

Seminole Integrated Wind-Water Demonstration System

Progress Report for December 2009

Submitted to

Texas Department of Rural Affairs
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, Entegriy Wind Systems, Texas Tech University and the US Department of Energy through Texas Tech University. The project was initiated in April 2009 and is expected to run for two years.

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 are believed to occur in Gaines County at depths ranging from 1500 to 2000 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 50 kW 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 50 kW wind turbine provided by Entegriy Wind Systems, 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;

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- 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;
- 7) Documentation and reporting of project results and performance.

1.3 Summary of Previous Activities A site visit and project initiation meeting was held in Seminole on 27 April Monday. Attending were Travis Brown and Julie Hartley of TDRA; Sanjeev Kalaswad of the TWDB; Mayor Wayne Mixon and City Administrator Tommy Phillips of Seminole; Kay Howard of Howco and Jamie Chapman of Texas Tech University. Reviewed were the procurement rules and procedures, schedule and other contract details. A proposed project organizational structure was presented and approved.

Subsequent to this meeting, procurement guidelines for design and engineering services and for construction activities were discussed and reviewed extensively with procurement officials from the TDRA. It was agreed that *design and engineering services* provided by outside vendors would be procured by TTU on behalf of Seminole, invoiced by the vendors to TTU and that TTU would in turn invoice Seminole. Design, engineering and management services provided by TTU faculty and staff also would be invoiced to Seminole.

It was agreed that *construction services* would be procured directly by Seminole with support from TTU.

Two hydro-geological investigations were conducted through Gaines County, in which Seminole is located. For each, well logs were procured and analyzed to assess the currently-available information about the Santa Rosa formation of the Dockum group. The wells and their associated logs traversed North to South and West to East across Gaines County. The depths of interest extended to about 2000 ft bgs. The investigations were conducted by Judy Reeves of Cirrus Associates¹ under contract to Texas Tech University. The analyses indicated that the Santa Rosa horizon appears to be situated at about 1440 to 1840 ft bgs. The analyses indicated the presence of several, separated, potential water-bearing sandstone layers within this range. There also may be a secondary sequence of potential water-bearing layers at 600 to 700 ft bgs.

In addition to the Cirrus activities, work was initiated with Parkhill, Smith and Cooper of Lubbock for the design and permitting of the production well together with a possible test hole. As part of this effort, contacts were made with drillers and pump manufacturers. This work is being accomplished under a purchase order issued to PS&C by Texas Tech University.

Discussions were held with geophysical well logging companies to gain information, tool-suite recommendations and costs for the logging of the well. A contract is in the process of being let to West Texas Consultants for design and layout of the infrastructure and civil works for the Seminole site.

¹ Information about Cirrus may be found at the web site <http://www.cirrusassociates.com> .

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2.0 SUMMARY OF ACTIVITIES THIS PERIOD

2.1 Overview Activities this period included the following: 1) under a purchase order issued to Parkhill, Smith and Cooper by Texas Tech, work continued on the investigation, design, permitting and expected cost of the Santa Rosa well; 2) Further discussions were held with and a purchase order is in the process of being issued by TTU to West Texas Consultants of Andrews, Texas. The initial scope includes layout of the Santa Rosa well, the location of the facility components (wind turbine, RO building and other subsystems), the associated infrastructure and advice on well details and potential well-driller bidders. Visits were made to a pump manufacturer-distributor and to a well driller. The preliminary version of a well design and a well driller bid package was completed and provided to Seminole, TWDB and TDRA for review.

2.2 Design and Permitting of the Santa Rosa Well Activity on the design, permitting and anticipated cost of the Santa Rosa well continued under a contract with PC&S. As described in the previous report, a production well and a separate, smaller-diameter test well were deemed not affordable under the current TWDB funding. Thus the production well will also serve as the test well as originally proposed. The focus during this reporting period was on determining the smallest drilled-hole size necessary to accommodate a pump having the capacity to lift the Santa Rosa water from 2000 ft bgs. Discussions were held with a pump manufacturer in Abernathy, Texas as part of our efforts to identify pump diameters, required casing inner diameters, power and voltage supply requirements.

Completed by PS&C and provided for review during this period to Seminole, TWDB and TDRA was a document containing the preliminary design of the production well and a specification-bid package for submission to prospective water well drillers. After review and appropriate revisions, the document will be submitted to the TCEQ for approval and permitting of the well. The process of bid procurement will be started after the review is complete.

With the well design documentation submitted to TCEQ, the bid package for the drilling of the well will be assembled. The package will include the procurement specifications in conformance with TDRA and TWDB requirements, the well design as submitted to the TCEQ, copies of the Cirrus analyses and other relevant information. Pursuant to TDRA procurement guidance, the availability of the package will be advertised. In addition, a bidder's informational meeting is planned to be held following placement of the advertisement.

The pump manufacturer Gicon Pumps and Equipment located in Abernathy, Texas was visited. The company appears to be an experienced nationwide provider of pumps and control equipment.

The well drilling company West Texas Water Well Drillers of Midland, Texas was visited. They suggested that the bidders capable of drilling the Seminole well were themselves, LT Drilling of Sun Ray, Texas and Hi-Plains Drilling, Abernathy, Texas. They allowed as how there were other capable drillers.