2006 Region "K" Water Plan
for the
Lower Colorado Regional Water Planning Group

Mark V. Lowry, P.E.
Project Manager
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Rebeka Lien, P.E.
Lead Engineer
Date: January 5, 2006

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Group Solutions RJW

containing carbon and/or nitrogen, in a body of water that is available as a food source to microbial and other aquatic organisms, which require the consumption of dissolved oxygen from the water to metabolize the organic material. The basin-wide concentrations of DO that have existed in the past were indicative of relatively unpolluted waters; however, these have been changing and have become a concern in some segments of the Colorado River and its tributaries, as populations and urban development continue to increase. The primary manmade sources of BOD in bodies of water are the discharge of municipal and industrial waste, as well as nonpoint source pollution from urban and agricultural runoff. Thus, the presence of excess amounts of BOD allows increased rates of microbial and algal metabolism, which in turn depletes the dissolved oxygen concentrations in the water. Without sufficient levels of DO in the water, other aquatic organisms such as fish cannot survive. Data from 2002 indicates that there are five classified stream segments with a concern for DO, based on the State Water Quality Criteria in the Lower Colorado Regional Water Planning Area (*Table 1.8* and *Table 1.9*).

Another set of surface water quality indicators that can deplete DO levels in surface water bodies are termed "nutrients" and includes nitrogen (Kjeldahl nitrogen, nitrite+nitrate, and ammonia nitrogen), phosphorus (phosphates, orthophosphates, and total phosphorus), sulfur, potassium, calcium, magnesium, iron, and sodium. Nutrients are monitored by the TCEQ as a part of the Texas Clean Rivers Program; however, there is no state or federal standards for screening nutrients. Currently, naturally occurring background levels reported by the U.S. Geological Survey (USGS) or historical data collected by the TCEQ are used to determine the level of concern for nutrients. Nutrients have the same primary man-made sources as the BOD sources described above. Based on 2002 data, there are three classified stream segments with a concern in the Lower Colorado Regional Water Planning Area (*Table 1.8* and *Table 1.9*).

Fecal coliform is harmless bacteria that is present in human and/or animal waste. However, the presence of this organism is an indicator for the presence of disease-causing bacteria and viruses that are also found in human/animal wastes. Municipal waste is treated to remove most of the bacterial and viral contaminants so that safe levels will exist in the surface water body upon discharge from the point source. Therefore, when fecal coliform is detected, the most likely source of contamination is nonpoint source pollution, which can include agricultural runoff as well as runoff from failed septic systems. A wastewater treatment plant point source could also be the source of contamination if the system is not functioning properly. Data, reported for 2002, indicate that there are no classified stream segments with a concern for fecal coliform, based on the State Water Quality Criteria in Region K (*Table 1.8* and *Table 1.9).*

The presence of toxic dissolved metals, such as aluminum, barium, arsenic, chromium, cadmium, copper, lead, nickel, mercury, selenium, silver, and zinc, in surface water are a concern in one classified stream segment in the Lower Colorado Regional Water Planning Area (*Table 1.8* and *Table 1.9*).

1.2.4.2 Threats Due to Water Quantity Issues

As mentioned previously, the primary threat to agriculture in Region K is water shortages for irrigation that are anticipated to occur in Matagorda, Wharton, and Colorado Counties during a repeat of the drought of record. The water supply available for irrigation is from three sources: ROR supplies, stored water from the Highland Lakes System, and groundwater. Whenever the Colorado River's natural flows are insufficient to meet irrigation demands, the LCRA releases water from upstream storage reservoirs to supplement the ROR supplies from streamflows. The water supplied from the Highland Lakes storage is considered an interruptible supply and is subject to curtailment in accordance with policies and procedures specified in LCRA's Water Management Plan. Consequently, under drought of record

conditions, there are substantial shortages of water for irrigation in Matagorda, Wharton, and Colorado Counties. Potential strategies for meeting these irrigation needs are presented in Chapter 4.

Water quantity is also a concern during drought conditions in terms of instream flows and freshwater inflows to Matagorda Bay. As discussed in Section 1.2.2.3, the free-flowing reaches below the Highland Lakes System downstream to the mouth of the Colorado River have been studied by the LCRA, and critical instream flows have been determined as the non interruptible demand on water resources. Instream flows have been maintained by LCRA at or above the minimum critical flow in accordance with the current WMP. Target instream flows, also determined by the LCRA study, provide flows to support an optimal range of habitat complexity for a well-balanced, native aquatic community within a stream reach. LCRA has maintained these flow regimes whenever water resources are adequate, but target flows are classified as interruptible demands that have been reduced during drought conditions. For further details, please refer to LCRA's WMP.

The Highland Lakes provide the primary surface water storage and flood control capabilities for Region K. The issue of providing maintenance of these reservoirs to retain the maximum water storage capacity will become increasingly important as natural sedimentation processes decrease the volume of water each reservoir can hold. Currently, there are no programs in place to address this issue.

With regard to flood control, Lake Travis is the only reservoir in the Highland Lake System specifically designated for this purpose. Currently, the LCRA must regulate the release of flood flows from Mansfield Dam so as to minimize and balance the impacts of floodwaters upstream and downstream of the dam without compromising the safety of the dam. Because development continues to encroach upon and alter the floodplain of the Lower Colorado River, the LCRA in cooperation with the USACE is currently studying alternative flood control measures, such as modifying current flood control operations and the possible addition of new off-channel flood control structures.

One of the major groundwater quantity concerns involves the Barton Springs segments of the Edwards aquifer (BFZ), which is a karst formation that responds quickly to changes in the environment due its highly permeable and transmissive characteristics. South of the artesian zone of the Edwards aquifer there exists an interface, or "bad water line," that separates the good quality groundwater from a layer of water that is not usable for human consumption due to the high TDS content. This line, which is also referred to as the saline-water line or freshwater/saline-water interface, marks the interface where the groundwater reaches a TDS concentration of 1,000 mg/l. Little is actually known about this interface and research is currently being conducted to delineate the "bad water line" and to determine the effects that pumping large quantities of aquifer water will have on its location. At present, there is a great deal of concern and uncertainty regarding the intrusion of poor quality water into the freshwater zone. The current lack of factual information makes the formulation of management strategies extremely difficult.

The second major issue in the Barton Springs segments of the Edwards aquifer (BFZ) is the minimum required environmental flows discharged from the artesian zone through Barton Springs. Increased groundwater pumping from the aquifer during drought conditions decreases all spring discharges, which can potentially impact the state and federally listed threatened and endangered species that depend on the springs for habitat, such as the Barton Springs salamander, and can potentially affect water supply availability downstream.

The primary water quantity issue in the Gulf Coast aquifer is subsidence, which is the dewatering of the interlayers of clay within the aquifer as a result of over-pumping. This compaction of the clay causes a

loss of water storage capacity in the aquifer, which in turn causes the land surface to sink, or subside. Once the ability of the clay to store water is gone, it can never be restored. The implementation of water conservation practices and conversion to surface water sources are currently the only remedies for this situation. Saltwater intrusion from the Gulf of Mexico into the Gulf Coast aquifer is also a potential concern due to groundwater pumping rates that are greater than the recharge rates of the aquifer.

The Trinity aquifer's primary water quantity concern is the anticipated water-level declines during drought conditions due to increased demand that will be placed on the aquifer's resources. Recently, a computer model has been developed to simulate the flow of groundwater within the Trinity aquifer and results, for the portion of the aquifer that lies within Region K, suggest that water levels in the Dripping Springs area of Hays County, could decline more than 100 feet by the year 2040. Other portions of Hays County as well as Blanco and Travis Counties, may experience moderate water-level declines between 50 to 100 feet by the year 2010. Most of the rivers gain water from the Trinity aquifer as they pass over the aquifer. Increased pumping during drought conditions will decrease the base flow of the rivers that cross the Trinity aquifer; however, the groundwater flow model suggests that these rivers will continue to flow seasonally.

The Carrizo-Wilcox aquifer's primary water quantity concern is the water-level declines anticipated through the year 2060 due to increased pumping. Groundwater withdrawals increased an estimated 270 percent between 1988 and 1996, from 10,100 to 37,200 acre-feet per year (ac-ft/yr), 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.

The LCRWPG passed a resolution regarding the "mining of groundwater" on February 9, 2000, which strongly opposes the over-utilization of groundwater, including the mining of groundwater, within its region at rates that could lead to eventual harm to the groundwater resources, except during limited periods of extreme drought. They define groundwater mining as "the withdrawal of groundwater from an aquifer at an annualized rate, which exceeds the average annualized recharge rate to an aquifer where the recharge rate can be scientifically derived with reasonable accuracy." This resolution addresses the concerns listed above for the Barton Springs segments of the Edwards (BFZ), Gulf Coast, Trinity, and Carrizo-Wilcox aquifers that are located within Region K. Based on the projected future groundwater demand in Region K, the LCRWPG's position on groundwater mining restricts the water supply strategies that can be considered for the Lower Colorado Regional Water Plan, which are discussed in more detail in Chapter 4.