Future of Irrigated Agriculture and the Transfer of Irrigation Use

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I. The Setting - Where Are We?

A. INTRODUCTION

To attempt to understand or predict the future of irrigated agriculture is a very challenging topic. To begin with, we must have an idea of where we are at this point in time, and consider some basic realities regarding agriculture in Texas, nationally and from a global perspective because Texas agricultural is influenced by agricultural production and consumption worldwide. The second part of the topic in this panel discussion assumes that wherever we are, it may be necessary to transfer existing water supply from agricultural use to municipal use (potable water for drinking) or industrial and manufacturing uses. This contemplates the economics of the conversion of agricultural water to other uses due to population growth and industrial development that has and is occurring in Texas and elsewhere.

B. REALITIES OF OUR TIME

The reality is that water is essential to human life. This is necessary before one can experience life. But, at the same time desire a lifestyle based upon the infrastructure available to us when we have necessary water supplies. Clearly, food is essential to this equation.

Keeping these realities in mind, we must look first to the availability of water, which is essential to all of us. In this respect, we must realize that there is a **definite** and fixed amount of water available to us. This means that there is only a set amount of water that is available for use worldwide. This fixed amount unfortunately, is specific to each geographic region and the amount of water available for human needs,

industrial, and environmental purposes is limited to the particular aspects of a region's geography and hydrology. It is called the "hydrological cycle." As Justice Wilson noted in his dissent, in *City of Corpus Christi v. City of Pleasanton*, 154 Tex. 289, 276 S.W.2d 798 (Tex. S.Ct. 1959) joined by Justices Griffin and Colvert, where he stated as follows:

> *"The movement of water from the ocean through clouds to fall on land as rain and its trip back to the ocean is called the hydrological cycle. It is not within the power of man to destroy water in any appreciable quantities but only to divert and control water as it flows toward the ocean."*

What this means is that in any one region in this state, in combination with other states or countries, there is only so much water that will be available for use for all purposes.

In Texas, similar to any other region, or in any state or country, available water supply is made up of surface and groundwater. The United States' Geological Survey estimated in 1986 that groundwater is a source of nearly 40% of all stream flows in rivers and streams in the United States. [1]

So, over 25 years ago, on a national basis, 40% of the groundwater supply represented stream flow in rivers and streams in the United States available for use as surface water and the remaining 60% of groundwater in the United States was available for use as groundwater. Forty percent (40%) of this groundwater in rivers and streams for use. It is supplemented by rainfall runoff (which is increased by the use of reservoirs which captures water for later use before it enters the Gulf of Mexico in Texas) which is available as surface water. Experience indicates that there will be less dams and reservoirs in Texas in the foreseeable future. Stream flow is dependent upon groundwater flowing (springs, etc.) into rivers and streams plus rainfall (run off or diffused waters). What this means is that if we are to manage the available fixed amount of water supply, both groundwater and surface water must be managed conjunctively taking into account the property right aspects held by those having a legal right to make use of it.

To bring this to a "Texas perspective," it was noted in 1995 that "Twenty-nine aquifers underlie eighty-one percent of the State . . . groundwater sources supplied fifty-six percent of all water used in the State, including sixty-nine percent of agricultural needs and forty-one percent of municipal needs" [2]

[1] David W. Woody, et al., *National Summary 1986, U.S. Geological Survey, Water Survey Paper No. 2325, 3* (1988).

There are more current and recent estimates of these amounts of groundwater and surface water available in the State. But these numbers suggests the relative relationship between these sources of water supply in the State. The amount of use made by agricultural needs and municipal needs has also changed. In the last half of the 20th century, about 90% of available water was used for agriculture and the remaining 10% for municipal and other needs. These percentages have also changed. A trend is developing of less available water supply for agricultural use because these percentages are rapidly changing due to population growth and industrial development.

Keeping in mind these realities of water supply, it was noted in dealing with irrigation management in terms of irrigation water needed for the production of food from a global perspective that:

> *"The water crisis is mainly a crisis of governance. Working towards effective water governance requires an enabling environment and appropriate institutional structures that allow stakeholders to work together for effective water management." (Global Water Partnership, Towards Water Security; a Framework for Action 2000)* See, *www.fao.org/nr/water/topics irrig conf overview.htm*

In reference to the needs for irrigated agriculture and food security for the world, it has been noted that:

> *"The central challenge facing irrigated agriculture today and in the foreseeable future is* ***how to produce more food and farmer income with less water****. With an increase of 90 million people per year, it is expected that by the year 2025 world population will reach eight billion people! Between now and then, approximately* ***80 percent of the additional food supply needed to serve the growing requirement will have to be produced on land served by irrigation****. With growing competition for water . . . (it is) . . . estimate(d) that only 12% more water can be made available for these food requirements. This can only be achieved by more productive and intensive agriculture and more productive and effective water use."* OVERVIEW PAPER: IRRIGATION MANAGEMENT TRANSFER, SHARING LESSONS FROM GLOBAL EXPERIENCE (JUNE 2001), *www.fao.org//nr/water/topics irrig conf overview.html*

This report indicates that in developing countries, about 70% of accessible fresh water, either groundwater or surface water, is used for agriculture. This is similar to the current percentages in Texas, which has declined from over 90% in the 1900's to approximately 70% currently. Since our total supply of water exists

[2] *Sipriano v. Great Spring Waters of America, Inc*., 1 S.W.3d 75, at 80, citing John B. Ashworth and Janie Hopkins, Aquifers of Texas, Texas Water Development Board Report 345 at 1 (Nov. 1995).

in rivers or aquifers, and can not be expanded because of the hydrological cycle resulting in a fixed maximum amount of water supply available for use in a region, this means that the trend is:

(1) Rising competition for scarce water,

(2) Rising pressures to use water much more efficiently and productively, and

(3) Rising socio-economic pressures to define water rights more clearly.

This seems to be consistent with the realities in Texas. That is, we have more competition for a scarce water supply, which is moving us to use water more efficiently and productively (water conservation), and a rising socio-economic pressure to define water rights more clearly.

In Texas, water rights to surface waters, through the adjudication process, have been defined more clearly. However, rights to groundwater has become more controversial for many reasons beyond the scope of this paper. Texas has not clearly adjudicated or defined rights to groundwater so that conjunctively both surface water and groundwater can be properly managed over the State to provide a necessary water supply for all needs in the State. In so stating, we must keep in mind various vested property rights interests involved in the overall legal structure of water rights in the State.

An emerging issue not yet confronted in Texas, based upon the availability of more technical information and legal principles, is the conflict of vested property rights between surface water rights and groundwater rights. That is the issue of what happens when a conflict develops between a groundwater user and a surface water user when it can be shown that the use of one is adversely impaired by the other's use of water under their respective rights. This is an issue that will be confronted at some point in time, but which is beyond the scope of this paper. [3]

II. What We Are Doing

Rights to surface water in the State has now been adjudicated and at least defined as much as is possible so that these waters can be better managed. In some areas, there are Watermasters who can enforce use of water based upon adjudicated water rights, which define those rights in a more manageable way. An area with a

[3]See, *The Legal Interface and Reconciliation of Ground and Surface Water Law in Texas* by the writer presented at this conference in May 2006 in San Antonio, Texas, Ch. 6.

Watermaster is the Rio Grande below Fort Quitman, Texas, below El Paso, which will be reviewed as an example of what is occurring with agriculture use surface water and the area above Fort Quitman, Texas in the El Paso far west Texas area where conjunctive use of surface and groundwater is involved.

A. SURFACE WATER RIGHTS - A Case Study on the Lower and Middle Rio Grande - a Large Agricultural Area - Conversion of Irrigation Rights to Municipal and Industrial Rights, Legislation and Marketing

Regions along the Rio Grande in Texas have experienced rapid population growth, a rise in retail, industrial, and services with a resultant need for additional water supplies. In the past two decades this growth has increased at a rapid rate. The developed land areas were once agricultural lands developed in the early 1900s for agricultural purposes. Water rights were obtained for these agricultural uses when there was less need for municipal and industrial water. At the time of the Adjudication in the 1960's in the Lower Rio Grande and 1970's in the Middle Rio Grande, there were irrigation claims adjudicated to over 800,000 acres. Agricultural use amounted to more than 90% of the adjudicated water supply. As a result, most all of the Rio Grande water supply was appropriated (over appropriated) for agricultural use. Population growth with resultant urbanization of agricultural lands has changed the dynamics of water supply demand.

Population in the Middle and Lower Rio Grande region in Texas (below Amistad Reservoir in the Del Rio area) increased from approximately 400,000 in 1950 to over 1.62 million in 2010 with much of this increase occurring after 1970. Population is projected to increase to 3.94 million by 2060. During the period from 1970, soon after adjudication was made final in the Supreme Court, through 1990, six of the 31 fastest growing counties in Texas were within this Rio Grande region, and now some are the fastest growing areas in the United States. There is also tremendous growth in the El Paso area in the Upper Rio Grande in Texas, and continued growth in the Middle Rio Grande reach principally in the cities of Laredo and Eagle Pass and in the Lower Rio Grande or the Rio Grande Valley area.

The population distribution in the Lower Rio Grande is concentrated in the Rio Grande Valley area (principally, Cameron, Hidalgo, Willacy and Starr Counties), and in the Middle Rio Grande area principally, Webb and Maverick Counties (Laredo and Eagle Pass). In 2010, the combined population of the Valley

counties was 1.23 million or 75% of the region's total population. It is projected that the population in Cameron and Hidalgo Counties only, by the year 2060 will be over 2.9 million. Webb County (Laredo) likewise, has over 250,000 in 2010 with a projected population of over 725,000 in 2060 and Maverick County (Eagle Pass) now over 58,000 to near 100,000 in 2060. *Rio Grande Regional Water Planning Group* (Texas Water Development Board), Rio Grande Regional Water Plan, Region M, 2010 (Pgs. 2-5).

This population growth and urbanization of previous agricultural lands caused pressure for the conversion of irrigation water rights to municipal and industrial use rights.

The 2010 Regional Water Plan identified shortages of supply in all use areas. In agricultural use no strategy would offset shortage, but could be reduced by conservation projects. As to municipal and industrial use waters recommended water management strategies to overcome these shortages includes water conservation, desalinization, and the voluntary transfer and conversion of agricultural rights to municipal use water rights since much of the population growth involves the subdivision of lands which were previously under irrigation.

The continued growth and need for municipal and industrial waters, have brought about calls for the transfer of water from traditional agricultural use to meet the new demands for municipal and industrial purposes. This has raised challenges and conflicts between agricultural and municipal use interests in how these water rights will be converted from one use to the other.

This pressure led to active water marketing and a statute passed in 2007 pertaining to the Lower Rio Grande reach which provides a mechanism for the conversion of agricultural rights held by water districts to municipal use and transfer to municipal suppliers.

(1) Background

It is necessary to generally define the water rights regime on the Rio Grande in Texas to understand the issues discussed in this paper. The River flows over 1200 miles from its head waters in Colorado to the Gulf of Mexico. The entire Rio Grande Basin has been divided by politics and needs of the time into two segments. When looking at the entire Rio Grande Basin as a whole, the term "Upper Reach" is the segment of the River from its head waters in the San Juan range of the Rocky Mountains in Southern Colorado through central New

Mexico to Fort Quitman, Texas, about 90 miles downstream of El Paso, Texas. This is the reach of the River involving far west Texas discussed below.

The "Lower Reach" is that portion of the River from Fort Quitman, Texas downstream to the Gulf of Mexico. The water in the Upper Reach is all from tributary sources in the United States whereas in the Lower Reach the majority of the flows derive from Mexico. Flows in the Lower Reach historically were mixed waters composed of United States flows from the Upper Reach, substantial inflows of water from several Mexican tributaries, and water from the Texas tributaries consisting mainly of the Pecos and Devils Rivers. Fort Quitman, Texas, is the important geographic dividing point on the Rio Grande because it is also the dividing point between the U.S., and Mexico international water rights. Upstream of Fort Quitman is controlled by the 1906 Convention, and downstream by the 1944 Treaty between the two countries. The ramifications of the impact of this circumstance is beyond the scope of this paper.

The Lower Reach in Texas has been further subdivided by custom, law, rules, and regulations into three separate segments referred to as the "Upper Rio Grande," being that portion of the River between Fort Quitman, Texas and Amistad Reservoir (near Del Rio, Texas); the "Middle Rio Grande," being that portion of the River between Amistad and Falcon Reservoirs; and the "Lower Rio Grande," being that portion of the Rio Grande downstream from Falcon Reservoir (downstream from Laredo, Texas) to the Gulf of Mexico, which includes an area called the Lower Rio Grande Valley at the southern tip of Texas where the River normally flows into the Gulf of Mexico. This is the area of rapid population growth discussed above. 30 TEX. ADMIN. CODE §303, contain specific rules governing River operations in Lower and Middle Rio Grande.

The legal regime in each reach of the Rio Grande downstream of Fort Quitman, Texas is also unique. The water rights in the Lower Rio Grande below Falcon Reservoir were adjudicated by a District Court in Hidalgo County, Texas, and appellate courts over a twenty year period between 1951 and 1971. The District Court in Hidalgo County initially took judicial custody of the waters in Falcon Reservoir, and established a Watermaster under the direction of the Court while the rights were being adjudicated by the Court. Following the final judgment, the Watermaster's office established by the Court was transferred to the Texas Water Rights Commission (now the TCEQ), and thus began water rights administration on the Lower Rio Grande. *State of*

Texas v. Hidalgo County Water Control and Improvement Dist. No. 18, et al., 443 S.W.2d 728 (writ ref'd. n.r.e.) commonly referred to as the "Valley Water Case."

In the 1970s and early '80s, the water rights in the Middle Rio Grande segment were adjudicated pursuant to the Texas 1967 Adjudication Act (Vernon's Ann. Texas Civil Stat., Texas Water Code, Subchapter G., §§11.376 *et seq*.) The Middle Rio Grande adjudication, although it involved some different legal issues than was involved in the Court adjudication, was blended with the adjudication by the Court in the Valley Water Case with respect to management of the reservoirs. This was done at that time because the Amistad Reservoir was then complete, and a decision was made by the Commission confirmed by the courts that the Amistad and Falcon reservoir systems would be better utilized through coordinated water management as a unit. The legal regime and water management system in the Middle Rio Grande and Lower Rio Grande were blended and managed as a single system.

The Upper Rio Grande segment in Texas was later adjudicated by the Commission, (now the TCEQ). Since there were no reservoirs in this reach of the River from Fort Quitman, Texas to Amistad Reservoir, the water rights were adjudicated as regular "run of the river" water rights. Following the adjudication of these "run of the river rights" in the Upper Rio Grande segment, the Commission enlarged the jurisdiction of the Rio Grande Watermaster to include the Upper Rio Grande. (*See* 30 TEX. ADMIN. CODE, Chapter 303).

These events established the operations of the Rio Grande Watermaster in the three reaches of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico. The rules established in each reach reflect the marked differences between the water rights system in the Middle and Lower Rio Grande segments compared to the "run of the river" system above Amistad in the Upper Rio Grande segment. Water rights in the Middle and Lower Rio Grande are similar to bank accounts because all water is allocated based upon storage in the reservoirs. In contrast, under 30 TEX. ADMIN. CODE §303.23, the distribution of water in the Upper Rio Grande segment is based upon the "prior appropriation system" of first in time is first in right with respect to the exercise of each water rights.

As a result of the unique adjudication and management of the Middle and Lower Rio Grande as a single unit of stored water rights, not based upon the prior appropriation system, all of the adjudicated prior

appropriation water rights above Amistad Reservoir, as a practical matter are senior and superior to the stored water rights in and downstream of Amistad Reservoir to the Gulf of Mexico. In other words, under Texas water law the storage water rights in the Middle and Lower Rio Grande have no priority or right to control use of Rio Grande water by water rights holders in the Upper Rio Grande. As such, the Middle and Lower Rio Grande rights are junior to rights in the Upper Rio Grande, and prior appropriation rights apply only between water rights holders in the Upper Rio Grande.

(2) Conversion of Irrigation Water Rights to Municipal on Urban Lands

As a result of over 20 years of disputes between irrigation water districts and municipal and industrial suppliers in the Rio Grande Valley, which are cities or water supply corporations. The water supply corporations were organized initially to serve rural residents but which, because of the growth in previously rural areas, now serve a large population. These disputes centered around how irrigation rights previously used on farm land now urbanized would be changed to municipal and industrial use.

This conflict resulted in the Texas State Legislature in 2007, passing a statute on the conversion of agricultural rights to municipal use rights. It was based upon a consensus compromise on the issue. It only applies to the Lower Rio Grande but impacts the Middle Rio Grande. The statute sets out a statutory method by which agricultural water rights are converted to municipal use and the terms of the conversion transaction. (Acts 2007, 80th Leg., Ch. 1430, Vernon's Texas Civil Statutes, Water Code, Subchapter O, Sections 49.501, *et seq.*)

This legislation only covers water districts and municipal water suppliers in counties that border the Gulf of Mexico and Mexico or is adjacent to such a county. This basically means the four-county area in the Lower Rio Grande Valley (Cameron, Willacy, Hidalgo and Starr Counties).

When subdivisions are platted and recorded, the municipal water supplier, who will serve the subdivision with potable water, has 2 years in which to petition the water district to (1) convey the water rights associated with the previous farm land now in the subdivision, or (2) contract for the water over a 40-year period for the delivery of the equivalent amount of water.

If the municipal supplier fails to file such a petition within this 2 year period, then after notice to other water suppliers in these counties, other water suppliers in the 4 county area may opt to acquire the rights at the

same terms and conditions as a purchaser from outside the county areas. If no one opts to purchase the rights within 90 days, then the sale may be made to the purchaser located outside the 4 county area. The effect on the Middle Rio Grande and one county in the Lower Rio Grande is that municipal suppliers in the 4 county area have first right to purchase the water rights.

The amount of water rights which are associated with a subdivision is based upon the number of previous irrigated acres within the subdivision and its prorated share of the district's water rights.

The law provides that a district can provide for the water rights out of its existing municipal use water rights or convert the previous irrigation rights of the district to municipal use through an amendment to its water rights as provided by TCEQ rules.

The statute provides that if the water rights are conveyed to the municipal water supplier, that the amount paid to the water district is equivalent to 68% of the prevailing market value of water rights sold in the Lower and Middle Rio Grande determined by the Rio Grande Regional Water Authority based upon the price paid in the last 3 sales transactions of 100 acre feet or more the previous year. If the water is to be delivered on a contractual basis, the law provides for a formula to determine the delivery charge to be paid by the municipal supplier to the water district on an annual basis.

The water district agrees to designate at least 75% of the proceeds from the sale of water rights for capital improvements of the district.

So far no petitions have been filed under this statute. The Authority has reportedly established the market value according to the statute as $2400 per acre foot of municipal use rights after conversion from irrigation rights for the year 2010. Executive Committee Minutes, Rio Grande Regional Water Authority, December 29, 2010, for confirmation at the Authority Board meeting, February 2, 2011.

(3) Water Marketing in the Lower and Middle Rio Grande

This reach of river has experienced a most active water market. In the initial adjudication cases, there were approximately 155,000 acre-feet of adjudicated water rights set aside for domestic, municipal, and industrial use. Currently there are approximately 390,000 acre-feet of municipal and industrial use rights in the region. So, about 235,000 acre feet of agricultural use rights have been converted to municipal and industrial

use rights since the early 1970's - a 40 year period. This increase in the quantity of municipal water rights is the result of the gradual, incremental conversion of irrigation rights to municipal and industrial use through voluntary or market-based transfers by direct sale or transfer or by contract. This trend is expected to continue for the foreseeable future.

A common means of converting irrigation use rights to municipal use rights in the past is the sale and transfer of agricultural rights by individual farmers outside of water districts who are abandoning their agricultural use of land for urban development or restricting their farming operations. Another, is by water districts (who were adjudicated most of agricultural use rights in the adjudication cases) by the conversion of irrigation rights in conjunction with the "exclusion" of non-irrigable land, or land that is urban in nature, from a district's boundary in accordance with applicable exclusion statutes. An irrigation district may, through an arrangement with a municipal supplier convert all or a portion of the water previously used to irrigate the excluded land to municipal use, or the district may retain all or a portion of such water for irrigation use depending upon what is in the best interest of the district. This process is separate and apart from the statute (§ 49.501, et sec., of the Texas Water Code) discussed above. This process leaves the specific terms of the water supply transfer to the parties' agreement.

In the past, some irrigation districts have converted some or all of their irrigation water rights associated with excluded lands to municipal use rights. The water is then supplied to a city or a water supply corporation on a contractual basis. Usually, this involves the district diverting and delivering the water supply for a city or water supply corporation for a specified charge based on a quantity of water delivered, or if delivered by another district, a specified charge for the water supply provided. These types of contracts are typically long term and provide a pre-determined amount of water.

Another method is contractual water rights sales under the TCEQ rules for short term needs. They are in the nature of a "lease" of a specific amount of allocated water. They must comply with restricted rules, such as:

- Sales are allowed only between the same purpose of use of water
- Accounts with existing contract balances cannot sell water from that account until such time as all contract water has been diverted and use.

- Purchased water cannot exceed the total storage amount allowed under the water right.
- Purchased irrigation water is valid only for a 12-month period.
- Purchased municipal water expires the last Saturday of each year.

In summary, these are methods for conversion of agricultural rights through purchase, exclusion through urbanization, and contract. Each method involves the conversion or change of purpose of use from irrigation water rights to municipal water rights, and normally change of place of use and diversion point through the TCEQ amendment process. Since all circumstances surrounding the transfer of water rights are not similar, it is difficult to predict which method is best suited for all interested parties.[4]

Data compiled indicate a market value in the sale of water rights in the range $2000 per acre foot to $2250 per acre foot of municipal and/or industrial use rights with most recent sales at the high end of $2250 per acre foot. However, as noted above, this has increased to $2400 per acre foot as determined by the Rio Grande Regional Water Authority in regards to conversions under the statute discussed above (§49.501 et seq., Texas Water Code). Contract sales of water allocations in specific amounts to be used within a year range from $10 to $50 per acre feet and has been as high as $60 per acre foot for agricultural use in drought years.[5] Municipal use water sales range from $45 to $52 per acre foot, and mining use water (same allocation type as irrigation) has a broad range depending upon demand and nature of transaction.

A recent court case involved the transfer of a total of 8059 acre feet of water per annum with 3 different, but old priority dates, of water rights from the Upper Rio Grande to the Middle Rio Grande with diversion points at or near Presidio, Texas. It involved many complex water rights amendment issues at the TCEQ.

This case[6] is referred to as the "Presidio Case" and represents an example of water marketing and water transfers that have occurred in the region where agricultural water has been converted to municipal use.

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[4]See, *Region M, (Rio Grande) Final Regional Water Plan, TWDB, Chapter 4, 4.5.1* (October 1, 2010).

[5]*See e.g.* Water Strategist, Copyright 2010 by Stratecom, Inc., November 2010 Report, Page 11, *www.waterstrategist.com*

[6]*Brownsville Irrigation District, Bayview Irrigation District, Cameron County Irrigation District No. 6, Hidalgo and Cameron Counties Irrigation District No. 9, and Valley Acres Irrigation District v. Texas Commission on Environmental Quality; Presidio Valley Farms, Inc.; Maverick County; City of Laredo; and City of Eagle Pass Water Works System*, 264 S.W.3d 458 (Tex. App.-

B. SURFACE AND GROUNDWATER - Upper Rio Grande - El Paso and Far West Texas

The region above Fort Quitman, Texas, is a separate and unique region of the Rio Grande in Texas, which is influenced by the River upstream to its head waters in Colorado. As opposed to the Rio Grande below Fort Quitman, Texas, it relies to a great extent, on groundwater supplies. The surface water from the Rio Grande is centered around the U.S. Bureau of Reclamation, Rio Grande project. The estimate of available groundwater supply has changed in the last several years which has resulted in a larger quantity available for use and has enabled the Region to develop a conjunctive use management plan that utilizes groundwater together with surface water in a sustainable manner.

Agriculture, including both the beef industry and irrigated farming, is the most significant economic activity in Far West Texas. The raising of crops in the region requires irrigation, which occurs along the flood plains of the Rio Grande through water districts in the El Paso area and Hudspeth County. Agricultural activities in this region rely on surface water designed to accommodate the intermittent nature of the supply, and in some cases, insufficient water for economical agricultural activity. This means that surface water will be supplemented by groundwater sources or else irrigation activities cease until the River supplies are replenished.

The total projected 2010 water consumptive use in the region is almost 650,000 acre feet. The largest category of use is irrigation where 77% of water use is by agricultural sector in support of irrigation. The remaining use is for municipal use and other purposes.

Austin, August 28, 2008) review denied. Sup. Ct. of Texas, January 9, 2009.

As noted above, this region's population is also expected to increase at rapid rates from an estimated population in 2010 of a total of over 860,000 to over more than 1.5 million in 2060. The largest growth area is the City of El Paso. [7]

The region has adopted far reaching water management strategies to fulfill future water needs in the region, including desalinization and conjunctive use of its available surface water and groundwater supplies. Irrigation water is converted to municipal use in the El Paso area through use of contracts with the irrigation district, El Paso County Water Improvement District No. 1, the U.S. Bureau of Reclamation, and the Lower Valley Water District that allow for conversion of water allocated for irrigation of lands owned or leased by the City into municipal supply. These contracts are in the nature of a forbearance by the landowners of the use of irrigation water and the transfer of water allocated to that land for municipal use purposes.

Currently, this amounts to approximately 60,000 acre feet per year in a full allotment year. Historical hydrologic data during the period 1940 to 2003 shows that 60,000 acre feet per year would be available for municipal use in 39% of the years, and that less than 20,000 acre feet per year would be available in 8% of the years. Thus, surface water is not a reliable stand-along source of municipal water supply. As a result, municipal suppliers must rely on groundwater sources and conjunctive use of ground water and surface water in order to sustain their needs. See *Far West Texas Water Plan (Texas Water Development Board Region E)*, January 2011, Chapter 4, Page 4-20.

Plans in El Paso County contemplates the conversion of additional agricultural use waters to municipal use of approximately 20,000 acre feet per year from the Rio Grande. This will result in the retirement of about 5,000 acres of land from irrigation. This is a result of population growth and economics. Population growth extends into previously irrigated areas, which will account for this reduction. This conversion will be voluntary by lease, sale, or forbearance agreements.

There is also a strategy which will utilize irrigation water rights for 24,000 acres of land in Hudspeth County. Conversion of these water rights would be voluntary as it is believed that due to deterioration of land suitable for agriculture, it is expected that irrigators will find it economically feasible to transfer or sell their land

[7]See *Far West Texas Water Plan (Region E, TWDB)* January 2011, Chapters 1-3.

or water rights. See *Far West Texas Water Plan (Texas Water Development Board Region E)*, January 2011, Chapter 5, Pages 5-2.

Thus, in the Far West Texas region, conversion of irrigation water rights for other uses is contemplated to take care of future municipal needs, however, the Plan includes extensive conjunctive use of Rio Grande and local groundwater and voluntary conversion of use with much of the irrigated farmland having water rights, being urbanized because of population growth.

C. WATER CONSERVATION

It is apparent that conversion of agricultural water rights to municipal use and the need for sustaining agriculture in the State, is challenging. Water conservation in both the agricultural and municipal use of water is becoming more and more an important component in reaching sustainability of both agricultural and municipal needs. This includes all practices, techniques, programs and technologies that will protect water resources, reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling or reuse of water so that a water supply is made available for future or alternative uses. Both the agricultural and municipal sectors must emphasize water conservation.

The Texas Water Development Board and the Texas State Soil and Water Conservation Board jointly conducted a study of ways to improve or expand water conservation efforts in Texas. The results of that study are available in its Joint 2006 Report to the State Legislature.(www.twdb.state.tx.us/publications/reports/TWDBTSSWCB 80th.pdf).

Considerable work is being done regarding agricultural conservation so that the maximum use of water can be made to produce profitable agricultural products. The urbanization of irrigation districts is an example where irrigation techniques such as the use of canal lining casing, replacing open canals with pipelines and remote agricultural water monitoring and control. This is being studied by the Irrigation District Engineering and Assistance Program on the Rio Grande under the Rio Grande Basin Initiative, administered by the Texas Water Resources Institute of Texas A&M University. This information can be reviewed at several websites: *http://idea.tamu.edu*; *http://itc.tamu.edu*, *http://riogrande.tamu.edu*, and further information contained within the Texas Water Development Board website.

Specific activities regarding agricultural water conservation is being conducted under the *Agricultural Water Conservation Demonstration Initiative* along the Lower Rio Grande by the Harlingen Irrigation District. Information regarding this activity and results pertaining to on-farm water conservation can be found at its website: *www.hidcc1.org*. Similar studies and work can also be reviewed with respect to groundwater pertaining to the *Irrigation Assessment Program* conducted by the Higher Plains Water District, headquartered at Lubbock, Texas. Information on these activities can be obtained through its website: *www.hpwd.com*. These are only examples of the work being done and other information is available from many sources involved in agriculture around the State. It is these type of programs and activities which will determine the future of irrigated agriculture in Texas.

III. Conclusion

The realities of the future of irrigated agriculture in Texas is that we only have a fixed amount of water supply either in our streams or as groundwater. These sources of supply are interconnected and must be managed accordingly. The above discussion of the Rio Grande only covers one River basin in the State. It discloses that within one river basin, there is a unique background, culture, and complex rules, customs, and laws. Another reality is that each river basin and aquifer in the State, is unique with a different historical background, culture and customs of use, rules and laws. The future of irrigated agriculture in the State will depend upon dealing with these unique features of each river basin and aquifer, and thoughtful water planning. In regions where agricultural areas are being urbanized, there will be strategies dealing with the conversion of irrigation rights to municipal and industrial rights. Also, the needs of the time and population growth in the State, is causing pressures to move water under existing irrigation water rights or water in undeveloped rivers and aquifers with unused water supply, to other parts of the State to meet the needs of a growing population. Water conservation, conjunctive use of surface water and groundwater, and augmentation will be required to maintain irrigated agriculture in the State and for economic growth, human needs required with a rapidly growing population and the environment. The future of irrigated agriculture will depend upon meeting these challenges and realities in a manner that respects the property rights of existing water rights, is voluntary, and hopefully on a consensus basis.