

2. Technical Proposal

A Local Scale Groundwater Availability and Flow Model to Enhance Water Resource Sustainability in
Central Texas

Prepared By:
Lost Pines Groundwater Conservation District
908 NE Loop 230
Smithville, TX 78957

Project Manager:
James Totten
908 NE Loop 230
Smithville, TX 78957
jtotten@lostpineswater.org
512.360.5088

GRANT WaterSMART Applied Science Grants for Fiscal Year 2024

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2.1 Executive Summary

Date: 10.15.23

Applicant: Lost Pines Groundwater Conservation District

Location: Bastrop and Lee Counties, Texas

The Lost Pines GCD, in collaboration with Dr. Bill Hutchison will develop a local scale Groundwater Availability Model (GAM) that is capable of interfacing with the existing regional scale GAM created by the Texas Water Development Board. The local scale GAM will allow the District to more accurately model the impacts of groundwater production both within the District and at a regional level on aquifer conditions and water quality. While the currently available regional GAM is able to model the impacts of production across the forty-six counties included in the model the spatial resolution of the model is limited. By limiting the scale of the model to the District's boundaries the level detail within model with regarding to geologic faulting and spatial variability in aquifer properties will be increased and will allow for the inclusion water quality data as well. More accurate modeling of the impacts of internal and external groundwater production will aid the District in evaluating permitting decisions, developing long term planning programs for water well mitigation, evaluating potential changes in both water availability and quality, and overall provide more accurate information for the District, the public and the state in regards to long term aquifer sustainability. The local scale GAM will be implemented such that it can interact with the existing regional GAM to allow modeled conditions to be passed between the models and allow for more accurate boundary condition information to be available within the regional GAM. The continued population growth in Central Texas along with increasing variability in surface water supplies will drive further demand for groundwater both within the District and across the state. This project will help the Lost Pines Groundwater Conservation District better manage the groundwater resources entrusted to it by the state and provide a higher level of certainty and understanding of those resources for residents of the District, stakeholders, and policy makers at the local, regional and state level.

Project Length and Completion Date: 18 months from award, approximately 10/31/25

Is the project located in a federal facility? No

2.2 Technical Project Description

Lost Pines Groundwater Conservation District is a governmental entity and a Category A applicant.

Detailed Project Description:

Groundwater Conservation Districts (GCDs) in Texas are local government entities authorized by the State to manage groundwater within their boundaries. The Texas Water Code codifies the regulatory authority and responsibilities of groundwater districts (TWC § 36.0015) and include:

- Protect property rights
- Balance the conservation and development of groundwater to meet the needs of the State
- Use the best available science in the conservation and development of groundwater through rules developed, adopted, and promulgated in accordance with the provisions of this chapter

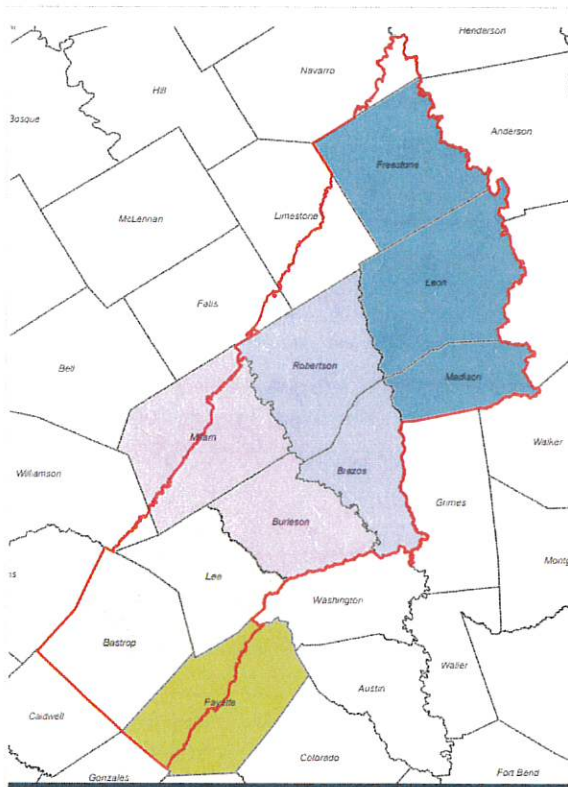


Figure 1: A map of the regional water planning group composed of 5 GCDs including LPGCD.

The central region of Texas has experienced rapid growth in both population and industry in over the last decade. This includes the Lost Pines GCD, shown in Figure 1, which is located in Bastrop and Lee counties in central Texas. The population growth within the District has resulted in increased water demands from local municipalities, water supply corporations and an increase in demand for individual domestic water wells.

Groundwater extraction in the Lost Pines GCD is affected by multiple factors including growth in local population, local industrial growth and regional population growth resulting in more groundwater use outside the District. In 2020, the Vista Ridge project (well field location shown in Figure 2), began pumping 50,000 acre-feet per year (AFY) of groundwater from 18 wells in the Carrizo-Wilcox Aquifer in Burleson County in the neighboring Post Oak Savannah GCD. Additional well fields in Burleson and Milam Counties (Figure 2, SLR) are currently under

construction. Since 2020 the Vista Ridge pipeline has transported groundwater extracted from a neighboring GCD to the City of San Antonio and in the next 18 months two additional groundwater projects are expected to begin transporting water from well fields along the District's southern border to counties and municipalities along the interstate 35 corridor (Figure 2, GBRA, ARWA). When the Vista Ridge project began operations water level declines of

greater than one hundred feet were observed in wells completed in the Carrizo formation in Lost Pines GCD near the production wells.

The challenge faced by the Lost Pines GCD—and all GCDs in the State—is to balance the conflicting responsibilities to conserve and protect groundwater, develop groundwater to meet needs of the State, and to protect private water property rights. The District is working to develop new rules to limit drawdowns by curtailing production and limit permit issuance as drawdowns approach key thresholds in the aquifers. Because the concepts of curtailing existing production or limiting new production permits are contentious and likely to result in litigation any rules regarding these issues must be supported by the best available science.

To improve the best available science and help guide the making of policies, rules, and decisions, the Lost Pines GCD has in the past provided in-kind services to the process of developing and enhancing the existing regional GAM used by the District. The current regional GAM was developed by the Texas Water Development Board (TWDB) to support regional water planning over a 50-year period and includes includes 46 counties, in whole or in part, that are located over the central portion of the Queen City/Sparta/Carrizo-Wilcox Aquifers. This model was updated and approved by TWDB in 2018 and has received some minor modification over the last five years.

Currently, there are known deficiencies in using the existing GAM to simulate groundwater flow in Bastrop and Lee counties. The GAM layers, which were developed approximately 20 years ago, are not sufficiently indexed using stratigraphic picks from drillers and geophysical logs in the areas where the aquifer outcrops. The GAM did not satisfactorily predict the drawdowns caused by production from the Vista Ridge project within the District. The lack of accuracy in the regional GAM predictions can attributed to a general lack of data localized data for aquifer properties, a lack of significant historic high volume production at both local and regional scales, and the current model’s reliance on standard one mile by one mile grid cells in areas of the model not located near surface water features.

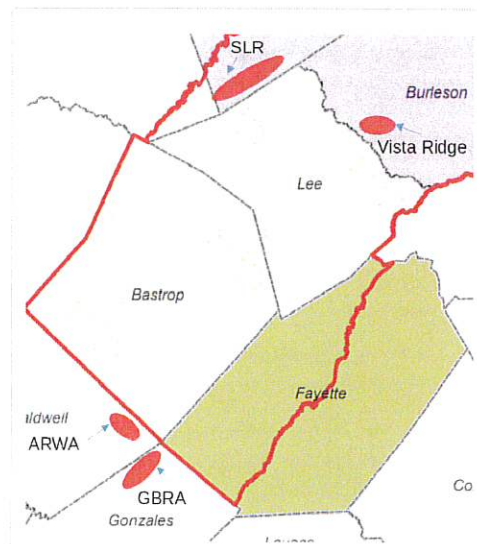


Figure 2: Locations of existing or permitted regional supply projects around LPGCD.

While the current regional GAM is the best available tool for GCDs to evaluate potential impacts to groundwater associated with management and permitting decisions it’s regional scale, reliance

on regular grid sizes and lack of water quality parameters limit its utility for guiding regulatory decisions at a local level. Addressing these deficiencies through the development and application of a local scale GAM will allow for improved groundwater management in the Lost Pines GCD and across the rapidly growing central Texas region. The local scale GAM will improve regional sustainability and resilience through better groundwater management of the Carrizo-Wilcox Aquifer within the District. Leveraging previous and on-going efforts in the region (such as the POSGCD OPMAN project funded by a 2022 BoR WaterSMART Applied Science Grant), the central portion of the existing State-developed Queen City/Sparta/Carrizo Wilcox GAM will be used as the foundation of local scale GAM. The approach to developing and applying this valuable tool is described in the following six tasks.

Task 1 – Gather and Evaluate Data to Extend the GAM Simulation of Historical Water Levels from 2010 to 2022.

The current regional GAM is calibrated based on historical pumping and estimates of hydraulic boundary conditions from 1930 to 2010. Task one will update the pumping, and recharge rates, as well as related boundary conditions through 2022. Historic pumping for this period will be developed based on records from databases maintained by state regulatory agencies and local GCDs. Estimates of recharge will be developed after a review of the method described in the GAM documentation using annual precipitation amounts. Potential modifications or updates to that method suitable to the scale of the local model will be evaluated.

Task 2 – Geologic Framework Update and Grid Development.

The the local scale GAM will be built using MODFLOW-6 rather than MODFLOW-USG which used for the current regional GAM. MODFLOW-6 is the most recently released version of the MODFLOW system and is the current standard for US Geologic Survey (USGS) groundwater modeling. Transitioning to MODFLOW-6 will allow the local scale GAM to employ Voronoi cells grids for the model rather than the rectilinear nested grid cells used in the regional GAM. Using a Voronoi cell grid will create irregular model cells to better match the contours and features of both surface and subsurface geography without introducing unnecessarily dense clusters of nested rectilinear grid cells.

The District is currently working to develop updated stratigraphic representations of the aquifers within the District. When completed in early 2024, the new stratigraphic picks for each aquifer within the District will be used to update cell elevations within the District. The outcrop areas for each aquifer will be adjusted as warranted to match known local surface geology. The process for updating any discrepancies in the outcrop areas will include evaluation of any available local lithographic data to better address the interactions between outcrop areas and local surface water systems.

Once the local scale GAM layer elevations have been corrected the Voronoi cell grid will be developed using the updated stratigraphic model. The “unstructured grid” composed of Voronoi cells of varying size will improve the utility of the local scale GAM by allowing for smaller cells that better follow geologic and hydrologic boundaries within the District, i.e. outcrop areas and surface water bodies. The updated layer elevations in conjunction with the new MODFLOW-6 based model will form the core of the new local scale model.

Task 3 – Build the Local Scale GAM.

The refined layer elevation data, as represented by the Voronoi cell grid, will form the framework of the local scale GAM using MODFLOW-6. New input files for the model will be developed using the updated data collected in Task 1 including historic pumping, water level measurements, estimates of recharge and other boundary conditions. Historic pumping data will be assigned to appropriate cells based on GPS coordinates or other location data.

Task 4 – Calibrate the Local Scale GAM.

Model calibration will rely on existing data available from Lost Pines GCD, neighboring GCDs, data collected from available state databases as well as any available streamflow data available through validated public databases. Model variables will be calibrated using historic water levels, groundwater quality parameters, streamflow data and pumping data from the GCD.

Task 5 – Reporting.

All work associated with the project will be documented in a final technical report submitted to the Bureau of Reclamation. The project report, final model, and any associated work products from the development and calibration of the model, including the model input and output files will be made available to the public and the District’s stakeholder on the District’s website and cloud storage locations.

Task 6 – Project Management.

For the purposes of this proposal project management will include technical, administrative and stakeholder focused tasks. The technical tasks include oversight of the goals, objectives, and deliverables to ensure timely completion and evaluation of any issues that may require the involvement of Reclamation. Stakeholder focused tasks will include interacting with the Lost Pines GCD board, members of the public and permit holders regarding the progress of the project and information or insights gained during the development process. Administrative tasks will include necessary documentation and reporting to Reclamation regarding progress, budgeting and schedule.

Goals:

The goal of the proposed project is to develop a tool that can be used by the Lost Pines GCD, its stakeholders and regional and state level entities to better understand the groundwater resources of the District and how the District's management decisions impact the sustainability and reliability of groundwater in the District. The development of an reliable and defensible local scale GAM will allow the development of better management decisions and strategies for meeting the increasing demands for groundwater while minimizing the negative impacts to existing users. By transitioning from a regional scale model, which currently represents the best available science, to a local scale model developed specifically for the District the District's ability to evaluate management and permitting decisions as well long term management strategies will be improved. Upgrading the underlying software from MODFLOW-USG to MODFLOW-6 and improving the stratigraphy based on the best available local scale data will allow the model to more accurately predict the impacts of groundwater production within the District. Designing the new model to pass data back and forth with the existing regional GAM the model will increase the accuracy of model results in the regional GAM.

2.3 Project Location

The geographic focus for this project is primarily within the boundaries of the Lost Pines Groundwater Conservation District which encompasses Bastrop and Lee Counties in Texas. The nature of the proposed local scale groundwater availability and flow model will extend to include portions of neighboring counties that share the Carrizo-Wilcox aquifer with Lost Pines GCD. The primary geographic area is show in figure 1.

2.4 Evaluation Criteria

2.4.A Water Management Challenges

The Lost Pines GCD is located near three of the top five fastest growing metropolitan areas in the United States between 2021 and 2022 according the U.S. Census Bureau. The western border of the District adjoins Travis and Williams Counties which are part of the fast growing Interstate 35 corridor that connects San Antonio and the Dallas-Fort Worth metroplex. The region around the District, especially along the Interstate 35 corridor has primarily relied on surface water sources to meet its water demands. Increases in climatic variability and lack of additional suitable sites for surface reservoirs has effectively placed a hard limit on the ability to continue to develop new surface water resources to meet demands within the region. A combination of federal endangered species regulation and hydrogeologic constraints limit the ability of aquifers in the corridor to supply additional water to meet the growing demands. As a result, due to their reasonable proximity and generally productive nature, the formations of the Carrizo-Wilcox

aquifer are now often viewed as the best possible choice for developing new supplies to meet the growing regional water demands.

Historically, the Carrizo-Wilcox formation within Lost Pines GCD and its neighboring GCDs have been utilized primarily to meet local demands with some limited export to adjacent counties. In 2022 permit holders within Lost Pines GCD produced approximately 30,000 acre feet of water from the Carrizo-Wilcox formations and exported 5,830 acre feet to end users in the adjacent Caldwell, Fayette, Travis and Williamson Counties. In 2020, the Vista Ridge well field in Burleson County began exporting 50,000 acre feet per year of water via pipeline to the city of San Antonio. The introduction of new, high volume pumping center just across the District's northern border caused significant impacts on groundwater levels within the District in both the Carrizo and Wilcox formations. Figure 3 shows the predicted declines in artesian pressure in the Carrizo aquifer in the year 2070. The impacts of the Vista Ridge well field and the ARWA and GBRA well fields in the south are clear.

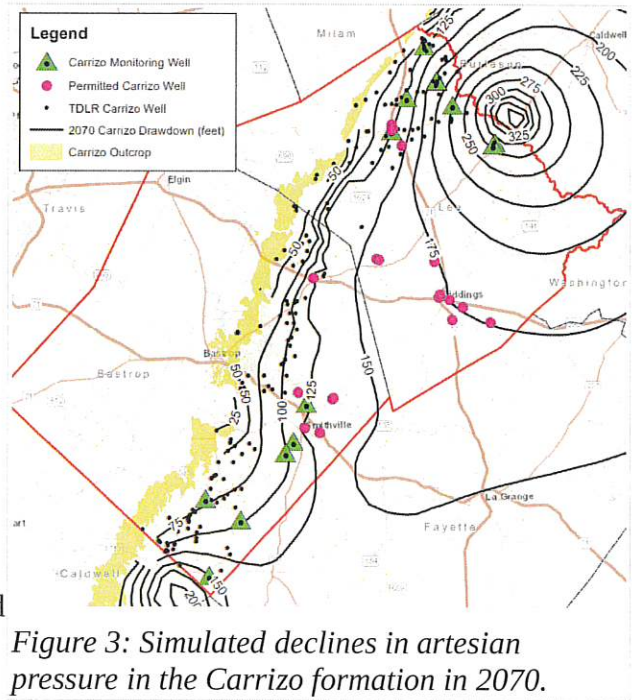


Figure 3: Simulated declines in artesian pressure in the Carrizo formation in 2070.

Lost Pines GCD is at the forefront of some of the most challenging issues in groundwater management in the state. The requirements under state law to provide an adequate balance between protecting private property rights, conserving and preserving the groundwater resources within the District, and allowing for the highest level of “practicable production” are especially acute when it comes to the District’s authority to grant new permits for groundwater production. While the current state law governing groundwater conservation districts, Chapter 36 of the State Water Code, provides a framework for making permitting decisions sufficient gray areas remain in the law creating room for uncertainty in the permitting process. As a result of these uncertainties the Lost Pines Groundwater Conservation District has been involved in multiple protracted contested permit hearings and incurred significant legal costs defending itself from two multi-million dollar lawsuits.

The legal uncertainties regarding permitting and some management decisions are further complicated by the uncertainty associated with Districts reliance on groundwater models to evaluate possible future outcomes. Most GCDs are reliant on regional scale models, models

originally developed to evaluate large scale impacts across multiple counties and intended for use a planning tool to understand the implications of their permitting and management decisions.

2.4.B Benefits

By developing a more robust and accurate local scale model the GCD will be able reduce one source of uncertainty in the permitting process. A local scale GAM will be able to provide more accurate predictions of the impacts of management decisions on the groundwater resources within the District. The increased certainty of the model results will help the District and its stakeholders make better informed decisions regarding how to continue balancing conservation, private property rights and groundwater production.

Developing a local scale GAM will help the District be better able to meet its statutory requirements to manage and conserve groundwater within the District. The local scale GAM will assist the District in:

- better understanding the impacts of groundwater production, locally and regionally, on the groundwater resources of the District
- providing better assessments of the impacts of groundwater production on both water availability and water quality within the District
- developing more accurate estimates of how changing water levels within the aquifers of the District will impact existing well owners and how the District should budget for assistance programs to minimize those programs
- investigate the potential benefits of using adaptive management to achieve greater sustainability and improved climate-resiliency by increasing the flexibility for pumping, especially during times of drought
- developing well completion guidelines for new water wells to “future proof” new wells and reduce the need for assistance in the future
- “war gaming” new management strategies and scenarios to test the impacts of new rules or policies.
- support District decisions that are likely to result in litigation, i.e. decisions around permitting reductions or production curtailment.

The development and application of a local scale GAM will address the previously identified water management issues by increasing certainty in decisions related to groundwater reliability, regional supplies, drought management, impacts to water rights, and conservation.

Water supply reliability. Increasing certainty and reliability of groundwater resources within the District is the core purpose of this project. The permitting and management of groundwater resources within the Lost Pines GCD requires a higher level science and understanding than is available with

current models. The state of Texas requires that GCDs manage groundwater resources in such a way that long term goals, Desired Future Conditions (DFCs), are achieved. GCDs have several tools in their tool box to achieve these long term goals including limiting new permits and curtailing production from existing permits. Limiting new permits or reducing the ability of existing permit holders to produce their permitted amounts can be viewed as a “taking of private property rights” by the District additionally curtailments to existing production reduce confidence in the reliability of water supplies. Reliable water supplies require reliable science to support the permits those supplies are based on. Adaptive management based on reliable science can provide the support a District needs to respond to the unknown but without reliable science to support both permitting and management decisions Districts are left vulnerable to litigation.

Regional Supplies. Under Chapter 36 of the State water code GCDs are not legally allowed to evaluate new production permits based on the place of use of the permit. The local scale GAM will provide the District, its stakeholder and permit applicants with more accurate assessments of how new regional supply projects might impact existing users of the aquifer. More accurate predictions of impacts can provide certainty to existing users, or may promote regional plans with fewer impacts on existing users. Alternatively, the improved spatial accuracy of the local scale model may help regional supply project find sites for their projects that meet their planned production needs while still minimizing impacts to existing users within the District.

Drought management activities. With the exception of a limited amount of agricultural irrigation the majority of water demands within the District are supplied by groundwater. In contrast, the nearby high growth region along the Interstate 35 corridor is served primarily by surface water systems where the majority of water rights are already claimed and highly vulnerable to drought. While most regional supply projects tend to provide “base load” water to multiple end users with little variation in production with regard to season or drought conditions there are also projects that have production patterns similar to local water suppliers, that is they exhibit both seasonal patterns and drought responsive production changes. The local scale GAM will be a useful tool for evaluating how District management decisions impact a mixed field of permit holders that includes high volume regional projects, regional projects that exhibit seasonal variations with drought

responsive production and local producers who exhibit the same patterns but on a smaller scale. More accurate local scale modeling results will allow the District to evaluate how each user group might be impacted by drought related management decisions made by the District and how the aquifers in the District might respond to those decisions in both the short and long term.

Conjunctive use of ground and surface water. Lost Pines GCD has issued a single conjunctive use permit that is used to supply a blend of surface and groundwater to a combined cycle natural gas power plant. The permit allows the permit holder to produce higher volumes of groundwater during dry years or bank groundwater for future when surface water is plentiful. The District will continue to promote and incentivize conjunctive ground and surface water permits when appropriate. The structure of the existing conjunctive use permit is based on simple rolling averages with a fixed maximum annual production. The use of a local scale GAM will allow the District to explore other options and alternative structure to more efficiently permit conjunctive use projects. Additionally, there are multiple projects in the state water plan that contemplate using Aquifer Storage and Recovery (ASR) within the District. Under these plans during wet years excess surface water would be pumped into the aquifers within the District and then withdrawn during drought periods. Uncertainties regarding how the aquifers would respond to increase pressure at the site of injection wells and the possible impacts to water quality are challenges that need to be addressed before these projects move forward but the local scale GAM would provide significant clarification to both questions.

Water rights. The current regional GAM for the central portion of the Carrizo-Wilcox Aquifer does a reasonable job of simulating the interactions between the aquifers and surface water systems on an average long-term basis. By increasing the spatial resolution and improving the lithography along surface water sources the local scale GAM will improve the accuracy of model interactions between the deeper aquifers, shallow flow systems and surface water systems. The primary surface water system in the District, the Colorado River, is managed by the Lower Colorado River Authority (LCRA). A better understanding of how groundwater production impacts surface water systems on a local level and across short and long term time scales will aid the District in evaluating permitting and management decisions.

Conservation and efficiency. The Lost Pines GCD currently is reviewing an Aquifer Conservation Program that would pay landowners to not develop their water rights over a fixed time horizon. Through implementation of this project, it is reasonable to expect that landowners will be more willing to join the Aquifer Conservation Program as they increase their trust in the long-term sustainable management of the Carrizo-Wilco Aquifer. In addition, predictive simulations of the spatially varied response of the Carrizo- Wilcox Aquifer to pumping will help the District determine what areas should be a priority for the Aquifer Conservation Program.

The current regional GAM has been a useful tool for the District to evaluate the impacts of permitting and regulatory decisions but its shortcomings with regard to local impacts are well known to the District and its stakeholders. Stakeholders frequently express the need for more accurate, reliable and meaningful modeled predictions especially with regard to large scale regional supply projects.

The results of the project will immediately be used to inform water resource management actions. The District is currently undergoing a process of updating and modernizing its rules and management plan. The results of this project will provide a tool to rigorously evaluate the potential impacts of changes to both of the Districts guiding documents. The third year of the recurring five year regional water planning cycle will begin in 2024 and while the results of this project may come too late to inform the final DFCs for this planning cycle it will be able to inform the District's management decisions with regard to how to implement the DFCs and effectively management toward achieving the new DFCs. A local scale GAM will aid in the refinement of the District's pending programs to assist well owners who's private wells have been impacted by regional or local pumping and will help the District proactively plan the next stages of the assistance programs while also developing design standards for new personal wells that will minimize the need for assistance in the future. Finally, the local scale GAM will be a tool to incorporate the best available science into the management and permitting decisions of the District going forward. By reducing uncertainty with regard to modeled impacts the District can increase the certainty of existing permit holders that the existing groundwater supplies will be reliable across the planning horizon and provide a tool to help stakeholders seeking additional production permits better plan their projects to limit impacts to existing groundwater users. Because this project will be inter-operable with the existing regional scale GAM the design principles and code base will be transferable to other GCDs in the state with only limited modifications.

The process and procedure for this project will be directly transferable to other entities that rely on groundwater modeling. The code used in the development of the model will be publicly

available along with all supporting documents supporting the development and calibration of the model. By upgrading the model from MODFLOW-USG to MODFLOW-6 this project will ensure that other adopters are able to interact with the most currently adopted version of the MODFLOW software.

The growing water demands along the Interstate 35 corridor creates the potential for conflict between projects seeking to meet regional demands, existing users who need a reliable source to meet growing local demands, and stakeholders within the District who seek to leave ground water in place either as a private property right or for environmental interests. The development of a more accurate model that can provide greater spatial resolution within the District can support the development of new management strategies, better long term planning by the District and its stakeholders, and clarity in the Districts permitting and management decisions.

This project is similar in concept to the currently funded project underway in the Post Oak Savannah Groundwater Conservation District to develop their Operational Model. Lost Pines GCD is shares a border with Post Oak GCD and has been heavily impacted by production occurring in Post Oak GCD. Although these two projects are similar in concept they are not duplicative or detrimental to each other. The proposed project will integrate into the current regional GAM used by both Districts and will provide more accurate information regarding changes in groundwater flow along the Districts shared border.

During the most recent state legislative session both houses of the state congress took significant interest in how the impacts of regional supply projects were able to spread out beyond the Districts that initially permitted them. By designing the local scale GAM to be able to pass data to and accept input from the regional GAM this project will create a tool that can more accurately assess how regional water supply projects impact local groundwater levels and water quality. This information can help guide members of the legislature as they craft new bills to clarify the ambiguities in Chapter 36 of the State Water Code and begin to more clear quantify landowners property rights with regard to groundwater.

2.4.C Project Implementation

Immediately upon entering a financial assistance agreement with the Bureau of Reclamation (Reclamation), the Lost Pines GCD is fully prepared to proceed with the development and application of the local scale groundwater availability and flow model. The District will contract Dr. Bill Hutchison to perform the technical work. Dr. Hutchison is intimately familiar with the groundwater issues facing the District as well as the adaptive management framework being used. Dr. Bill Hutchison is a subcontractor with the District's current consulting hydrogeology firm, LRE Water, and is already actively involved with the District in modeling efforts associated with permitting decisions and regional planning. Dr. Hutchison has a long history with

development of regional scale GAMs and has led the process of developing local scale GAMs for several other GCDs in the state.

The approach for developing the local scale GAM incorporates the modeling techniques and software that have been thoroughly vetted by the Lost Pines GCD’s hydrogeologic consultant, LRE Water. The groundwater modeling code MODFLOW-6 will be used to develop the local scale GAM based on the existing regional scale GAM. The regional scale GAM has been thoroughly vetted by the Texas Water Development Board, regional and local stakeholders and is available on the TWDB website. The hydrogeologic data will be retrieved from reliable, publicly available data sources including state, local, and Federal agencies.

The District’s proposed Project Manager, Mr. James Totten, will oversee the efforts of several Technical Leads that include sub-contractors from LRE Water. In their role as the District’s hydrogeologic consultants, Mr. Totten has developed effective communication channels with the company’s upper management and technical staff. Prior to working for the Lost Pines Groundwater Conservation District Mr. Totten worked in multiple academic settings on projects funded by the National Institute of Health, National Science Foundation, and local contracts. He is familiar with the reporting and oversight associated with programs funding by federal grants. Dr. Hutchison has worked to develop similar local scale groundwater availability and flow models for several other groundwater conservation districts in the state.

Table 1: Summary of Tasks, Timelines and Costs

Task	Description	Estimated Start and Completion Date	Estimated Costs
1	Data Collection and Extension of GAM Historic Period to 2022	4/24 – 10/24	\$50,000
2	Geologic Framework Update and Grid Development	4/24 – 12/24	\$75,000
3	Build Local Scale GAM	12/24 – 4/25	\$75,000
4	Calibrate Local Scale GAM	5/25 – 9/25	\$50,000
5	Technical Report	7/25 - 9/25	\$10,000
6	Project Management	4/25 - 9/25	\$20,000

The total project budget is \$300,000, and the project duration is 18 months. Table 1 provides a budget and schedule for each project task. These tasks are described under Section 2.2, Technical Project Description. There are three key milestones for the project. The first milestone is extending the groundwater availability model historic period from January 2010 to January 2022

(end of Task 1). The second milestone is completing the development of local scale GAM at the end of Task 3. The final milestone is the completion of the draft technical reports at the end of Task 5.

The products anticipated to result from the local scale GAM project are shown in Table 2.

2.4.D Dissemination of Results

Results of this project will be actively disseminated, transferred, and communicated directly with partners and resource managers in the region and throughout the western United States as described in the following subsections. The final report, documenting the results of the development and application of local scale GAM, will be publicly available on the Lost Pines GCD website.

The primary beneficiaries of this project are well owners, landowners and stakeholders of the Lost Pines GCD. An improved model means the District can better meet its conservation goals, more easily enforce regulations, and withstand legal and technical challenges. This project is an intrinsic and

Table 2: Anticipated Deliverables

	Deliverable	Description
Software	Local Scale Groundwater Availability and Flow Model	Calibrated MODFLOW-6 based model focused on the aquifers within the boundaries of the LPGCD
	Online repository of input, output and calibration files	All files associated with the development and calibration of the model
Reports	Technical Model Report	Final report on development and calibration of the model

crucial component of the Lost Pines GCD’s long-term Management Plan, which has been evolving over the years as the need for more sophisticated planning tools has become more apparent and, as more data are available to conduct the necessary analyses. As such, District staff and Board members are actively aware of and understand the importance of the project. Lost Pines GCD staff will be closely monitoring project progress and results.

The Lost Pines GCD has an ongoing and active stakeholder outreach program in Bastrop and Lee Counties; including multiple stakeholder driven rules advisory groups. These events are a perfect forum to share results from this project.

District staff are active in local, regional and state level water planning activities and will discuss the development and applications of the local scale GAM with water management professionals from multiple state and local regulatory agencies as well as consultants, engineers and stakeholders involved in the water planning processes in Texas. Additionally, Dr. Hutchison is involved in both regional and state level water planning as well as inter-state water disputes. His exposure will allow for a broad dissemination of the processes, applications and benefits of developing local scale GAMs.

2.4.E Presidential and Department of the Interior Priorities

This project supports the Biden-Harris Administration's priorities, including E.O. 14008 Tackling the Climate Crisis at Home and Abroad", E.O. 13985 "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government".

2.4.E.1 Climate Change

This project addresses climatic variability and its impacts on the reliability of water supplies in the central Texas region. While groundwater does respond to increased climatic variability those responses are typically more muted and over a longer period than the responses of surface water sources. By developing a model that supports more progressive and proactive management of groundwater resources in the District this project improves the sustainability and reliability of a resource that can back stop traditional surface water supplies during extreme drought. Providing increased resilience to climatic variability to communities that rely on this resource whether in the District or in the central Texas region.

The local scale GAM developed by this project will provide the Lost Pines GCD and its stakeholders with a greater understanding of the dynamics of the aquifers in the District, higher confidence in predictions of future aquifer conditions in response to production, and a stronger tool to test and evaluate new management strategies, particularly during drought conditions. These advances will allow the District and its stakeholders to better evaluate the risks and potential benefits associated with complex changes in management strategies or permitting decisions. Increasing climate variability is likely to result in both long term droughts worse than the current drought of record or increased incidence of short term drought of high severity similar to conditions between June and September of this year. Better understanding of how the aquifers respond to short and medium term swings in production will provide the District and its stakeholders with more potential options to determine how best to manage production during drought.

2.4.E.2 Disadvantaged or Underserved Communities

Communities benefiting from this project include the local Lost Pines GCD counties of Bastrop and Lee. These counties represent a mix of rural and semi-urban centers. Demographic data for the counties within the Lost Pines GCD were compiled from the Climate and Economic Justice Screening Tool. Three tracts within Bastrop County and a single tract in Lee County were evaluated as disadvantaged based on the criteria of the screening tool. Two adjacent tracts in southwest Bastrop County with predominantly Hispanic or Latino populations were listed as disadvantaged due to low incomes and elevated wildfire risk. Large sections of these two tracts are currently not served by public water supply systems meaning that residents are primarily reliant on private water wells for their water needs. A tract in central Bastrop county which is majority Hispanic or Latino in population is also categorized as disadvantaged due to low income and elevated wildfire risks. This tract also contains former and current defense sites which are considered potential sources of legacy pollution by the screening tool. While this tract does have more developed water infrastructure than the tracts in southwestern Bastrop County private groundwater wells still provide for a large portion of the water demands in this area. Additionally, land in this area is has been permitted for two large groundwater export projects which may further impact groundwater availability or reliability for residents in the future. The fourth tract identified as disadvantaged by the screening tool is located in the area surrounding the county seat of Lee County. The population of this tract is a mixture of White, African American and Hispanic or Latino and the primary metric that defines this tract as disadvantaged is its low income. While the area in and around this tract is generally well served by public water supply options there is are still sections of the population that are entirely dependent on personal water wells for their water supply needs.

This project will help to ensure that the residents of these under served communities have a more secure and resilient water supply. The improved ability to predict and plan for changes in groundwater levels within the District will allow the District and its stakeholders to better plan for the impacts of climate change, drought or impacts of increased regional groundwater production. Increased certainty of the long term reliability of groundwater resources within the District can help recruit new industries and businesses to the counties within the District and drive job creation that can alleviate the impacts of historic low incomes in these under-served communities.

2.4.E.3 Tribal Benefits

Not applicable. There are no tribes in the project area.

2.5 Project Budget

Salaries and Wages. Lost Pines GCD costs will accrue only from staff salaries. No travel costs or indirect costs will be incurred. Salaries are for the General Manager at the District who will serve as Project Coordinator and the office manager who will coordinate reporting and accounting.

Table 3: Project funding from Federal and Non-Federal entities.

FUNDING SOURCES	AMOUNT
Non-Federal Entities	
1. Lost Pines Groundwater Conservation District	\$ 150,000
2.	
Non-Federal Subtotal	\$ 150,000
REQUESTED RECLAMATION FUNDING	\$ 150,000

Fringe Benefits. No separate fringe benefits are included.

Travel. There are no travel requirements for the project.

Equipment. There are no separate equipment costs.

Materials and Supplies. There are no separate costs for materials and supplies.

Contractual. As mentioned in the Technical Proposal and Evaluation Criteria of this application, the Lost Pines GCD is working with Dr. Bill Hutchison on this project. The costs associated with each task represent the estimated costs for Dr. Hutchison’s services on each task.

Third-Party In-Kind Contributions. There are no third-party in-kind contributions.

Environmental and Regulatory Compliance Costs. There are no costs associated with environmental or regulatory compliance.

Other Expenses. There are no other expenses anticipated for the execution of this project.

Indirect Costs. There are no indirect costs that will be incurred on the project.

Total Costs. As shown in Table 3, the total project cost is \$300,000. The Federal portion being requested is \$150,000, with the Lost Pines GCD contributing the remaining \$150,000

3.1 Required Statements and Disclosures

The proposed project to develop an enhanced digital groundwater model is unlikely to have direct impacts to environmental or cultural resources. Future responses to the questions in Section H.1 of the NOFO are included below.

3.1.A Environmental and Cultural Resources Compliance

Will the proposed project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? No, the proposed project does not include any physical work in the environment that will affect the air, water, or animal habitat in the project area.

Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? There are species listed or proposed to be listed as a Federal threatened or endangered species, and designated critical habitat in the project area, however they will not be affected by any project activities.

Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as “Waters of the United States?” There are wetlands and surface waters inside the project boundaries that potentially fall under CWA jurisdiction, the proposed project will not impact them.

When was the water delivery system constructed? Not applicable.

Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? No.

Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? While there are buildings and structures within the boundaries of the Lost Pines GCD (Bastrop and Lee Counties, Texas), the proposed project will have no impact on them.

Are there any known archeological sites in the proposed project area? Yes, there are archeological sites in the proposed project area but this project will have no impact on them.

Will the proposed project have a disproportionately high and adverse effect on low income or minority populations? No, the proposed project will not have a disproportionately high and adverse effect on low income or minority populations.

Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands? No, the proposed project will not limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands.

Will the proposed project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area? No, the proposed project will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area.

3.1.B Required Permits or Approvals

The digital nature of this project will not require the either the application for or approval of any activities to comply with NEPA, NHPA or the ESA.

3.1.C Overlap or Duplication of Effort Statement

There is not any overlap between the proposed project and any other active or anticipated proposals or projects in terms of activities, costs, or commitments of key personnel. Furthermore, the proposed project submitted for consideration under the WaterSMART Program is in no way duplicative of any proposal or project that has been or will be submitted for funding consideration to any other potential Federal or non- Federal funding source. If at any time the Lost Pines GCD becomes aware of a proposal being awarded funds that would be duplicative of the funding requested from Reclamation, the District will immediately notify the Program Coordinator.

3.1.D Conflict of Interest Disclosure Statement

The applicant is not aware of any actual or potential conflicts of interest.

3.1.E Notification

The applicant will immediately notify the Program Coordinator of any conflicts of interest that develop during the life of the award.

3.1.F Uniform Audit Reporting Statement

Lost Pines Groundwater Conservation District was not required to file a Single Audit report in the most recently closed Fiscal Year.

4 Supporting Documentation

4.1 Official Resolution

No. 2023-09-01

**LOST PINES GROUNDWATER CONSERVATION DISTRICT
RESOLUTION APPROVING APPLICATION FOR THE BUREAU OF
RECLAMATION WATERSMART APPLIED SCIENCE GRANT**

WHEREAS, the Lost Pines Groundwater Conservation District (the "District") was created in 1999 by Senate Bill 1911, 76th Texas Legislature, pursuant to Section 59, Article 16 of the Texas Constitution and Article 7880-3c, Texas Civil Statutes (now Chapter 36, Texas Water Code); ratified by the 77th Texas Legislature in 2001; and confirmed by voters in Bastrop and Lee counties in November 2002;

WHEREAS, the District seeks to obtain grant funds pursuant to Tex. Water Code §36.158; and

WHEREAS, by law every five years the District is required to consider groundwater availability models (GAM) and other data or information for the management area and shall propose for adoption desired future conditions for the relevant aquifers within the management area pursuant to Tex. Water Code §36.108(d) with consideration of the GAM;

WHEREAS, the scale of current regional GAMs limit the ability of districts to evaluate potential impacts of local and regional pumping on existing groundwater users and to reasonably plan for mitigation costs or to develop accurate tools for managing groundwater within the district;

WHEREAS, the Board seeks to use grant funds to create a District-scale monitoring GAM;

WHEREAS, the District is seeking funding through the Bureau of Reclamation WaterSMART Applied Science Grant to support the research and development of a District-scale GAM;

WHEREAS, the Bureau of Reclamation WaterSMART Applied Science Grant will provide 50% of the funding for research and development of a District-scale GAM leaving 50% to be funded by the District;

WHEREAS, the Board reviewed the application attached as *Attachment A* at its September 20, 2023, meeting and seeks to approve this application pursuant to Tex. Water Code §36.158.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Lost Pines Groundwater Conservation District that the Application for the Bureau of Reclamation WaterSMART Applied Science Grant attached as *Attachment A* is approved. The Board further directs the General Manager to take all necessary steps to execute and submit to application and coordinate with the Bureau of Reclamation as needed.

PASSED AND EFFECTIVE ON _____, 2023.

LOST PINES GROUNDWATER
CONSERVATION DISTRICT



Elvis Hernandez, Board President

ATTEST:

Mike Simmang, Secretary-Treasurer

TEXAS  STATE
UNIVERSITY

The rising STAR of Texas

October 9, 2023

Department of the Interior
Bureau of Reclamation

RE: WaterSMART: Applied Science Grant for Fiscal Year 2023, R23A500446

Dear Members of the Application Review Committee:

The Meadows Center for Water and the Environment at Texas State University is committed to inspiring research, innovation and leadership that ensures clean, abundant water for the environment and all humanity. Over the years, we have partnered with the Lost Pines Groundwater Conservation District to engage with their local stakeholders and explore policy solutions to the challenges posed by the growing state population and the requirements and constraints of the Texas Water Code that governs their authority. This District has faced some of the most challenging and unique threats to their governance of what is already a very complex groundwater system. Their stakeholders have been asking for more refined groundwater models to guide decision-making.

As an applied research center committed to advancing science-based solutions for the most pressing water-resource challenges facing Texas we fully support the District's proposal to develop a local-scale groundwater availability and flow model to provide more accurate modeling of impacts to groundwater levels. These resources are crucial in enabling the district to better understand the impacts to groundwater levels and water quality within District and to create and enforce rules to manage the groundwater appropriately.

Thank you for the opportunity to express our support for the District's WaterSMART Applied Science Grant Application. We urge your thoughtful consideration of funding to support this deserving project.

Sincerely,



Robert E. Mace, PhD., P.G.

**Executive Director, Meadows Center for Water and the Environment
Professor of Practice, Department of Geography and Environmental Studies**



October 12, 2023

Department of the Interior
Bureau of Reclamation

RE: WaterSMART: Applied Science Grant for Fiscal Year 2023, R23AS00446

Dear Members of the Application Review Committee:

This letter is on behalf of Environmental Defense Fund (EDF) in support of the above referenced grant application being submitted by the Lost Pines Groundwater Conservation District (LPGCD). The Lost Pines Groundwater Conservation District (LPGCD) has submitted a proposal to develop a local scale groundwater availability and flow model to provide more accurate modeling of impacts to groundwater levels.

Founded in 1967, EDF is a leading international environmental non-profit organization representing more than 2.5 million members with more than 100,000 residing in Texas. Guided by science and economics, EDF focusses on strong science to inform policy and develop innovative solutions that address the most serious environmental problems.

The LPGCD was created by the State of Texas to regulate the groundwater resources of Bastrop and Lee Counties, Texas. Authority given by Chapter 36 of the Texas Water Code designates the District to serve the public interest of developing, promoting, and implementing water conservation, augmentation, and management strategies to both conserve and utilize groundwater resources for the benefit of the citizens, economy, and environment of Bastrop and Lee Counties, Texas.

This proposed project is critical to providing LPGCD the needed information to allow for the proactive and more sustainable management of groundwater resources under its jurisdiction. The area is growing rapidly with more demands on the aquifers to support local and regional communities. The rapid population growth within the District, combined with its existing permits for groundwater production and proximity to several of the fastest growing counties in Texas, highlights the need for the District to develop the best possible science to support its policy and management decisions. Once implemented, the local scale groundwater availability model will be used to better understand the impacts to groundwater levels and water quality within the District and to craft stakeholder-driven policy that reflects a greater understanding of the system.

We appreciate the opportunity to express our support for the LPGCD WaterSMART Applied Science Grant Application and urge your thoughtful consideration of funding to support this deserving project.

Sincerely,

A handwritten signature in black ink that reads "Dan Mueller".

Dan Mueller, P.E.
Senior Manager, Texas Water Program
Environmental Defense Fund
dmueller@edf.org

Simsboro Aquifer Water Defense Fund

P.O. Box 981 * Elgin, TX 78621
512-461-8179 * www.simsborowaterdefensefund.org

~~ Working to leave a legacy of aquifers that last forever ~~

October 13, 2023

**Department of the Interior
Bureau of Reclamation**

RE: WaterSMART: Applied Science Grant for Fiscal Year 2023, R23AS00446

Dear Members of the Application Review Committee:

The **Simsboro Aquifer Water Defense Fund** [SAWDF] writes this letter in support of the above referenced grant application by the Lost Pines Groundwater Conservation District (LPGCD) to develop a local-scale groundwater availability and flow model that can provide more accurate modeling of impacts to groundwater levels. **SAWDF** fully supports this important groundwater project.

Under Chapter 36 of the Texas Water Code groundwater conservation districts are the state's preferred method of groundwater management in order to protect property rights, balance the conservation and develop groundwater to meet the needs of the state, and use the best available science in the conservation and development of groundwater. The LPGCD was created by the State of Texas to regulate the groundwater resources of Bastrop and Lee Counties, Texas. **SAWDF** supports this project because:

- This project is important and timely.
- Provides greater resilience through management of multiple water sources at the local and regional level.
- The rapid population growth within the District and its proximity to several of the fastest growing counties in Texas combined with existing permits for groundwater production highlight the need for the District to develop the best possible science used to inform policy and management decisions; and
- Once implemented, the local-scale groundwater availability model will be used to better understand the impacts to groundwater levels and water quality within District.

Thank you for the opportunity to express our support for the LPGCD WaterSMART Applied Science Grant Application. We urge your thoughtful consideration of funding to support this deserving project.

Sincerely,



Andrew Wier, Executive Director
Simsboro Aquifer Water Defense Fund
Awier.tx@gmail.com
512-545-4779 (voice/text)

LAW OFFICES OF
McCARTHY & McCARTHY, L.L.P.

1122 COLORADO STREET, SUITE 2399
AUSTIN, TEXAS 78701
(512) 904-2310
(512) 692-2826 (FAX)

October 13, 2023

**Department of the Interior
Bureau of Reclamation**

RE: WaterSMART: Applied Science Grant for Fiscal Year 2023, R23AS00446

Dear Members of the Application Review Committee:

I write in support of the WaterSMART Grant Application filed by the Lost Pines Groundwater Conservation District (LPGCD) to facilitate the development of a local scale groundwater availability and flow model. My perspective is one you likely do not see frequently.

The Lost Pines Groundwater Conservation District (LPGCD) proposes to develop a local scale groundwater availability and flow model to provide more accurate modeling of potential impacts of increasing production on groundwater levels. As an attorney with over four decades of concentrated practice in water issues who represents clients interested in the large scale development of groundwater across the State, including Bastrop and Lee Counties within the District's jurisdiction, I have what technically would be described as an "adversarial relationship" with the District. While I do not regularly support the decisions or policies of the District, I am writing this letter to support enthusiastically the LPGCD's grant application.

The Texas Legislature has declared that local groundwater conservation districts like LPGCD are the State's preferred method of managing our groundwater resources in Texas. The Legislature, however, has not equipped these districts with all of the tools necessary to carry out the important stewardship duties reposed in these districts. As always, money is the limiting factor.

The State, through our Texas Water Development Board, has developed large scale regional groundwater models lovingly referred to as "GAMS". These regional models, which typically have a grid scale of one square mile, are the "best available" science in the way of models that the State had provided to District's and stakeholders to use in evaluating the availability of groundwater for permitting as well as predicting long-term impacts to the aquifers under the District's jurisdiction. Unfortunately, these regional models come with an express disclaimer that they are not appropriate for site specific analysis. Therefore, they are not appropriate for evaluating "local" permitting projects.

In other words, the GAMs are useless to Districts in the exercise of one of their primary functions – the evaluation of groundwater production permit applications to determines both the availability of groundwater for the requested purpose and the impact, if any, of granting the requested permit. Permitting requires tools that facilitate scientific analysis on a localized basis.

October 13, 2023

Page 2

The area within the LPGCD's jurisdiction, and the surrounding Counties are some of the fastest growing regions of the United States. The LPGCD was created by the State of Texas to regulate the groundwater resources of Bastrop and Lee Counties, Texas. Authority given by Chapter 36 of the Texas Water Code designates the District to serve the public interest by promoting the development of the groundwater resources within its boundaries in a manner that protects private property rights, and maximizes the potential beneficial use of the groundwater resources within its boundaries in balance with protection of the aquifers on a long-term basis through water conservation, augmentation of the aquifer, and management strategies.

In the past decade since he assumed the mantle of General Manager of the LPGCD, James Totten has been committed to enhancing the District's science both through the (i) collection of data, (ii) increased use of trained hydrogeologists and modelers, and the advancement of tools available to the District and its constituents to better manage the aquifers subject to its jurisdiction. This application for funding to develop a localized small scale groundwater availability and flow model is the latest step in the District's continued march to advance reliable science that the District's Management and Constituents and Stakeholders can rely upon.

The Project LPGCD seeks funding for is both important and timely to the property interests the District regulates, and the larger community that benefits from and relies upon the aquifers subject to LPGCD's regulatory jurisdiction. The local scale model LPGCD seeks to develop will provide greater resilience to the affected aquifers by allowing the District to better manage the multiple groundwater sources subject to LPGCD regulation both on a local and regional level. Once implemented, the local scale groundwater availability model will be used to better understand the impacts to groundwater levels and water quality within District.

Thank you for the opportunity to express our support for LPGCD's WaterSMART Applied Science Grant Application. We urge your favorable consideration of LPGCD's grant application for this important Project.

Best wishes.

Sincerely,

McCarthy & McCarthy, LLP

Edmond R. McCarthy, Jr.

Edmond R. McCarthy, Jr.

cc: GateHouse Water LLC
Attn: Dean Blaine, Manager
Lost Pines groundwater Conservation District
Attn: James Totten, General Manager