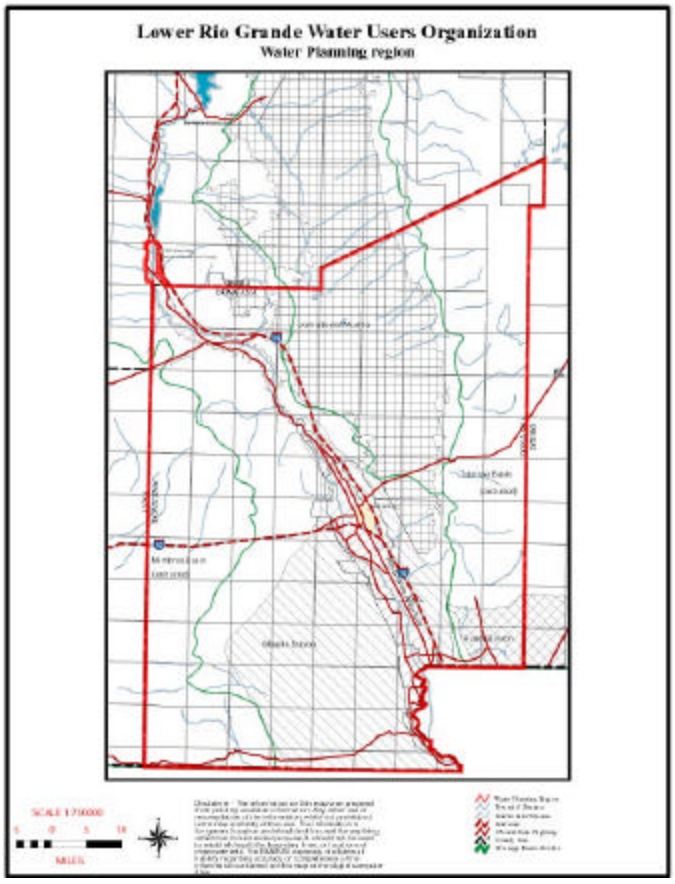
EXECUTIVE SUMMARY

INTRODUCTION



Terracon, John Shomaker and Associates, Inc., Livingston Associates, LLC, Inc., Zia Engineering and Environmental, Inc., and Sites Southwest have completed the New Mexico Lower Rio Grande Regional Water Plan for the Lower Rio Grande Water Users Organization (LRGWUO). The Planning Region is located in south central New Mexico primarily within Doña Ana County.

The two year effort has built upon the previous water planning efforts in the region (1994), and was designed to bring the technical research up to the standards required by the Interstate Stream Commission (ISC) Regional Water Planning Template published December 1994 and modified June 1999. This report was completed in general accordance with the proposal dated June 4, 1999 (Terracon Proposal No. P99-048E, and LRGWUO Project No. 98-99-390), and the ISC Regional Water Planning Template.

The New Mexico Lower Rio Grande Regional Water Plan includes, but is not limited to the following items:

- Public Involvement;
- Legal Issues;
- Analysis of the surface and ground-water supply available in the region;
- Population projections to thru 2040;
- Current water use and projected water demand (2040); and
- Strategies for future management of the region's water.

PUBLIC INVOLVEMENT

The LRGWUO is a public entity that was given a mandate to guide the regional planning effort in the Lower Rio Grande region of New Mexico. It is an organization made up of the City of Las Cruces, Doña Ana County, Doña Ana Mutual Domestic Water Consumers Association, the Town of Mesilla, the Anthony Water and Sanitation District, the Village of Hatch, New Mexico State University, and Elephant Butte Irrigation District (EBID). The Joint Powers Agreement (JPA 97-046) creating the LRGWUO was approved the New Mexico Department of Finance and Administration on February 7, 1997.

The goal of the public involvement effort was to make the citizens of the Planning Region aware of the progress of the regional water planning process and to offer them opportunities to comment and make suggestions. A handout was developed summarizing water planning activities for the region. The objective of the handout was to summarize for the public the various elements key to the Plan. This information was developed to give the public information prior to formal Public Meetings/Hearings so that they could be better prepared to provide ideas and/or additional information that would help in the overall development of the Plan.

A web site (www.lrgwuo-waterplan.com) was also established at the beginning of the planning process to provide information to the public. The web site includes a description of the project, opportunities for public participation, meeting notices, contact names and phone numbers and draft documents that can be viewed on-line, printed out or downloaded. The web site allowed for public comments and questions via email. Information was also posted for Public Meeting/Hearing times and places and viewing locations of the Plan. A copy of the handout is also located on the web page.

The LRGWUO Board appointed a Technical Committee to hold meetings (open to the Public) to deal with the daily, detailed issues of the planning process on every third Thursday of each month from 1:30 to 3:30. These meetings were established to discuss water-planning issues and make decisions regarding the direction of the water planning process. The focus of meetings was to complete technical work and to meet public involvement requirements of the ISC Regional Water Planning Template.

Members of the LRGWUO Technical Committee presented portions of the Lower Rio Grande Regional Water Plan through formal presentation and informal talks to various public

and technical organizations to encourage public input during various stages of Plan development. Additionally, public meetings were held in the region in the communities of Hatch, Las Cruces, Santa Teresa/Sunland Park and Chaparral. The majority of the public meeting time was devoted to answering questions from the public and recording their comments. The public meetings were in an "open house" format that allowed the public participants to view displays, ask questions and provide comments individually. The majority of the meetings included presentations of key information from the Lower Rio Grande Regional Water Plan. Comment sheets were available for written comments and all attendees were encouraged to identify themselves on sign-in sheets. Special arrangements were made to comply with the Americans with Disabilities Act.

BACKGROUND INFORMATION

The Planning Region is located in south central New Mexico and lies within the northern extreme of the Chihuahua Desert. The majority of the Planning Region is within Doña Ana County, which is the 16th largest county in the state, and has the second largest population (174,682 residents according to the 2000 Census). The Planning Region is bordered by Luna County, Sierra County, and Otero County to the west, north, and east, respectively, and by the State of Texas and the Republic of Mexico to the south. The Planning Region also includes a small portion of Sierra County below Caballo Dam and the community of Chaparral in Otero County.

The Planning Region has one of the lowest levels of per capita income in the United States and the government is the predominant employer. However, the Planning Region is also an important producer of agricultural goods. Agriculture is considered one of the largest segments of income for the Region and agriculture is the dominant use of land within the Rincon and Mesilla Valley. Major crops include chili, cotton, pecan, alfalfa and cereal grains.

In general, the economy has experienced a slow but steady growth within each major industry group through the 1990's. The economic base of the Mesilla Valley has been very stable over the past several years and no great change is anticipated in the near future. The Planning Region appears to have some potential for attracting agriculture-related light industry for several of the following reasons including: low cost of living, available land and labor force, adequate water and utility systems, and good transportation facilities. There is also a potential

for the development of a retirement-related industry due to the excellent year-round climate of the area and the relatively low cost of living in the area.

LEGAL ISSUES FOR THE REGION

Adjudication of water rights in the Lower Rio Grande began in 1986. The New Mexico Office of the State Engineer is also conducting a supplemental survey of domestic surface-water rights that will be completed in 2003. The adjudication will determine the elements necessary to quantify the water right of each water user in the basin, i.e., the "priority date, amount, purpose, diversion point and place of use. As to water used for irrigation … the specific tracts of land to which it shall be appurtenant…." See NMSA 1978, 72-4-19 (1907).

Legal limitations on the water supply for the Lower Rio Grande will ultimately be determined in the ongoing stream adjudication. The actual amount of ground-water use in the Lower Rio Grande that can occur without damage to a senior water right holder will ultimately be determined by the court. In order for junior ground-water users to continue to pump, they will have to acquire more senior ground-water rights, switch to surface water and receive water through one of the regional surface-water treatment plants or acquire offsets to their effect on senior water right holders through a mechanism like a Special Water Users Association (SWUA). Surface-water allocations in the Project between EBID and El Paso County Water Improvement District No. 1 (EPCWID#1#1) will ultimately be determined in some form of Operating Agreement. Texas entities have alleged that the New Mexico portion of the Project is taking more than their share and seek a larger portion of the allocation of Project supply. The United States may also pose a hurdle in the conversion of Project water to Municipal and Industrial use. EBID has initiated litigation to have the court determine whether or not the United States will have a say in these transfers under the 1920 Act.

WATER RESOURCES ASSESSMENT FOR THE PLANNING REGION

Surface Water

According to the environmental service records of the NMSU Climate Center, the average annual precipitation is 8 to 8 ½ inches for Las Cruces. More than half of this annual precipitation usually occurs during the summer months in the form of thunderstorms. The more intense of these storms often occur during the period of July through September.

The study area consists of four distinct drainage basins which are structurally depressed units that were displaced downward with respect to surrounding mountain uplifts. Upland watershed areas drain to the basins in the direction of the Rio Grande, which is the sole surface-water source in the Plan area. A few of these watershed drainage systems reach the Rio Grande, while a significant number of them "dead-end" into the sandy bottoms of the main drainage basins.

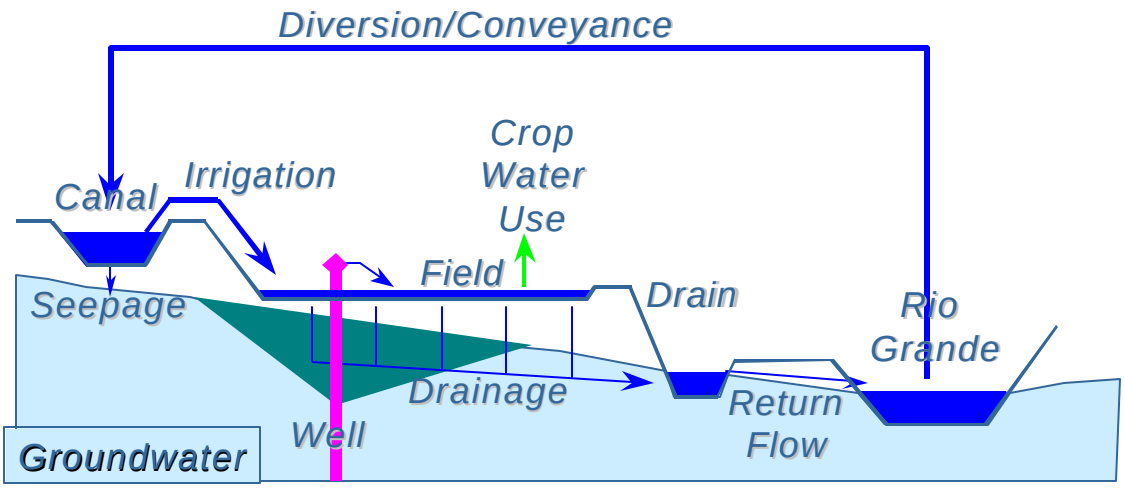
There are six wastewater treatment plants/systems that discharge to the lower Rio Grande in New Mexico. The total treated wastewater permitted discharge is approximately 19.1 MGD from the six (6) plants, which represents a return flow of approximately fifty-nine (59) acre-feet/ day (ac-ft/day) to the Rio Grande.

Due to the extensive volume of irrigated lands within the study area and the EBID system, this portion of the Rio Grande in New Mexico is one of the most heavily monitored portions of the river system within New Mexico in terms of monitoring of stream flows. Both the United States Geological Society (USGS) and the EBID maintain an extensive array of flow gages along the Rio Grande, in canals, laterals, and drains within the bounds of the Plan area.

Within the planning region there are no major storage reservoirs. stormwater runoff from the low-lying west central portion of Las Cruces drains to Burn Lake, which is also fed by irrigation and irrigation drain water. The approximate capacity of this recreational facility is 390 acre-feet (ac-ft). Storm-water dam facilities are also located within the planning region that are only designed as detention facilities, and therefore do not maintain a permanent pool behind them.

Ground Water

There is a link between the surface-water system of the Rio Grande and the ground-water supplies. Agriculture provides the major source of ground-water recharge in the Plan area and in return the aquifer provides water to the river under certain conditions. Existing conditions which affect the relations between the surface-water sources and the underlying shallow aquifer include irrigation practices, weather and precipitation patterns, releases of water from the Caballo Reservoir upstream, and well pumping rates.



The Planning Region contains portions of four ground-water basins: the Mesilla Basin, Jornada del Muerto, Hueco Bolson, and the Rincon Valley Basin. The shapes and sizes of these basins are controlled by the underlying geologic structure. The main ground-water bearing formations in these areas consist of thick sequences of basin-fill deposits of the Santa Fe Group and deposits of the current Rio Grande.

Mesilla Basin

Mesilla Basin is an important hydrologic basin in southern New Mexico and occupies the central portion of Doña Ana County, covering approximately 1,110-square miles. The main aquifers of the Mesilla Basin consist of the Rio Grande deposits and the Santa Fe Group basin-fill. Water levels in the Mesilla Basin range from 10 feet below ground level (bgl) near the Rio Grande to 300 feet or more bgl in the western and east-central part of the basin. Ground-water flow in the Mesilla Basin is generally to the southeast, parallel to the trend of the Rio Grande with ground water flowing from higher elevations to lower elevations. Natural discharge from the Mesilla Basin occurs near the El Paso Narrows. The majority of ground water is discharged as drain flow and evaporation. Ground-water recharge in the Mesilla Basin occurs along arroyos during precipitation events. This process is known as 'slope-front recharge'. Recharge also occurs from the Rio Grande and associated irrigation canals.

Jornada del Muerto

Jornada del Muerto lies between the San Andres Mountains to the east and Caballo, San Diego, and Doña Ana Mountains, and the Mesilla Basin to the west. Water levels in the Jornada del Muerto Basin range from 50 to over 500 feet bgl. The direction of ground-water flow in the Jornada Basin is west to southwest towards the Rio Grande Valley. Natural discharge from the basin occurs as ground-water flow along the western part of the basin. Recharge to the Jornada del Muerto Basin occurs by means of mountain front recharge, subsurface ground-water flow, and from geothermal upwellings. According to previous studies there are approximately 40 million ac-ft of ground water available for pumping in the Jornada Basin.

Hueco Bolson

The Hueco Bolson covers approximately 255 square miles and is located primarily in the southeastern corner of Doña Ana County, and extends eastward into Otero County. Only approximately 3 percent of the Bolson lies within New Mexico. Aquifer characteristics of the Hueco Bolson vary, and are dependent on grain size and sorting of the sediments. The average water level in the New Mexico portion of the Hueco Bolson is about 350 feet bgl. Ground-water flow in the New Mexico portion of the Hueco Bolson is generally eastward along the northwestern portion of the basin. Natural discharge from the bolson is estimated to be 4,650 ac-ft/yr for the portions of the aquifer that have total dissolved solids (TDS) concentrations of 1,000 mg/l or less. Recharge of the Hueco Bolson comes from the Tularosa Basin, with a small amount of flow from the Mesilla Basin. Surface recharge to the basin-fill comes from storm runoff percolating through the alluvial fans on the sides of the Organ and Franklin Mountains. Recoverable ground water in storage estimates for the Hueco Bolson are based on the assumption that 50 percent of the water in storage can be recovered by pumping. It is assumed that the Hueco Bolson has approximately 6 million ac-ft of ground water within the study area available for pumping.

Rincon Valley Basin (Palomas Basin)

Rincon Valley Basin (Palomas Basin) is located in the south-central Sierra County and the northwestern corner of Doña Ana County. The main aquifer in the Rincon Valley Basin is the post-Santa Fe Group alluvial deposits. Yields in the irrigation wells in the floodplain aquifer can be quite high. Water levels in the Rincon Valley Basin vary between 0 feet bgl, in the flood

plain to 400 feet bgl in the Caballo Mountains. Along the Rio Grande in Doña Ana County, depth to water is less than 20 feet bgl. Water is replaced quickly in the alluvial aquifer, due to high transmissivity and proximity to the Rio Grande. The average water levels within the valley do not appear to be decreasing, though seasonal fluctuation does occur. The direction of ground-water flow in the Rincon Valley Basin is northeast, from the mountains into the valley and then south and east down to the river. Recharge to the Rincon Valley basin is via seepage from the Rio Grande and irrigation canals. Some recharge also occurs from subsurface flow through the coarse sediments in mountain front tributaries and arroyos. Development of ground water in the Rincon Basin will be at the expense of surface-water flow in the Rio Grande. The total amount of recoverable ground water in storage that can be recovered by pumping (fresh and saline) is approximately 320,000 ac-ft.

Water Quality

Within the planning region the Rio Grande meanders approximately one hundred miles through fertile farmlands, populated communities, and base piedmont slopes. Human activity along the river results in discharge of chemicals to the surface-water system and subsequently to shallow ground water.

Impact point sources from within the bounds of the planning region are generally limited to municipal and regional wastewater treatment plant facilities. Storm drain system runoff is also considered a point of source impacts within the planning region. The water quality from domestic wastewater systems is monitored and controlled, and impacts from these sources are generally minor or positive to the overall water quality within the river. Impacts from storm drain runoff are not monitored and vary depending on the volume and timing between precipitation events. Additional investigation on the storm drain runoff is beyond the scope of this study. However, non-point source impacts are a concern to water quality within the region. Uncontrolled stormwater runoff from municipal areas, commercial and industrial sites and agricultural farmlands and dairies can result in significant volumes of contaminants entering the surface-water system.

Ground-water discharge permits within the planning region include:

- Private and commercial septic systems

- Land application to crops from municipalities, dairies, food processing facilities and other agricultural related operations
- Evaporation lagoons for agricultural, commercial and industrial operations
- Discharges from small domestic wastewater systems to leach fields, evaporation lagoons or land applications.

The National Pollution Discharge Elimination System (NPDES) regulated by the New Mexico Environmental Department (NMED) Surface Water Bureau indicate that permits have been issued to six (6) municipal and other wastewater treatment plants/systems along the Rio Grande. Hatch, Las Cruces, Gadsden ISD, Anthony, Santa Teresa, and Sunland Park hold permits from the NMED and NPDES. Treated wastewater is required to conform to the US Environmental Protection Agency (EPA) regulatory standards.

Commercial and industrial entities in the planning region also have ground-water discharge permits, which were issued by the NMED Ground Water Division. The majority of industries with ground-water discharge permits are dairy, food processing facilities, or rural smaller industrial/ commercial operations. These permit holders are allowed to store their wastewater in lined ponds or to utilize land-application and/or discharge to septic systems. Doña Ana County also operates a septage disposal facility in Mesquite, consisting of lined evaporation basins. These facilities do not directly discharge into the Rio Grande, or any canals or drains, therefore, they do not directly impact the available surface-water supplies within the lower Rio Grande region.

Mesilla Basin Water Quality

The water quality within the Mesilla Basin is dependent on factors such as irrigation within the Rio Grande corridor, bedrock found in recharge zones, and the presence of geothermal water. Ground-water contamination sources in the Mesilla Valley include leaking underground storage tanks (LUST) sites, septic tanks, cesspools, landfills, dairies, agricultural and municipal chemicals, and other waste disposal practices. LUSTs are a major source of ground-water contamination in New Mexico. Within the Mesilla Basin there are sixty-six LUST sites currently undergoing investigation, remediation, or monitoring.

Jornada Basin Water Quality

There is a wide range of saline levels in the Jornada Basin, and water in the south-central part of the basin is generally slightly saline. Pockets of more highly saline water tend to occur along faults where deep water can flow upward. There are also pockets of very fresh water, located along recharge zones near arroyos.

Hueco Bolson Water Quality

Water quality in the Hueco Bolson is variable. Hardness and chloride content can be very high; however sulfate concentrations are below the USEPA secondary maximum contaminant levels. Freshwater is found in a wedge where recharge comes off the alluvial fans on the western side of the basin. There is a closed landfill in the town of Chaparral; however it is unknown if there is ground-water contamination from the landfill. Some of the wells located in Chaparral have elevated nitrate levels mostly likely due to septic systems.

Rincon Basin

The Rincon Valley Basin has very hard water that contains high amounts of dissolved solids. There are four active LUST sites in the Rincon Valley Basin, all are located in Hatch. Liquid waste disposal, septic tanks, and cesspools also are known sources of ground-water contamination in the basin. The aquifer is very susceptible to contamination due to the high water table.

WATER DEMANDS

Historically, there have been (and continue to be) two broad water-demand categories in the Planning Region:

- The use of the surface-water supply developed under the U.S. Bureau of Reclamation's Rio Grande Project, and
- The use of the regional ground-water supply as developed by private individuals, industrial-commercial interests, semi-public entities, and municipalities.

Surface-Water Demand

The surface-water demands for irrigation in the region are met by water delivered by the EBID, most of which originates as releases from storage in Elephant Butte and Caballo Reservoirs located 30 miles north of the Region in Sierra County. Not all of the releases from

Elephant Butte Reservoir are used in the Region. Some water is lost to evaporation in Caballo Reservoir (about 20,000 ac-ft/yr) and to vegetation below the two dams; part is ear-marked for delivery to Mexico (60,000 ac-ft/yr) and about 43 percent of the supply for delivery to the EPCWID#1 in Texas.

The consumptive use of the surface-water supply available to New Mexico from Elephant Butte Reservoir is now allocated exclusively for irrigated agriculture. There is a significant amount of consumptive use associated with the non-beneficial vegetation that grows along ditches and drains maintained by the EBID and in the bosque areas.

Non-consumptive use of the flow of the Rio Grande is associated with recreation for State parks at Percha Dam and at Leasburg Dam. The City of Las Cruces also maintains a river park at Picacho Bridge that is also a non-consumptive use of flow.

Irrigated Lands

The surface-water supply available to the lower Rio Grande section of the Project from Elephant Butte Reservoir is currently allocated exclusively for irrigated agriculture. The main source of surface irrigation water in the Region is obtained from flows stored in the Elephant Butte Reservoir. This reservoir is the basic storage unit for the Rio Grande Project established in 1906 to provide irrigation water to farms in Texas and New Mexico by capturing flood-flows and storing them. The Rio Grande Project lands, canal system, drains and diversion dams are located on a narrow 150 river-mile reach of the Rio Grande from Elephant Butte Reservoir to the southern line of El Paso County

The Rio Grande Project was also established to make certain that the United States could deliver water to Mexico. The 1906 Treaty negotiated with Mexico required 60,000 ac-ft of water to be delivered to Mexico at the Acequia Madre. The United States has been able to deliver this amount in most years; however the amount is sometimes reduced during periods of short supply from the Elephant Butte Reservoir.

Colorado, Texas and New Mexico entered into an interstate compact that divided the supply of the Rio Grande between the three states by providing a sliding scale delivery system. The compact required the annual delivery of water by Colorado to the New Mexico-Colorado State line and the delivery of water by New Mexico to Texas (and southern New Mexico) at the Elephant Butte Reservoir.

Prior to the start of the irrigation season each year, EBID announces the anticipated allocations to EBID farmers in terms of ac-ft/acre. EBID must also limit diversions at Perchas, Leasburg and Mesilla dams based on the storage available for release from Elephant Butte and Caballo reservoirs. EBID must make certain that sufficient water will be available to provide Project water to downstream users in Texas and Mexico. At the end of the water year, if there is unused water, it is allowed to remain in storage for reallocation the following year.

Irrigation water demands in EBID are based on crop consumptive use or crop evapo-transpiration. Factors that affect demand for water in the District include the cropping patterns and associated length of the growing seasons, the weather and the effective rainfall for each crop.

Environmental Demands

Currently, the demand value for the environment has not been adequately or accurately determined. This is an important consideration for planning within the region and studies are currently being conducted to assess the amount of water that is used for the environment and how much will be needed in the future.

Evapotranspiration by "desired" and "undesired" riparian vegetation is implicitly included in the river efficiency (diversion/release), since it is one of the loss terms in the river. While explicit quantification of the evapotranspiration by riparian vegetation in the river reach from Caballo to the Texas state line has not been performed, some general information has been developed from research in the Middle Rio Grande.

Ground-Water Demand

Within the Plan area, there is a significant tie between the surface-water system of the Rio Grande and ground-water supplies that generally results in recharge of the underlying ground-water aquifer system. Ground water is used in categories of demands in the region including irrigation. Irrigation represents the first and largest source of demand followed by municipal requirements, small public water supplies and industrial and commercial demands in the Region. Present uses of ground water include:

- Public Water Supply – Diversions for small community and municipal water supply uses.
- Domestic Use – Private domestic wells.
- Industrial – Metered industrial uses.
- Commercial – Metered commercial uses.

- Irrigated Agriculture – Surface and ground-water diversions and depletions.
- Livestock – Based on type and total number of animals.
- Mining – Sand, gravel and rock quarries.
- Power – Cooling towers.

Domestic Wells

Domestic wells serve single family or multiple housing units as long as the total demand does not exceed 3 ac-ft. If more than 25 occupants are served, the supply is classified as a public water system. Water from domestic wells is used for drinking, food preparations, bathing, washing clothes and dishes, flushing toilets and watering lawns and gardens.

Industrial

Industrial uses of water are met by diversions from ground water. The Office of the State Engineer (OSE) identifies twenty-five industrial wells in the Region.

Commercial

Commercial uses within the planning region include agricultural product processing, institutions, business, campgrounds, picnic areas and visitors centers.

Irrigated Agriculture

Agriculture uses ground water to irrigate crops, process agricultural products, clean facilities and provide cooling water. The OSE lists 1,738 wells used for irrigation. Wells used for irrigation purposes fall under three categories:

- Provide supplemental water to EBID lands during years when a full surface supply is not provided.
- Provide additional irrigation water beyond that available from the EBID, even in years of full supply.
- Provide irrigation water for crops where ground water is the only source of supply

Livestock

The majority of livestock demands in the planning region depend on ground water. Only one percent of water for livestock is obtained from surface water. OSE lists one hundred and forty wells in planning region as sources of water for livestock.

Mining

Mining in the planning region includes sand and gravel operations, rock quarries and the mining of volcanic materials. According to OSE, 60 wells serve the mining demands.

Power

There is one power generation facility in the Planning Region and it is owned and operated by El Paso Electric. The power generation facility is located near Sunland Park, in the southern part of Doña Ana County. The water requirement for the power generation is approximately 3,500 acre feet-per year.

Public Water Supply

Water demands for public water supplies include those exerted by water utilities, both publicly or privately owned, have at least 15 service connections or that regularly serve an average of at least 25 individuals daily at least 60 days out of the year. Most of the public water supplies in the planning region serve a relatively small number of connections where uses are limited to household and garden purposes. Public water supplies also provide water for parks, playing fields, golf courses and recreational activities.

Per capita water withdrawal rates vary from just over 70 gallons per capita per day (GPCD) to 255 GPCD. The over-inflated water use figure occurs in the White Sands Missile Range water system and are due to the influx of non-resident populations during the working hours. The average person in the planning region consumes 182 GPCD.

Population Projections to 2040

Population projections for the incorporated and the unincorporated communities of the planning region are complex. Three different growth rates; medium, high, and low have been developed to provide the possible variability for the projections.

A regression model was used to extend the historic census data to provide population estimates at ten (10) year intervals. The model used is provided by Peach and Williams and assumes that population growth-rates are related to the economic growth-rate of the region, migration, and natural growth-rates of the population.

PROJECTED POPULATIONS FOR 2000 TO 2040					
Growth Scenario	**2000**	**2010**	**2020**	**2030**	**2040**
Medium	189,436	243,425	288,458	341,822	405,060
High	189,436	266,252	336,809	426,063	538,970
Low	189,436	220,692	235,037	250,314	266,585

Total and Projected Demand

The current diversions within the Planning Region total 494,307 ac-ft. Approximately 24 percent of the total diversions are from ground water, and about 76 percent are from surface-water supplies. Irrigated agriculture accounts for the majority of the diversions within the Region (90%), and public water systems use about 7 percent. The following table summarizes the projected water diversions, in 10-year increments, in the Planning Region.

PROJECTED DEMANDS FOR 2000 TO 2040 (AFY)					
Category	**2000**	**2010**	**2020**	**2030**	**2040**
Public/Public Water Supply	35,000	47,000 to 56,000	50,000 to 70,000	53,000 to 88,000	57,000 to 110,000
Irrigated Agriculture	446,500	446,500	446,500	446,500	446,500
Livestock	4,500	4,500	4,500	4,500	4,500
Commercial, Industrial and Mining	6,500	7,000	7,500	8,000	8,500
Power	2,500	2,500	2,500	2,500	2,500
Environment[1]	25,000 to 90,000	25,000 to 90,000	25,000 to 90,000	25,000 to 90,000	25,000 to 90,000
Total[2]	**495,000**	**507,500 to 516,500**	**511,000 to 521,000**	**514,500 to 549,500**	**519,000 to 572,000**

[1] This is for a full supply year, when the river runs all irrigation season and does not constitute an appropriation of a water right.
[2] Total does not include the demand for the environment.

For the planning horizon of 2000 to 2040, water use in the Planning Region may grow from approximately 495,000 ac-ft/yr to almost 572,000 ac-ft/yr.

WATER PLAN ALTERNATIVES

The water supply available to the region in meeting future water demand must consider both the surface water (Rio Grande) and the groundwater in storage in the groundwater basins (Rincon Valley, Mesilla, Jornada del Muerto and Hueco). The annual supply of surface water in the Planning Region is extremely variable as documented in section 6.1.1. Additionally, the groundwater supplies in the Jornada and Hueco basins are essentially a fixed amount (e.g., annual recharge to these basins is very low) and any withdrawal above this recharge amount will basically mine the groundwater supply. The Rincon Valley and Mesilla groundwater basins are interconnected to the Rio Grande, which has historically and fortunately been able to recharge these basins in years of above-normal flows. However, if groundwater development expands much above the current levels, the Rio Grande will not be able to continue replenishing the groundwater and this will result in groundwater mining in the Rincon Valley and Mesilla basins. Since the river cannot be isolated from the Rincon Valley and Mesilla basins, it will continue to replenish the basins, which in-effect robs the river of water. This is water that should be in-stream flow for local agricultural users as well as meeting Compact delivery obligations to Texas users and the Mexican Treaty water users.

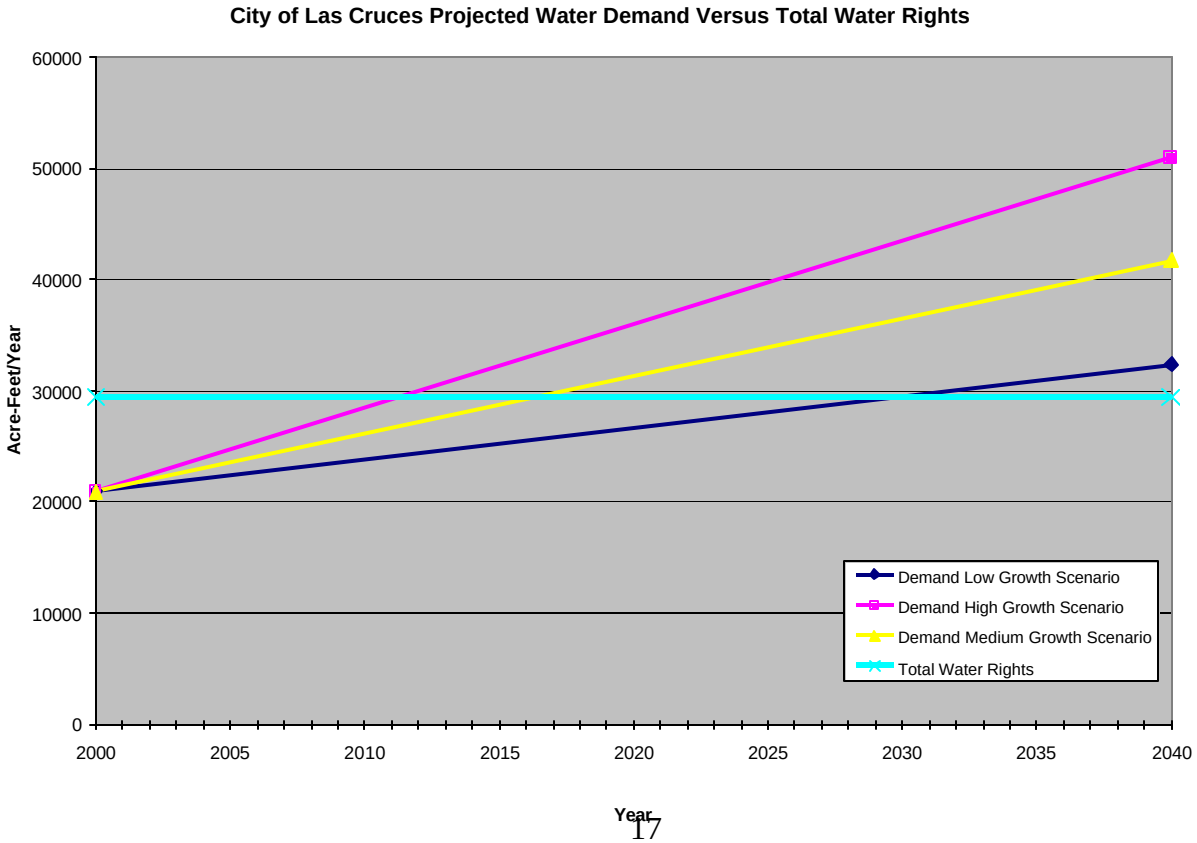
The Mesilla and Hueco bolson aquifers are both shared by New Mexico, Texas, and the Republic of Mexico. This fact generates a great deal of uncertainty relative to the long-term management and viability of the aquifers. Mexico and El Paso are by far the largest users of the Hueco, and their extensive withdrawals have mined the aquifer significantly. In Mexico, uses of the Hueco bolson include irrigation and as the primary source of water for Ciudad Juarez. In El Paso, the Hueco has provided a major part of the City's municipal and industrial supply. While estimates vary, it is clear that the long-term viability of the Hueco bolson is poor, with declining water levels and declining water quality already presenting problems for these two areas. Both will have to look elsewhere for water to support their current and future needs, and while surface water will take much of the burden previously shouldered by the Hueco, periods of drought require a groundwater reserve, and El Paso and Mexico will both turn to the Mesilla basin.

The water managers and water right holders in the region have recognized these facts and this Plan is developed so that the best solutions can be found that will allow for continued growth and development without exhausting a critical resource. Conjunctive management of both surface and ground water is essential. Likewise inter-temporal management will be required to

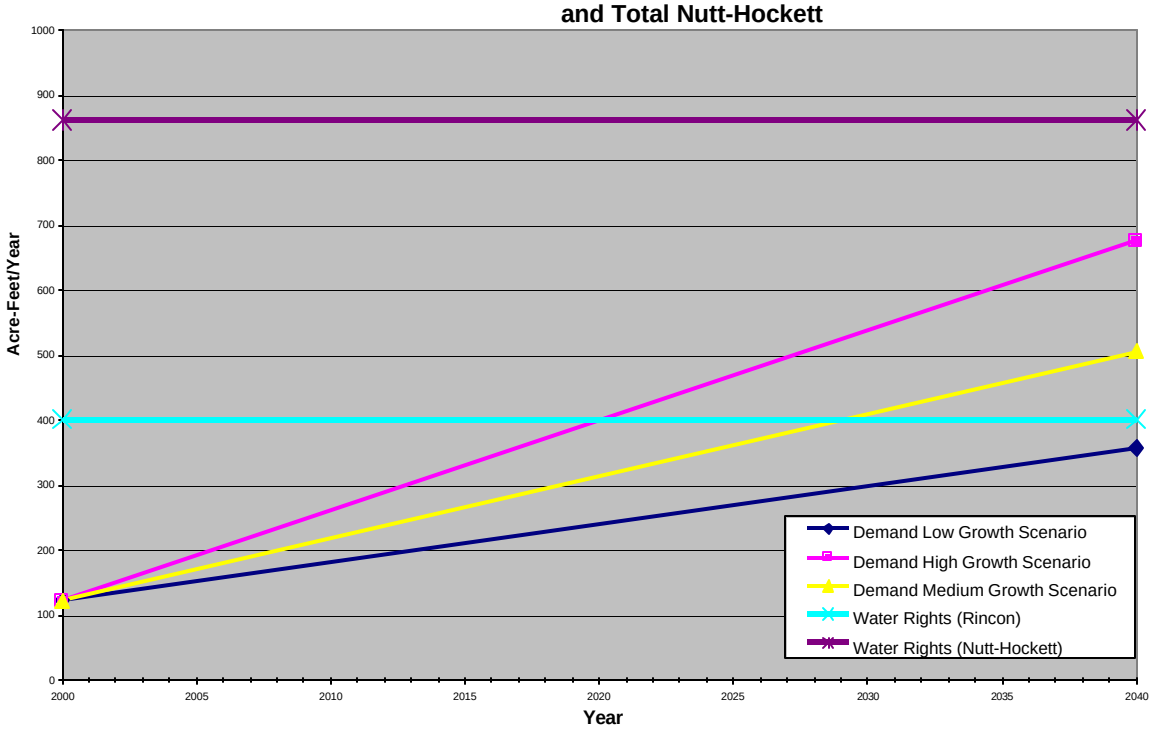
deal will shortages due to drought and to take advantage of excess supplies. These strategies are discussed in the following sections.

Comparison of Water Rights versus Demand

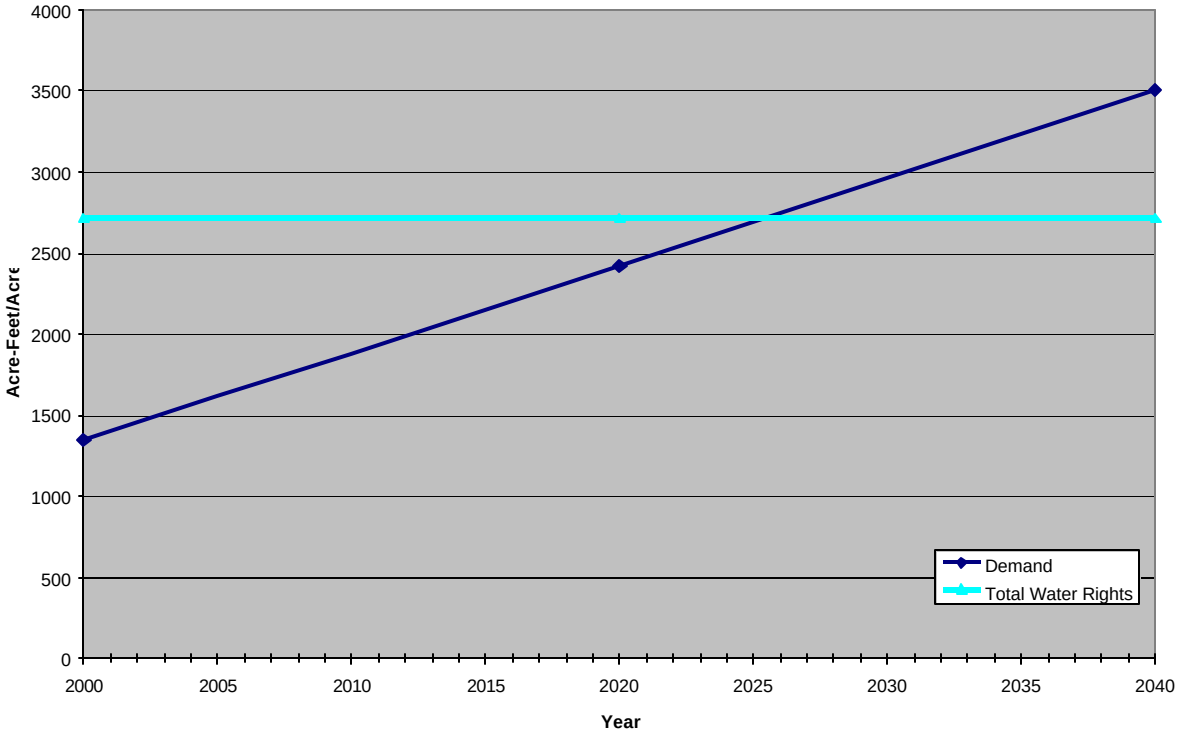
Projected water demands, through the year 2040, for the Low, Medium and High growth scenarios versus the total water rights for City of Las Cruces, Village of Hatch and Doña Ana Mutual Domestic Water Consumers Association (estimated total users only) are shown in the following graphs of the project water demands. The City of Las Cruces' demand for water will exceed their total water rights (for both the Mesilla and Jornada del Muerto basins) by the year 2012 for the high growth scenario, by the year 2016 for the medium growth scenario and by the year 2030 under the low growth scenario. The Village of Hatch will exceed their total water rights for the Rincon Basin by the year 2020 for the high growth scenario, by the year 2029 for the medium growth scenario and after the year 2040 under the low growth scenario. However, based on the projections, the Village of Hatch will not exceed its total water rights for both the Rincon and the Nutt-Hockett by 2040. Based on the estimated total water users, the Doña Ana Mutual Domestic Water Consumers Association will exceed their total water rights by the year 2025.



Village of Hatch Projected Water Demand Versus Total Rincon Water Rights and Total Nutt-Hockett



Dona Ana Mutual Domestic Water Consumers Association Projected Water Demand Versus Total Water Rights



Water Management Alternatives

The water resources in the region may be extended with proper management tools. These tools include educational, institutional and governmental programs, which protect and enhance the water resources in the Region. Some suggested water management alternatives are:

- Public education
- Water conservation
- Reuse

Public Education/ Awareness

Proper management begins with public education. An effective conservation measure is education and awareness training. An educational campaign aimed at water conservation and supply protection could extend water supplies within the planning region. Education goals would include:

- Making the public aware of the value of water
- Emphasize that rainfall is low in the region, and
- Emphasize that we are depleting potable water resources.

Water Conservation

The development of water conservation plans within the communities and the use of reclaimed water on areas such as parks, golf courses and other green spaces would also help with conservation goals and lower the use of potable water for these green areas. Reduction of industrial and commercial water demands can be accomplished with little capital investment and without reducing the competitive position of the product. The most cost-effective method of conservation would be the reuse of water in the production process, this is called waste minimization.

Suggested agricultural conservation alternatives found in King, J. P. and J. Maitland, 2003, Water for River Restoration: Potential for Collaboration between Agricultural and Environmental Water Users in the Rio Grande Project Area, Report prepared for Chihuahuan Desert Program, pages 108 to 126, include:

- Metering- quantification of the benefit of conservation measures

- Laser Leveling- enhanced surface irrigation efficiency by precision-grading fields using laser leveling equipment.
- Pressurized Irrigation (Drip and Sprinkler)- increased efficiency, lower labor requirements, ability to irrigate on uneven land, and potential improvements in yield and quality.
- High Flow Turnouts- rapid and efficient water flow across the irrigated field by pushing the advancing water without eroding the field.
- Low Water Use Crops- identify low water use crops new to the area with the benefits of low market risk and low management levels.
- Deficit Irrigation- apply less water during irrigation than is required or delay irrigation until some moisture stress has occurred.
- Cultural Practices- develop cultural practices to improve irrigation efficiency and manage deficit irrigation.
- Canal Lining- line irrigation canals to reduce seepage.
- Rates and Rate Structures- modify the rate structure to encourage reduction in water use.
- Charges to Constituents- charge for diversions and deliveries.
- Release Management to Maximize System Efficiency- start releases from Caballo later than in full supply years.

Reclaimed Water/ Reuse

Treated wastewater effluent could also be reclaimed and used on green spaces to offset the use of potable water. New regulations on reclaimed water quality have been proposed by NMED, and require the additional treatment of reclaimed water beyond the conventional secondary wastewater treatment, this further eliminate pathogens and bacteria from the water and make the reclaimed water safe for unrestricted uses.

Water Development Alternatives

Whereas the Water Management Alternatives outline managerial methods to extend the life of the supply, the following Water Development Alternatives actually create additional "wet water" for the Region. Potential Alternatives for the planning region include, but are not limited

to the following, (please refer to section 8.2.2 for a complete list of water development alternatives):

- Watershed Management
- Desalination
- Underground Aquifer Storage and Recovery (ASR)
- Residential/ Commercial Water Conservation
- Leasing of Agricultural Water Use to Municipal, Industrial (M&I) and Environmental Use
- Surface-Water Capture
- Importation of Water

Water Shed Management

Watershed management involves methods to improve the quantity and/or quality of the water within an area. For example, the thinning or removal of invasive plant species along the Rio Grande and the reduction of the mesquite could increase recharge to the upper aquifer layers.

Desalination

Desalination of brackish ground water has been an economical technology as water becomes scarce. The use of desalination could help tap the deeper, brackish aquifers in the planning region. The pumping of deeper aquifers would also have less effect on the Rio Grande. The cost of desalination is proportional to the levels of TDS and increases with TDS levels above 10,000 mg/L.

ASR

ASR refers to taking water from the surface and injecting it into an aquifer for storage. The water is then withdrawn at a later date for use. ASR allows for large amount of water to be stored without evaporation losses or the needs for surface lakes or tanks. It replenishes areas where declines in ground water are severe. Sources of injection water include treated wastewater, storm-water runoff, excess EBID water, and treated surface water from agricultural users. Treated wastewater from municipalities would be re-injected up gradient from well fields to reduce ground-water drawdown. The State of New Mexico promulgated rules that allow

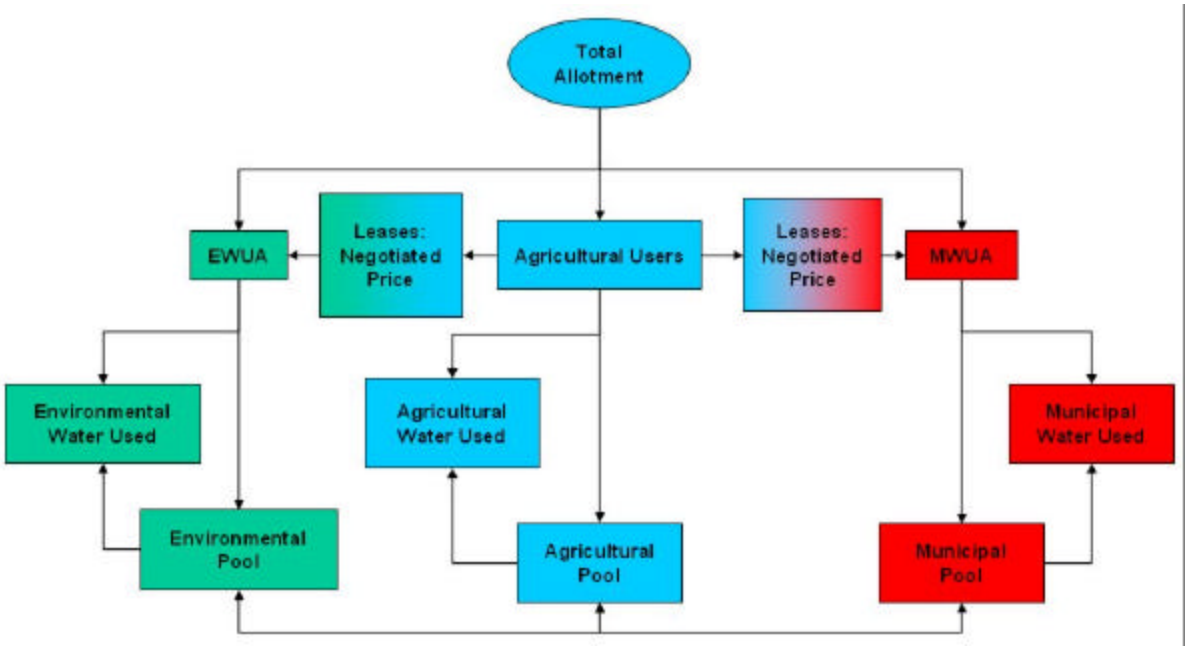
municipalities and other governmental entities to store water in underground aquifers for later recovery.

Flood control facilities may also be used as an aquifer recharge. Detention ponds and spreading basins (french drains), can be used for storm-water control and the percolation of flood waters. This process would recharge ground water in shallow aquifers.

Leasing of Agricultural Water Use to Municipal, Industrial (M&I) and Environmental Use

The EBID is establishing a water lease/transfer program where member municipalities may lease EBID water for municipal use. This lease program could defer water rights from a water-righted land and lease it to other lands within EBID boundaries. At present, all water managed by EBID is delivered to agricultural users. The creation of the Special Water Users Associations (SWUA) was due to the recognition by EBID and the New Mexico State Legislature of the need for a surface-water supply for municipal growth within the EBID service area. The SWUA concept is an EBID board approved policy that sets several rules for the use of water for municipal purposes. It was created to maintain equity among EBID water users, maintain consistency with EBID policies and statutory obligations, and to maintain the hydrologic health of the system.

SWUAs can provide a model for the development of a policy on environmental water use. In fact, this type of use co uld be classified as a specific type of SWUA. While there are many issues to address, a starting point for negotiations between irrigators and environmentalists could be a policy mirroring that for SWUAs. Allowing Environmental Water Users Associations (EWUAs) to acquire water through purchase, lease, or from transfer through an environmental pool would provide access to surface water for restoration activities through the market or by donation.



Storm-water Capture

Storm-water capture is the idea of impounding and diverting storm-water run off from the mountain areas, before it enters the ground water and becomes more mineralized. The construction of dams and diversion structures would be required.

Importation of Water

The importation of water from other areas outside the planning region could be used in conjunction with an ASR program, or immediate drought use. Potential areas of importation include: Gila River Central Arizona Project, Nutt-Hockett Basin, and the Salt Basin. It should be noted that importation of water from neighboring regions is not expected to provide a continuous or substantial portion of the needs of this region and would be expensive and difficult to implement. Thus, importation of any water is expected to only contribute to inter-regional emergency supply programs.

Recommendations

Water Management Alternatives

Water Management Alternatives for the Planning Region include water conservation and public education and a Region-wide public educational and water conservation programs should

be developed. The following Water Management Alternatives are recommended to provide the additional water supply needed for the planning period, by basin.

Water Development Alternatives

Mesilla-Rincon Basin

Water Development Alternatives include watershed management through the removal of high water use invasive vegetation along the Rio Grande, storm-water capture, and ASR. The EBID water lease program, in conjunction with the El Paso-Las Cruces Sustainable Water Project will be used as the basis to convert surface water currently used to meet agricultural demands to municipal and industrial uses by the communities of Hatch, Salem/Ogaz, Garfield, Rincon, Doña Ana, City of Las Cruces, Anthony (NM), Berino, Chamberino, Vado and Las Mesa and for environmental demands.

A reclaimed water program should be developed by NMSU for golf course and turf irrigation. The City of Las Cruces should use reclaimed water on parks, school playing fields and golf courses (Sonoma Ranch and Las Cruces Country Club). The La Mesa WWTP can provide reclaimed water to green spaces in the area. These reclaimed water use alternatives will require significant financial investments for the necessary infrastructure. Water metering has been implemented in some areas where participating entities have the authority to do so; however, there is a need for a comprehensive metering program throughout the basin.

Jornada Basin

The Water Development Alternatives include additional ground-water use by the City of Las Cruces, storm-water capture, ASR and, at some point in the future, desalination of deeper brackish ground water may be required. Waste water reclamation and re-use is also recommended for the public schools with large turf irrigation requirements.

Hueco Bolson

The Water Development Alternatives include desalination of deeper brackish ground water; storm-water capture, ASR and importation of Salt Basin water for aquifer recharge. Waste water reclamation and re-use is also recommended for turf irrigation requirements on public properties. Retirement of some agricultural water rights, and their conversion to municipal use may also be considered. Importation of Rio Grande water is not considered feasible.