Regional Approach to Alternative Water Supply Planning and Funding is a Win-Win for Central Florida Stakeholders

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The concept of taking a regional approach to water supply planning is not new in central Florida. The utilities in Polk County, in collaboration with the Southwest Florida Water Management District (SWFWMD), prepared a countywide regional water supply plan in 2009. The Central Florida Water Initiative (CFWI) came about in 2011, which was jointly developed by the three water management districts that have jurisdiction in the central Florida region: St. Johns River Water Management District (SJRWMD), South Florida Water Management District (SFWMD), and SWFWMD.

It was determined in 2015 that approximately 1,100 mil gal per day (mgd) of water supply would be needed in the five-county region in 2035, while the sustainable supply from the Upper Floridan aquifer (UFA) is only about 850 mgd, leaving a large deficit. The heavily populated areas of central Florida have nearly reached their limits of permittable, traditional, fresh groundwater, and utilities are now forced, out of necessity, to seek alternative sources of water to meet growing demands. Other water supplies, including brackish water pumpage from the Lower Floridan aquifer (LFA), will need to be developed to help meet the shortfall in demand.

The Polk Regional Water Cooperative (PRWC) was formed in 2016 by 16 local government members (15 cities and Polk County), as shown in Figure 1, with the intention of proactively developing a large, regional water supply system to provide additional capacity to the participating members.

Public water supply demand projections developed during 2018 in Polk County showed a need of approximately 109 mgd by 2040. The sustainable yield of the UFA, which is the current source of water supply, is estimated to be 72 mgd. The deficit of 37 mgd will need to be met by an alternative water supply (AWS). The PRWC identified over 200 potential water supply projects, and three were selected for implementation. Two of the projects will ultimately involve large-capacity wellfields that will supply raw water from the LFA to reverse osmosis (RO) treatment facilities at the West Polk and Southeast plant sites: The Southeast plant will have a design capacity of 30 mgd, whereas the West Polk plant is estimated to generate up to 15 mgd of new water supply. A third project, called the Peace Creek Integrated Water Supply Plan (IWSP), seeks to increase available water supply from the UFA by using innovative surface water capture and aquifer recharge methods.

The initial phase of work required to implement the new water supply projects included feasibility studies to estimate the yield of each project and to collect the data required for preliminary design of the facilities. The cost to conduct the phase I work, which includes test drilling, groundwater modeling, water quality sampling, and other hydrologic analyses, is $23 million. Funding is being provided by SWFWMD (50 percent share), while the remaining costs will be provided by the member governments, State Revolving Fund (SRF), and other grants or loans from the CFWI and private financial institutions.

Alternate Water Supply Options and Funding

The key to the successful implementation of the project is willing participation and clear communication through contracts among the various stakeholders who have a vested interest in the outcome of the project. Having viable, alternative water resources to meet the needs of this growing region is vital to the economy and people who call central Florida home. The collaborative effort of the PRWC members represents a positive change in organizational dynamics and an innovative approach to funding large-scale water supply projects, and brings attention to a region with sensitive natural resources.

Rapid population growth in central Florida has greatly stressed its primary water source, the UFA. The population of Polk County for example is projected to increase from an estimated 592,082 in 2015 to 789,760 in 2035 (CFWI, 2015). A number of south Florida utilities have turned to RO desalination of brackish groundwater as their primary AWS because hydrogeologic conditions in the region are favorable for the implementation of this technology. Abundant brackish groundwater resources are available in the aquifer systems, and an extraordinarily transmissive injection zone, the so-called "Boulder Zone" of the LFA, is present and can be used to efficiently and economically dispose of the desalination concentrate. The Florida Department of Environmental Protection (FDEP) promotes the use of AWS and estimates that 70 percent of additional public water supplies developed in the state by 2035 will entail AWS development (Regional Water Supply Planning Annual Report, 2016).

The AWS options in central Florida are more limited because of its inland location and local hydrogeological conditions. Brackish groundwater development in central Florida has been much more limited to date than in south Florida because brackish groundwater resources that are hydraulically isolated from the overlying freshwater UFA occur at relatively great depths (and are thus more expensive to utilize) and potential injection zones are less well-developed than in areas further to the south. The cost to develop and treat brackish groundwater supplies can be 50 to100 percent greater than conventional freshwater sources because the supply wells are deeper, the RO treatment process utilizes more energy, and there are costs associated with concentrate disposal (injection wells). As a result, it would be difficult for a small utility to construct, operate, and maintain a brackish RO plant.

A significant economy of scale is realized by constructing large, regional water treatment

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facilities as opposed to smaller, local plants. The SFWMD regional water supply plan reported an estimated cost of $2.65/1000 gal for brackish water supply from a hypothetical 15-mgd plant that increases to $5.81/1000 gal from a similar 3-mgd plant (SFWMD, 2016). The concept of PRWC is to join several utilities together that have common water supply needs, with the goal being the development of a reliable, economical, and sustainable large-scale public water supply to serve the growing population.

Examples of funding initiatives that the PRWC has seen as successful include:

- The SWFWMD is providing a 50 percent share of the funding for the $23 million feasibility study underway for the three PRWC projects. The district promotes these regional water supply efforts to use AWS, as it reduces stress on traditional groundwater sources and consolidates the withdrawals so that numerous entities are not vying for the resource, which complicates permitting efforts. An added benefit to collaborating with these agencies is that, for example, through these projects, SWFWMD has brought additional technical resources and improved regulatory processes.
- The PRWC has secured low-interest SRF loans for the projects, which has eased much of the burden on small municipalities to generate the funds needed to maintain cash flow.
- The PRWC members joined forces to draft the Heartland Headwaters Protection and Sustainability Act, which was adopted by the Florida Legislature in 2017 and statutorily recognizes the vital importance of the region's water resources to Polk County and the surrounding regions. It declared that fostering partnerships between regional water supply authorities is in the state's interest and it facilitates state funding support. The goal of this effort was to bring more attention to Polk County, and there has been some success in allocating additional funding in the 2019 legislative session that is currently underway.
- The PRWC was recently invited by the U.S. Environmental Protection Agency to apply for a low-interest and flexible Water Infrastructure Financing and Innovation Act loan.

Full-scale implementation of the three PRWC projects are expected to cost over $600 million to construct, so it's clear that a group effort is required, given the magnitude of the undertaking.

Test drilling at the proposed Southeast and West Polk wellfield locations was initiated during spring 2018 and work has also been conducted at two sites as part of the Peace Creek IWSP. An update on the status of these projects follows.

Test Drilling Updates: Southeast and West Polk Water Treatment Plant Wellfields

Locations of the West Polk and Southeast wellfield sites are show in Figure 2. Limited existing data are available on the hydrogeology of the LFA in Polk County, and central Florida in general. A southeast deep exploratory well (SE-DEW) program was completed near the southern end of the proposed southeast water treatment plant (WTP) wellfield in 2010 (PBS&J, 2010). Pumpage from a wellfield consisting of 15 brackish water LFA supply wells was permitted in 2014 by SFWMD, with a combined withdrawal rate of 37.5 mgd. The proposed southeast WTP production wells will be located along Boy Scout Camp Road between CR-630 and FL-60.

A deep LFA southeast test production well (SE-TPW), LFA monitoring well (SE-LFA), UFA monitoring well, and water table aquifer monitoring well were constructed and tested near the north end of the proposed wellfield alignment. The test program began during spring 2018 and included water quality sampling, geophysical logging, packer testing, a long-term aquifer performance test, and lithologic analyses. Testing was completed during March 2019.

The production interval of the supply wells occurs between the approximate depths of 1,400 and 1,900 ft. Potential injection zones for concentrate disposal may be present below 2,300 ft at the WTP site. The brackish water source has total dissolved solids (TDS) that vary from approximately 1,200 to 3,000 mg/l and well yields may vary from 2 to 2.5 mgd. The conceptual plan for the SE-WTP is to obtain raw water from the upper part of the LFA (Zone I) and inject the RO concentrate

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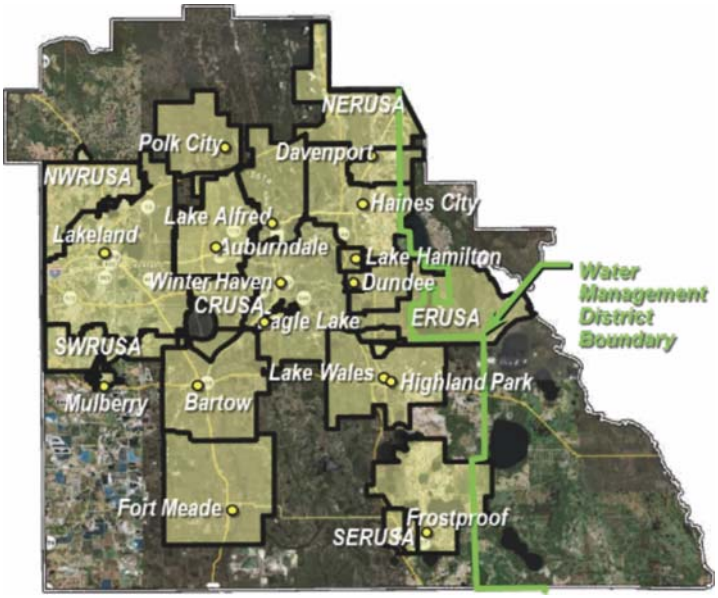

Figure 1. Member governments in the Polk Regional Water Cooperative.

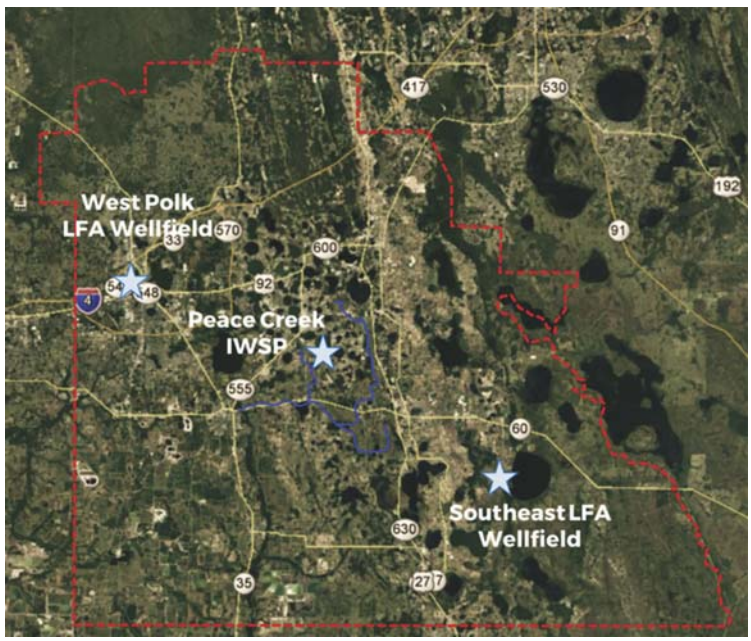

Figure 2. Proposed wellfield and Peace Creek project site locations.

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into a deeper zone. Figure 3 shows the general stratigraphy of the site and the approximate well depths. The WTP and deep injection well system are planned to be located at the north end of the wellfield alignment.

Drilling at the West Polk site (Figure 4) began during spring 2018 and was completed in November 2019. A surficial aquifer monitor well, UFA monitor well, dual-zone monitor well, and test/production well were completed at the Lakeland site. Aquifer performance testing, geophysical logging, and water quality sampling were also completed during 2019. The supply wells at the West Polk site are anticipated to be deep, with Fiberglass casings set to approximately 1,900 ft below land surface and total depths of roughly 2,200 ft.

Peace Creek Integrated Water Supply Plan Update

The purpose of the study is to determine if seasonally available excess surface water can be stored or used for aquifer recharge and wetland rehydration to potentially offset the impacts of freshwater pumpage from wellfields in Polk County. The project involves site evaluations, data collection, modeling, permitting, and data analyses to determine if an IWSP is feasible. Site evaluations were initiated in early 2019 and are currently underway at several locations.

Geotechnical data, including standard penetration test (SPT) borings, slug tests, and water-level monitoring were conducted at two of the sites to assess the potential for storing water and aquifer recharge. The amount of water that may be available for recharge has been estimated with computer model simulations. Currently, the team is pursuing conceptual design alternatives for water use and environmental resource permitting efforts that will be conducted in 2020, assuming favorable results are achieved during the site evaluations.

Conclusions

Large-scale water supply offers inherent benefits via economies of scale and regional water supply plans are looked upon favorably by regulators and funding sources. The PRWC has undertaken a focused approach to addressing water supply needs in Polk County with the evaluation of two large water supply wellfields and an innovative plan to increase water storage, wetland restoration, and aquifer recharge. The three projects currently being evaluated are estimated to provide in excess of 45 mgd of public water supply. With construction costs estimated to be over $600 million to implement these projects, a cooperative approach among the utilities, regulators, and other stakeholders is essential to the success of the program.

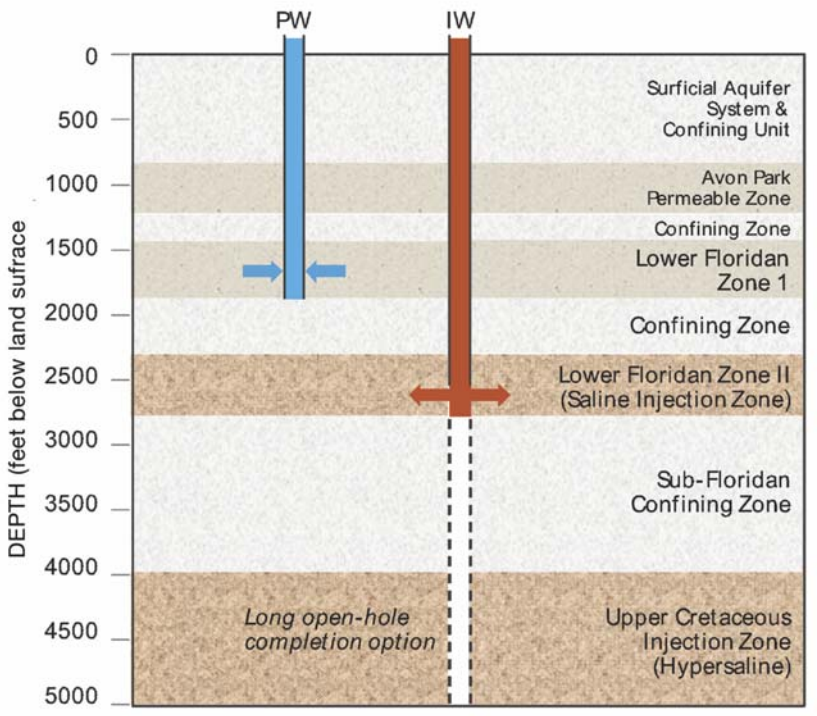

Figure 3. Southeast test site aquifer units.

Figure 4. West Polk test drilling site.

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