Desired Future Conditions of the Carrizo-Wilcox Aquifer – Is it to be managed in a manner that is sustainable or will it be mined?

Summary: Shortly after being created the Lost Pines Groundwater Conservation District (LPGCD) prepared its management plan which included an assessment of the status of the Carrizo-Wilcox aquifer and established its desire to manage the aquifer in a sustainable manner. In 2005 the Texas State Legislature passed HB 1763 which required Groundwater Conservation Districts within a delineated Groundwater Management Area (GMA) to work jointly to adopt desired future conditions for each aquifer within their GMA. Based on this mandate, the LPGCD established its initial desired future conditions in keeping with their desire to manage the aquifer in a sustainable manner (drawdown of 50 ft up-dip and 150 ft down-dip). However, due to the water marketing activities of a neighboring GCD that has contracted to export significant quantities of water outside the region in a manner that will mine the aquifer, the LPGCD has been placed in the position of having to revise its desired future conditions downward to 150 ft up-dip and 350 ft down-dip. It appears that drawdown of this magnitude may adversely impact the artesian head on the aquifer and thereby have undesirable consequences to the environment and economies of Bastrop and Lee Counties. The establishment of appropriate desired future conditions is extremely important because they become the statutory limits that authorize the LPGCD to take remedial action to protect the aquifer from further deleterious withdrawals. There is a short window of opportunity to affect the outcome of this situation.

Recommendation:
Based on the conclusions stated at the end of this paper, it appears that it would be beneficial to encourage and support the LPGCD in basing the desired future conditions of the aquifers of Bastrop and Lee Counties on criteria and measurements that reflect the current and/or past conditions of these aquifers and that provide sustainable use and protection of these aquifers as part of the sound ecological environment of the watersheds in these counties. In specific they should be encouraged to use language that includes the protection of groundwater levels, artesian pressure, exempt wells, springs, environmental flows, and base-flow to the streams and rivers that run in and through these counties and tie this language to the "sound ecological environment" standard used in surface water legislation.

Initial Position of the Lost Pines Groundwater Conservation District:

The Lost Pines Groundwater Conservation District (LPGCD) was created by Senate Bill 1911 in 1999, ratified by House Bill 2432 in 2001, and confirmed by general election vote in Bastrop and Lee Counties in November 2002. According to the LPGCD website and management plan dated September 15, 2001, the District was created to protect the water supply for the residents of Bastrop and Lee Counties, Texas, and that is its sole mission. Under Texas law, a water district is the only tool available to protect our groundwater supply. In fulfilling its mission, the LPGCD's management plan establishes the intent to endeavor to maintain the aquifers in the District on a sustainable basis; "sustainability" means to develop and use groundwater in a manner that can be maintained in perpetually.

In August of 2000 Dr. Robert S. Kier published "Lost Pines 2000 Aquifer Evaluation," a report that evaluated the impact of then proposed production of 55,000 acre-feet per year of water from the Carrizo-Wilcox Aquifer for delivery to San Antonio as proposed in the Region L Water Management Plan. The study concludes that "*extensive 'dewatering' of the Simsboro Aquifer would begin before the year 2040 if the proposed production for San Antonio occurs. Over time, the 55,000 acre-feet/year, in addition to other projected pumping in the area, would result in reduced artesian pressure, lower well water levels, and ultimately 'dewatering,' or 'mining' the aquifer – that is, the level of water in the Simsboro Aquifer would drop below the top of the aquifer".* The contact for this activity was cancelled and the plans have not gone forward.

According to the LPGCD's management plan, "*groundwater supply issues are relatively simple and straightforward, though potential solutions are not readily apparent. Looking solely at the total amount of*

water within the Carrizo-Wilcox Aquifer, there is approximately 235 million acre-feet of water in storage. In addition, there is slightly more than one million acre-feet of water in artesian storage and the existence of artesian storage is critical because it is the pressure associated with this artesian storage that drives the natural behavior of the aquifers, most particularly the discharge of groundwater to surface water courses. Artesian pressure also likely influences the overall quality of water in the aquifers". As stated in the management plan, the LPGCD recognizes that *"some temporary decline in artesian pressure must occur for groundwater to be produced, ,,, "* and further states that *"a long-term, continued reduction in artesian pressure is not in the best interests of the citizens and businesses in Bastrop and Lee counties, which depend on groundwater for a potable water supply. This fact, coupled with the limited amount of potentially usable natural recharge, restricts the amount of groundwater that can be withdrawn from aquifers within the District without potentially adversely affecting artesian pressure, water levels in the aquifers, and the amount of groundwater contributing to the base flow of the surface water courses" (emphasis added).* According to the LPGCD website the recharge for the aquifer is as follows:

"Carrizo-Wilcox Aquifer Recharge for District

- *Lee County: 7,500 Acre ft. per year*
- *Bastrop County: 28,000 Acre ft. per year*

Total Recharge: 35,500 Acre ft. per yr."

Based on this information the LPGCD recognized in its management plan that *"its ability to manage groundwater resources within the District on a sustainable basis in accordance with its mission statement is severely restricted because there is so little of the total amount of water in storage to work with"* (Managed Available Groundwater). As such, the management plan states that *"LPGCD's ability to achieve its mission statement -- to manage the groundwater resources within the District on a sustainable basis in perpetuity – is, thus, tenuous, at best, given that even the current estimated in-District demands for ground water exceed the apparent amount of water being recharged within the District by approximately 10,000 acre-feet per year."* The management plan goes on to state *"whether the LPGCD will be able to achieve its mission statement remains to be seen, even to meet only in-District demands. It is clear, though, that with major transfers of groundwater outside of the District, achieving the mission statement will be impossible."*

Stated Position of the Citizens of Bastrop County:

In Bastrop County the citizens have indicated their vision for the environment (desired future conditions) through Opportunity Bastrop County, a document that was adopted by the Commissioners Court in December 2007 and the Smithville City Council in May 2008. Citizens who participated in the "town hall" meetings and surveys indicated that they were very concerned about the environmental issues facing Bastrop County, especially in the face of rapid growth. These issues relate to groundwater protection, aquifer recharge, water conservation, land use practices, preservation of farm and ranch land and wildlife habitat, rainwater collection, air quality, and waste disposal. Water quality and quantity was the most important single issue, as well as the most important environmental issue, according to comments and survey results.

The citizens' desire that the county's aquifers, including the Colorado River alluvium, be preserved and protected, and that the springs and riparian habitats be identified and protected as indicated in the following information taken from the Opportunity Bastrop County document:

Support Aquifer Preservation and Protection (page 6)

Though most of the water supply for the County comes from the Carrizo/Wilcox aquifer group, much of the municipal and private water in the County are taken from the shallower aquifer immediately below and bordering the Colorado River.

However, the Colorado River alluvium aquifer is not recognized by the State as an aquifer and therefore is not afforded the protective measures and monitoring that other minor aquifers in the State receive. Since this shallow aquifer is such an important part of the geophysical and ecological system of the County, the County should take measures:

- To protect and enhance this resource by having it recognized as a minor aquifer; and
- To encourage land management and runoff management that enhances groundwater recharge.

Identify and preserve significant springs and riparian habitat (page 7)

The County should identify significant springs and other riparian features that contribute to water quality and have potential for nature-tourism. Springs along the river provide a considerable portion of its total flow after it leaves Travis County, especially in times of drought and low water releases from the Highland lakes. This flow supports river floating sports and fishing and dilutes Austin's effluent. Increased ground water pumping may result in these springs drying up and reducing surface water in the Colorado River and other streams in the County.

Preserving undeveloped natural buffers along streams has a significant economic benefit. Preservation retains the ecological value of the streams, reduces flooding, and reduces the need for storm water management because it slows runoff and filters many pollutants before they enter waterways.

These buffers also provide a corridor for wildlife movement as well as human walking trails along streams and the river. Leaving the river in a more natural state will also enhance its attraction for river users.

Establish strong relationship with Lost Pines Groundwater Conservation District and Municipal Utility Districts (page 7)

Groundwater provides municipal drinking water for most city and rural residents in the County. This groundwater derives from the Carrizo-Wilcox Aquifer, which reaches form the Hooper Formation in the west to the Carrizo Formation in the east. It provides water to riverbank terraces and springs along the Colorado as the river flows through Bastrop County.

One of the concerns voiced at several meetings was the 'over pumping' of groundwater, when more water is taken from the aquifer than is replenished. According to the LPGCD, currently more water use is permitted than is capable of being recharged into the aquifers from rainwater. With continued population growth, and the potential for groundwater to be pumped to users outside of the County, inadequate aquifer recharge will increase in magnitude and consequences.

Texas law is somewhat unique in that there is little control over groundwater pumping. Typically, property owners have been able to produce and use the water beneath their land. This was not a problem when the population was small and there were not very many wells. More wells being drilled results in more conflict among well owners about the amount of water being pumped versus capacity. Recent legislation will require that water suppliers have water conservation plans that encourage citizens and industries to conserve water

The Lost Pines Groundwater Conservation District (LPGCD) is charged with conserving groundwater in Bastrop and Lee counties. Texas law regarding groundwater districts and water mining exemptions limit the LPGCD's ability to protect groundwater resources.

Working closely with the LPGCD can ensure that water management in new development minimizes negative impacts on existing well owners and future water supplies. The County's involvement can

ensure that desired future conditions for water sources and supplies adequately protect those resources.

Becoming a stakeholder in the work of the Lower Colorado Regional Water Planning Group (LCRWPG – Region K) will help ensure adjacent cities and counties have similar objectives and use per-customer targets. Such conservation plans need to be incorporated into city/county regulations where possible.

Position of the Water Development Board;

In 2001 the Texas Water Development Board, in Attachment C titled "Discussion of Apparent Bastrop County Groundwater Over-Allocation" concluded that the "Bastrop County groundwater supply from the Carrizo-Wilcox (Simsboro) Aquifer is therefore estimated to average 24,405 ac-ft/yr pursuant to adoption of this revision by the Lower Colorado RWPG" (Region Water Planning Group). In the same document the TWDB acknowledged that the South Central Texas PWPG had relied upon estimates provided by TWDB in 1998 ranging from 33,391 ac-ft/yr to a "mining" rate in excess of 72,000 ac-ft/yr. According to Attachment C, the *parties "conditionally agree[d] to the assessment of Bastrop County groundwater supply and demand summarized in Table 2*. In discussions of drought withdrawals, the document concludes that *"2050 drought withdrawals [of about 2,556 ac-ft/yr] could occur about one year in six without exceeding the average Supply identified by the Lower Colorado RWPG."* The 2006 LCRWPG Water Plan lists the water availability in the Carrizo-Wilcox Aquifer in Bastrop County at 28,000 ac-ft/yr which is consistent with this 2001 finding.

Desired Future Conditions – House Bill 1763:
Since the management plan was written House Bill 1763 was passed in 2005 requiring that desired future conditions be established for all the major and minor aquifers of Texas. According to an analysis of this legislation written by Robert Mace, Rima Petrossian, Cindy Ridgeway, and Andy Donnelly of the Texas Water Development Board, a desired future condition can consider water levels, amounts of water in storage, discharge to springs, separate desired future conditions for specific parts of the aquifer, etc. According to its analysis, "sustainability" is "the development and use of groundwater in a manner that can be maintained for an indefinite time <u>without causing unacceptable environmental, economic, or social consequences</u>." To continue the analysis "a key part of using sustainability is to identify what the unacceptable consequences are. Such consequences may include spring flow, base flow to rivers and streams, and groundwater levels. An additional requirement is that the desired future conditions <u>must be physically possible</u>, both individually and collectively.

The LPGCD is in Groundwater Management Area (GMA) 12 which consists of the following groundwater districts (counties):

Brazos Valley Groundwater Conservation District	Brazos, Robertson
Fayette County Groundwater Conservation District	Fayette
Lost Pines Groundwater Conservation District	Bastrop, Lee
Mid-East Texas Groundwater Conservation District	Freestone, Leon, Madison
Post Oak Savannah Groundwater Conservation District	Burleson, Milam

The other counties that are not within a groundwater district include: Falls, Limestone, Navarro, and Williamson. For these counties, the Judge is the contact point for participation in the process because counties have the authority to establish county subdivision rules that can have groundwater management implications.

To adopt desired future conditions for aquifers within GMA-12, two-thirds (2/3) of the member groundwater districts present at the meeting must vote in favor of the desired future conditions proposed. Based on the desired future conditions adopted by GMA-12, the TWDB calculates the Managed Available Groundwater (MAG) for the aquifers and provides that information to the groundwater districts to incorporate into their management plans. This information would then be available to incorporate into the regional planning

process, depending on the schedule of the planning group. Bastrop County is in the Lower Colorado Region Water Planning Group (LCRWPG) also known as Region K. Region K has indicated that they can use the MAG in the current round of planning if it is received by the fall of 2008 (target September).

The counties in GMA -12 are in the following Regional Water Planning Groups:
Lower Colorado RWPG (Region K) includes Bastrop, Fayette
Brazos G RWPG includes Williamson, Milam, Robertson, Falls, Limestone, Brazos, Lee, Burleson
Region H WPG (Brazos) includes Leon, Madison,
Region C (North Texas) WPG includes Freestone, Navarro

Positions of the Regional Water Planning Groups (RWPG)

Lower Colorado Regional Water Planning Group (Region K): The LCRWPG supports the power of the Groundwater Conservation Districts to modify the Rule of Capture in order to preserve groundwater quality and quantity but recognizes the authority of the Rule of Capture in locations where no GCD exists. The LCRWPG also supports the creation of a GCD within the LCRWPA if the need arises for such an entity at the local level. The LCRWPA supports the management of groundwater resources at the sustainable level wherever possible and has established the sustainable use of groundwater resources as a policy for the region. Sustainability is defined as balancing groundwater withdrawals with natural recharge and replenishment to maintain long-term stability in regional or local groundwater supplies. The availability of the Carrizo-Wilcox aquifer in Bastrop County is taken from the Lost Pines Groundwater Conservation District Groundwater Management Plan. The availability in Fayette County is taken from the Fayette County Groundwater Conservation District Groundwater Management Plan.

Brazos G Regional Water Planning Group (Region G): The BGRWPG is in opposition to the LPGCD's assessment of available groundwater and has over-ridden (under protest) their estimate of 7,500 acft/yr and established 45,000 acft/yr as the estimated available groundwater from the Carrizo-Wilcox in Lee County. Likewise, they have used the same 45,000 acft/yr estimate for each of Milam, Burleson, Brazos, and Robertson Counties. Overall these five counties represent 225,000 acft/yr (42%) of Brazos G estimated 553,520 acft/yr of available groundwater from the 36 counties. These estimates greatly exceed the recharge of the aquifer in those counties which are estimated at 7,500, 31,600 and 13,300 acft/yr in Lee, Milam and Burleson Counties and 19,000 acft/yr in Brazos and Robertson Counties; a total recharge of about 71,400 acft/yr. The BGRWPG took the action of over-riding the LPGCD in order to "obtain a determination of administrative completeness from the TWDB" and is not supported by GAM runs or other quantified studies.

Positions of the Groundwater Conservation Districts:

Brazos Valley Groundwater Conservation District – Brazos and Robertson Counties:

Based on its 2004 Management Plan, the guiding principles of BVGCD are as follows: The residents of Brazos and Robertson counties rely solely on the local groundwater supplies to meet all of their drinking water needs and the majority of their agricultural and livestock needs. Therefore, the local groundwater resources are vital to the Brazos Valley's growth, health, economy, and environment. The District believes that this valuable resource can be managed in a prudent and cost effective manner through conservation, education, and regulation. The overall management goal will be to ensure a sustainable supply of water from the local groundwater resources while recognizing the need to balance the protection of rights of private landowners with the responsibility of managing the area's groundwater resources for future generations. A basic understanding of the local aquifers and their hydro-geologic properties, as well as the quantification of available water supplies, is the foundation for development of prudent management strategies. The Carrizo-Wilcox aquifer as well as the minor aquifers in the area, must be conserved and preserved for future generations, to the extent allowed by law and made possible through the development of scientific data. This management document is intended as a tool for the District to provide continuity and develop an understanding of local aquifer conditions and subsequently implement proper groundwater management policies. (emphasis added)

However, the management plan goes on to indicated that the available groundwater from the Carrizo-Wilcox in Brazos and Robertson Counties are 47,450 and 46,450 acft/yr respectively with recharge being 19,000 acft/yr in both counties (based on Region G Planning Study 2001). This may be in variance with their stated guiding principles.

Fayette County Groundwater Conservation District - Fayette County:

Based on its 2003 Management Plan, the guiding principles of FCGCD are that the District was formed, and has been operated from its inception, with the guiding belief that the ownership and pumpage of groundwater is a private property right. The District has adopted the principle of "education first" and regulation as a last resort in their effort to encourage conservation of the resource.

The Carrizo-Wilcox aquifer's primary water quantity concern is the water-level declines anticipated through the year 2050 due to increased pumping. Groundwater withdrawals have increased an estimated 270 percent between 1988 and 1996, from 10,100 acre-feet/year to 37,200 acre-feet/year, from the mostly porous and permeable sandstone aquifer. The area in and around the Carrizo-Wilcox aquifer is expected to see continued population growth and increases in water demand. The TWDB co-sponsored a study of the Central Texas portion of the Carrizo-Wilcox aquifer using a computer model to assess the availability of groundwater in the area. Six water demand scenarios were simulated in the model, which ranged from considering only the current 1999 demand, to analyzing all projected future water demands through the year 2050. On the basis of the calibrated model, all withdrawal scenario water demands appear to be met by groundwater from the Carrizo-Wilcox aquifer through the year 2050. The simulations indicate that the aquifer units remain fully saturated over most of the study area. The simulated water-level declines in the Carrizo-Wilcox aquifer mainly reflect a pressure reduction within the aquifer's artesian zone. Some dewatering takes place in the center of certain pumping areas. In addition, simulations indicate that drawdown within the confined portion of the aquifer will significantly increase the movement of groundwater out of the shallow, unconfined portions to the deeper artesian portions of the aquifer. The relationships that currently exist between surface and groundwater may also change. Simulations indicate that the Colorado River, which currently gains water from the Carrizo-Wilcox aquifer, may begin to lose water to the aquifer by the year 2050.

Current Position of the Lost Pines Groundwater Conservation District – Bastrop and Lee Counties:

Initially the LPGCD's desired future conditions for the Carrizo-Wilcox aquifer was that the draw down in the upper portion of the aquifer be no more than 50 ft, and drawdown in the down-dip portion be no more than 150 feet. Presumably this level of drawdown would be consistent with the desire to manage the aquifer on a sustainable basis relative to recharge potential. However, based on activities in adjacent water districts -- which appear to be "mining" the aquifer for purposes of exporting water outside the district and for economic benefits – the LPGCD has, it would seem of necessity, changed its position to comply with the requirement to be "physically possible" as stated above. The more recent drawdown limits being discussed are a 150 ft in the upper portion, and 350 feet in the down-dip portion. However, the environment, economic, or social consequences of these drawdown levels are unknown and likely detrimental.

To make matters more difficult the Lower Colorado RWPG has indicated that they need to have revised groundwater availability information by September 2008 in order to include this information in the current round of regional and statewide water planning. The LPGCD has indicated their desire to meet this goal but must have the cooperation of the other GMA-12 water districts to meet this deadline.

Conclusions:

It appears that management of the Carrizo-Wilcox Aquifer is rapidly moving from "sustainable" to "mining." From the information available it would appear that these future conditions may be unacceptable for Bastrop and Lee Counties on an environmental, economic, and social basis. This conclusion is based on the following:

▲ Though some temporary decline in artesian pressure must occur for groundwater to be produced, ,,, a long-term, continued reduction in artesian pressure is not in the best interests of the citizens and businesses in Bastrop and Lee counties, which depend on groundwater for a potable water supply.
– LPGCD Management Plan.

▲ The limited amount of potentially usable natural recharge [estimated 35,000 ac-ft/yr from both Bastrop and Lee Counties], restricts the amount of groundwater that can be withdrawn from aquifers within the District without potentially adversely affecting artesian pressure, water levels in the aquifers, and the amount of groundwater contributing to the base flow of the surface water courses.
– LPGCD Management Plan.

▲ Extensive 'dewatering' of the Simsboro Aquifer would begin before the year 2040 with production of 55,000 acre-feet/year in addition to other projected pumping in the area would result in reduced artesian pressure, lower well water levels, and ultimately 'dewatering,' or 'mining' the aquifer – that is, the level of water in the Simsboro Aquifer would drop below the top of the aquifer.
– Lost Pines 2000 Aquifer Evaluation

▲ The availability of groundwater from the Carrizo-Wilcox Aquifer in Bastrop County is estimated to be 24,405 - 28,000 ac-ft/yr.
– TWDB & LCRWPG Water Plan 2006.

▲ Groundwater modeling indicates that the permitting of a 30,000 ac-ft/yr well in the Porter well field about 1 ½ miles from the Lee County line will cause drawdown in Bastrop and Lee Counties that exceed the desire to manage the Carrizo-Wilcox Aquifer on a sustainable basis.
– LPGCD Meeting 19 March, 2008.

▲ Current laws apparently require the LPGCD to continue permitting wells in the District regardless of the fact that the volume permitted clearly exceeds recharge.
– LPGCD meeting notes and conversations.

▲ Opportunity Bastrop County clearly shows that the citizens and Commissioners Court in Bastrop County desire future conditions of the aquifer that protect their local environmental, economic and social interests.
– Opportunity Bastrop County, 2007.

Recommendation:

Based on the above information it appears that it would be beneficial to encourage and support the LPGCD Board of Directors in basing the desired future conditions of the aquifers of Bastrop and Lee Counties on criteria and measurements that reflect the current and/or past conditions of these aquifers and that provide sustainable use and protection of these aquifers as part of the sound ecological environment of the watersheds in these counties. In specific they should be encouraged to use language that includes the protection of groundwater levels, artesian pressure, exempt wells, springs, environmental flows, and base-flow to the streams and rivers that run in and through these counties and tie this language to the "sound ecological environment" standard used in surface water legislation.

Reference:

House Bill 1763
http://www.legis.state.tx.us/tlodocs/79R/billtext/pdf/HB01763F.pdf
House Bill 2432
http://www.legis.state.tx.us/tlodocs/77R/billtext/doc/HB02432F.doc
Lost Pines Groundwater Conservation District website:
http://www.lostpineswater.org
Lost Pines Groundwater Conservation District, Management Plan:
http://www.lostpineswater.org/documents/LPGCDMgmtPlan.pdf
Lost Pines Groundwater Conservation District, Lost Pines 2000 Aquifer Evaluation
http://www.lostpineswater.org/gwater.html
Lost Pines Groundwater Conservation District, Quick Facts - Carrizo-Wilcox recharge:
http://www.lostpineswater.org/about.html
Lower Colorado Region Water Planning Group (Region K), 2006 Water Plan
http://www.twdb.state.tx.us/rwpg/2006_RWP/RegionK/
Opportunity Bastrop County:
http://www.co.bastrop.tx.us/ips/export/sites/bastrop/downloads/Opportunity_Bastrop_Revised.pdf
Senate Bill 1911
http://www.legis.state.tx.us/tlodocs/76R/billtext/doc/SB01911F.doc
Texas Water Development Board, Groundwater Resources website:
http://www.twdb.state.tx.us/GwRD/pages/gwrdindex.html
Texas Water Development Board, Groundwater Resources, Desired Future Conditions General Information: http://www.twdb.state.tx.us/GwRD/pdfdocs/03-1_mace.pdf
Texas Water Development Board, Groundwater Management Area 12 website:
http://www.twdb.state.tx.us/GwRD/GMA/gma12/gma12home.htm
Texas Water Development Board, Regional Water Planning website:
http://www.twdb.state.tx.us/wrpi/rwp/rwp.htm