuated Diesel pump packages would also serve as back-ups in the event of power outages. Standby generators were not needed, again reducing costs and need for additional equipment maintenance.

The Solution

Fairfield Glades selected the SAPP66S12 diesel package for the initial pump station. Testing, after installation, confirmed that the SAPP66S12 would provide more than adequate flow and pressure to meet the historical volumes during high infiltration periods. Three additional sound attenuated pump packages have since been installed.



The pumps are controlled by LOFA CP750 panels which provide an auto start/stop function that is triggered by a level transducer. As the level of wet well rises, the pump speed is increased to maintain safe levels during rain events. The control panel is wired to the main VFDs so that the main lift station does not run unnecessarily when the diesel package is running. When the level drops below a set point, the diesel package shuts off.

The sound attenuated diesel packages include integrated fuel tanks sized to provide 24 hour run time. The SCADA system alerts the maintenance crew when the packages are running.



Service and maintenance

Fairfield Glade has one technician who maintains all of the pump stations within the collection system. Because the diesel packages are not run regularly, he has a routine for “exercising” the pumps. The recommended cycle for exercising these pumps is to run each pump, weekly, for a period of ten to fifteen minutes. Also, lubricants should be checked for moisture accumulation and changed as necessary.

Conclusion

Having proven the cost effectiveness of this approach, Fairfield Glade plans to add two or three diesel packages each year until they have all of the critical stations upgraded. At a savings of over \$30k each, the budget needed to make these changes is almost \$100K less than the next closest alternative.

The overall savings realized by installing pumping capacity that addresses peak flow without the costs associated with sizing the main lift station for exception conditions has made this an easy plan to work with. The installation of similar packages at each station provides a common platform that can easily be managed with common service and maintenance resources.

Working with Wascon Sales and Service in the initial phase of the project brought pump system design expertise to the project that might have otherwise come too late to be of value. Assessment of the impact of sizing lift stations for peak flow on the overall equipment costs provided valuable information and lead to a cost effective solution that could be scaled as needed in the future.