THORNHILL GROUP, INC.

Professional Hydrogeologists • Water Resources Specialists

October 30, 2013

Mr. Brandon Wade
City Manager
City of Pflugerville
100 East Main Street
Pflugerville, Texas 78691

Re: Revised Proposal for Hydrogeologic Services —
Evaluation of Existing Production Wells and Test Drilling Program
City of Pflugerville, Travis County, Texas

Dear Mr. Wade:

As a follow up to our meeting on September 25, 2013 regarding the results of our initial investigations, Thornhill Group, Inc. (TGI) submits herein this revised Proposal including Scope of Services, Cost Estimate, and Scheduling to provide professional hydrogeologic services to the City of Pflugerville (City). The Work outlined in this proposal pertains to evaluating characteristics of the City's existing wells and the aquifer characteristics where the wells are completed in order to conduct evaluations regarding optimizing available ground-water supplies.

REVISED SCOPE OF SERVICES

TGI will build upon information collected as part of our initial investigations by focusing on data pertaining to the City's existing wells, and on potential exploration areas near the Stone Hill Town Center. The objectives of the proposed Work are:

- To evaluate the City's existing wells, particularly Well No. 1, Well No. 4, Well No. 6, and Well No. 7, to assess optimum production rates, especially during dry periods (i.e., drought) when aquifer water levels are deepest;
- To determine whether wells can be modified or refurbished to optimize production to meet the projected water demand through 2025.
- Ascertaining whether conditions near a selected site within City property near the Stone Hill Town Center is favorable for exploration;
- Conducting a drilling and testing program at the Stone Hill Town Center site; and,
- To ascertain water-quality trends and explore possible options for using well water including blending with City surface water sources or use as "re-use" water.

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While the Work proposed herein does not include any engineering services, the information and results from this study will enable TGI to provide the information necessary to assist the City and project engineers, as applicable, in future work with the following:

- Developing final plans and designs for well construction/well modification, pumping equipment and other appurtenances;
- Obtaining TCEQ approvals to construct production wells for public supply use;
- Obtaining competitive bids for production wells from qualified water well contractors;
- Providing guidance for specifications for completing and testing large-capacity production wells; and,
- Providing the necessary data to the City and project engineers for planning and designing future infrastructure and treatment facilities for the well(s).

Task 1 – Perform Background Assessments and Site Selection (for potential wells near Water Treatment Plant)

Task 1A – Perform Background Evaluations

Task 1A work will build upon existing data by conducting an "in-house" hydrogeologic evaluation of the available data for the City's wells. TGI has already collected data from public sources for the City's wells; however, it will be critical for TGI to acquire all available well data from City files. Work during this Task will focus on compiling and evaluating the records kept by the City on their wells. Specifically, items conducted during this task will include:

- Working with the City to obtain records for each well relating to:
  - Well construction
  - Water quality sampling
  - Water levels
  - Production
  - Maintenance
  - Testing
- Reviewing and cataloging the records for each well
- If records are in a hard copy format, entering data into a digital format to facilitate analysis
- Evaluate and determine potential well productivity from one or more wells and potential quality of water at favorable new sites west of Stone Hill Town Center
- Determine the optimal well design and the number of wells needed to meet the projected demand through 2040

Task 2A – Planning Testing Programs and Solicit Bid Packages (As Required)

Task 2A will include designing and planning all field work to test and evaluate the City's existing wells, specifically Well No. 1, Well No. 4, Well No. 6 and Well No.7, and to conduct drilling and testing at one selected site on City parkland near the Stone Hill Town Center. TGI understands that the City will follow its standard processes and procedures in selecting a qualified water well or pump installer contractor to perform the Work associated with logging and production testing. TGI will prepare the testing plan and will assist the City in soliciting bids and procuring the contractor(s) to perform the work. No subcontractors will likely be needed for testing Well No. 1, Well No. 4 and Well No. 7. Specifically, this task will include:

- Planning and cost estimates or bids for Well No. 6 downhole video inspection. TGI will prepare a brief Scope of Work for contractors to provide pricing for pulling and inspecting existing pumping equipment, conducting downhole video logging of the well, and re-setting pumping equipment;
- Designing, preparing a Scope of Work, obtaining bids and assisting the City in selecting a qualified contractor to conduct drilling and testing at one selected site. This Work will include:
  - Preparing a detailed Scope of Work and Specifications for a properly designed drilling and testing program;
  - Preparing and soliciting a competitive bid proposal package to at least three (3) qualified, experienced and reputable water well contractors, licensed in the State of Texas, to obtain detailed and accurate costs, availability of each contractor, and ensure that contractors are sufficiently experienced and qualified for the proposed work;
  - Providing to the City a Bid Tabulation summarizing the results of bids and assisting the City in selecting the appropriate contractor to do the proposed work; and,
  - Coordinating and planning with the City and water well contractor specific drill site locations, site access and security, schedules, water needs during drilling, security and safety plans, any excavations and discharge needs, etc.

Task 3A – Conduct Field Programs

This task will include professional hydrogeological services associated with effectively conducting field programs to assess the City's existing wells and the potential for completing a successful well at the selected Stone Hill Town Center site. This task will include:

Production Testing of Well No. 1, Well No. 4 and Well No. 7

- Visit each well to inspect well head, discharge arrangements, obtain water-level measurements and determine whether testing is feasible and practicable; and,
- Testing existing wells including:
  - Conducting short-term performance testing (2 hours) at selected wells to determine current specific capacity.
  - Collecting field water-quality parameters.

Inspection and Video Logging of Well No. 6

- Coordinating with City personnel and the selected water well contractor an opportune time to take Well No. 6 offline, pull the pumping equipment, and let the well remain idle for at least 24 hours.
- Witnessing the downhole video logging of the well and obtaining a copy of the video or in-house review.

Pilot Hole Drilling and Logging Near Stone Hill Town Center (Data Center)

- Drilling a pilot hole/test hole with minimum diameter of 8¾-inches using air rotary techniques to the base of the Edwards aquifer, between 600 and 800 feet below land surface.
- During drilling, compiling logs of drill cuttings, drill time, fluid produced or lost, air volume needed to purge the hole and, if possible, collecting field water quality parameters (specific conductance, pH, temperature) of water jetted from the hole during drilling.
- After the hole is drilled to the total depth, conducting geophysical logging with a qualified logging company to obtain downhole measurements of geophysical parameters including, but not limited to, natural gamma, spontaneous potential, dual induction resistivity, and caliper. Other log signatures may be obtained.
- It is possible during drilling and air jetting the hole that substantial information regarding the general productivity and water-quality characteristics of the aquifer at the site can be estimated. This information will be used to determine whether a temporary test well is warranted at the site. If a site is deemed to be unfavorable based on drilling and logging, the pilot hole will be plugged and abandoned in accordance with TDLR and TCEQ guidelines and requirements.

Temporary Test Well Installation and Testing Near Stone Hill Town Center (Data Center)

If the initial pilot hole drilling results appear favorable, then the following work will be conducted:

- Temporarily setting 6-inch diameter casing in the drilled hole to the top of the producing interval. Note that the hole will not be reamed to a larger diameter, and the casing will not be cemented in place;
- Installing a large-capacity pump (e.g., 25 HP or more) capable of pumping more than 150 gpm for production testing purposes;
- Conducting a step-rate pumping test at three selected pumping rates in order to assess aquifer efficiency and optimum pumping rates;
- Conducting a 24-hour constant-rate pumping test, including measuring water levels at selected intervals during a 12-hour static period prior to the pump being turned on, during the 24-hour production test, and 12-hour recovery period after the pump is turned off;
- Monitoring field water-quality parameters (e.g., specific conductance, pH, temperature, turbidity and others) throughout the pumping test;
- Collecting and delivering samples to a qualified laboratory for analysis of water quality, particularly analyzing for parameters relating to potable or public drinking water supplies per TCEQ regulations;
- Pulling and removing the temporary pumping equipment and 6-inch diameter casing; and,
- At favorable sites (if possible), capping and securing the pilot hole to preserve the hole for reaming to complete a large-capacity production well in the future. At unfavorable sites, plugging/abandoning the drilled hole per TDLR and TCEQ regulations and guidelines.

Task 4A – Ground-Water Supply Evaluation

Task 4A will include analyzing the data and information compiled in order to evaluate the likely production and water quality from existing active and inactive City wells, as well as to assess the overall availability and quality of ground water in the area, including during drought periods. Specifically, this task will include:

- Assessing historical and current production characteristics and water quality trends in the City's existing wells;
- Determining whether Well No. 6 (or other existing City wells) could be recompleted, modified, refurbished, altered or replaced to optimize and gain production capacity;
- Evaluating drilling, logging, and testing results to assess productivity and water-quality characteristics of the aquifer (and properly designed wells) at the test location;

- Assessing for the local aquifer, ground-water availability and water quality for short-term and long-term needs, particularly with respect to dry periods;
- Determine optimal pumping rates for the existing wells and assessing the potential new wells needed to meet current and future water demands for the City;
- Developing recommendations and, as applicable, draft specifications and bid proposals for well drilling, well modification, and/or well rehabilitation;
- Compiling general cost estimates for mitigating Well No. 6 (and other existing City wells); and,
- Providing a written letter report and a presentation to the City summarizing the hydrogeologic evaluations.

COST ESTIMATE

Estimated costs for TGI's services to conduct the Work as described in this Proposal are provided as Table 1 in Attachment A. TGI fees and costs will be determined by actual working hours and direct expenses associated with completing the work tasks outlined above and are based on the attached Standard Fee Schedule (Attachment B) and Equipment Fee Schedule (Attachment C). Invoices are payable upon receipt.

TGI obtained preliminary and unofficial cost estimates from several water well contractors. TGI understands that the City will obtain competitive bids for the drilling, logging and well completion services, and will contract directly with the selected water well contractor. Per test drilling site, estimated costs for water well contractor services could range from $56,000 to $114,000 for complete testing. Drilling costs may vary depending upon actual geologic conditions encountered, actual depths drilled, and actual testing needed. Should any work result in an increase in total cost, prior to proceeding with the work TGI will submit a change order request and require written approval from the City. In the event that TGI should identify additional work items necessary to effectively and successfully complete the project, TGI will provide written recommendations and associated costs. Such additional work will only be conducted with verbal or written approval from the City.

SCHEDULE

Once authorized, we anticipate being able to begin work immediately. Testing of the existing wells can begin at the City's discretion. TGI will work with the City to coordinate pulling of the pump and video logging of well No. 6. The primary factors dictating the scheduling and completion of the work will be the City's bidding process, the availability of the licensed water well drilling contractor. We anticipate that the Work described in this Proposal could be completed in 60 to 90 days, depending on drilling and weather conditions beyond our control.

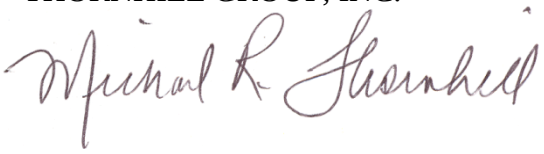
AUTHORIZATION

If the included Scope of Work, Cost Estimate, and Schedule are acceptable, please authorize work in the space provided below and return a copy to us via facsimile to (512) 244-1461 or by mail. Upon receipt of an executed copy, we will proceed with the work as described.

We very much appreciate the opportunity to provide you this Cost Estimate and look forward to assisting you with this project.

If you have any questions, please call.

Sincerely,
THORNHILL GROUP, INC.



Michael R. Thornhill, P.G.
President

Attachments

APPROVED:

_____
(Client Signature)

_____
(Title)

_____
(Printed Name)

_____
(Date)

STANDARD FEES FOR PROFESSIONAL SERVICES BY THORNHILL GROUP, INC.

Fees for professional services provided by Thornhill Group, Inc. are based on the actual and direct time of personnel on the project at the following hourly rates:

Principal	$ 200
Project Manager	$ 150
Technical Staff 3	$ 125
Technical Staff 2	$ 105
Technical Staff 1	$ 85
GIS Staff	$ 85
Graphics Staff	$ 75
Field Technician	$ 60
Clerical Staff	$ 40

Reimbursement for actual expenses incurred that are directly related to work and performance on the project are billed per the following:

a. for reproductions by graphics department, charges equivalent to commercial rates for similar commercial services.

b. for transportation in company or personal vehicles, mileage will be billed at the current IRS approved rate per mile.

c. for use of company field equipment, including but not limited to steel tapes, electric lines, conductivity, pH and turbidity meters, computers, data recorders, transducers and air monitoring equipment, charges are equivalent to commercial rates for similar equipment rentals.

d. for all other expenses, including but not limited to reproduction, transportation, meals, lodging, parking, taxi fares, vehicle rentals, airfare, long distance telephone calls, printing, maps, photographs, field supplies, equipment rental, shipping, drilling contracting, laboratory costs, charges will be based on the actual invoice costs.

Invoices are payable upon receipt, and accounts unpaid more than 30 days after the billing date are subject to 1.25 percent interest per month (15 percent annual rate) from the invoice date.

STANDARD FEES FOR FIELD EQUIPMENT PROVIDED BY THORNHILL GROUP, INC.

Fees for use of company field equipment provided by Thornhill Group, Inc. are based on actual daily usage in the field, at the following rates:

	Daily	Weekly	Monthly
Field Vehicle	$50.00	$150.00	$450.00
Data Recorders	$25.00	$75.00	$225.00
E-Line	$20.00	$60.00	$180.00
Conductance Meter	$15.00	$45.00	$135.00
pH Meter	$15.00	$45.00	$135.00
ORP Meter	$15.00	$45.00	$135.00
DO Meter	$25.00	$90.00	$300.00

Evaluation of Existing Wells and Preparation of Testing Program
City of Pflugerville, Travis County, Texas

Table 1. TGI Services Cost Estimate.

Task	Description	Cost Estimate
1	**Perform Background Assessments and Site Selection (for potential wells near Water Treatment Plant)**	
	TGI Fees and Expenses	$4,600
1A	**Perform Background Assessments and Site Selection**	
	TGI Fees and Expenses	$ 6,100
2A	**Design a Testing Program and Solicit Bid Packages**	
	TGI Fees and Expenses	$ 10,400
3A	**Conduct Field Programs – Exploration Drilling, Logging, Testing, and Sampling**	
	Production Testing of Well No.1, Well No. 4 and Well No. 7	*$ 4,500*
	Inspection and Downhole Video of Well No. 6	*$ 1,500*
	Pilot Hole Drilling and Logging	*$ 12,500*
	Temporary Test Well Installation and Testing	*$ 22,400*
	Task 3 Subtotal	$ 40,900*
4A	**Ground-Water Supply Evaluation**	
	TGI Fees and Expenses	$ 11,500
	TGI COST ESTIMATE TOTAL	**$ 73,500**

Estimated costs are based on drilling, logging, and testing at ONE SITE near the Stone Hill Town Center. For each additional drilling and logging site, TGI fees would be $4,900; also, for each additional testing site, TGI fees would be $4,900. TGI fees for production testing of additional existing City wells would be $1,000 per well.