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INTEGRATED WATER MANAGEMENT STRATEGIES FOR THE CITY AND COUNTY OF EL PASO

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Regional water planning in Texas began with the passage of Senate Bill 1 in 1997. The state was divided into 16 regions for the purposes of developing regional water plans that would eventually be integrated into a single state wide water plan. El Paso lies within the Far West Texas Region (Region E). In 2001, the first regional plan was developed that included demand estimates for through 2050, current supplies, and identified deficits, or imbalances between current supplies and future demands.

For El Paso County, the 2001 plan identified the deficits and provided several potential alternatives to meet the increasing demands that had been projected. However, there was no specific plan to meet future demands. During the second round of planning that led to an updated regional plan in 2006, considerable effort was made to develop a specific plan to meet future demands through 2060.

El Paso County is currently supplied water from the Rio Grande, local groundwater and reclaimed water. Potential future supplies include imported groundwater from other parts of Far West Texas. The 2006 regional plan includes the development of six alternative integrated strategies that include local surface water, local groundwater, expansion of reclaimed water and imported groundwater. The 2006 regional plan provides for meeting all future non agricultural demands in El Paso County through the adoption of Alternative 6, which includes conjunctive use of local surface and groundwater resources, expansion of conservation, expansion of reclaimed water use, and the importation of groundwater from the Dell City area and from the Capitan Reef Aquifer, located southeast of Dell City. Other potential imported supplies identified in other alternatives in Culberson, Jeff Davis and Presidio Counties will not be used prior to 2060 under the adopted alternative.

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Integrated Water Management Strategies for the City and County of El Paso

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Abstract

Current water supplies for El Paso County, Texas include the Rio Grande, local groundwater and reclaimed water. Potential future supplies include imported groundwater from other parts of Far West Texas.

Regional water planning in Texas began with the passage of Senate Bill 1 in 1997. The state was divided into 16 regions for the purposes of developing regional water plans that would eventually be integrated into a single state wide water plan. El Paso County lies within the Far West Texas Region (Region E). In 2001, the first regional plan was developed that included demand estimates for through 2050, current supplies, and identified deficits, or imbalances between current supplies and future demands. For El Paso County, the 2001 plan identified the deficits and provided several potential alternatives to meet the increasing demands that had been projected.

During the second round of planning that led to an updated regional plan in 2006, considerable effort was made to develop a specific plan to meet future demands through 2060. The 2006 regional plan included the development of six alternative integrated strategies that include local surface water, local groundwater, expansion of reclaimed water and imported groundwater. The 2006 regional plan provided for meeting all future non agricultural demands in El Paso County through the adoption of Alternative 6, which includes the continued conjunctive use of local surface and groundwater resources, expansion of conservation, expansion of reclaimed water use, and the importation of groundwater from the Dell City area and from the Capitan Reef Aquifer, located southeast of Dell City. Other potential imported supplies identified in other alternatives in Culberson, Jeff Davis and Presidio Counties will not be used prior to 2060 under the adopted alternative.

Past and Current Water Supplies

Since the beginning of the 20th century, El Paso County has relied on both surface water and groundwater for municipal water supply. Currently, El Paso Water Utilities (EPWU) supplies about 90% of all municipal water in El Paso County (Far West Texas Regional Planning Group, hereinafter FWTRPG, 2006). Surface water is supplied from the Rio Grande (Figure 1). The Rio Grande flows that are diverted in the El Paso area are primarily derived from snowmelt runoff in southern Colorado and northern New Mexico. Historically, there are also occasional flood surges associated with storm systems in the summer monsoon season. Spring runoff is stored in Elephant Butte Reservoir in southern New Mexico before releases are made for irrigation and municipal use in southern New Mexico and the El Paso area. EPWU is a customer of the local irrigation district (El Paso

County Water Improvement District No.1), and obtains water through ownership of water rights land and leasing of water rights from agricultural water rights holders in El Paso County.

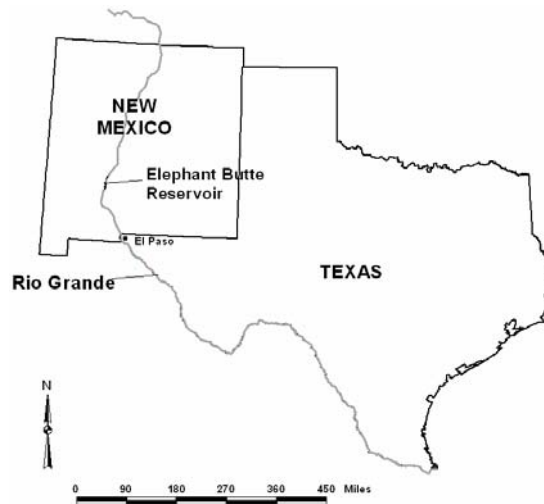


Figure 1. Rio Grande and Elephant Butte Reservoir

Groundwater supplies are pumped from the Mesilla Bolson and the Hueco Bolson (Figure 2). The Los Muertos Bolson, adjacent to the Mesilla Bolson is also shown. These groundwater basins underlie portions of New Mexico, Texas and Chihuahua (Creel and others, 2006). Groundwater occurs in unconsolidated fluvial, alluvial, and lacustrine sediments. The Rio Grande plays an important role in the recharge and discharge of both groundwater basins. Annual production from each of these sources is summarized in Figure 3.

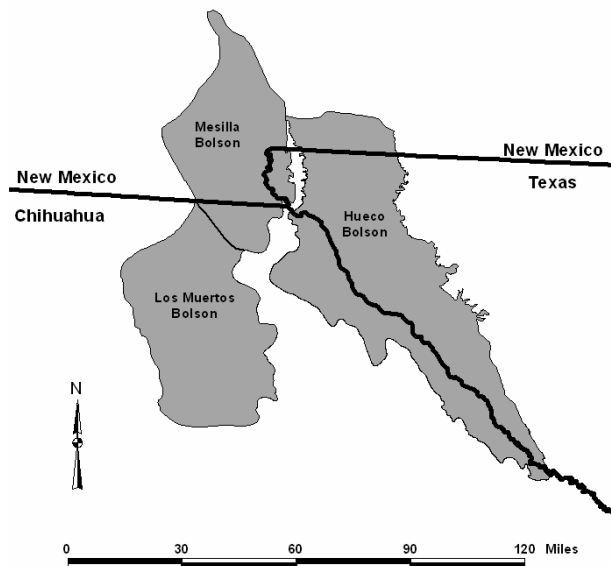


Figure 2. Location of Hueco Bolson, Mesilla Bolson and Los Muertos Bolson

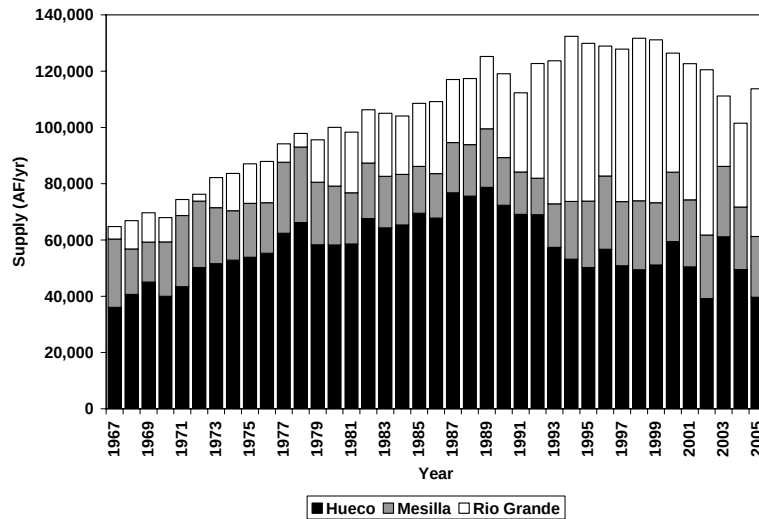


Figure 3. History of EPWU Supplies from Groundwater (Hueco Bolson and Mesilla Bolson) and Surface Water (Rio Grande)

EPWU pumping in the Hueco Bolson peaked at about 80,000 acre-feet per year (AF/yr) in 1989. As a result of concerns regarding the long-term ability to continue this level of pumping (e.g. Muller and Price, 1979 and Boyle Engineering, 1991), EPWU implemented the following water management strategies: 1) adopted a rate structure that increases the cost of water for high use, 2) promoted water conservation through various incentive programs, 3) increased the use of Rio Grande Water, and 4) expanded the reuse of reclaimed water.

EPWU pumping in the Hueco Bolson in 2002 was below 40,000 AF/yr for the first time since 1967. Hueco pumping increased in 2003 and 2004 from 2002 levels due to a drought and the associated reduction in surface water diversions. Pumping again dropped below 40,000 AF/yr in 2005 as a result of a return of nearly full river allocation conditions. The conjunctive use of surface water and groundwater (increasing groundwater pumping in times of surface water shortages) to meet overall demands is part of EPWU's overall water supply strategy.

The surface water plants have a combined capacity of 100 mgd. Under normal river flow conditions, the plants operate seven months during the year (i.e. during the irrigation season). EPWU is a customer of El Paso County Water Improvement District No.1, and receives water from the Rio Grande Project via its ownership of lands within the project area or through leases from water rights holders. Currently, El Paso has water rights of about 65,000 AF/yr from the Rio Grande Project (FWTRPG, 2006).

Total demand has been declining since the late 1990s due to conservation and pricing strategies. Current total demand is about 110,000 AF/yr. Per capita demand has been reduced from about 225 gallons per person per day in the 1970s to about 137 gallons per person per day in 2005.

Regional Planning Process

The regional planning process for the State of Texas was initiated in 1997 via adoption of Senate Bill 1 (SB1). The state was divided into sixteen regions (Figure 4), and a Regional Water Planning Group was formed in each of these regions. El Paso lies within the Far West Texas Region (Region E).

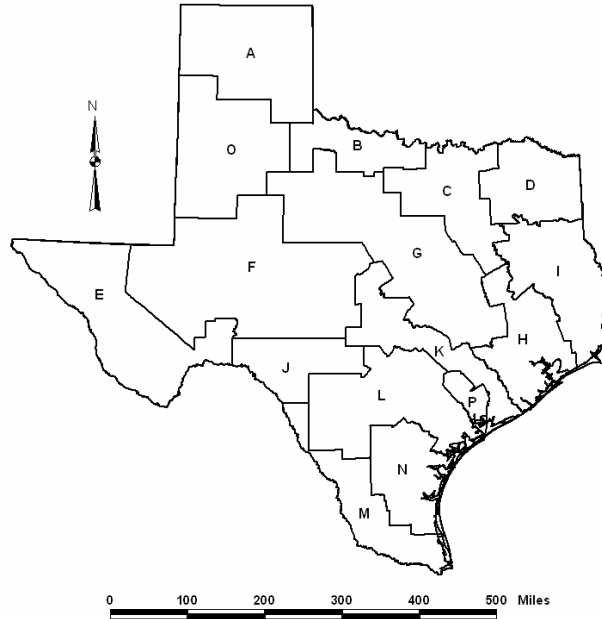


Figure 4. Regional Planning Areas in Texas

Every five years, each Regional Water Planning Group develops a water management plan that covers regional water supplies and demands for a 50-year period. The Texas Water Development Board uses these sixteen regional plans in the development of a state water plan. The initial regional water plans were developed in 2001, and in January, 2006 each region developed its first update. The next state water plan is due to the legislature in January, 2007.

The 2006 Region E plan identified, in detail, the expected population growth and expected water demands through 2060. The Texas Water Development Board provided these data to the regional planning group. The plan also identified current water supplies. Where expected demands were greater than existing supplies, the plan identified strategies to close the supply deficit. These strategies were wide ranging, and included relatively low-cost measures such as conservation, and relatively high-cost measures such as construction of pipelines to transfer water within the region.

The 2006 Region E plan contained an integrated strategy for El Paso County that recognized the continued local conjunctive management of surface and groundwater, continued conservation, and expansion of reclaimed water use. The integrated strategy also identified alternatives for transfer of water from properties currently owned by EPWU in Hudspeth, Culberson, Jeff Davis, and Presidio Counties. Some alternatives

considered the transfer of water from within the Hudspeth County Underground Water Conservation District No. 1 (HCUWCD) in the Dell City area. Although El Paso does not currently own land within HCUWCD boundaries, there has been substantial interest in the area due to its favorable hydrogeology and long history of groundwater pumping for irrigation without extensive groundwater level declines.

Summary of Integrated Water Management Strategies for El Paso County

The recently completed Regional Water Plan included a study of alternative means of supplying nonagricultural water to El Paso County through the year 2060 (FWTRPG, 2006 and Gooch and others, 2006). Based on current capacities of wells and surface water plants, and the limitation that surface water is only available during the irrigation season, total available municipal supply in El Paso County is about 150,000 AF/yr (FWTRPG, 2006). This total includes about 5,000 AF/yr of reclaimed water supply that is available independent of drought conditions. Under full surface water allocation conditions, municipal surface water supply is about 60,000 AF/yr. Under these conditions, Hueco Bolson groundwater pumping supply is about 50,000 AF/yr, and Mesilla Bolson pumping supply is about 35,000 AF/yr for the entire County (FWTRPG, 2006). Under drought-of-record conditions, it is expected that surface water supplies would drop to 10,000 AF/yr. During drought-of-record conditions, pumping supplies in the Hueco Bolson increase to 90,000 AF/yr and Mesilla Bolson pumping supplies increase to 45,000 AF/yr in order to maintain the full supply of 150,000 AF/yr.

Figure 5 summarizes these conjunctive use scenarios. Scenario 1 represents a full surface water allocation scenario. Scenario 6 represents a drought-of-record scenario. Scenarios 2 through 5 represent intermediate surface water allocation scenarios that are less than full allocation, but more than drought-of-record conditions.

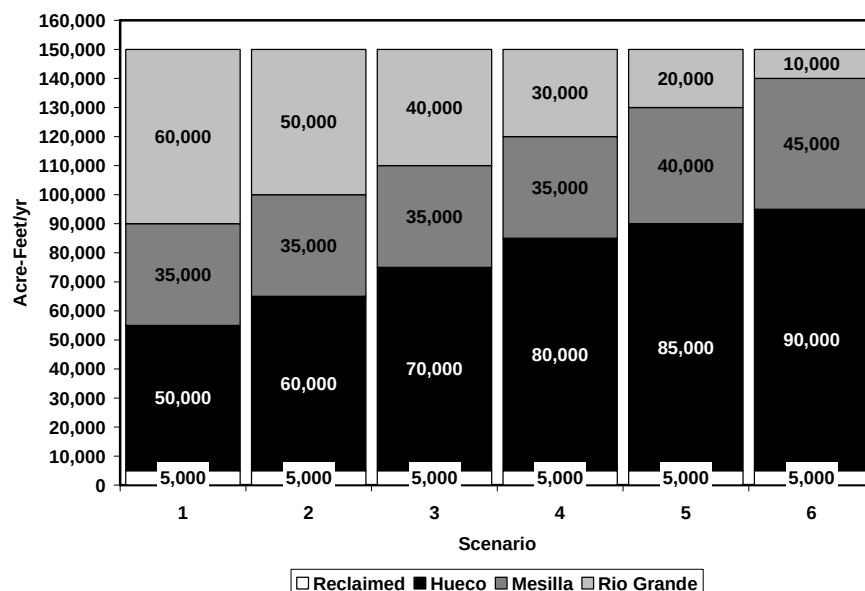


Figure 5. Current Conjunctive Use Supplies in El Paso County

The conjunctive use management of surface water and groundwater resources in El Paso County recognizes that there are limits to surface water supplies and limits to groundwater supplies. The most significant limitation to the surface water supply is that droughts occur, and surface water allocations are reduced in some years. As a result of reduced river availability, groundwater pumping is increased in order to meet demands. The management of local groundwater requires the recognition of limits with respect to the ability of local groundwater basins to supply water reliably over many decades. Simply increasing local groundwater pumping to meet increased demands has been shown to be an ineffective groundwater management strategy in El Paso County in terms of water quantity (declining groundwater levels) and water quality (brackish groundwater intrusion).

Future demands are projected to increase as a result of increasing population. A summary of the expected water demand increases for the entire County and within the EPWU service area are shown in Table 1. The current supply is about 150,000 AF/y. Current supplies can meet expected future demands until sometime between 2015 and 2020.

Table 1. El Paso County Supply and Demand Comparison

Year	El Paso County Demand AF/yr	El Paso County Supply AF/yr	Supplied by EPWU AF/yr	Percent Supplied by EPWU
2005	123,717	150,000	113,721	91.9
2010	138,905	152,387	122,667	88.3
2020	164,672	165,531	143,072	86.9
2030	187,557	188,676	161,025	85.9
2040	207,317	207,820	176,676	85.2
2050	227,299	227,964	192,592	84.7
2060	247,424	248,109	208,573	84.3

The 2006 regional plan included the development of six alternative integrated strategies to meet future demands after 2020. The strategies were “integrated” in that they included local surface water, local groundwater, expansion of reclaimed water and imported groundwater (FWTRPG, 2006 and Gooch and others, 2006). Potential areas considered for importation of groundwater included properties currently owned by EPWU as follows:

1. “Capitan Reef Properties” located in Hudspeth and Culberson Counties that overlie the Capitan Reef Aquifer (about 30,000 acres)
2. Wildhorse Ranch in Culberson County that overlies the Wildhorse Flat area of the West Texas Bolson Aquifer (about 21,000 acres)

3. Antelope Ranch in Presidio and Jeff Davis Counties that overlies the Ryan Flat area of the West Texas Bolson Aquifer (about 25,000 acres)

The plan also considered properties in the Dell City area that overlie the Bone Spring/Victorio Peak Aquifer. EPWU does not currently own any land or water rights in this area (Gooch and others, 2006, pg. 27). The location of properties owned by EPWU and the Dell City area properties are shown in Figure 6.

Groundwater from the Dell City area would require desalination due to high concentrations of total dissolved solids (about 2,500 mg/l). Groundwater in the Capitan Reef area could require desalination if pumping induced brackish groundwater flow from the west. Groundwater in the Wildhorse Ranch and Antelope Ranch area would not require desalination.

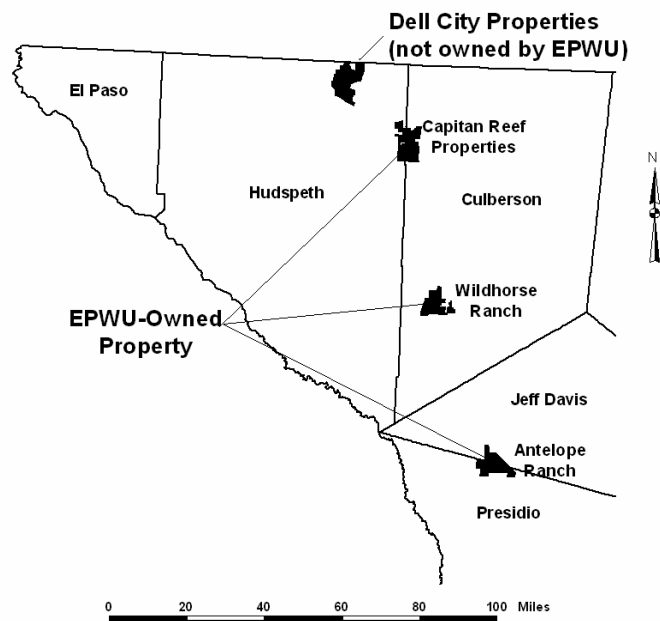


Figure 6. Location of Properties in Hudspeth, Culberson, Jeff Davis, and Presidio Counties for Potential Future Groundwater Importation Projects

Litigation regarding the water rights in the Dell City area is ongoing, and EPWU has decided to suspend negotiations to purchase any Dell City property until the litigation is settled, or the courts render a decision (e.g. Harman, 2006 or Wilder, 2006). However, for purposes of long-term planning, the Far West Texas Regional Water Plan considered the Dell City properties as a potential source of supply for El Paso.

The 2006 regional plan provided for meeting all future non agricultural demands in El Paso County through the adoption of Alternative 6, which included conjunctive use of local surface and groundwater resources, continued conservation, expansion of reclaimed water use, and the importation of groundwater from the Dell City area and from the

Capitan Reef Aquifer, located southeast of Dell City. A summary of Alternative 6 is presented in Table 2. Other potential imported supplies identified in other alternatives from Antelope Ranch and Wildhorse Ranch will not be used prior to 2060 under the adopted alternative.

**Table 2. Summary of Future El Paso County Water Supplies – Alternative 6
Far West Texas Regional Water Plan
all values (except population) in acre-ft/yr**

	Year					
	2010	2020	2030	2040	2050	2060
Existing Conjunctive Use Supply	145,000	145,000	145,000	145,000	145,000	145,000
Existing Reclaimed Water Supply	5,000	5,000	5,000	5,000	5,000	5,000
Additional Reclaimed Water Supply	2,387	5,531	8,676	11,820	14,964	18,109
Additional Rio Grande Diversions	0	10,000	15,000	20,000	20,000	20,000
Dell City Groundwater	0	0	15,000	16,000	33,000	50,000
Capitan Reef Groundwater	0	0	0	10,000	10,000	10,000
Total Supply	152,387	165,531	188,676	207,820	227,964	248,109
Projected Demand	138,905	164,672	187,557	207,317	227,299	247,424
Projected Population	714,375	823,104	918,534	1,000,838	1,083,142	1,165,446

Discussion

Rio Grande diversions (and associated increases in local groundwater pumping in drought years) are estimated to be needed by 2020 in order to meet increased demands. These diversions would be increased again in 2030 and 2040.

Importation of groundwater from the Dell City area would begin in 2030, and increase each decade until 2060 when total importation would reach 50,000 AF/yr. The Hudspeth County Underground Water Conservation District No. 1 has adopted a management plan and rules to implement the management plan that is based on an estimated availability of groundwater (63,000 AF/yr). The rules further set limits on pumping based on existing and historic uses through a complex permitting process that results in the issuance of a permit for “validated land”. Irrigation water is allocated up to 4.0 AF/acre of validated land. This allocation can be reduced if the groundwater elevation in a single monitoring well falls below a specified elevation. Under the current rules, if a validation permit holder wishes to transfer groundwater out of the district, the limitation for pumping is set up to 2.8 AF/acre of validated land, as transfers are limited to the consumptive use of water rather than the total pumping. Under these rules, in order to meet the Far West

Texas Regional Water Plan projections of an El Paso groundwater importation project in 2060 (50,000 AF/yr) and assuming that a desalination plant could be operated at 80% efficiency, El Paso would need to own about 22,300 acres of validated land, and total pumping would be about 62,500 AF/yr.

Importation from the Capitan Reef properties currently owned by EPWU would begin in 2040, and remain at 10,000 AF/yr through the balance of the planning period. The best available information regarding the hydrogeology is from Reed (1965 and 1973). Reed (1965) estimated that recharge to the Diablo Farms area is about 15,400 AF/yr. Reed (1973) estimated that annual pumping in the range of 25,000 to 30,000 AF/yr would result in annual groundwater level declines of about 2 to 3.5 feet. The relatively low amount of projected pumping contained in the plan acknowledges the uncertainty in how much can be pumped in a sustainable manner, and recognizes the potential for brackish groundwater intrusion.

Participation in the regional planning process is an important factor in overall groundwater management for El Paso. El Paso's anticipated need to transfer water in the mid 2020s from other areas of the Far West Texas Region will necessitate the development and communication of future groundwater management approaches to other landowners in the area. The participatory nature of regional water plan development is an ideal forum to work with others in the region to manage water on a regional basis. Inclusion of the strategies in the State Water Plan is also a prerequisite for any potential state finding assistance for local projects.

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Bill Hutchison has 25 years of experience as a hydrogeologist, and is licensed as a Professional Engineer and Professional Geoscientist in Texas. He has been at El Paso Water Utilities since 2001, and currently serves as the Water Resources Manager. He has a BS from the University of California, Davis, an MS from the University of Arizona, and a Ph.D. from the University of Texas at El Paso.