

# **Seminole Integrated Wind-Water Demonstration System**

## **Progress Report for November 2012**

### **Submitted to**

Texas Department of Agriculture  
Att: Travis Brown  
Tel 512-936-7878  
PO Box 13231  
Austin, TX 78711

Contract No. 728082

Texas Water Development Board  
Att: Sanjeev Kalaswad  
Tel 512-936-0838  
PO Box 13231  
Austin, TX 78711-3231

Contract No. 0804830832

### **Submitted by**

City of Seminole  
Att: Tommy Phillips, City Administrator  
Tel 432-758-3676  
302 South Main Street  
Seminole, Texas 79360

December 10, 2012

## **1.0 INTRODUCTION AND OVERVIEW**

**1.1 Scope and Content** This progress report is submitted jointly to the Texas Department of Rural Affairs (TDRA) and to the Texas Water Development Board (TWDB). TDRA formerly was called the Office of Rural and Community Affairs (ORCA). The report is submitted as part of TDRA contract number 728082 and TWDB contract number 0804830832. In addition to project funding from the TDRA and the TWDB, major participants include the City of Seminole, Texas Tech University and the US Department of Energy through Texas Tech University. The project was initiated in April 2009, and the completion date is currently set at March 2013.

**1.2 Project Description** This project addresses the continuing depletion of the Ogallala aquifer, the current principal source of potable groundwater for much of west Texas and northward through Kansas. The approach is to access, lift, and purify brackish, much deeper water-bearing formations in the Santa Rosa of the Dockum group. On the basis of preliminary evidence, these formations were believed to occur in Gaines County at depths ranging from 1500 to 2000 ft. There may also be water-bearing strata between 600 and 800 ft. Our drilling and geophysical investigation found potentially productive zones at 540-650 ft, 890-920 ft, and 1610-1770 ft. The purification will be accomplished using reverse osmosis (RO). The electrical energy required for the well lift pumps and those of the RO system will be supplied principally by a grid-connected wind turbine. The purified water is to be utilized as part of the municipal water supply of Seminole, Texas, a community with a population of about 7,000. Seminole is located in Gaines County in the southern panhandle of West Texas bordering New Mexico. The results are expected to be applicable to many other arid and semi-arid regions as well.

The project encompasses the following broad tasks:

- 1) The siting, permitting, drilling and characterization of a well drilled into the Santa Rosa, including site acquisition, pre-drilling hydro-geological investigations, permitting, logging, well completion and test,
- 2) The design and construction of required infrastructure, including well completion, site preparation, foundations and civil works to support the wind turbine, RO system and other system elements,
- 3) Installation and commissioning of a wind turbine including the foundation, electrical infrastructure, and liaison with the local utility,
- 4) The procurement, installation and commissioning of a commercial reverse osmosis system, including necessary permits, civil structures, electrical work and piping,
- 5) The design, permitting and construction of an evaporation pond or other means for dealing with the concentrate from the RO system,
- 6) Operation and characterization of the integrated wind-water purification system for a period of 12 months, and
- 7) Documentation and reporting of project results and performance.

## **2.0 SUMMARY OF ACTIVITIES THIS PERIOD**

**2.1 Overview** Collaboration between the City of Seminole, WRC and WiSE researchers, and engineering/management consultants continued. Most construction activities have been

completed, and startup of the RO system occurred in early October. Final details of wind turbine and well pump adjustments are being worked out .

**2.2 Site Construction** West Texas Consultants (WTC) reported Tejas Partners' construction work as completed previously. The building that houses the RO system has lights and grid-based electricity. On-site plumbing and the lift station for the water leaving the building are complete, and grid-based power is also available for the well.

**2.3 Wind Turbine and Site Preparation** The installation of the tower, nacelle, and blades was completed on March 13. The final electrical connections at the wind turbine and the meter boxes with Xcel Energy are all that remain to be done. WTC requested assistance from WRC and WiSE faculty to make sure the details of those connections are properly negotiated with Xcel. WTC prepared the documents required for the metering connection. Chad Tompkins and Jon Link of WTC, Stephen Bayne of WiSE, and Ken Rainwater of the WRC met with Julius Heslop of Xcel Energy in Lubbock on November 2 to discuss the proper paperwork and metering requirements. Mr. Heslop confirmed WTC's questions about the proper documentation and application costs, and the group finalized an appropriate metering scheme. The electric line from the wind turbine tower to the RO building is in place, and Real-Time Automation will install the disconnect in December and assist in the meter selection and installation. The wind turbine should be commissioned, including the first operation, emergency brake test, and other startup testing in December.

**2.4 RO System** The RO system was moved to the RO building in May. Startup of the RO system with Keith Summerford of Crane Environmental and PSC took place on October 2 through 5. The RO system currently operates with grid-based power. According to Summerford, the RO system operates properly and drops the TDS in the water from over 2000 ppm to less than 100 ppm easily. Lance Lovelady and several other City of Seminole water staff members were trained on the operation of the RO system, and they are running the well and RO system for 30 minutes to 1 hour most days to prevent deterioration of the membranes and other parts of the system. PSC and the WRC are working with the City to identify sources of affordable replacement filters and purchase of items for ongoing operation and maintenance. PSC provided a source for the prefilters for \$8 per filter, improving on the local cost of \$35 per filter.

**2.5 Santa Rosa Well** As noted previously, the recent static water level in the well has remained at approximately 96 ft below ground surface, much higher than the 750 ft below ground surface shortly after the initial well construction and pump test. Under the current conditions, the pump set at 900 ft below ground surface is subject to much higher intake pressures than the initial conditions, so the discharge from the pump is a much higher pressure than the design conditions for the variable speed booster pump between the well pump and the RO system. To allow controllable flow and pressure during the system start-up period and the short-term operations since, part of the flow is bypassed to the land surface. The WRC and PSC are proposing a variable frequency drive (VFD) addition to the well pump controls to allow pressure control at that position, which should allow properly pressurized flows with the currently high static water level as well as lower static water levels if the well behavior tends back to the deeper static water level seen initially. Ken Rainwater met with David Anderson of Anderson Welding Pump & Machine, Inc., in Seminole on November 20 about his experience with VFDs and working with the City of Seminole. The WRC will work with PSC and the City to complete the design

## Seminole Integrated Wind-Water Demonstration System Progress Report for November, 2012

selection and procurement, which will also include a sand separator for suspended solids removal upstream of the RO system.

**2.6 Local Outreach** The kickoff workshop and media event is still being planned to explain the different aspects of the project for the local public and other interested parties. The workshop had been tentatively planned for late August, but is now postponed until all systems are operational. The WRC and WiSE staff will be contacting all contributing organizations for their interest and availability as the final date is confirmed.

### Distribution:

Sanjeev Kalaswad, TWDB  
Travis Brown, TDRA  
Tommy Phillips, City of Seminole  
Kay Howard, Howco  
Pam Groce, SECO  
Judy Reeves, Cirrus  
Chad Tompkins, WTC  
Zane Edwards, PSC

Leonard Nail, PSC  
Jay McMillen, TTU  
Ken Rainwater, TTU  
Phil Nash, TTU  
John Schroeder, TTU  
Lori Barnes, LEUWCD  
Daniel Albus, PSC