

I. GENERAL INFORMATION

- (1) **Legal Name of Applicant(s):**
High Plains Underground Water Conservation District No. 1 on behalf of
Llano Estacado Regional Water Planning Group (LERWPG)
- (2) **Regional Water Planning Group:**
Region O – Llano Estacado Region
- (3) **Authority of Law Under Which the Applicant was Created:**
Article XVI, Section 59, Texas Constitution.
High Plains Underground Water Conservation District No. 1 was Designated as a
Representative of the Regional Water Planning Group on March 18, 2002
- (4) **Applicant’s Official Representative:**
Jim Conkwright, General Manager
High Plains Underground Water Conservation District No. 1
2930 Avenue Q
Lubbock, Texas 79405
Telephone: (806) 762-0181
Fax: (806) 762- 1834
E-mail: hpwd@hpwd.com
Vendor ID Number: 17560036547-001
- (5) **Application in Response to a Request for Proposals published in the Texas Register?**
Yes
- (6) **Document Number and Date of Publication of the Texas Register:**
RWP RFP, (TAC) §355.92, TexReg February 15, 2008 Texas Register
TRD- 200800727
- (7) **Total Proposed Planning Cost:** \$ 635,430
- (8) **Cash Contribution to the Study:** (Zero)
- (9) **List Source of Cash Contribution, Explanation of Source of Local Cash Contribution:** (None)
- (10) **Total Grant Funds Requested from the Texas Water Development Board:**
 \$ 635,430
- (11) **Detailed Statement of the Purpose for Which the Money will be Used.**

Grant funding from the Texas Water Development Board (TWDB) will be used to revise and update the 2006 Llano Estacado Regional Water Plan, as mandated by Senate Bill 2, as amended, and TWDB Rules.

(12) Detailed description of why state funding assistance is needed. (Not to exceed 1 page).

Pursuant to Senate Bill 1 (1997) Texas was divided into 16 water planning regions by the TWDB, with each region required to develop and adopt a regional water plan in 2001, and every 5 years thereafter. In response to Senate Bill 2, as amended, the Llano Estacado Region (Region O) has developed regional water plans for 2001, and 2006, in 2008, with assistance from the TWDB, began the process to develop a plan for 2011, and with this application, will complete the development and adoption of an updated plan for 2011. Since no other sources of funding are available for these purposes state funding assistance is needed.

(13) Identify potential sources and amounts of funding available for implementation of viable solutions resulting from proposed planning.

Local water user groups who need water are expected to finance those facilities needed from their own sources, and state loans and state participation funding, as needed.

II. PLANNING INFORMATION

(14) A detailed scope of work for proposed planning.

Scope of Work: Pursuant to The Texas Water Development Board (TWDB) request for applications for regional water planning (TRD-200800727) Texas Register, February 15, 2008 pursuant to 31 Texas Administrative Code (TAC) §355.92, the Llano Estacado Regional Water Planning Group (LERWPG) hereby proposes a Scope of Work to revise and/or update the 2006 Llano Estacado Regional Water Plan as described in 31 TAC Chapter 357. The Scope is presented in the order of the Tasks, as set forth in TWDB “Guidance for Preparation of Scope of Work for Regional Water Planning, Prepared for Phase II of the 3rd Round of Regional Water Planning,” 33 Texas Register, February 5, 2008.

Task 1. Planning Area Description

Base Funding Request: \$10,000

A limited effort will be made to update Section 1, Planning Area Description of the 2006 Llano Estacado Regional Water Plan. This work will include attention to new industries that have located within the region since the adoption of the 2006 regional water plan, including, ethanol plants, and dairies (Results of Phase I, 2011 Regional Water Planning special study), and substantial changes to the following areas:

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- (A) wholesale water providers, current water use, and identified water quality problems,
- (B) current water use,
- (C) identified water quality problems,
- (D) sources of groundwater and surface water including major springs that are important for water supplies or natural resource protection purposes,
- (E) major demand centers,
- (F) agricultural and natural resources,
- (G) social and economic aspects of the regional water planning area including information on current population and primary economic activities including businesses dependent on natural resources,
- (H) assessment of current preparations for drought within the regional water planning area,
- (I) summary of existing regional water plans,
- (J) recommendations in the state 2007 water plan,
- (K) summary of local water plans,
- (L) any identified threats to the agricultural and natural resources of the regional water planning area due to water quantity problems or water quality problems related to water supply; and
- (M) information compiled by the board from water loss audits performed by retail public utilities pursuant to §358.6 of this title (relating to Water Loss Audits).

With respect to the new ethanol plants and the markedly increased number of dairies, the results of the Round 3 Phase I Study, Section 2 entitled “Population and Water Demand; The Ethanol Sector and The Dairy Sector” will be integrated into the updated and revised planning area description.

Task 2. Presentation of Current and Projected Population and Water Demands

Base Funding Request: \$8,500

Results shall be reported by:

- (A) water user groups
 - (i) city for cities with population greater than 500 people,
 - (ii) retail public utility for counties that have less than five retail public utilities which provide more than 280 acre-feet per year for municipal use,
 - (iii) individual retail public utility or collective data for all such retail public utilities that form a logical reporting unit, such as being served by a common wholesale water provider or having a common source or other association appropriate for the area, in the judgment of the regional water planning group, for counties with more than five retail public utilities which provide more than 208 acre-feet per year for municipal use, and

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- (iv) categories of water use (including municipal not otherwise reported, manufacturing, steam electric power generation, irrigation, mining, and livestock watering) for each county or portion of a county in the regional water planning area. If a county or portion of a county is in more than one river basin, data shall be reported for each river basin;
- (B) for each wholesale water provider by category of water use (municipal, manufacturing, irrigation, steam electric power generation, irrigation, mining, and livestock) for each county or portion of county in the regional water planning area. If a county or portion of a county is in more than one river basin, data will be reported for each river basin. The wholesale water provider's current contractual obligations to supply water will be reported in addition to any demands projected for the wholesale water provider;
- (C) an adjustment will be included to each municipal demand due to water savings from using plumbing fixtures identified in Chapter 352 of the Texas Health and Safety Code. The regional water planning group will determine and report the extent to which such plumbing fixtures impact projected municipal water use using parameters approved by the executive administrator.

Primary data for the work of Task 2 will be the projections of population and water demands of Section 2 of the 2006 Llano Estacado Regional Water Plan, as will be modified and updated using the results of the Round 3 Phase I Study, Section 2 entitled "Population and Water Demand; The Ethanol Sector and The Dairy Sector," and other modifications as may be requested and justified by WUGs of the Llano Estacado Water Planning Region, in accordance with TWDB Guidelines for Regional Water Plan Development. Specifically, the municipal, manufacturing, and dairy (livestock) WUGs will be modified as needed.

Task 3(A). Evaluation of Adequacy of Existing Water Supplies

Base Funding Request: \$8,160

The adequacy of existing water supplies legally and physically available to the regional water planning area for use during drought of record will be evaluated. The evaluation will consider surface water and groundwater data from the 2006 Llano Estacado Region Water Plan and the 2007 State Water Plan, existing water rights, contracts and option agreements, other planning and water supply studies, and analysis of water supplies existing in and available to the planning area.

Representatives of the LERWPG will identify methodology to calculate water availability during drought of record, in consultation with the Executive Administrator, who in turn will coordinate with TCEQ and Texas Parks and Wildlife Department (TPWD) upon such methodological determinations. The LERWPG expects the Executive Administrator to provide technical assistance in selecting appropriate methods and data to be used in the determination of water supply availability. Water supplies based on contracted agreements will be based on the terms of the contracts, which will be assumed to renew at the contract termination date if the contract provides for renewal or extensions.

- (A) For purposes of this subsection, “existing” means water supply available at the beginning of this task (September 1, 2008), and “firm yield” means the supply the reservoir can provide each year including during a drought of record using reasonable sedimentation rates and the assumption that all senior water rights will be totally utilized.
- (B) Analysis of surface water available during drought of record will be based on firm yield. At the request of regional entities, safe yield may be used for some reservoirs in order to ensure a dependable supply of water during a drought worse than the drought of record (1950s). If requested by a regional reservoir sponsor or owner, the LERWPG will request approval of the use of safe yield from the Executive Administrator. Firm yield will also be reported.
- (C) The available Texas Commission on Environmental Quality (TCEQ) water availability models will be used for evaluating the adequacy of surface water supplies, assuming full utilization of existing water rights and no return flows, and/or estimates of the projected amount(s) of surface water that would be available from existing water rights during a drought of record until information is provided by the TCEQ. Once this information is available from TCEQ, the Llano Estacado Regional Water Planning Group (LERWPG) will incorporate it in its next planning cycle, unless better site-specific information is available.
- (D) The Ogallala Aquifer groundwater availability amounts of the 2006 Llano Estacado (Region O) Regional Water Plan will be used in the 2011 Llano Estacado (Region O) Regional Water Plan, since these amounts were determined by the TWDB using the southern Ogallala GAM. In addition, if GAMs for other aquifers of the region become available, information from such models will be used, as relevant and appropriate.
- (E) The LERWPG will quantify quantities available for reuse and include these quantities in supply available, as appropriate.
- (F) Evaluations will be reported by:
 - i. city for cities with population greater than 500 people,
 - ii. retail public utility for counties that have less than five retail public utilities which provide more than 280 acre-feet per year for municipal use,
 - iii. individual retail public utility or collective data for all such retail public utilities that form a logical reporting unit, such as being served by a common wholesale water provider or having a common source or other association appropriate for the area, in the judgment of the regional water planning group, for counties with more than five retail public utilities which provide more than 208 acre-feet per year for municipal use, and
 - iv. categories of water use (including municipal not otherwise reported, manufacturing, steam electric power generation, irrigation, mining, and livestock watering) for each county or portion of a county in the regional water planning area. If a county or portion of a county is in more than one river basin, data shall be reported for each river basin;

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- (G) for each wholesale water provider by category of water use (municipal, manufacturing, irrigation, steam electric power generation, irrigation, mining, and livestock) for each county or portion of county in the regional water planning area. If a county or portion of a county is in more than one river basin, data will be reported for each river basin. The wholesale water provider's current contractual obligations to supply water will be reported in addition to any demands projected for the wholesale water provider.

Task 3(B) Water Supply and Water Demand Analysis Comparisons

Base Funding Request: \$4,500

- (A) water demands as developed in paragraph (2)(A) of this subsection with current water supplies available to the regional water planning area as developed in paragraph (3)(A) of this subsection to determine if the water users identified in paragraph (2)(A) of this subsection will experience a surplus of supply or a need for additional supplies. The social and economic impact of not meeting these needs will be evaluated and reported by river basin. The LERWPG will request the executive administrator to provide technical assistance to evaluate the social and economic impacts of not meeting needs. Other results will be reported as follows:
 - i. city for cities with population greater than 500 people,
 - ii. retail public utility for counties that have less than five retail public utilities which provide more than 280 acre-feet per year for municipal use,
 - iii. individual retail public utility or collective data for all such retail public utilities that form a logical reporting unit, such as being served by a common wholesale water provider or having a common source or other association appropriate for the area, in the judgment of the regional water planning group, for counties with more than five retail public utilities which provide more than 208 acre-feet per year for municipal use, and
 - iv. categories of water use (including municipal not otherwise reported, manufacturing, steam electric power generation, irrigation, mining, and livestock watering) for each county or portion of a county in the regional water planning area. If a county or portion of a county is in more than one river basin, data shall be reported for each river basin;
- (B) water demands as developed in paragraph (2)(B) of this subsection with current water supplies available to the wholesale water provider as developed in paragraph (3) of this subsection to determine if the wholesale water providers in the LERWPG water planning area will experience a surplus of supply or a need for additional supplies. Results will be reported for each wholesale water provider by categories of water use (including municipal,

manufacturing, steam electric power generation, irrigation, mining, and livestock watering) for each county or portion of a county in the LERWPG area. If a county or portion of a county is in more than one river basin, data will be reported for each river basin.

Task 4. Water Management Strategies to Meet Projected Needs, as Determined in Task 3(B)

Base Funding Request: \$10,600

The planning process will focus on ways of maximizing the total available supply through conservation, brush control, reuse, recycling, recharge and development of supplemental supplies to achieve the greatest value for the people of the region.

- (A) Water management strategies of the 2006 Regional Plan will be reevaluated and costs will be updated for;
 - i. city for cities with population greater than 500 people,
 - ii. retail public utility for counties that have less than five retail public utilities which provide more than 280 acre-feet per year for municipal use,
 - iii. individual retail public utility or collective data for all such retail public utilities that form a logical reporting unit, such as being served by a common wholesale water provider or having a common source or other association appropriate for the area, in the judgment of the regional water planning group, for counties with more than five retail public utilities which provide more than 208 acre-feet per year for municipal use, and
 - iv. categories of water use (including municipal not otherwise reported, manufacturing, steam electric power generation, irrigation, mining, and livestock watering) for each county or portion of a county in the regional water planning area. If a county or portion of a county is in more than one river basin, data shall be reported for each river basin;

- (B) water management strategies will be reevaluated for wholesale water providers. The water management strategies will meet the new water supply obligations necessary to implement recommended water management strategies of other wholesale water providers and water users for which plans are developed under this paragraph. Results will be reported for each wholesale water provider by category of water use (including municipal, manufacturing, steam electric power generation, irrigation, mining, and livestock watering) for each county or portion of a county in the LERWPG area. If a county or portion of a county is in more than one river basin, data will be reported for each river basin.

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- (C) The plan to be used for water supply during drought of record will meet all needs for the water use categories of municipal, manufacturing, steam electric power generation, irrigation, mining, and livestock watering except:
 - (i) plans will identify those needs for which no water management strategy is feasible, including irrigation. Full evaluation of water management strategies will be presented and reasons given for why no water management strategies are feasible.

The data of Tasks (2) through (4) will be presented in appropriate units, as required.

- (D) The following specific evaluations and revisions are proposed and will be accomplished with additional funding to that of the “base funds:”
 - a. It is the considered opinion of the LERWPG that groundwater availability information from the existing Southern Ogallala Groundwater Availability Model (GAM) is questionable as to accuracy, as was documented in the 2006 Plan for Bailey County. In addition, although not as thoroughly documented, the LERWPG feels that there are similar inaccuracies for other counties of the region. Therefore, the LERWPG proposes to improve and refine the Southern Ogallala Groundwater Availability Model (GAM) for Bailey, Parmer, and Dawson Counties in order to evaluate the accuracy of the GAM for these counties, and to obtain more accurate estimates of groundwater availability for use in updating the Llano Estacado Regional Water Plan for 2011, and to determine whether or not the improvement and refinement of the GAM for the entire region is necessary and justified. This will include evaluating alternative groundwater availability estimates and assessment of their accuracy based upon the methods and procedures for generating the estimates. (Method of Approach: obtain Southern Ogallala GAM, Texas Tech, Lubbock, and Edwards-Trinity Groundwater Models, compilation of aquifer saturation maps and data, including historic water level measurements of observation and index wells, refinement and calibration of GAM for the 3 study counties, calculation of water in storage in year 2000, prepare simulations quantities of water available for use annually in each study county for specified water demand projections, documentation of work, and meetings.)

Additional Funding Request: \$102,000.

- b. Update groundwater availability information for 43 of the 51 municipal water user groups of Region O. This proposed task involves a review and updating of assessments of municipal well fields that presently supply a part or all of the water supplies for these municipal WUGS. Such an assessment was made in the late 1990s for the 2001 regional plan, and was used for the 2006 plan. The assessment included a determination of the saturated thicknesses of the aquifer at and in the immediate vicinity of the

locations of the operational well fields, well yields and trends of well yields as the water table declines, and an assessment of the capabilities of the wells and well fields to meet projected future water needs of each respective municipal WUG. The previous assessments are out of date and an updating of this information is essential to the identification, planning, sizing, and costing of water management strategies to meet projected future municipal needs, especially in view of the recent new water demands for dairies and crop irrigation being placed upon areas near to many of the municipal WUGs. (Method of Approach: review and update water level measurements of observation wells near municipal well fields, select representative GAM Runs for long term trends of water level changes in and near municipal well fields, prepare hydrographs of trends for 2010 through 2060, compare projected hydrographs with projected municipal water demands, estimate time of need of additional supplies, prepare Water Management Strategies to meet projected needs, and document results.)

Additional Funding Request: \$92,000.

- c. Water Management Strategies for Confined Animal Feeding Enterprises (Beef, Dairy, and Other): There are approximately 60 beef feedlots located in Region O, and since adoption of the 2006 regional water plan, the number of dairies has increased from about 20 to 59 in late 2007, with additional dairies under construction. Although water demands and water supplies were included in the 2006 plan for beef feedlots, dairies, and other confined animal feeding enterprises, no specific water management strategies were developed to meet these specific livestock water needs. It was assumed that these WUGs would meet their own individual needs, as necessary. However, since the total size of the confined animal feeding enterprises is growing rapidly, and may soon impinge upon other water users of the region, including municipalities in the vicinity of these livestock operations, for the 2011 regional plan, it is proposed to develop illustrative, conceptual water management strategies for confined animal feeding enterprises. The proposed effort is similar to that done for municipalities, which is to identify the general location and estimate the cost of well fields projected to be needed to meet water needs in the future, and would include estimates of date of need, quantity needed throughout the planning period to 2060, distance to locations having saturated thicknesses that would meet the needs, and cost of wells and pipelines to meet the projected needs. (Method of Approach: See methods outlined in Subtask b above.)

Additional Funding Request: \$80,000.

- d. The LERWPG proposes to update the Lubbock Water Management strategies, since there have been several significant changes to Lubbock's water development plans, including updated information about Lubbock's

Bailey County aquifer conditions, removal of Lake 8 from the Lubbock Jim Bertram Lake System Strategy, and the addition of South Fork Reuse Project and Post Reservoir Project, as follows: (1) South Fork Reuse Project would extend Lubbock's 9 MGD reuse line 25 miles from the Hancock Land Application Site near the City of Wilson for discharge into the South Fork of the Double Mountain Fork of the Brazos River to directly supplement flows into Lake Alan Henry with reuse water; and (2) Post Reservoir Project in cooperation with White River Municipal Water District. The Post Reservoir Project is included in the 2006 Llano Estacado Regional Water Plan as a Region-Wide Water Management Strategy, and the city of Lubbock is negotiating with the White River Municipal Water District to cooperate in the development of the Post Reservoir to supply water to the White River Municipal Water District and Lubbock systems. The Lake Alan Henry Pipeline Project of the 2006 Llano Estacado Regional Water Plan, which is being implemented at this time (May 2008), will run just west of the planned Post Reservoir Project site, and is proposed to be sized to bring water from this site to Lubbock and surrounding communities. Reuse water as well as other developed and permitted water stored in Lake Alan Henry will be used by this project.

Additional Funding Request:

South Fork Reuse Project: \$ 28,670.

Post Reservoir Project: \$ 32,000

Total: \$ 60,620.

- e. The LERWPG proposes to update the CRMWA Water Management Strategies since there have been major revisions to sources of supply, including expansion of groundwater sources in response to declining supplies from Lake Meredith. The Panhandle Planning Region (Region A) has indicated that additional review of the yield of Lake Meredith will be needed when the current drought, much more critical than the previous drought of record, has ended. In the meantime, water management strategies for CRMWA member cities need to be evaluated to determine whether additional expansion of CRMWA groundwater supplies is warranted. Because supplies available from Lake Meredith have fallen below the levels indicated by the Water Availability Model previously used, and because replacement supplies from CRMWA groundwater sources are not sufficient to completely replace the shortage of surface water, water management strategies to provide supplemental supplies to CRMWA member cities of Region O (Brownfield, Lamesa, Levelland, O'Donald, Plainview, Slaton, and Tahoka) need to be identified and evaluated. (Note: Lubbock is also a member of CRMWA, and obtains a part of its supply from CRMWA, but Lubbock's needs are addressed in Task D.d, above. Fro the 7 CRMWA member cities listed above, the LERWPG proposes to identify locations of potentially available groundwater near each respective city, and conduct an analysis similar to

that outlined in D.b,above. (Method of Approach: review and update water level measurements of observation wells near each CRMWA member citys of Region O, except Lubbock, select representative GAM Runs for long term trends of water level changes in and near each city, estimate time of need of additional supplies for each city, prepare Water Management Strategies to meet projected needs, and document results.)

Additional Funding Request: \$ 21,000

- f. The LERWPG proposes to evaluate the surface water supply potentials of controlling salt cedar and other phreatophytes in the headwaters of water supply reservoirs of the region, including, Lake Mackenzie, White River Lake, Lake Alan Henry, and Lake Meredith, coordinated with Region A. (Method of Approach: update review of recent brush control studies, obtain recent aerial (color infrared) photographs of watershed drainage areas upstream of Lakes Alan Henry, Whiter River, and Mackenzie, calculate acreages of brush infestation, estimate quantities of water used by brush infestation, calculate costs of brush management and estimates of potential water supply to these lakes from brush management, and calculate quantities, costs, and environmental effects of these potential Water Management Strategies. In the case of Lake Meredith, update information from existing brush management efforts upstream of Lake Meredith will be obtained and integrated into the Llano Estacado Regional Water Plan, as appropriate.)

Additional Funding Request: \$ 50,000.

- g. The LERWPG proposes to evaluate aquifer recharge potentials to increase long-term water supplies available from the Ogallala Aquifer. (Method of Approach: review available High Plains area aquifer recharge studies, identify up to three potential recharge methods and recharge sites for assessment, estimate costs and potential quantities of water that might be recharged, and document results. One of the methods and sites will be for an engineered recharge method.

Additional Funding Request: \$ 43,000.

- h. The LERWPG proposes to determine the extent of the implementation of municipal and irrigation water conservation water management strategies included in the 2006 Llano Estacado Regional Water Plan. (Method of Approach: for municipal water conservation, conduct a mail survey with follow up telephone calls to non respondents of municipalities of the Llano Estacado Water Planning Region to determine water conservation programs being used [Best Management Practices of the Regional Water Plan and Other methods in use]; for irrigation water conservation use aerial photographs to determine locations and acreages on which center

pivot LEPA and other low application rates methods and furrow dikes are in use.

Additional Funding Request: \$ 8,800.

Task 5. Impacts of Water Management Strategies on Key Water Quality Parameters in the State and Impacts of Moving Water from Agricultural and Rural Areas

Base Funding Request \$4,500

The LERWPG will describe how implementing recommended water management strategies could affect water quality in Texas. The LERWPG will also discuss how water management strategies could affect: 1) agricultural resources including analyses of third-party impacts of moving water from rural and agricultural areas; 2) water resources of the state including ground and surface water interrelationships; and 3) other factors deemed relevant by planning groups such as recreational impacts. The LERWPG will also consider statutory provisions regarding interbasin transfers of surface water [(TWC §11.085(k)(1)] for any water management strategies involving interbasin transfers, including a summation of water needs in basins of origin and receiving basins based on water needs in approved regional plans.

Task 6. Water Conservation and Drought Management Recommendations

Base Funding Request: \$10,000

The 2006 Llano Estacado Regional Water Plan includes “active” water conservation as a water management strategy for municipal and agricultural irrigation water user groups. Active water conservation strategies are those that conserve water over and beyond what would happen as result of “passive” water conservation measures that stem from federal and state legislation requiring more efficient plumbing fixtures in new building construction. The LERWPG will review and updated these water conservation strategies, as needed. In addition, the LERWPG will include active water conservation strategies for water user groups or wholesale water providers that will obtain water from new interbasin transfers, if there any such water management strategies are recommended in the 2011 regional plan.

The LERWPG will also consider drought management strategies for identified water needs, and whenever applicable, drought management strategies will be consistent with guidance provided by the Texas Commission on Environmental Quality [TWC §11.1272]. (Note: Drought management strategies decrease short-term peak water requirements. Strategies for drought management are similar to those for water conservation, although there are some basic differences. For example, water conservation and drought management strategies differ in their longevity. Water conservation strategies are generally implemented on a permanent basis, whereas drought management practices are implemented during times of severe drought or other emergencies that can limit water supplies. If the LERWPG does not select drought management as a water management strategy, the reason will be documented.

Task 7. Description of how Regional Water Plan is consistent with the Long-Term Protection of the State's Water, Agricultural and Natural Resources

Base Funding Request: \$10,000

The LERWPG will describe how the 2011 water plan is consistent with the long-term protection of Texas' water, agricultural and natural resources including the requirement that planning analyses and recommendations honor all existing water rights and contracts. Given that much of the analysis pertaining to this task will be developed for other tasks including tasks associated with estimating the environmental and water quality impacts of water management strategies, the LERWPG will identify the specific resources important to the Llano Estacado water planning area and describe how these resources are protected through the regional water planning process.

Task 8. Unique Stream Segments and Reservoir Sites and Other Legislative Recommendations

Base Funding Request: \$15,000

The Llano Estacado Water Planning Region does not have unique stream segments or reservoir sites. Consequently, the 2006 Llano Estacado Regional Water Plan does not contain reference to such segments or sites, and the LERWP does not plan to consider such segments and/or sites for the 2011 Regional Plan. However, the LERWPG does plan to update the legislative, administrative, and regulatory recommendations of the 2006 Regional Water Plan, including those pertaining to playa basins as unique recharge wetlands (playas), and will include these revisions in the 2011 Regional Plan.

Task 9. Reporting of Financing Mechanisms for Water Management Strategies

Base Funding Request: \$7,800

The LERWPG will assess how local governments, regional authorities, and other political subdivisions would finance the implementation of water management strategies, using a formal survey instrument provided by the TWDB. The TWDB will develop a survey instrument and methodology. The LERWPG will conduct a survey and report findings to the TWDB, in accordance with instructions provided by the TWDB. The TWDB will provide instructions and documentation describing the survey methodology and formats for reporting resultant data.

Task 10. Adoption of Plan and Public Participation

Base Funding Request: \$80,950

Base Scoping: \$8,000

June 2, 2008

The LERWPG will allow for public participation in the plan preparation and adoption process in accordance with administrative rules and statute and will adopt a 2011 Llano Estacado Regional Water Plan in accordance with rules in effect.

(15) Task budget for detailed scope of work by task:

TASK BUDGET for Base Funding Request

TASK	DESCRIPTION	Amount (\$s)
0	Scope of Work	8,000
1	Planning Area Description	10,000
2	Presentation of Current and Projected Population and Water Demands	8,500
3 (A)	Evaluation of Adequacy of Existing Water Supplies	8,160
3 (B)	Water Supply and Water Demand Analysis Comparisons	4,500
4	Water Management Strategies to Meet Projected Needs	10,600
5	Impact of Water Management Strategies on Key Water Quality Parameters in the State and Impacts of Moving Water from Agriculture and Rural Areas	4,500
6	Water Conservation and Drought Management Recommendations	10,000
7	Description of how Regional Water Plan is Consistent with the Long-Term Protection of the State's Water, Agricultural and Natural Resources	10,000
8	Unique Stream Segments and Reservoir Sites, and Other legislative Recommendations	15,000
9	Report of Financing Mechanisms for Water Management Strategies	7,800
10	Adoption of Plan	80,950
	Total	\$ 178,010

TASK BUDGET for Additional Funding Request

TASK	DESCRIPTION	Amount (\$s)
4 a	Revise Groundwater Availability Models for Bailey, Parmer, and Dawson Counties	\$ 102,000
4 b	Update Groundwater Availability for 43 Municipal WUGS of Region O	92,000
4 c	Water Management Strategies for Confined Animal Feeding	80,000
4 d	Update Lubbock Water Management Strategies	60,620
4 e	Update CRMWA Water Management Strategies	21,000
4 f	Surface Water Potentials – Invasive Species Control	50,000
4 g	Artificial Recharge Potentials	43,000
4 h	Water Conservation Implementation Determination	8,800
	Total	\$ 457,420

(16) Expense budget for detailed scope of work by expense category; Base Funding Request:

<i>CATEGORY</i>	<i>Total Amount (\$s)</i>	<i>Subcontract(\$s)</i>
Salaries and Wages		\$ 28,771
Fringe		13,511
Travel		3,466
Expendable Supplies		174
Subcontract Services	97,060	
Tech/Computer Services		2,600
Communications		174
Reproduction		1,820
Overhead		36838
Profit		9,706
Administration	80,950	
TOTAL	\$ 178,010	\$ 97,060

Expense budget for detailed scope of work by expense category; Additional Funding Request:

<i>CATEGORY</i>	<i>Total Amount (\$s)</i>	<i>Subcontract(\$s)</i>
Salaries and Wages		\$ 132,984
Fringe		62,450
Travel		20,022
Expendable Supplies		1,801
Subcontract Services		0
Tech/Computer Services		13,937
Communications		1,801
Reproduction		8,412
Overhead		170,271
Profit		45,742
Administration		0
TOTAL		\$ 457,420

A time schedule for completing detailed Scope of Work by task; Base Funding Request:

Tasks	Months 1 -- 5	Months 5 -- 12	Months 13 -- 15	Months 16 -- 18	Months 19 -- 22
Task 0					
Task 1					
Task 2					
Task 3 A					
Task 3 B					
Task 4					
Task 5					
Task 6					
Task 7					
Task 8					
Task 9					
Task 10					
Completion					

A time schedule for completing detailed Scope of Work by task; Additional Funding Request:

Tasks	Months 1 -- 5	Months 5 -- 12	Months 13 -- 15	Months 16 -- 18	Months 19 -- 22
Task 4 a					
Task 4 b					
Task 4 c					
Task 4 d					
Task 4 e					
Task 4 f					
Task 4 g					
Task 4 h					
Completion					

(17) Specific deliverables for each task in Scope of Work.

The results of work of each task will be presented in draft report form to the Regional Water Planning Group at regularly scheduled planning group meetings for review. Upon response to the review, appropriate changes and/or corrections will be made, and final report(s) will be submitted to the planning group and the TWDB.

(18) Method of monitoring study progress.

The High Plains Underground Water Conservation District No. 1 (HPUWCD) will provide administrative functions in support of all activities, including contract administration, subconsultant contract management and oversight, meeting preparation and management, posting of meeting notices, meeting attendance, and public participation activities.

Monthly progress reports will be required of the subconsultant, and will be a part of the monthly requests for reimbursement from TWDB.

Periodic progress meetings will be held with the subconsultant by the (HPUWCD) to review progress, and the subconsultant will be required to make presentations to the LERWPG at appropriate points of the work. Draft and final reports will be required of the subconsultant, and transmitted to TWDB, in accordance with planning contract procedures and requirements.

(19) Qualifications and direct experience of proposed project staff.

Proposed Project Staff: LERWPG Members.

Harold P. "Bo" Brown Jr., Chair, LERWPG: Mr. Brown is an attorney and rancher.

Jim Conkwright: Mr. Conkwright is manager of HPUWCD No. 1, the political subdivision selected by LERWPG to administer Llano Estacado Water Planning, pursuant to SB 1, as amended.

Subconsultant Project Staff: Herbert W. Grubb, Ph.D., Larry Land, P.E. and Mark Graves, P.E. (See resumes attached).

WRITTEN ASSURANCES

1. The proposed work does not duplicate existing projects.
2. Implementation of viable solutions identified through the proposed planning will be diligently pursued and identification of potential sources of funding for implementation of viable solutions will be done.

PROOF OF NOTIFICATION

Notice will be provided, not less than 30 days before board consideration of the application, that an application for planning assistance is being filed with the executive administrator. This notification will be accomplished by:

- (1) Publishing notice in a newspaper of general circulation in each county located in whole or in part in the Llano Estacado Water Planning Region, and

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2. Mailing notice to: (a) each mayor of a municipality with a population of 1,000 or more or which is a county seat and that is located in whole or in part in the Llano Estacado Regional Water Planning Area, (b) each county judge of counties located in whole or in part in the Llano Estacado Regional Water Planning Area, (c) each regional water planning group chairperson within Texas, and (d) river authorities and districts within the Llano Estacado Regional Water Planning area.

A copy of the notice will be sent to the Board, with a list of those to which the notice was sent, the date on which the notice was sent, copies of all notices as published showing name of the newspaper and the date on which the notice was published.

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RESUMES

Herbert W. Grubb, Ph. D.

Education

Ph.D. Agricultural Economics, North Carolina State University, 1964

M.S. Agricultural Economics, Oklahoma State University, 1960

B.S. Agricultural Education, Berea College, 1958

Experience

Dr. Grubb is a water resources planner, with emphasis in water development, regional water and sewer systems, and municipal and agricultural water conservation. He was Director of Planning for the Texas Water Development Board from 1976 through 1988, where he supervised the planning staff and was principal author of the 1984 Comprehensive Texas Water Plan. As Director of water planning he prepared and presented testimony before State and Federal legislative committees and State and Federal administrative agencies, and made numerous presentations of water planning information at public meetings. Since 1988, Dr. Grubb has been a member of HDR Engineering, Inc.'s water resources planning staff where he has done water planning and water conservation studies for individual cities, river basins, and multi-basin regions. He has written more than 80 reports, papers, and journal articles pertaining to water resources and economic development. Representative experience includes:

Regional Water Planning

Project Manager for 20.5 county South Central Texas and the 21 county Llano Estacado Regional Water Planning projects from 1998 through 2006. These planning efforts are being carried out by The Texas Water development Board under Senate Bill 1 enacted in 1997 by the Texas Legislature to develop water plans to meet the needs of regions of Texas through 2060. The plans include descriptions of the respective regions, evaluations of available water supplies to meet projected water shortages of each water user group of each county of each region, identification and evaluation of quantities, costs, and environmental effects of water management strategies to meet each projected water shortage, and descriptions of plans to meet each projected shortage. The Regional Water Planning Group of each region guided and directed the selection of water management strategies included in each regional plan. **San Antonio River Authority, South Central Texas Regional Planning Group, San Antonio, Texas, and High Plains Underground Water Conservation District No. 1, Lubbock Texas, respectively.**

Professional Endeavors

HDR Engineering, Inc. (1988 – Present)

Texas Water Development Board and Texas Department of Water Resources (1976—1988)

Office of the Governor, State of Texas (1968—1975)

Texas Tech University and South Plains Research and Extension Center, Texas A & M University (Joint Appointment; 1964 – 1968).

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Larry F. Land, P.E.

Senior Project Manager

Education

Master of Science, Agricultural Engineering, Colorado State University, 1967

Bachelor of Science, Agricultural Engineering, Texas Tech University, 1965

Professional Registrations

Professional Engineer, Texas, No. 31380, 1971

Professional Affiliations

American Water Resources Association, Member

American Water Works Association, Member

National Ground Water Association, Member

National Society of Professional Engineers (NSPE), Texas (NSPE), Member

HDR Tenure

8 Years

Industry Tenure

39 Years

Professional Experience

Mr. Land has over 37 years experience as a water resources engineer. His career includes over 30 years of experience with the U.S. Geological Survey-Water Resource Division. He has worked in the fields of ground water, surface water, and water quality. Mr. Land's greatest interests are solving water supply problems and issues and bringing all the disciplines of hydrology together for a comprehensive, technical assessment. His activities with HDR have been in water-resource planning, development, monitoring, well design, well field evaluation, and conjunctive use of surface water and ground water.

HDR Project Experience

Assessment and Management of Water Supplies in the Republican River Basin.

Project Engineer. The Republican River starts in Colorado, flows into Kansas, then Nebraska, and finally back into Kansas. To allocate the surface water supplies in the late 1930s and early 1940s, the three states formed the Republican River Compact. Since, several reservoirs were constructed to develop the surface water supplies for irrigation and flood control, and wells have been constructed, mostly for irrigation, in all three states. Over the years, the streamflow has been declining; and, Kansas has blamed the upstream states wells as the cause. Mr. Land has assisted Nebraska and its defense team in determining the amount of streamflow declines and the causes. He is very much involved in the development of groundwater flow and stream-reservoir models for legal defense purposes as well as management tools.

Assessment of Aquifer Storage and Recovery in the Brazos River Alluvium. Project Manager. One alternative in expanding the water supplies in the Brazos River basin is to

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store excess surface water and recover the water during periods of shortage. Mr. Land proposed a concept to divert water from the Brazos River during seasons of high flow and to recharge the nearby Brazos River Alluvium and to recover the water with wells during the season of high summer demands or drought. Mr. Land is testing this concept by the development and application of a MODFLOW groundwater model of the study area.

Bureau of Reclamation, Assessment of Western Navajo and Hopi Tribes Water Supply Needs Distribution Analysis Alternatives and Impacts, AZ, NV. Quality Control Reviewer. In support of the Little Colorado River Water Rights Negotiations between the U.S. Government and the Navajo Nation and Hopi Tribe, Mr. Land is a member of a team of scientists and engineers within HDR and other consulting firms who are developing a comprehensive water development plan for the Navajo and Hopi communities of northeast Arizona for the U.S. Bureau of Reclamation. Mr. Land is providing guidance in the development of the technical work plans for the assessment of the surface water and groundwater resources and water supply projects, which includes the development and application of models. His primary role is providing quality assurance and control in the preparation, analyses and reporting of the groundwater resource assessment, the assessment of potential groundwater development strategies and their impacts.

Calculating Volume of Groundwater in Storage. Project Engineer. The Llano Estacado Regional Water Planning Group is developing long range water plans for the central part of the High Plains Aquifer. In support of the planning, the groundwater in storage was calculated for several counties using aquifer data from wells in several databases, reports, and Geographic Information System software. In addition, the water table was mapped in 1995 and 1995 were prepared and water level changes were calculated.

Determination of Brackish Groundwater Supplies in the vicinity of Corpus Christi is desalination of local surface water (Gulf of Mexico) and groundwater (Gulf Coast Aquifer). To assess the feasibility of developing brackish groundwater, Mr. Land developed a groundwater model of the major water bearing zone of the Gulf Coast Aquifer in Nueces County. He tested three potential well field locations and several different well spacing by calculating drawdowns. He also prepared salinity maps of groundwater in the Goliad Sand to aid in the design of the desalinization facility.

Review of Groundwater Model for Platte West Well Field (2004-current). Senior Engineer. The Metropolitan Utilities District (MUD) is in the process of expanding the water supplies for Greater Omaha, Nebraska by installing a well field in the Platte River Valley west of Omaha. To plan and permit the water supply facility with 42 wells producing 90 million gallons per day, a groundwater model (MODFLOW) has been designed and developed by Chatman and Associates, Inc who are under contract with HDR. The model area covers about 650 square miles and has cell dimensions of 100 ft in the vicinity of Platte West Well Field. The model represents, major streams, well pumpage, evapotranspiration, recharge from precipitation and irrigation return flows, and areas outside the model boundary. Mr. Land provided an extensive technical review the models design, calibration, and applications for the district. His comments lead to

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refining the estimates of recharge and pumpage by irrigation wells, improving the calibration by considering base flow in streams, and clarifying the presentation of effects of Platte West pumping on the surrounding area.

Mark C. Graves, P.E.

Project Manager

Education

Master of Science, Civil Engineering, University of Texas System, 1998

Bachelor of Science, Civil Engineering, Auburn University, 1995

Professional Registrations

Professional Engineer - Civil, Texas, No. 90151, 2002

Professional Affiliations

American Water Works Association, Member

International Desalination Association, Member

Water Environment Federation, Texas Chapter (WEAT), Member

HDR Tenure

6 Years

Industry Tenure

11 Years

Professional Experience

Mr. Mark Graves is located in HDR Engineering's Austin, Texas office. He is project manager with ten years of experience in planning, design, and construction administration for water and wastewater treatment projects and water distribution systems. His experience includes water treatment design and costing including membrane treatment, desalination, ozone, biological filters, and disinfection. Mark has participated in several water supply planning studies and has conducted a variety of treatment system analyses, bench tests, and pilot studies.

HDR Project Experience

Water Treatment Plant Expansion 2004, City of Kerrville, Texas. Project Manager. Project consists of procurement, design, and bidding for a 1.6 MGD low-pressure membrane water treatment plant to expand the water treatment capacity at an existing conventional water treatment plant site. Current design phase consists of a new building with membrane system, electrical and I&C facilities, chemical feed, and modifications/expansion of existing water plant piping and pumps for integration of new membrane water treatment plant.

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Membrane Pilot Study, City of Kerrville, Texas. Project Manager. Conducted a four-month membrane pilot study to evaluate the performance of competing membrane systems in treating Guadalupe River water. Results used in selection of a membrane treatment system for a 1.6 MGD expansion of existing water treatment capacity.

Water Supply Study, City of Kenedy, Texas. Project Engineer. Primary author of water supply and treatment options report. Evaluated upgrades to existing reverse osmosis water desalination plant, alternative treatment options for arsenic and dissolved solids removal, well field expansion, and surface water treatment and delivery options.

City of Pflugerville Colorado River Water Supply Project. Project Engineer for a 15 mgd membrane surface water treatment plant. The new plant includes a raw water pump station, ultrafiltration membrane system along with the associated chemical feed systems, clearwell, high service pump station, administration building, residuals handling facilities, plant security and associated site improvements for the plant.

Texas Water Development Board. Project Engineer. Primary author of several sections of report, "Desalination for Texas Water Supply", for the Nueces River Authority and Texas Water Development Board. Prepared detailed desalination cost estimating model for a wide range of water conditions and siting factors.

US Environmental Project Agency. Project Engineer. Developed design criteria and cost curves for the "Manual of Cost Estimates for Selected Water Treatment Technologies" for EPA. Technologies included membrane treatment (microfiltration, ultrafiltration, nanofiltration, and reverse osmosis), ozone, biologically active filtration, and GAC adsorption.

Reverse Osmosis Water Desalting Facilities, City of Goodyear, AZ. Project Engineer. Assist in the design of reverse osmosis desalination facilities at several locations treating brackish groundwater.

Dallas Water Utilities Evaluation of Lake Texoma Water Supply Options. Project Engineer. Developed water supply options to deliver Lake Texoma water to the City of Dallas. Conducted evaluations comparing Lake Texoma water quality for raw water, anticipated treated water quality with desalination, and existing City of Dallas distribution system water quality to determine potential for corrosion. Developed treatment requirements, finished water quality goals, and mitigation strategies for the introduction of Lake Texoma water to the City of Dallas distribution system.

Water Supply Study, City of Graham, TX. Project Engineer. Project consisted of developing water supply options including the desalination of brackish surface water from Possum Kingdom Lake.

Lavaca-Navidad River Authority. Project Manager. Assisted in the development of a desalination water supply option for the Lavaca Regional Water Planning Group (Region P). The plan included evaluation of a seawater desalination plant on the Texas coast and pipelines for transmission to major demand centers near San Antonio, TX.

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Oliver Ranch Trinity Aquifer Water Quality, San Antonio Water System. Project Manager. Six Trinity Aquifer well sites within Oliver Ranch were evaluated to determine chlorine demand and related water quality parameters to determine the concentration of reduced constituents that may exert a chlorine demand and determine an adequate chlorine dose to maintain a free chlorine residual of at least 0.2 mg/l in the SAWS distribution system.

ASR Water Treatment Plant, San Antonio Water System. Project Engineer. A new 30-MGD water treatment facility was constructed as part of the SAWS Aquifer Storage and Recovery (ASR) Project. The plant will initially treat ground water from the Carrizo Aquifer from a well field in south Bexar County, but will likely accept surface water sources in the future. The Carrizo ground water has very high levels of carbon dioxide, hydrogen sulfide, iron (up to 20 mg/L), and manganese (up to 0.5 mg/L). The treatment process selected was defined largely by the results developed in SAWS Multiple Source Water Integration Study, which was completed by Mr. Graves.

Multiple Source Water Integration Study, San Antonio Water System. Project Engineer. Oversaw study to quantify the impact that new source waters might have on the existing corrosion scales in the SAWS distribution system. The study utilized old, galvanized pipe samples excavated from the SAWS system. The waters (and blends of waters) were circulated and stagnated in a pipe loop experimental apparatus while water quality changes were monitored. After the potential for iron and corrosion product release was examined, various water conditioning schemes were tested in the loops to determine the treatment requirements and target finished water quality goals for the new sources.

Water Quality and Treatment Model, City of Corpus Christi, Texas. Project Engineer. This model was part of a project to comprehensively assess alternative supply system operation scenarios for the City of Corpus Christi. The City is supplied by two sources of water with different chemical qualities. Additional water sources are being evaluated that also differ from the current supply. A water quality and treatment model was developed to assess the impact on plant operations, costs and finished water quality from different blends of these water sources.

Water Treatment Plant Improvements, City of Alice, Texas. Project Engineer. Evaluated existing disinfection scheme and recommended improvements. Developed disinfection benchmarking data and analyzed system for current and future SDWA compliance.

Non-HDR Project Experience

Desalination Facilities Evaluation, City of Corpus Christi, Texas. Project Engineer. Assisted in a feasibility analysis to provide additional water to the Mustang Island-Port Aransas area located on the barrier island offshore of the City of Corpus Christi. The island is currently supplied with water through a water supply pipeline from the mainland. Options to supplement or replace the current water supply with desalinated water from the Gulf of Mexico or brackish water below the island were evaluated. Available desalination options including reverse osmosis and distillation (both for

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primary desalination and zero discharge co-use with RO) were evaluated and ranked based on cost estimates, siting constraints, regulatory requirements, and local issues.

Paula Jo Lemonds, P.G., P.E.
Project Engineer

Registration and Education

Professional Geologist, Texas, No. 10173

Professional Engineer - Environmental, Texas, No. 99449

M.S., Geological Engineering, Hydrogeology emphasis, Colorado School of Mines, 2003

B.S., Geology, Texas A&M University, 2000

Professional Endeavors

HDR Engineering, Inc.

2003-present

Colorado School of Mines, Graduate Research Assistant

2001-2002

Colorado School of Mines, Teaching Assistant

2000-2001

Mickey Leland Environmental Internship Program, Texas Commission on Environmental Quality (TCEQ)

2000

Professional Associations

American Water Resources Association

Geological Society of America

Association of Engineering Geologists AEG - Texas Section Secretary

Experience

Ms. Lemonds is a geological engineer with five years of experience specializing in water resources and environmental projects. Ms. Lemonds has assessed watershed-scale hydrology and water quality, modeled groundwater and surface water flow and transport, and completed hydrogeologic field investigations. She has been a project engineer for local, state, and federal projects involving NEPA compliance, highway and railway corridor studies, statistical analysis of groundwater samples, water system and pipe design, calculation of irrigation canal seepage, decision support system review, site characterization, and GIS-based analysis and mapping. She has an in-depth knowledge of several modeling programs, including SWAT (Soil and Water Assessment Tool) and MODFLOW. Modeling project work has included groundwater and surface water interaction and availability, reservoir operations, water rights, and watershed-scale water quality to support TMDL creation. Other specific models with which Ms. Lemonds is experienced include the HDR-developed Nueces Bays and Estuary model (NUBAY), Water Rights Analysis Package (WRAP), and various decision support systems. Projects representative of Ms. Lemonds' experience are included below.

Bitterroot Watershed Water Quality Model, Montana Department of Environmental Quality, Missoula, MT. Provided technical modeling to Montana Department of Environmental Quality in their development of a Bitterroot River watershed model to simulate non-point and point source loading for the Bitterroot River and key tributaries using Soil and Water Assessment Tool (SWAT). Calibrated model to observed streamflow, sediment, and nutrient measurements

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on annual, monthly, and daily time steps. Model to be used for development of potential TMDLs in 303(d)-listed stream segments.

Fort Phantom Hill Reservoir Operations, City of Abilene, TX. Completion of numerous Water Availability Model (WAM) scenarios to assess Fort Phantom Hill Reservoir evaporation and corresponding lake elevations beginning the simulations at full capacity and present capacity for various diversion amounts at both drought and average hydrologic conditions.

2006 Regional Water Plan, Coastal Bend Regional Water Planning Group (Region N), Corpus Christi, TX. As Project Engineer evaluated Texas Water Development Board (TWDB) water demand and supply projections from 2000-2060 and developed water management strategies included in the 2006 Coastal Bend Regional Water Plan using the HDR-developed NUBAY water supply model.

Nueces River Basin Feasibility Study, USACE, Fort Worth District, TX. Examined numerous water resources projects in the Nueces River Basin for federal interests in ecosystem restoration and flood damage reduction. Activities also included coordination of four field trips for about 60 individuals involved in the feasibility study.

Environmental Compliance, Permitting, and ROW Services, University NAVSTAR Consortium (UNAVCO, Inc.), Boulder, CO. Completed site analysis and suitability assessment of potential short-drill braced or deep-drill braced Continuous Global Positioning Systems (CGPS) sites within specified areas. Field work included siting of 14 CGPS within specific site criteria: bedrock depth, percent of sky view, site security, and location of other infrastructure that could potentially affect seismic readings in the area.

Brazos G Regional Water Plan, Brazos River Authority, Waco, TX. As project engineer completed yield analyses investigating water that could be made available through conjunctive use of groundwater and surface water. Several proposed water management strategies were investigated through modifications to the Brazos Water Availability Model (WAM) model (utilizing Water Rights Analysis Package).

Republican River Basin (Kansas vs. Nebraska). Litigation centered on allegations of over pumping based on the Republican River Compact. Working with water resources staff, tasks included data compilation, analysis, and approximation of irrigation canal losses and deep percolation using ArcView and MS Excel. Estimates of losses and recharge were then used for groundwater model input. Settlement agreement reached prior to litigation.

Aurora Wells, City of Aurora, CO. Project engineer responsible for the connection of two newly drilled wells into the City of Aurora water system. One connection was designed for linkage to the Griswold Water Treatment Plant. The other link was a connection of the well into an existing 16" pipeline feeding Quincy Reservoir in Aurora. Duties included facility design, construction management and coordination.

Navajo and Hopi Reservations Assessment of Western Navajo and Hopi Water Supply Needs, Arizona. Comprehensive water development plan to establish the most cost-effective set of projects to supply high quality M&I water to the major Navajo and Hopi communities (Tribal Communities) in the study area, while minimizing negative impacts, including but not limited to, impacts to the springs flowing from the N Aquifer.

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