

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

## **Progress Report for May 2013**

### **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

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## **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, the State Energy Conservation Office, Llano Estacado Underground Water Conservation District, Texas Tech University National Wind Institute (NWI) and Water Resources Center (WRC), and the US Department of Energy through Texas Tech University. The project was initiated in April 2009, and the completion date was originally set at March 2013. As of early February, 2013, the construction contracts at the site have been completed, such that the TDRA and TWDB contracts could financially end. Continuous operation and monitoring of the system will extend for a year into 2014, so that the seasonal behavior of the wind turbine energy generation can be observed and documented while the well and RO system also perform.

**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 6430 located in Gaines County in the Southern High Plains. The results will be applicable to many other arid and semi-arid regions.

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 and WRC and NWI researchers continued. Continuous operation of the well, wind, turbine, and RO system began with a successful 24-hr operation test starting on April 18, and the system ran successfully through the end of the month. Unfortunately, the motor in the well pump failed on May 2, and a new motor was ordered with delivery anticipated in early June.

**2.2 Site Construction** The security fence was installed around the wind turbine.

**2.3 Wind Turbine and Site Preparation** The wind turbine became operational on March 6. After consultation with WTC and the City of Seminole staff, the WRC is working with Real-Time Automation of Hobbs, NM, to install a data-logging system to remotely track the electricity generation from the wind turbine and allow delivery of those data to the City's SCADA system and also through the internet. The five-year warranty and maintenance agreement on the wind turbine was started on May 1, 2013, in a written agreement with Entegrity Wind.

**2.4 RO System** The RO system was idle while the well pump was down. The WRC is also working with Real-Time Automation to add a data collection system to monitor the digital data collected by the RO system and make it available through the City's SCADA system.

**2.5 Santa Rosa Well** On May 2, the well pump motor stopped, with a ground fault recorded on the VFD controller. The one-year warranty on the pump and motor had expired. Anderson Welding, Pump, and Machine Service was brought in to pull and service the well pump motor. A replacement motor was ordered with delivery expected in early June. Real-Time Automation will also set up data collection from the well's VFD to the City's SCADA system.

**2.6 Local Outreach** The kickoff workshop and media event is still being planned to explain the project for the local public and other interested parties. The WRC and WiSE staff will be contacting all contributing organizations for their 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  
Amy Cook, TTU  
Ken Rainwater, TTU  
Phil Nash, TTU  
John Schroeder, TTU  
Lori Barnes, LEUWCD  
Daniel Albus, PSC