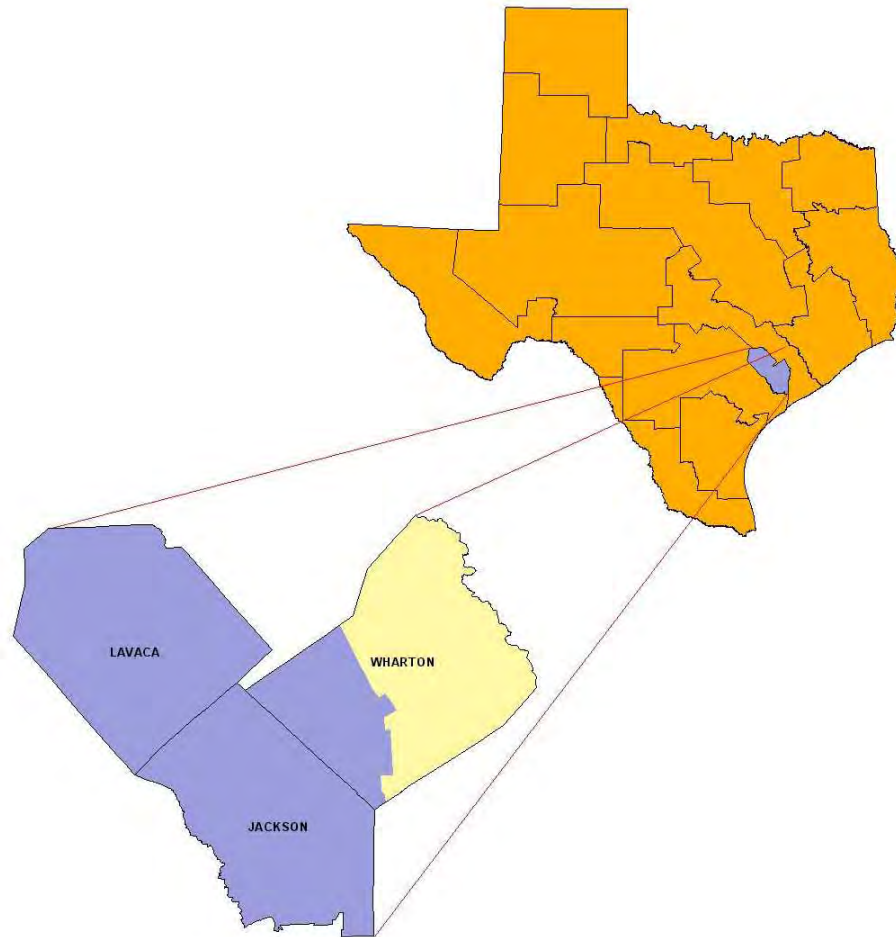


# Lavaca Regional Water Planning Group



## Agricultural Water Demands Analysis

AECOM


April 2009  
AECOM Job No. 60072962

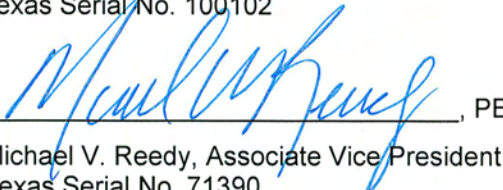
# Agricultural Water Demands Analysis

for

## Lavaca Regional Water Planning Group

Prepared by  
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April 2009  
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# Executive Summary

Agricultural water use within the Lavaca Regional Water Planning Area (LRWPA) is by far the greatest use in the area, with these demands making up more than 90 percent of the total demand in the region. As a result, maintaining reliable and up-to-date estimates of irrigation demands is essential to ensuring a viable water supply for agricultural operations in the future. For this reason, the LRWPA requested and received funding from the Texas Water Development Board (TWDB) for investigation of a changed condition in water demands.

For the 2006 Regional Water Plan (RWP) the LRWPA elected to forego the TWDB baseline irrigation estimates for agriculture and develop a methodology based on local information and experience. This methodology was carried out using a tabular analysis integrating planted acreage, irrigated acreage, water usage rates, and other region-specific information.

Estimates for the current planning round explored in this study utilize a similar region-specific methodology to the 2006 RWP but enhance the process through the use of more current and specific data for determining water demands. Factors considered in demand estimation included crop acreages, irrigation rates, water sources, second crop production, farm policy impacts, and short- and long-term agricultural market projections. Data was obtained from the Farm Service Agency (FSA) regarding crop acreage estimates for each county. Where available, updated information regarding application rates from sources, such as the Coastal Bend Groundwater Conservation District (CBGCD), was applied to these acres to produce a projected water demand for each county. Second crop rice production was also estimated based on FSA data and appropriate irrigation rates to produce a ratoon crop demand. Loss factors were considered for water conveyance and separate demands were determined for both groundwater and surface water irrigated crops. Additional information regarding the development of this methodology can be found in *Appendix A* of the main report. Current estimates for Year 2010 irrigation water demand are shown in *Table ES-1*.

As indicated in the table, rice irrigation accounts for a majority of the projected irrigation demands in the LRWPA, making up 87 percent of total irrigation demands. Rice irrigation is proportionally highest in Lavaca County; while its overall demand is low compared to the other counties in the LRWPA, demand for other crops in the county is very small. Overall regional demand is dominated by Wharton County, which represents the highest irrigation demands for all crops except turfgrass. The LRWPA section of Wharton County makes up 69 percent of total LRWPA agricultural irrigation demand.

A number of factors were considered in viewing how the overall regional water irrigation demand could change over the planning horizon (to Year 2060). These included weather, water source, crop price, production costs, market projections, fuel cost and biofuel demand, and farm policy impacts. It was decided that no one factor indicated a trend of either increasing or decreasing potential for rice production in the LRWPA. No factors point to either the conversion of current rice acreage to other crops or the reversion of land that has transitioned to other uses back to the growth of rice.

**Table ES-1 Summary of LRWPA Projected Demands for Year 2010**

Water Use Category	Total Water Demand (ac-ft)			Percentage of County Irrigation Demand (%)			Region P Total	
	LRWPA Wharton Co.	Jackson Co.	Lavaca Co.	Wharton Co.	Jackson Co.	Lavaca Co.	Water Demand	
							(%)	(ac-ft)
<b>Rice</b>								
GW Source	107,526	51,261	7,848	71.8%	85.7%	93.9%	76.5%	166,634
SW Source	17,572	4,073	429	11.7%	6.8%	5.1%	10.1%	22,074
<b>Total Rice Irrigation</b>	<b>125,097</b>	<b>55,333</b>	<b>8,277</b>	<b>83.6%</b>	<b>92.5%</b>	<b>99.0%</b>	<b>86.6%</b>	<b>188,708</b>
Cotton Irrigated crop	5,262	1,233	3	3.5%	2.1%	0.0%	3.0%	6,498
Corn Irrigated crop	5,399	654	0	3.6%	1.1%	0.0%	2.8%	6,053
Milo Irrigated crop	4,544	0	0	3.0%	0.0%	0.0%	2.1%	4,544
Soybean Irrigated Crop	2,306	0	44	1.5%	0.0%	0.5%	1.1%	2,350
Turfgrass Irrigated Crop	429	1,304	0	0.3%	2.2%	0.0%	0.8%	1,732
<b>Total Crop Irrigation</b>	<b>143,037</b>	<b>58,524</b>	<b>8,324</b>	<b>95.6%</b>	<b>97.9%</b>	<b>99.6%</b>	<b>96.3%</b>	<b>209,885</b>
Waterfowl habitat	2,355	144	33	1.6%	0.2%	0.4%	1.2%	2,531
Aquaculture	4,296	1,133	0	2.9%	1.9%	0.0%	2.5%	5,430
<b>Total Irrigation</b>	<b>149,688</b>	<b>59,801</b>	<b>8,357</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>217,846</b>

A comparison of current 2010 demand estimates to those for previous RWP is shown in *Table ES-2*. Total estimated 2010 demand is similar to the value from the 2006 RWP and several thousand acre-feet lower than the value from the 2001 RWP. While the 2006 RWP had the greatest demands for rice, demands for the remaining crops were generally lower than for the 2001 RWP or the current study. The current study shows water demands in excess of the 2001 and 2006 RWPs for the majority of non-rice crops, with the exceptions being corn and turfgrass. The proportion of estimated total irrigation demands for rice is similar to the 2001 RWP as well. Rice irrigation represents 87 percent of the total irrigation demand while this percentage was found to be 86 and 93 percent in the 2001 and 2006 RWPs, respectively. Correspondingly, there has been an estimated increase in the relative demand for first crop rice. From the 2001 RWP to the present study, first crop rice estimates have increased from 71 to 81 percent of total rice demand (61 to 70 percent of total irrigation demand).

**Table ES-2 Crop Water Demands for 2001 and 2006 RWPs and Current Study**

Crop	2001 RWP (ac-ft)	2006 RWP (ac-ft)	Current (ac-ft)
Aquaculture	0	2,260	5,430
Corn	15,187	2,421	6,053
Cotton	5,832	3,758	6,498
Sorghum	4,077	1,883	4,544



**Table ES-2 cont.**

<b>Crop</b>	<b>2001 RWP (ac-ft)</b>	<b>2006 RWP (ac-ft)</b>	<b>Current (ac-ft)</b>
Soybeans	1,219	338	2,350
Turfgrass	5,750	3,250	1,732
Waterfowl	802	877	2,531
1st Crop Rice			
GW	110,549	141,492	135,153
SW	27,381	15,131	17,340
2nd Crop Rice			
GW	46,430	39,642	31,481
SW	9,583	7,640	4,734
<b>Total</b>	<b>226,810</b>	<b>218,693</b>	<b>217,846</b>

The agricultural irrigation demand estimates presented in this study are subject to influence by a number of different factors. Future fuel and production costs, federal farm policy, and trends in domestic and international commodity markets all have the potential to create shifts in planted acreage and, in turn, water demands. However, as indicated earlier, there is currently no clear indication of either a growth or decline in LRWPA agricultural irrigation demands. For this reason, the estimated 2010 demand projections are recommended for use throughout the planning horizon.

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# Section 1 – Introduction

## 1.1 Need for Agricultural Demand Estimation

Capturing the current magnitude and the potential future magnitude of agricultural irrigation demands within the Lavaca Regional Water Planning Area (LRWPA) is essential to ensure a viable water supply for agricultural operations in the future. This is particularly important given the predominantly agricultural nature of water demands within the region. An estimated 95 percent of the LRWPA water demand is dedicated for agricultural uses, with rice irrigation composing approximately 85 percent of the agricultural demand according to estimates in previous Regional Water Plans (RWPs). Only a small proportion of the total water demand supplies municipal and industrial needs. Lavaca County, while having the largest population as of the Year 2000 Census, had the smallest water demand in the region. As such, estimating the LRWPA's irrigation needs is a key element of the regional water planning process.

While Texas Water Development Board (TWDB) developed baseline water demand estimates for irrigation, these demands were not adopted by LRWPA for the 2006 RWP, which instead elected to use a methodology based on local experience and guidance. In the 2006 RWP, this was performed using a tabular analysis of planted acreage as reported by the National Agricultural Statistics Service (NASS), usage rate as provided based on experience of local growers, and other pertinent factors. For the current planning round, analyses of agricultural demands are performed in a similar manner using updated information where available. The primary factors considered in this estimation of agricultural demands are:

- Planted crop acreage for Year 2000 through Year 2005
- Groundwater/surface water irrigation
- Irrigation rate (acre-feet/acre [ac-ft/ac])
- Second crop production
- Estimated impacts of the Farm Bill and other policy, as available

Information on data sources and detailed discussion of individual input parameters are given in the following sections.

## 1.2 2006 RWP Methodology and Demand Estimates

The 2006 RWP for the LRWPA estimated demands for both irrigation and non-irrigation uses. As shown in *Table ES-1* in the 2006 RWP, total demands in the region for 2010 were estimated at 225,561 acre-feet per year, declining to 206,908 acre-feet per year by 2060. While manufacturing and mining demands were projected to increase, both municipal and irrigation demands were projected to gradually decline. The estimated irrigation usage was found to consistently represent 94 to 95 percent of the total regional demand. For the 2006 RWP, the Lavaca Regional Water Planning Group (LRWPG) did not adopt TWDB baseline irrigation demands, opting instead to use local knowledge and data to develop more accurate demand estimates. Irrigation demand projections were based on 1995 through 2000 NASS data. Irrigation demands were developed by determining the amount of water applied to specific crops along with corresponding acreage. Regional water demands were dominated by rice production, which represented a majority of both agricultural and total demands. Other irrigated crops and non-irrigation uses produced relatively minor demands by comparison.

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## Section 2 – Methodology Development

A meeting of the LRWPG Agricultural Demands Committee was called on January 31, 2008, with the intent of reviewing demand calculations produced in the development for the 2006 RWP and to outline a method for refining the demands for the 2011 RWP. The following points were among the items discussed regarding the methodology to be used for calculating irrigation demands:

The use of surface water sources should be reevaluated due to the increasing cost of groundwater production. Sources of data may include the South Texas Water Master (STWM) and the LCRA Garwood Irrigation Company (Garwood).

The Coastal Bend Groundwater Conservation District (CBGCD) has recorded groundwater usage in extensive detail, including usage for the irrigation of rice and other crops within Wharton County.

Crop acreage from the Farm Service Agency (FSA) provides a reliable data source for crop production that is consistent across the LRWPA counties.

Land available for rice production in the LRWPA is projected to remain constant as much of the land that is suitable for growing other crops (blackland prairie) has already been converted and it is unlikely that this land would be reverted to rice production. The Gulf Coast prairie land is best suited for rice production and will likely remain in rice production throughout the planning horizon.

### 2.1 Presentation and Approval

The methodology utilizing the data sources described above was presented in a public meeting of the LRWPG on February 25, 2008. A packet including a summary of the proposed methodology was provided to 25 local stakeholders and representatives of the FSA and the CBGCD to solicit input on the proposed methods. A list of these invitees, materials provided to them, and meeting minutes are shown in *Appendix A*.

No comments were received regarding the methodology which was then provided to Mr. David Meeseey of the TWDB for agency review. After minor discussion, LRWPG received notice on June 4, 2008, that the methodology had been approved by the TWDB and would be eligible for use in preparing the 2011 RWP. A copy of this letter is provided in *Appendix B*.

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## Section 3 – Data Sources

Determination of agricultural water demands requires the integration of multiple datasets of varying detail and focus. Both the 2001 and 2006 RWPs served as guiding documents in establishing a basic methodology for estimating regional irrigation water demands. This basic methodology was then adapted as necessary to available data. Because the available data takes several forms and has been collected by organizations and agencies with various objectives, care has been taken to integrate all data in a compatible and logical manner.

Rice acreage is provided in two FSA datasets summarized in *Appendix C*. The first included 1993 to 2007 rice acreage by county for all rice-producing counties in the state. The second detailed irrigation practices, crop status (planted, failed, or prevented), and acreages for rice, and a number of other crops in the three LRWPA counties for 2000 through 2007. This data is presented in the appendix as a set of summary tables organized by crop and year for planted acreage. Values given are whole-county only. Any numbers used in the report specifically for the LRWPA portion of Wharton County are adjusted to remove any acreage associated with Region K.

Groundwater usage data was provided by CBGCD for 2005 and 2006 (shown in *Appendix D* in summarized form). Please note that data not used for this study has been omitted for clarity. The 2005 dataset included crop type and groundwater use by month for over 600 individual well permit holders, along with well coordinates. The 2006 dataset contained similar information on a bimonthly basis with the addition of crop acreage. Well latitude and longitude values listed for each permit allowed the dataset to be imported into GIS and trimmed to remove all wells in Wharton County falling outside the LRWPA. While there may be some distortion of values for wells near the eastern regional boundary (due to wells in LRWPA irrigating fields in Region K as well as the opposite), this is expected to be minor and is preferable to scaling total county demand based on a ratio of LRWPA Wharton area to total Wharton County area. Note that CBGCD does not serve Jackson or Lavaca Counties.

Surface water usage was derived from information provided by the STWM and Garwood. The STWM dataset, given in *Appendix E*, listed 2005 through 2007 calls for water (diversion volumes) by month for the seven active water rights that it serves in Jackson, Lavaca, and Wharton Counties. Examination of the TCEQ Water Rights Database confirmed that all seven rights fall within the LRWPA boundary. Garwood provided 1999 through 2005 water usage for their entire service area along with an annual breakdown of irrigated acreage between Regions K and P (*Appendix F*).

A source of meteorological data was required to determine impacts of climate on crop production and irrigation demands. The Lavaca-Navidad River Authority (LNRA) served as the source for rainfall records, with monthly rainfall at Palmetto Bend used to represent precipitation for LRWPA.

Investigation of crop acreage and specific land management practices for rice was also carried out through an analysis of aerial photography. Digital images were examined in a GIS environment to identify and quantify areas associated with rice production and various land management techniques.

Due to the complex factors influencing agricultural production and irrigation water demands, consideration was also given to factors and information sources outside of those detailed above. This includes local input from farmers and water resource managers on agricultural trends, secondary crop production, irrigation practices, and potential impacts of state and federal policy.

All demand estimates rely on these datasets or, where necessary, assume values from the 2006 RWP.

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## Section 4 – Results of Demand Methodology

### 4.1 First Crop Demands

#### 4.1.1 Planted Crop Acreage

Planted crop acreage was taken from FSA records. Due to incomplete information for several crops for 2006-2007, the period of analysis was limited to the years 2000 through 2005. To determine representative acreages for each county, the detailed dataset was sorted by county, year, and crop. Because crop type listings were very specific (grasslands listed by individual species, fish listed by species, corn listed by variety, etc), non-rice crops were grouped into broader categories to simplify data analysis. These categories, along with average acreage by county, are shown in *Table 4-1*. Values given reflect both irrigated and non-irrigated areas and both successfully planted and failed crops as a conservative assumption that crops failed in later stages following the application of water for irrigation. The acreage listed under Wharton County represents the entire county, including the eastern portion in Region K. Subsequent calculations and demand estimates focus on a subset of the acreage found within LRWPA. Prevented planted acreage is excluded. A more detailed set of tables giving irrigated and non-irrigated acreage for each year can be found in *Appendix C-2*. This analysis also excludes a number of food crops (fruits, vegetables, tree nuts, etc) that occupy a negligible amount of irrigated acreage.

**Table 4-1 Average Planted Crop Acreage by County**

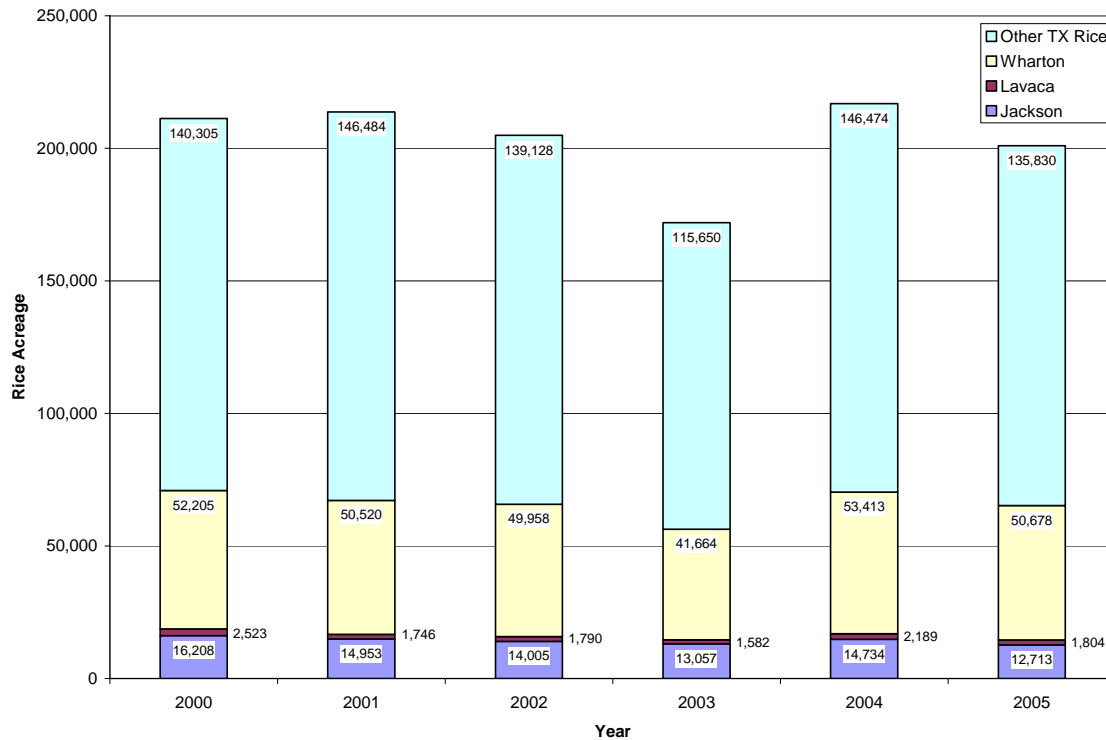
Crop	Average Crop Acreage			
	Jackson	Lavaca	All Wharton	Total
Aquaculture	270	0	650	920
Corn	49,071	5,269	38,544	92,885
Cotton	36,989	25	76,697	113,712
Nursery	0	0	0	0
Pasture/Hay	80,715	75,051	123,493	279,259
Sorghum	26,988	1,789	58,662	87,439
Soybeans	9,620	351	18,673	28,644
Turfgrass	261	0	3,994	4,255
Waterfowl	0	0	0	0

As can be seen from the table, crop acreages tend to be highest for Wharton County, with somewhat smaller totals for Jackson County and relatively little acreage for Lavaca County. Corn is an exception to this trend, with the highest planted acreage in Jackson County. Please note that the values of zero given for waterfowl do not indicate a lack of waterfowl habitat, but rather that this is not a planted acreage. For water demand estimation, waterfowl habitat is considered a subset of rice acreage and is thus dependent on planted rice area.

Due to the importance of rice in determining the total agricultural irrigation demand of the region, it was examined separately from the other crops. Use of an average acreage over the period of record is appropriate for the non-rice crops as some portion of the acreage is likely to shift from one crop to

another from year to year. Thus, using maximum acreage during the study period rather than an average would likely lead to double-counting of some acreage. For rice, however, taking the study period maximum rather than average is advisable. While planted rice acreage varies from year to year, the study period does not represent a period of significant conversion of fields to or from rice production. For that reason, use of a maximum value allows for a conservative estimate of acreage and water demand without double-counting field area. Rice acreage was represented by the acreage during the year of highest statewide rice production (2004) for the study period. State and LRWPA rice production is shown in *Figure 4-1*. For 2004, rice acreage is 14,734 acres for Jackson County, 2,189 acres for Lavaca County, and 53,413 acres for all of Wharton County.

**Figure 4-1 State and LRWPA Rice Acreage**



### 4.1.2 Percent of Crop Area in LRWPA

For Jackson and Lavaca Counties, the percentage of crop area within LRWPA defaults to 100 percent since both counties are completely within the region. For Wharton County, which is divided between the LRWPA in the west and Region K in the east, an estimate of the proportion of Wharton County water usage and crop acreages found in LRWPA was determined through Geographical Information System (GIS) analysis. The CBGCD dataset was imported into ArcMap and converted to shapefiles using the included well coordinates to identify the location of agricultural irrigation wells. The well location data, shown in *Exhibit 1*, was then overlaid with the LRWPA boundary and trimmed to generate a subset of the data containing only those water users within LRWPA. Both trimmed and original datasets were sorted by crop type and used to calculate the ratios of Wharton County crop acreage in LRWPA to total Wharton County crop acreage. Proportions for 2005 and 2006 usage as well as 2006 acreage are shown in *Table 4-2*. Please note that these values do not represent all planted acreage for Wharton County but only irrigated acreage served by CBGCD.

**Table 4-2 Percentage of Wharton County Usage and Crop Acreage Within LRWPA from CBGCD Data**

Crop	2005 - Usage (ac-ft)			2006 – Usage (ac-ft)			2006 – Acreage (ac)		
	All Wharton	LRWPA Wharton	%	All Wharton	LRWPA Wharton	%	All Wharton	LRWPA Wharton	%
Aquaculture	4,986	1,075	22	9,400	4,005	43	1,173	606	52
Cotton	5,329	2,176	41	1,911	1,018	53	2,968	1,058	36
Corn	3,231	1,348	42	7,401	4,553	62	9,753	5,007	51
Livestock	152	70	46	142	87	61	30	0	0
Milo	397	371	93	1,094	1,002	92	1,294	1,043	81
Nursery	2,610	1,859	71	2,852	1,730	61	18	18	100
Pasture/Hay	3,978	2,169	55	6,132	3,565	58	7,778	4,513	58
Soybeans	1,548	1,299	84	1,191	1,135	95	2,298	2,053	89
Turfgrass	23,188	1,196	5	20,801	894	4	8,333	420	5
Waterfowl	3,736	2,762	74	4,865	4,113	85	3,722	2,942	79
1st Crop Rice	70,870	48,447	68	44,696	29,652	66	16,909	10,664	63
2nd Crop Rice	15,525	9,972	64	12,562	8,166	65	9,760	5,907	61

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### 4.1.3 First Crop Percent of Acres Irrigated and Total Irrigated Acreage

The percentage of area irrigated was determined on a per-crop basis using the FSA data for all crops except rice and waterfowl. All rice acreage was assumed to be irrigated due to the dependence of rice farming on flooding of fields. The values of percent irrigated acreages for waterfowl, which indicate a percentage of total rice crop area, were assumed to be the same as the 2006 RWP. For remaining crops, a ratio of irrigated to total acreage was calculated by crop and county, as shown in *Table 4-3*. Values listed as zero represent crops listed as non-irrigated in the raw datasets. Total irrigated acreage for each crop was determined by multiplying the average FSA acreage by the percent of the total crop irrigated. For waterfowl, the percentage was multiplied by total rice acreage. Due to the data collection method biasing irrigated acreage below true values, the values presented in *Table 4-3* were not used. The current study instead relied on appropriate values from the 2006 RWP.

**Table 4-3 Percentage of Total Crop Irrigated\***

Crop	Jackson (%)	Lavaca (%)	All Wharton (%)
Aquaculture	0.00	0.00	6.07
Commercial	0.00	0.00	0.00
Corn	0.00	0.00	1.47
Cotton	0.11	0.00	0.44
Nursery	0.00	0.00	0.00
Pasture/Hay	0.00	0.00	0.04
Rice	--	--	--
Sorghum	0.13	0.00	0.24
Soybeans	1.31	0.00	0.72
Turfgrass	4.27	0.00	0.00
Waterfowl	0.00	0.00	0.00

\*Not used in current demand estimates.

For rice, irrigated acreage is further divided between groundwater and surface water sources. Of the three information sources on water usage (CBGCD, STWM, and Garwood), acreage associated with source type is limited. Available rice acreage information is given in *Table 4-4*. Garwood, which provides surface water, does list an annual acreage total for LRWPA but does not specify crop type; the acreage is assumed to be predominantly rice. The other source of information on surface water usage, STWM, does not include irrigated acreage in its records. The groundwater source, CBGCD, only includes crop-specific irrigated area for 2006 and, of course, this data is limited to Wharton County. Because this limited amount of data precludes accurate classification of irrigated area as served by surface water or groundwater, values estimated for the 2006 RWP are used.

**Table 4-4 Available Rice Acreage Data\***

Year	FSA Rice Acreage	Groundwater	Surface Water	
		CBGCD (ac)	Garwood (ac)	STWM (ac)
1999		--	3,017	--
2000	74,869	--	2,470	--
2001	73,322	--	2,025	--
2002	65,684	--	2,265	--
2003	61,555	--	2,244	--
2004	70,185	--	2,569	--
2005	66,158	--	3,618	--
2006	46,385	10,664	--	--
2007	46,072	--	--	--

\*Not used in current demand estimates.

#### 4.1.4 First Crop Irrigation Rate and Total Irrigation Demand

For Jackson and Lavaca Counties, irrigation rates were assumed from the 2006 RWP due to a lack of more current reliable data. For the portion of Wharton County within LRWPA, irrigation rates for all crops except surface water-supplied rice were determined from 2006 CBGCD. This was the only dataset which included crop-specific information on both water usage and associated acreage. Both usage and acreage for the six bimonthly periods were summed by crop to generate annual totals. Water usage volumes (in ac-ft) were then divided by associated acreage to generate an annual irrigation depth for each crop type, as shown in *Table 4-5*. Second crop rice acreage will be discussed in greater detail later in this report. As shown by the table, estimated water use per acre is generally higher than the estimate used for the 2006 RWP.

**Table 4-5 Irrigation Depth by Crop Type from CBGCD Data**

Crop	Usage (ac-ft)	Acreage	Irr. Depth (ac-ft/ac)	2006 RWP (ac-ft/ac)
Aquaculture	4004.8	606.0	6.6	4.2-5.0
Cotton	1018.1	1058.0	1.0	0.7
Corn	4553.3	5007.0	0.9	0.7
Milo	1002.4	1043.0	1.0	0.5
Nursery*	1729.9	18.0	96.1	--
Pasture/Hay	3565.3	4513.0	0.8	--
Soybeans	1135.3	2053.0	0.6	0.5
Turfgrass	894.4	420.0	2.1	2.5-5.0
Waterfowl	4112.9	2942.0	1.4	0.5

**Table 4-5 cont.**

Crop	Usage (ac-ft)	Acreage	Irr. Depth (ac-ft/ac)	2006 RWP (ac-ft/ac)
1st crop rice (GW)	29651.8	10664.0	2.8	2.3-2.6
2nd crop rice (GW)	8165.7	5907.0	1.4	1.9-2.1

\*Irrigation depth for nursery not used as values are biased due to under-reported acreage.

The irrigation rate for surface water-supplied rice in Wharton County was determined from the Garwood data (*Table 4-6*). Because crop information was not provided for Garwood, this study assumes a rice crop, with acreage for other crops being negligible. Because the crop type for Garwood is assumed as rice, this total represents both first and second crop rice. To generate an estimate of water usage for first crop rice only, the annual usage values were multiplied by a ratio of first crop water use to total water use (equivalent to 0.78) from the Year 2006 CBGCD data for Wharton County. The resultant usage was divided by the associated acreage to generate an annual irrigation rate which varied between 2.9 and 6.0 feet and averaged 4.1 feet.

**Table 4-6 Garwood (LRWPA Only) Rice Irrigation Rates**

Year	<sup>1</sup> LRWPA Total		1st Crop Rice			2nd Crop Rice		
	Water Use (ac-ft)	Rice Acreage (ac)	<sup>2</sup> Water Use (ac-ft)	Rice Acreage (ac)	Usage Rate (ft)	<sup>3</sup> Water Use (ac-ft)	<sup>4</sup> Rice Acreage (ac)	Usage Rate (ft)
1999	13,643	3,017	10,697	3,017	3.55	2,946	1,671	1.76
2000	10,004	2,470	7,844	2,470	3.18	2,160	1,368	1.58
2001	12,358	2,025	9,690	2,025	4.79	2,668	1,121	2.38
2002	12,548	2,265	9,838	2,265	4.34	2,709	1,255	2.16
2003	11,322	2,244	8,877	2,244	3.96	2,445	1,243	1.97
2004	19,545	2,569	15,325	2,569	5.97	4,220	1,423	2.97
2005	13,140	3,618	10,302	3,618	2.85	2,837	2,004	1.42
<b>Avg</b>	<b>13,223</b>	<b>2,601</b>	<b>10,368</b>	<b>2,601</b>	<b>4.09</b>	<b>2,855</b>	<b>1,441</b>	<b>2.03</b>

<sup>1</sup>From Garwood data.

<sup>2</sup>Scaled by the 2006 CBGCD ratio of 1st crop rice demand to total rice demand.

<sup>3</sup>Scaled by the 2006 CBGCD ratio of 2nd crop rice demand to total rice demand.

<sup>4</sup>Scaled by the 2006 CBGCD ratio of 2nd crop rice acreage to total rice acreage.

First crop total water demand was calculated by multiplying the irrigation depth in ac-ft per acre by the irrigated acreage to generate a volume in ac-ft. Conduit losses, which were included in the demand estimate for the 2006 RWP, were not included in the current analyses for Wharton as the updated data represents water volume at the source location (at the well meter or surface water source). This means that conduit losses are already included in the demands calculated. This may be part of the reason for higher irrigation rates for surface water, as surface water transfer would be expected to have a greater transmission loss than groundwater. This corresponds with assumptions of loss rates made in the previous RWP. For Jackson and Lavaca Counties, which assumed irrigation rates from the 2006 RWP, conduit losses from the previous plan were assumed to remain valid.

## 4.2 Second Crop Demands

In addition to first crop water demands, rice also includes a demand associated with a subsequent ratoon or second crop harvested from regrowth from the stubble of the first crop. The other crops examined in this study do not include second crops.

### 4.2.1 Second Crop Acreage

For Wharton County, second crop acreage as a proportion of first crop rice acreage, was calculated from 2006 CBGCD data and indicated that the second crop occupied 55 percent of first crop acreage. Due to a lack of more specific data, this value was applied to both groundwater and surface water irrigation areas. For Jackson and Lavaca Counties, the proportions were assumed from the 2006 RWP. Acreages were determined by multiplying these percentages by the corresponding first crop rice acreages.

### 4.2.2 Second Crop Water Use Rate and Total Irrigation Demand

The calculation methodology for second crop irrigation rate was similar to that used for first crop irrigation. For Jackson and Lavaca, the irrigation rate was assumed to remain the same as the 2006 RWP; for Wharton, the rate was calculated based on updated information from CBGCD. As shown in *Table 4-5* earlier in the report, for CBGCD the second crop rice irrigation depth was 1.4 feet (49.7 percent of the demand for the first crop). To determine the second crop irrigation rate for surface water, the estimated Garwood LRWPA water demand for all rice calculated earlier was multiplied by the ratio of second crop water use to total water use (equivalent to 0.22) from the Year 2006 CBGCD data for Wharton County. The resultant usage was divided by the associated acreage to generate an annual irrigation rate which varied between 1.4 and 3.0 feet and averaged 2.0 feet (50 percent of the first crop rate).

## 4.3 Identification of Rice Fields and Management Practices

In addition to calculating demands, the analysis also included examination of aerial photography to determine locations of improved acreage rice production and, where possible, associated acreages and presence of any land improvement practices. Total rice acreage was determined from FSA records. Acreage values were scaled to represent first crop acreage only, using the 2006 ratio (from CBGCD) of first crop rice acreage to total rice acreage.

Maps of planted rice acreage from the TWDB were downloaded and used as guidance for identifying regions of rice production. These maps are shown in *Exhibit 2*. Aerial photographs obtained from the USDA National Agricultural Imagery Program (NAIP) for 2005 through the Texas Natural Resources Information Service (TNRIS) were analyzed in an ArcMap GIS environment. The aerial imagery was overlaid with a grid to assist in keeping track of location during the analysis. Each grid cell was visually inspected, with acreage identified as improved rice outlined and exported to a separate shapefile. Contours appearing to be flood irrigation levees were considered to be a strong indication for the presence of rice production. Identified rice acreage was further examined at greater magnification for indicators of improvement, particularly laser leveling (contours paralleling each other closely). For the majority of fields, contour presence was observed but was not accepted as sufficient indication of improved rice production acreage. This occurred for several potential reasons, including contour patterns inconsistent with rice irrigation, lines following natural rather than straight contours, appearance of field fallowing or abandonment, or poor local image resolution. Rice acreage data was exported from GIS in a tabular format and sorted by county and land improvement practices. The results of the aerial analysis are presented in *Table 4-7*.



**Table 4-7 Improved Rice Acreage**

<b>County</b>	<b>2005-2006 Planted Rice Area (ac)</b>	<b>Improved Area (ac)</b>	<b>Percent of Total Planted</b>
Jackson	27,447	840	3.06%
Lavaca	3,993	99	2.49%
Wharton (P)	65,647	13,292	20.25%
<b>Total</b>	<b>97,087</b>	<b>14,232</b>	<b>14.66%</b>

As shown in *Table 4-7*, approximately 15 percent of planted rice acreage (as given from FSA datasets) in LRWPA was identified as improved. The western portion of Wharton County, which contains the greatest percentage of the LRWPA's rice acreage, also contains the majority of improved (laser-leveled) rice acreage. For Lavaca County, which has the smallest planted rice acreage, only a small amount of land was reliably identified as being improved.

Locations of improved rice acreage identified as part of the aerial photography analysis are shown in *Exhibit 3*. The majority of identified improved acreage was found in the northwestern portion of Wharton County; this corresponds to the FSA datasets, which indicate higher rice acreage for Wharton County than for Jackson and Lavaca Counties. Remaining improved rice acreage is predominantly scattered throughout the northern half of Jackson County, with minimal improved acreage identified in Lavaca County. While some programs are in place to facilitate improvement of rice acreage, it is unlikely that there will be any dramatic shifts toward field improvement in the near future. A large portion of the rice cropland in the LRWPA is owned by someone other than the grower. For this reason, there is reduced incentive to undertake the effort and risk to improve field condition without guaranteed long-term benefit to the grower.

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## Section 5 – Total Year 2010 Irrigation Demands

As noted previously, rice acreages in the water demands table were adjusted to peak (2004) values to represent conservative Year 2010 demands. A summary of these demands is given in *Table 5-1*, with more detailed information in *Appendix G*.

**Table 5-1 Summary of LRWPA Projected Demands for Year 2010**

Water Use Category	Total Water Demand (ac-ft)			Percentage of County Irrigation Demand (%)			LRWPA Total	
	<sup>1</sup> LRWPA Wharton Co.	Jackson Co.	Lavaca Co.	<sup>1</sup> LRWPA Wharton Co.	Jackson Co.	Lavaca Co.	Water Demand	
							(%)	(ac-ft)
<b>Rice</b>								
GW Source	107,526	51,261	7,848	71.8%	85.7%	93.9%	76.5%	166,634
SW Source	17,572	4,073	429	11.7%	6.8%	5.1%	10.1%	22,074
<b>Total Rice Irrigation</b>	<b>125,097</b>	<b>55,333</b>	<b>8,277</b>	<b>83.6%</b>	<b>92.5%</b>	<b>99.0%</b>	<b>86.6%</b>	<b>188,708</b>
Cotton Irrigated crop	5,262	1,233	3	3.5%	2.1%	0.0%	3.0%	6,498
Corn Irrigated crop	5,399	654	0	3.6%	1.1%	0.0%	2.8%	6,053
Milo Irrigated crop	4,544	0	0	3.0%	0.0%	0.0%	2.1%	4,544
Soybean Irrigated Crop	2,306	0	44	1.5%	0.0%	0.5%	1.1%	2,350
Turfgrass Irrigated Crop	429	1,304	0	0.3%	2.2%	0.0%	0.8%	1,732
<b>Total Crop Irrigation</b>	<b>143,037</b>	<b>58,524</b>	<b>8,324</b>	<b>95.6%</b>	<b>97.9%</b>	<b>99.6%</b>	<b>96.3%</b>	<b>209,885</b>
Waterfowl habitat	2,355	144	33	1.6%	0.2%	0.4%	1.2%	2,531
Aquaculture	4,296	1,133	0	2.9%	1.9%	0.0%	2.5%	5,430
<b>Total Irrigation</b>	<b>149,688</b>	<b>59,801</b>	<b>8,357</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>217,846</b>

<sup>1</sup>Values given are for the portion of Wharton County within the LRWPA.

As illustrated in the table, rice is the dominant water user in the region, accounting for 84 to 99 percent of irrigation water demand by county and 87 percent for the entire LRWPA. Remaining crop irrigation demands are relatively small, accounting for just under 10 percent of total estimated irrigation. The remaining 3.7 percent is attributable to water use for aquaculture and waterfowl habitat. The portion of Wharton County within LRWPA is by far the largest irrigation water user, accounting for 69 percent of the region's irrigation usage. Net rice irrigation rates for the three counties are shown in *Table 5.2*.

While surface water irrigation rates for first and second crop rice are higher than the rates for groundwater, groundwater remains the largest source of irrigation water in LRWPA. This is primarily due to the large acreage of rice, which is flood-irrigated primarily with groundwater.

**Table 5-2 Net LRWPA Rice Irrigation Rates**

County	LRWPA Summary Rice Irrigation Water Use Rates (ac-ft/1st crop acres)						
	Groundwater Use Rates			Surface Water Use Rates			Overall Water Use Rates (ac-ft/ac)
	1st Crop	2nd Crop	1st and 2 <sup>nd</sup> Crop	1st Crop	2 <sup>nd</sup> Crop	1st and 2 <sup>nd</sup> Crop	
LRWPA Wharton	2.78	1.38	3.55	4.09	2.03	5.22	3.71
Jackson	3.23	2.10	3.75	4.36	3.27	5.67	3.85
Lavaca	3.23	2.10	3.75	4.36	3.27	4.36	3.78
<b>Total LRWPA</b>	<b>2.93</b>	<b>1.52</b>	<b>3.62</b>	<b>4.14</b>	<b>2.20</b>	<b>5.27</b>	<b>3.76</b>

# Section 6 – Irrigation Demand Projections Throughout Planning Horizon

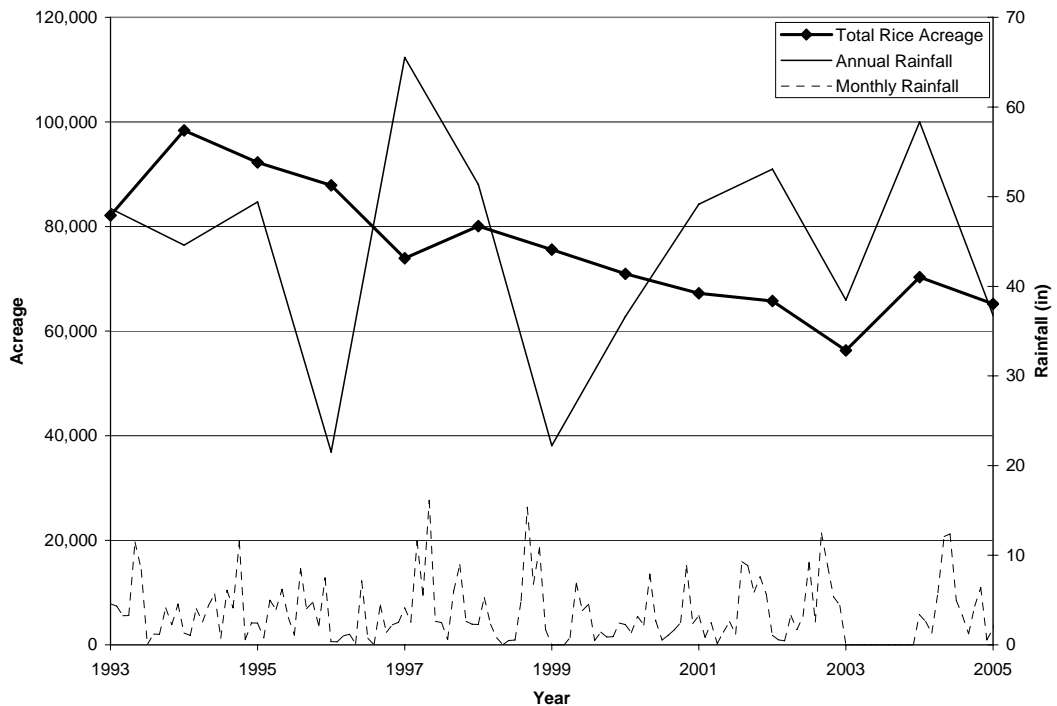
The projection of agricultural demands beyond the year 2010 requires the examination of numerous factors that may influence long-term trends in crop production. This is especially true for rice crops. Potential factors include long-term forecasts for rainfall and the price of rice. The potential for changes in agricultural policy and the expansion of the export rice market may also influence total planted rice acreage. At the same time, increases in production costs may serve to dampen potential growth in the rice

## 6.1 Acreage and Demand Trends

### 6.1.1 Weather Conditions

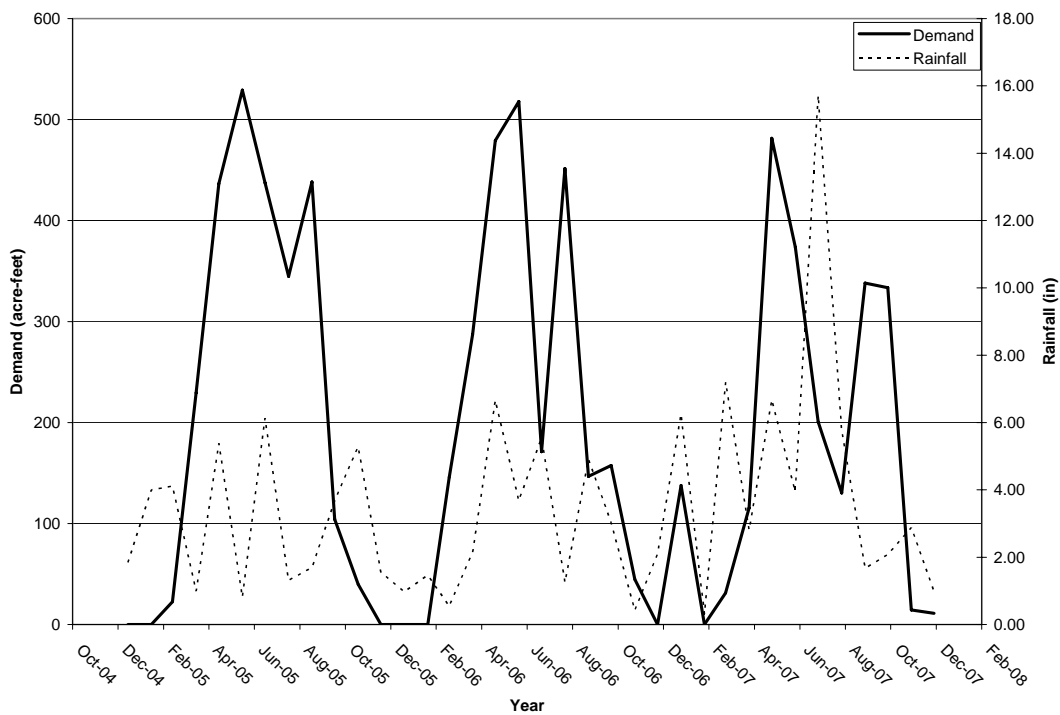
Annual acreages and water use characteristics for various crops were compared to annual, monthly, and growing season precipitation (*Figure 6-1*); planted acreage for rice does not show a discernable relationship ( $r^2 = 0.01$ ) between annual precipitation and planted acreage. Even when viewing precipitation in a time-shifted manner (for example, comparing 1993 precipitation and 1994 planted acreage), no trend could be found. A comparison for corn, which is predominantly non-irrigated in LRWPA, displayed a similar lack of relationship between precipitation and planted acreage. The simplest explanation is that, due to high uncertainty in predicting precipitation for the growing season and the availability of irrigation water for rice, neither anticipated nor observed rainfall trends may be factored into the decision-making process for determining planted area.

**Figure 6-1 Rice Acreage and Precipitation**

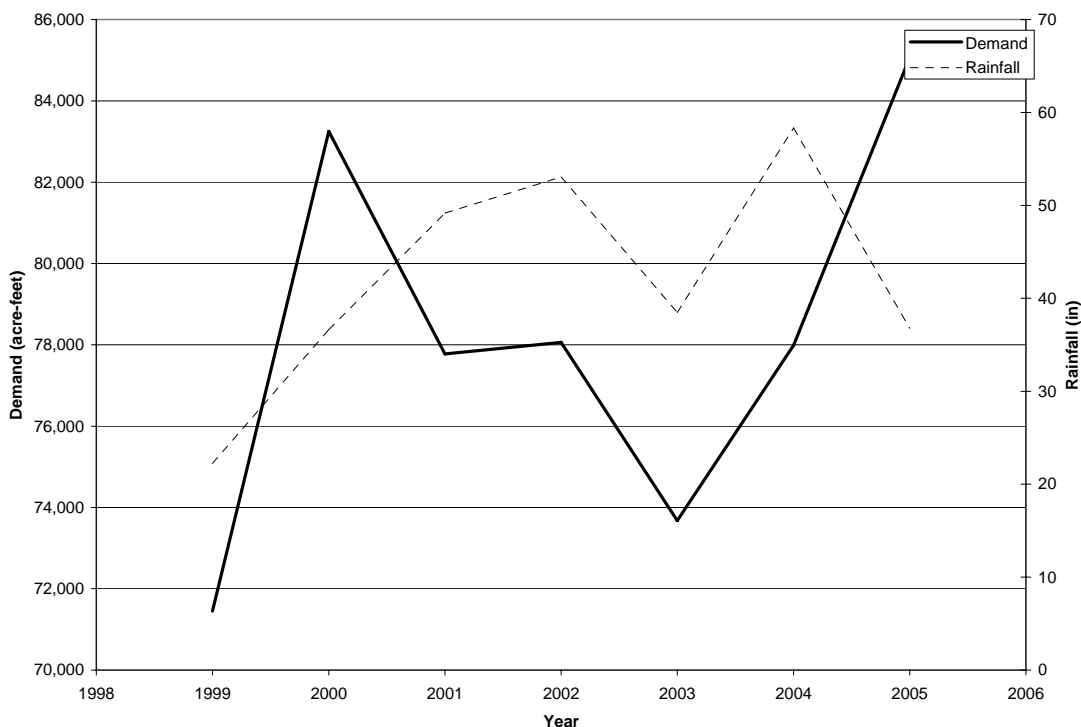


However, one might expect precipitation to play some role in determining total irrigation water usage, producing an inverse relationship with increased precipitation resulting in decreased demands per acre. Because usage data was not available outside of 2006 for CBGCD, comparison of usage and precipitation were made only for STWM and Garwood. Irrigation calls made to the STWM and monthly precipitation are shown in *Figure 6-2*. Note that no acreage data was associated with STWM data. While there are a few instances of precipitation spikes corresponding with reduced calls for the same month or following month, there are also a number of months with high rainfall and increased irrigation demands. No relationship between precipitation and irrigation demand could be found ( $r^2 = 0.02$ ). A comparison of Garwood demands per acre, including those in Region K, to annual precipitation (*Figure 6-3*) showed a similar low  $r^2$  of 0.05. One possible explanation for the increased irrigation amounts in months with high rainfall totals is the breaching of levees during rainfall events. The breaching of the levees allows the fields to drain prematurely, so after the levees are repaired, the fields must be flooded once again from the source water, hence the higher usage.

**Figure 6-2 Precipitation and STWM Demand**



**Figure 6-3 Precipitation and Garwood Demand**



The lack of clear correlation between precipitation and irrigation demands could have a number of causes. For the STWM data, the lack of acreage data is a limiting factor, as demand per irrigated acre would be a better relationship indicator. However, as mentioned, this did not result in a clear trend for Garwood. Demands may be influenced by a complex combination of factors, including antecedent condition, timing of rainfall on a sub-monthly scale, crop type and variety, irrigation and land management practices, irrigation water source, evapotranspiration rates, and total planted acreage. Since the majority of non-rice cropland in the region is non-irrigated, these crops contribute only 13 percent of total demand and, therefore, will not greatly influence any relationship between precipitation and regional water use. Given the dominance of rice in both planted acreage and water demands for LRWPA, it follows that rice production practices will drive regional demand patterns. Since the total estimated annual irrigation for rice (31 inches) is three-fourths of the average annual precipitation for the area (42 inches at Palmetto Bend from 1973 to 2007), variations in annual rainfall may be too small in comparison to create a discernable impact on usage. This may be enhanced by the usage of flooding irrigation for rice and the large proportion of total irrigation demand supplied by groundwater. Since low precipitation will not immediately reduce groundwater availability to the extent that it can limit surface water, irrigation water usage from a groundwater source may be determined more by crop need than by water availability.

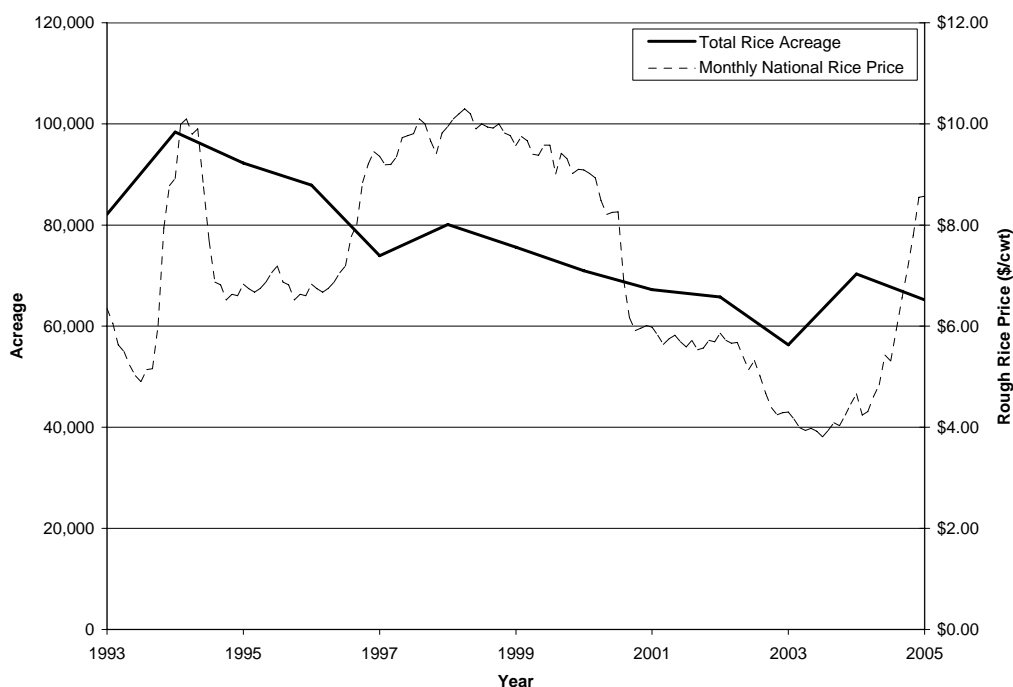
From this analysis, it appears that meteorological trends of magnitude neighboring or surpassing the drought of record would be required to significantly impact production. Long-term drought may increase the demand for groundwater which could potentially result in lowered ground-water tables and increased costs for producing water from agricultural wells. At this point, reduction in rice production may occur due to an increased cost of production.

**6.1.2 Price**

The price of rice was also examined as an influencing factor for planted rice acreage. An examination of the rough rice price received by farmers for 1993 to 2005 (USDA-ERS 2007) shows

planted acreage following price in a very general trend. While the magnitude of acreage changes did not vary consistently with price, increases in price tended to correspond with increased acreage, with a similar reverse trend for decreased acreage (*Figure 6-4*). Results were similar when viewing annual, growing season, and early year average rice prices. While no useful mathematical relationship between price and acreage could be drawn, major increases in rice acreage are not expected in the near future. The USDA's 10-year rice market forecast for 2008 through 2017 (USDA-ERS 2008c) indicates increasing season-average farm prices through 2017, with prices reaching their highest level since the 1980/1981 growing season. The September 2008 rice outlook (USDA-ARS 2008b) indicates midmonth August 2008 as having the highest rough rice price on record, up \$7.60 from a year previous. Earlier outlooks from 2008 (USDA-ARS 2008a) indicated limited rice expansion due to competing crops and high fuel and fertilizer costs. For the Gulf Coast, which has the highest per-unit cost of production, little if any expansion is expected. It is currently unknown what impact Hurricanes Gustav and Ike will have on short-term or long term price or production.

**Figure 6-4 Rice Acreage (Including All of Wharton County) and Price**



## 6.2 Other Influences on Crop Production

### 6.2.1 Production Cost

As mentioned previously, the Gulf Coast region has a relatively high production cost for rice. While the Gulf Coast climate enables producers to generate a lower-cost second or ratoon crop, a number of factors keep production costs high (USDA-ERS 2004). The need to control red rice weeds generates increased cost from aerial seeding and acreage rotation/fallowing. Costs may also be higher due to higher seed cost (treated against water weevils), use of fungicides, and fertilizer application. Additionally, the higher initial moisture content of Gulf Coast rice relative to that from other areas requires more product drying. Fuel costs will also influence the production cost of all crop types, with increased fuel costs already raising production cost for the current season.



### **6.2.2 Farm Bill**

The 2008 Farm Bill includes changes in a number of provisions as compared to the previous 2002 Farm Bill. While counter-cyclical payment target prices have remained the same for corn and rice, soybean and sorghum target prices will increase for 2010 through 2012 while upland cotton prices are reduced for 2000 through 2012. Marketing loan rates for the major crops in LRWPA have not changed. One of the most significant changes in the 2008 bill is a reduction in the income cap for direct payments; producers with adjusted gross income (AGI) from farming over \$750,000 would not be eligible for direct payments. Individuals with non-farm AGI in excess of \$500,000 would not be eligible for commodity program payments. Furthermore, an adjusted gross income in excess of \$1,000,000, unless at least 66.66 percent is from farming, ranching, or related activity, precludes eligibility for conservation payments. Married couples filing jointly have the option of appropriating their income for purposes of applying both the \$500,000 non-farm income test and the \$750,000 AGI test. The total payment cap for direct payment is set to \$40,000, while the cap for counter-cyclical payments is set to \$65,000. Limitations on marketing loan gains and loan deficiency payments have been removed. Under the 2008 Farm Bill, funding for the Environmental Quality Incentives Program (EQIP) is expanded by \$3.39 billion while maintaining the existing 60/40 split in favor of livestock operations. Contract limits for EQIP are set to 10 years, with a payment limit of \$300,000 over six years; projects with special environmental significance are limited at \$450,000. The 2002 Farm Bill's Ground and Surface Water Program is also replaced and modified by the Agricultural Water Enhancement Program (AWEP) under EQIP. The 2008 Farm Bill also extends the Conservation Stewardship Program (CSP, formerly the Conservation Security Program) with \$1.1 billion in new funding to enroll approximately 13 million acres per year. Contracts are for five year terms, with a payment limit of \$200,000 over the contract term.

While impacts of the new farm policy are not certain, the provisions of the 2008 Farm Bill are not expected to create any beneficial impacts within LRWPA. While the EQIP program is being increased, farmers are not always able to afford the matching share of the cost. The lack of benefit from EQIP is especially significant in LRWPA, as much of the region's agriculture is operated by tenant farmers with year-to-year land contracts. Thus, there is little incentive to accept the risk of a matching share since they may not benefit from improvements beyond the year of implementation. Conservation measures may be further discouraged by increasing production costs. Reduction of the adjusted gross income (AGI) limit is also expected to adversely impact typical farm operations in the region and could significantly reduce the number of farms qualifying for benefits programs. Thus far, direct payments have not positively impacted rice production and have discouraged planting of rice in LRWPA. While the current provisions of the 2008 Farm Bill are not expected to create a major shift among crop types in LRWPA, there is the potential for overall reduced crop production in the region.

### **6.2.3 Exports/Export Policies**

According to the FAO's 2007-2016 Agricultural Outlook, only moderate growth in rice exports from the US is expected (OECD-FAO 2007). However, the opening of a new market for rice has the potential to escalate the demand for domestically grown rice at any time. The magnitude of the potential impact from this event is only escalated by the rising price of rice throughout the world.

### **6.2.4 Demand for Biofuels**

Increasing demand for biofuels is expected to significantly impact multiple agricultural sectors. According to recent USDA agricultural projections (USDA 2008), demand for biofuels is expected to increase both domestically and internationally. Global demand for biofuels will result in increased demand for corn and soybean oil, generating an increase in total planted acreage. A greater combined share of acreage is expected to go to these crops, with competing crop acreage expected to decrease. Commodity prices in general are expected to increase. Increasing biofuel demand and associated high agricultural prices are also predicted by the FAO (OECD-FAO 2007).

The potential for future cellulosic ethanol production to alter water demands for LRWPA is currently unknown but may result in significant impacts. Cellulose-rich crop residues, particularly those from rice, could serve as a biomass source for ethanol production. This market for crop residue could result in some shift in acreage distribution among crops. Additionally, the production of biomass on fields in rotation for rice when rice is not being produced may require some level of irrigation to maintain production during drought. Current studies suggest the need for local facilities to produce fuel for these types of cellulosic ethanol in order to be economically viable. This is an example of a situation where changes in agricultural production may result in increased water demands in other water use categories (manufacturing) as a result of shifts in economies and technology.

### **6.2.5 Groundwater vs Surface Water**

Due to the primary use of groundwater in LRWPA for rice irrigation and calculated differences in irrigation rates for groundwater and surface water, any significant shift in water source will have an impact on the total regional water demand. However, there is currently no plan or indication of a significant shift toward increased surface water usage in LRWPA. The limited data available for Wharton County indicate a slightly greater ratio of groundwater to surface water rice irrigation (6.1 times vs 5.7 times surface water use) than the 2006 RWP; however, given the small magnitude of the change and the limited data available for the region, an overall shift to or from groundwater use is not apparent. Due to a lack of more reliable up-to-date information, there is no clear basis on which to modify the 2006 RWP's conclusions regarding proportions of land irrigated with surface water and groundwater. In the event of establishment of a groundwater conservation district or other body similar to CBGCD for Jackson and Lavaca Counties, it is likely that the additional data generated would greatly clarify the relative importance of water sources. According to the 2006 RWP, the current use of groundwater as a primary water source is expected to continue due to overall low regional demand and anticipated low demand growth. In addition, the cost of surface water is lower in comparison to groundwater only for those producers with access to a water feature, either a creek or a canal. Construction of additional canals is not feasible and long-term availability of surface water for irrigation in the region is limited. Groundwater pumpage in recent years has not caused additional static water level decline, with some wells showing small amounts of level recovery. Subsidence in the region due to groundwater withdrawals has been minor for several decades. The region has only one reservoir (Lake Texana) which currently has its supplies committed outside of the region. However, 10,400 acre-feet (ac-ft) of this supply can be recalled for use in Jackson County if the economic means were found to use this supply to meet irrigation demands.

### **6.3 Decadal Demand Projections Through the Year 2060**

The water demands calculated as described above were then used to develop projected decadal demands through Year 2060. Calculated demands were assumed to represent water demand for a starting year of 2010.

Based on the impacts discussed above, it was decided that no one factor indicated a trend of either increasing or decreasing potential for rice production in the LRWPA. The level of rice production seen in the region today represents a far lesser stage of production than historical records, although no factors point to either the conversion of current rice acreage to other crops or the reversion of land that has transitioned to other uses back to the growth of rice. While some factors such as increased cost of production seem to point toward a decline in production, the increasing price of rice and the potential for the opening of a new rice market may potentially increase the demand for the crop abroad.

This projection of steady agricultural demands for the LRWPA region differs from the assumption in the 2006 RWP when it was assumed that irrigation demands would continue to decline at the rate estimated by the TWDB. However, following the more in-depth analysis of factors influencing rice production, it is not evident that downward trends in production will occur below their current level. For this reason, the estimated 2010 demand projections are recommended for use throughout the planning horizon.

## Section 7 – Comparison to 2001 and 2006 RWP

### RWPs

#### 7.1 Irrigation Rates

A comparison of current estimated irrigation rates to those used in prior RWPs (*Table 7-1*) did not reveal any clear trend in irrigation rates with time. For the 2001 and 2006 RWPs, water demand estimates utilized the same irrigation rates per acre with the exception of rice. The current estimate, due to a lack of more recent information, relies on irrigation rates from the 2006 RWP for Jackson and Lavaca Counties. Both first crop and ratoon (second crop) rice irrigation rates were slightly higher for the 2006 RWP than for the 2001 RWPs. For most of the remaining crop types, rates for the 2001 and 2006 RWPs are similar. Current estimates are limited by a relatively small amount of data representing only one year for the portion of Wharton County in LRWPA. However, comparing the current Wharton County data to that for previous plans, it appears the current irrigation rates are higher for most crops except for turfgrass and rice; estimated rice rates for the current study are lower than the 2006 plan but are at or above the 2001 RWP estimates. Rainfall records indicate 2006 as a dry year, with a total rainfall of 32 inches compared to a 30-year average of 42.3 inches and median of 44. This is within the lowest 21 percent of rainfall over the most recent 30-year period. Thus, the rates calculated for this study are likely conservative, indicating that estimated proposed demands would be adequate for a large portion of drier-than-average years.

**Table 7-1 Irrigation Rates for 2001 and 2006 RWPs and Current Study**

Crop	2001 RWP (ac-ft/ac)			2006 RWP (ac-ft/ac)			Current (ac-ft/ac)		
	J	L	W	J	L	W	J	L	W
Aquaculture	4.2	4.2	5.0	4.2	4.2	5.0	4.2	5.0	6.6
Corn	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1.0
Cotton	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.9
Nursery	--	--	--	--	--	--	--	--	96.1
Pasture / Hay	--	--	--	--	--	--	--	--	0.8
Sorghum	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0
Soybeans	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Turfgrass	2.5	2.5	2.5	5.0	5.0	2.5	5.0	5.0	2.1
Waterfowl	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.4
1st Crop Rice									
GW	2.5	2.5	2.3	3.2	3.2	2.9	3.2	3.2	2.8
SW	3.6	3.6	3.4	4.4	4.4	4.0	4.4	4.4	4.1
2nd Crop Rice									
GW	1.5	1.5	1.4	2.1	2.1	1.9	2.1	2.1	1.4
SW	1.8	1.8	1.7	3.3	3.3	3.0	3.3	3.3	2.0

J = Jackson County, L = Lavaca County, W = Wharton County (LRWPG Portion)

## **7.2 Baseline Acreage**

A comparison of irrigated acreage by crop for the previous RWPs and the current study is shown in *Table 7-2*. Note that this table does not include non-irrigated cropland. A more detailed table of both irrigated and non-irrigated acreage can be found in *Appendix C*. The current estimate of irrigated acreage falls between the estimates used for the 2001 and 2006 RWPs. While the estimated irrigation area for Jackson and Lavaca Counties is highest for the 2001 RWP, the current study shows the highest estimate of irrigated acreage for Wharton County. Estimated irrigated acreage for first crop rice is similar for both RWPs and this study; however, the 2006 RWP and this study estimate much lower second crop acreage. There have also been significant reductions since the 2001 RWP for corn, sorghum, and turfgrass, while soybeans have been estimated to expand. It is possible given the increasing demand for biofuels that future plans will need to make upward revisions of both corn and soybean acreage.

**Table 7-2 Irrigated Acreage for 2001 and 2006 RWP and Current Study**

Crop	2001 RWP (ac)				2006 RWP (ac)				Current (ac)			
	Jackson	Lavaca	Wharton (P)	Total	Jackson	Lavaca	Wharton (P)	Total	Jackson	Lavaca	Wharton (P)	Total
Aquaculture	200	100	80	380	200	100	200	500	270	0	650	920
Corn	16,860	2,355	2,481	21,696	1,047	0	2,584	3,631	981	0	5,937	6,918
Cotton	4,780	0	3,551	8,331	1,555	0	4,082	5,637	1,849	5	5,468	7,322
Sorghum	3,980	185	3,989	8,154	0	0	3,767	3,767	0	0	4,728	4,728
Soybeans	1,750	0	687	2,437	0	0	677	677	0	88	4,171	4,259
Turfgrass	200	100	2,000	2,300	0	0	1,300	1,300	261	0	201	462
Waterfowl	719	111	774	1,604	446	88	1,220	1,754	287	66	1,684	2,037
1st Rice												
GW	21,555	3,330	20,634	45,519	21,201	2,785	21,956	45,942	13,655	2,090	30,317	46,063
SW	2,395	370	5,158	7,923	1,116	131	2,440	3,687	719	99	3,369	4,186
2nd Rice												
GW	15,089	2,331	14,444	31,863	5,300	696	14,271	20,268	3,414	523	16,793	20,729
SW	1,677	259	3,611	5,546	446	0	2,074	2,520	287	0	1,866	2,153
<b>Total</b>	<b>51,720</b>	<b>6,440</b>	<b>38,580</b>	<b>96,740</b>	<b>25,119</b>	<b>3,017</b>	<b>37,005</b>	<b>65,140</b>	<b>17,735</b>	<b>2,282</b>	<b>54,841</b>	<b>74,858</b>

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### 7.3 Total Demands

Total LRWPA crop water demands for the 2001 and 2006 RWP and current study are shown in *Table 7-3*. A more detailed breakdown including data by county can be found in *Appendix H*.

**Table 7-3 Crop Water Demands for 2001 and 2006 RWP and Current Study**

Crop	2001 RWP (ac-ft)	2006 RWP (ac-ft)	Current (ac-ft)
Aquaculture	0	2,260	5,430
Corn	15,187	2,421	6,053
Cotton	5,832	3,758	6,498
Sorghum	4,077	1,883	4,544
Soybeans	1,219	338	2,350
Turfgrass	5,750	3,250	1,732
Waterfowl	802	877	2,531
1st Crop Rice			
GW	110,549	141,492	135,153
SW	27,381	15,131	17,340
2nd Crop Rice			
GW	46,430	39,642	31,481
SW	9,583	7,640	4,734
<b>Total</b>	<b>226,810</b>	<b>218,693</b>	<b>217,846</b>

As shown by the values in *Table 7-3* total irrigation water usage estimates are similar to the 2006 RWP. While 2006 RWP estimates were lower than the 2001 RWP, the 2006 RWP did estimate the highest first crop rice usage. Due to higher first crop rice demands for the current study (as compared to the 2001 RWP), total rice water demands for the 2001 and current RWP estimates are similar. The greatest difference in estimated water usage is for non-rice irrigation; for the 2006 RWP, estimates of irrigation demands for other crops had fallen below 2001 RWP estimates except for aquaculture and waterfowl. The current study shows water demands in excess of the 2001 and 2006 RWP for the majority of non-rice crops, with the exceptions of corn and turfgrass.

The proportion of estimated total irrigation demands for rice is similar to the 2001 RWP as well. While rice irrigation for the 2001 RWP baseline data represents 86 percent of total irrigation demand, the proportion increased to 93 percent for the 2006 RWP and 87 percent for this study. At the same time, there has been an estimated increase in the relative amount of rice demand for first crop rice. From the 2001 RWP to the present study, first crop rice estimates have increased from 71 to 81 percent of total rice demand (61 to 70 percent of total irrigation demand), with a corresponding decrease in the ratio of second crop rice demand.

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## Section 8 – Conclusions

The results of the agricultural irrigation demands analysis indicate an estimated year 2010 irrigation demand of 217,846 ac-ft of water, comparable to the 2006 RWP estimate and lower than the 2001 RWP. This estimated demand is the result of multiple factors. Non-rice planted and irrigated acreage is estimated to be higher than the 2006 RWP based on more current FSA data. Additionally, estimates of rice irrigation rates for Wharton County, which account for a large proportion of LRWPA acreage, have increased since the last RWP. As with the previous RWPs, rice is the dominant consumer of irrigation water in the region, accounting for an estimated 87 percent of agricultural irrigation demand.

This projection of steady agricultural demands for the LRWPA region differs from the assumption in the 2006 RWP when it was assumed that irrigation demands would continue to decline at the rate estimated by the TWDB. However, following the more in-depth analysis of factors influencing rice production, it is not evident that downward trends in production will occur below their current level. The value estimated for demand could be influenced in the future by a number of factors. While this study found no clear trend between short-term weather and planted acreage, long-term shifts in climate or prolonged drought could result in altered acreage and/or a reduction in surface water reliability. Production costs are also an important influence and, given recent increases in fuel costs, seem likely to rise. Rice, the predominant water user in the LRWPA, faces competition from an expanding biofuel demand for corn and soybeans. At the same time, farm rough-rice prices are at record levels and are projected to increase through 2017. Due to the lack of a clear long-term increasing or declining acreage trend, the Year 2010 demand estimate is recommended for use throughout the 50-year planning horizon.

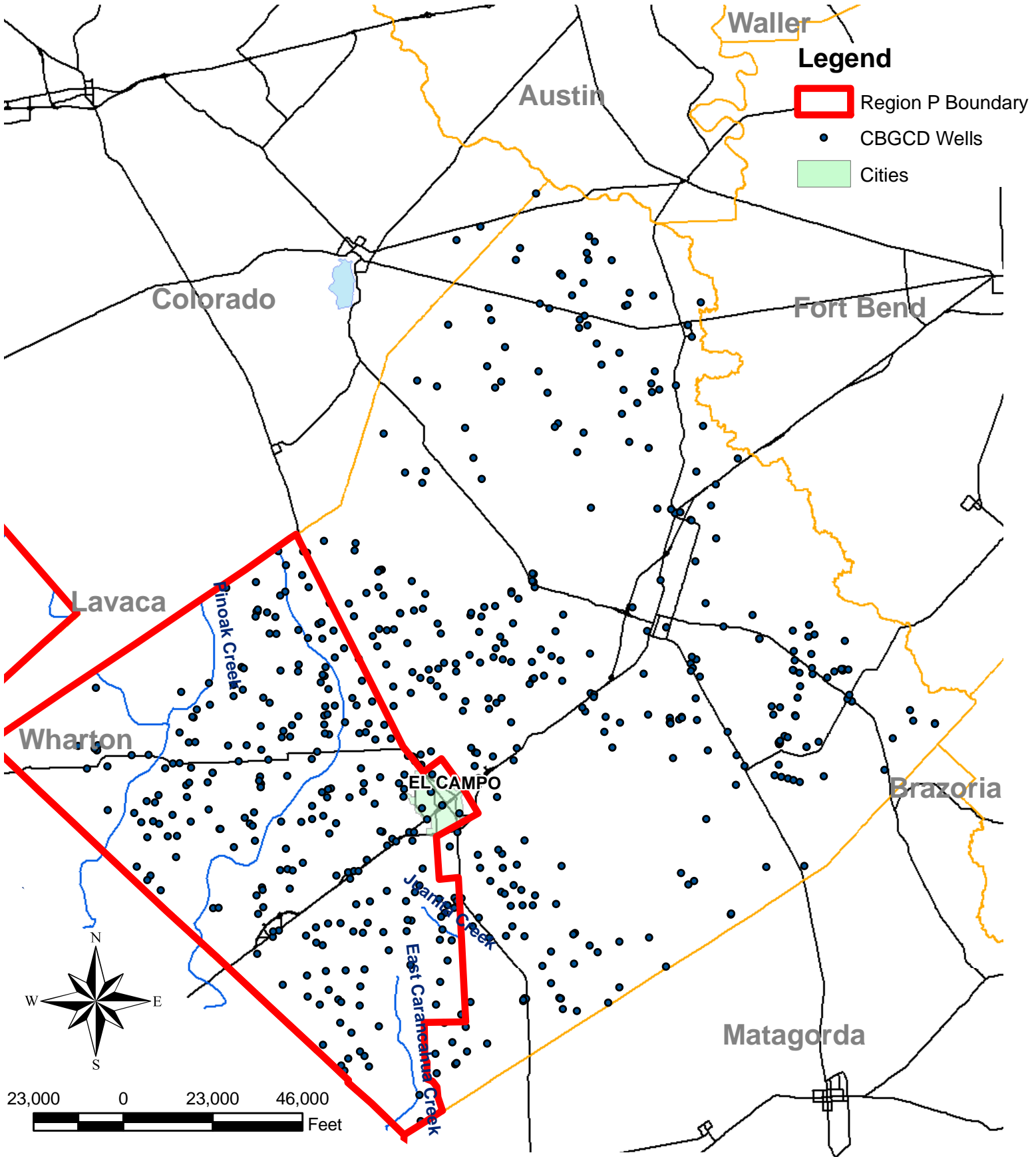
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## Section 9 – References

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## **Exhibits**

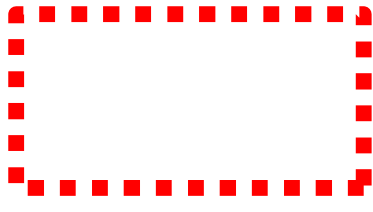

# Lavaca Regional Water Planning Group Wharton Co. Wells

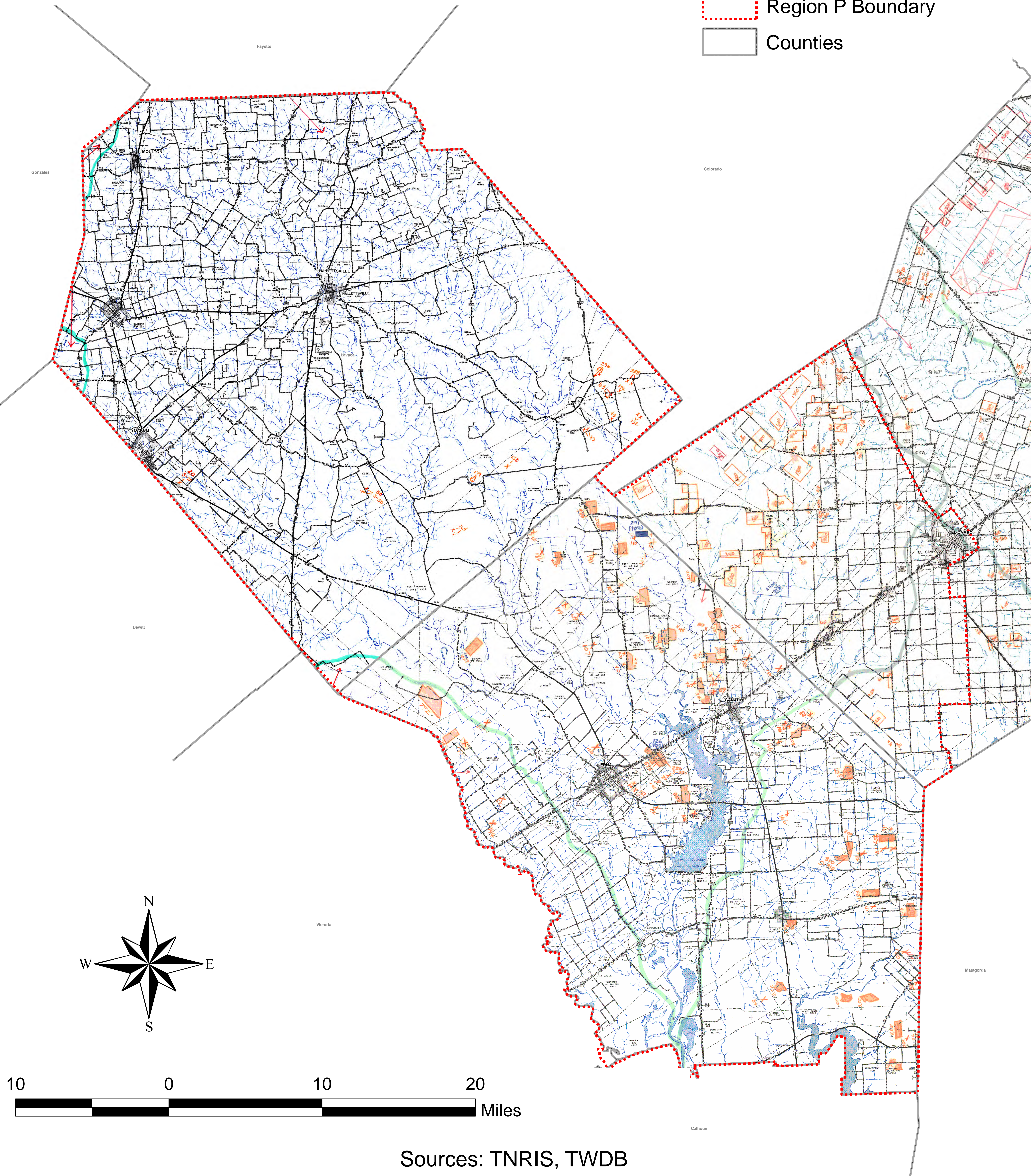


Sources: TNRIS, CBGCD

# **Lavaca Regional Water Planning Group TWDB Irrigated Acreage**

## **Legend**

-  Region P Boundary
-  Counties



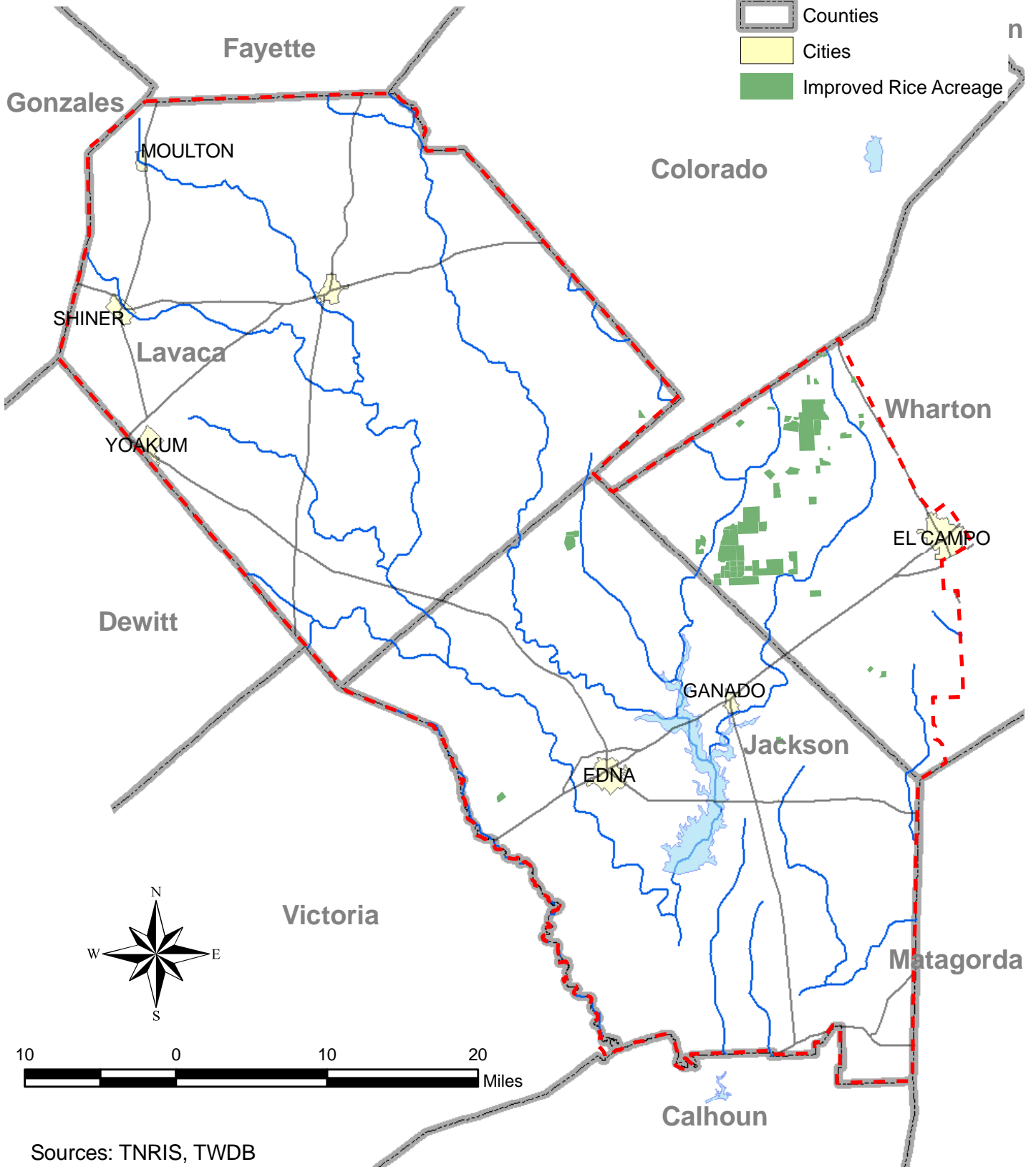
Sources: TNRIS, TWDB

# Lavaca Regional Water Planning Group Improved Rice Acreage

**Exhibit 3**  
April 2009

## Legend

- Region P Boundary
- Counties
- Cities
- Improved Rice Acreage



Sources: TNRIS, TWDB

**Appendix A**  
**Stakeholder Meeting**



February 19, 2008

[Addressee or Company Name]  
[Street Address]  
[City, State Zip]

**Subject: Agricultural Water Demands Meeting**

Dear [M/M Last Name]:

The Lavaca Regional Water Planning Group (LRWPG) is seeking stakeholder input on agricultural irrigation as part of State and Regional Water Planning processes for Jackson, Lavaca, and western Wharton Counties. The efforts put into regional planning directly impact the State Water Plan and will influence the way in which water is budgeted throughout the State, including the allocation of vital water resources for agriculture. Information related to crops and acreage irrigated, amounts of irrigation water used, and sources of irrigation water are particularly important to water planning. Data collected from stakeholders will help ensure that future State Water Plans will allocate adequate amounts of water to support irrigated agriculture.

There will be a regular public meeting of the LRWPG at Lavaca-Navidad River Authority (LNRA) headquarters in Edna on February 25<sup>th</sup> at 1:30 P.M. A meeting regarding agricultural water demands will follow at approximately 3:30 P.M. The attached information packet includes the meeting notification as well as a summary of the methodology used to determine agricultural water demands in the Lavaca region. You are invited to attend the public meeting at 1:30 if you are interested in learning more about the Regional Water Planning process. However, attendance is not mandatory if you wish to participate in the agricultural demands meeting that follows.

Your attendance and input are greatly appreciated as the LRWPG works to secure the future of agricultural water supplied in the Region. If you are interested in attending the meetings or would like additional information please contact me at 713.267.3122 or at [jason.afinowicz@tcb.aecom.com](mailto:jason.afinowicz@tcb.aecom.com).

Sincerely,

Jason D. Afinowicz, P.E.  
Project Engineer

PIT

Attached: Notice of public meeting;  
Lavaca Regional Water Plan Agricultural Water Demand Methodology

# LAVACA REGIONAL WATER PLANNING GROUP

P.O. Box 429  
Phone: 361-782-5229

Edna, Texas 77957  
Fax: 361-782-5310

## EXECUTIVE COMMITTEE

Judge Harrison Stafford II  
Chairman  
Counties

Bob Weiss  
Vice-Chairman  
Public

Patrick Brzozowski  
Secretary  
River Authorities

Roy D. Griffin  
Electric Service

Ed Weinheimer  
Small Businesses

## MEMBERS

Calvin Bonzer  
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John Butschek  
Municipalities

Gerald Clark  
Agricultural

Pat Hertz  
Water Districts

Jack Maloney  
Municipalities

Commissioner Philip Miller  
Counties

Richard J. Ottis  
Industries

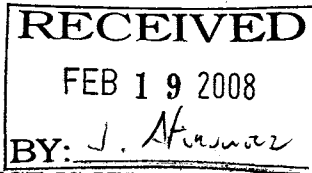
L. G. Raun  
Agricultural

Dean Schmidt  
Agricultural

Robert Shoemate  
Environmental

Commissioner David E. Wagner  
Counties

Larry Waits  
Agricultural

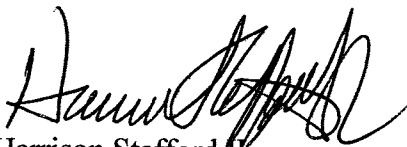


## Notice of Meeting

NOTICE IS HEREBY GIVEN of the Lavaca Regional Water Planning Group, meeting to be held on Monday, February 25, 2008 at 1:30 p.m. in the Meeting Room of the Lavaca Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 for the purpose of:

1. Receive public comments.
2. Consider approval of minutes of September 10, 2007 meeting and take action as necessary.
3. Discuss Lavaca Regional Water Planning Group membership and attendance and take action as necessary.
4. Conduct election of officers: Secretary, Vice-Chair, Chair and selection of Executive Committee and take action as necessary.
5. Consider appointment of new voting member and take action as necessary.
6. Discuss committee assignments, specifically for the Agriculture Committee and the Scoping Committee and take action as necessary.
7. Receive and discuss Agriculture Committee report, including dates, locations, and times of meetings in each County with stakeholders and take action as necessary.
8. Discuss and approve methodology for revising water demands for rice irrigation and authorize presentation of approved methodology to Texas Water Development Board for approval and take action as necessary.
9. Review and discuss the RFP from the Texas Water Development Board for the next biennium funding and take action as necessary.
10. Consider authorizing scoping committee to work with Turner Collie Braden to develop draft scope for presentation to Lavaca Regional Water Planning Group and take action as necessary.
11. Discuss RFP response schedule and dates and take action as necessary.
12. Discuss deliverables from irrigation demand task and take action as necessary.
13. Recess Lavaca Regional Water Planning meeting.
14. Reconvene Lavaca Regional Water Planning meeting to discuss agriculture water demands and take action as necessary.

WITNESS MY HAND this 12<sup>th</sup> day of February 2008

  
Harrison Stafford II  
Chairman

**TCB**

5757 Woodway Drive, Suite 101W, Houston, Texas 77057-1599  
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## Technical Memorandum

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Date February 14, 2008

Prepared by Jason Afinowicz, PE

Subject Lavaca Regional Water Plan  
Agricultural Water Demand Methodology

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Capturing the magnitude and potential magnitude of agricultural irrigation demands within the Lavaca Regional Water Planning Area (LRWPA) is essential to ensure a viable water supply for agricultural operations in the future. In the 2006 Regional Water Plan (RWP), this was performed using a tabular analysis of planted acreage, usage rate, and other pertinent factors. The methodology presented in *Attachment A* of this memorandum is representative of projections compiled in the 2006 planning round.

Initial plans are that the agricultural demand projections for the 2011 RWP will be prepared in a similar fashion with attention to several items that will be updated from available information. In general, the 2011 demands will be calculated from the following components:

- Planted crop acreage for the past five years since the 2006 RWP data was collected and analyzed
- Groundwater/surface water irrigation
- Irrigation rate (in./ac)
- Second crop production
- Estimated impacts of the Farm Bill and other policy, as available

The tables shown in *Attachment A* show the demand calculation methodology in the 2006 RWP. Values shown in bold text indicate fields that will be updated according to available information.

### **Planted Crop Acreage (Red Tab)**

Numbers for the 2006 RWP were obtained from the National Agricultural Statistics Service (NASS). Data for the 2011 round will be developed from a number of sources including planted rice acreage data (*Attachment B*) from the Farm Service Agency (FSA). Additional data may be obtained from the Coastal Bend Groundwater Conservation District (GCD) which keeps records of planted acreage associated with groundwater use. Similar information may be available from the LCRA Garwood Irrigation Company and the South Texas Watermaster for volume of surface water used for irrigation. Knowledge of the diversion point may allow for water usage to be tied to specific fields.

Data from the Coastal Bend GCD will also be used to aid in identifying the crop acreage associated with the western portion of Wharton County that falls within the LRWPA. As Wharton County is split between the LRWPA and the Lower Colorado Regional Water Planning Area, it will be essential to divide the acreage identified through the above sources into portions in each Region.

Extensive consideration will also be given to local expertise and guidance in determining ultimate, potential demands for irrigation, pending potential, reasonable changes in the economic climate that may increase the production of crops with high water usage such as rice.

**Groundwater/Surface Water Irrigation (Green Tab)**

The amount of groundwater or surface water may affect the average water consumption for crop irrigation. Additionally, identifying the portion of irrigation demand satisfied by each source provides information useful in identifying water supplies for these demands in the planning process. This information will be updated using data from Coastal Bend GCD, Garwood Irrigation, and the South Texas Watermaster. Reported usage will be used to develop trends in the use of surface water and groundwater sources.

**Irrigation Rate (Blue Tab)**

Information will be obtained from the Coastal Bend GCD, Garwood Irrigation, and the South Texas Watermaster concerning water use for various crops. This will allow for the development of a per-acre water demand for irrigated crops when used in conjunction with planted acreage data.. Data from Coastal Bend GCD may be available to allow the comparison of metered irrigation rates to irrigation rates estimated from pump run time. This will allow for a better understanding of any possible disparity caused by the estimation of water application. For the sake of demand calculation, preference will be given to actual metered data in developing the per-acre usages as well as determining the difference in per-acre usage between precision leveled and non-precision leveled fields.

Additionally, the prevalence of conservation measures implemented in the LRWPA impacts the amount of water used for irrigation. Data pertaining to conservation will be obtained from a number of sources including the Natural Resource Conservation Service (NRCS) and interested stakeholders. A review of aerial photography will yield additional data concerning the extent of conservation practices. Metered data from Coastal Bend GCD will allow for the investigation of impacts on water demands resulting from the implementation of conservation practices.

**Second Crop Production (Yellow Tab)**

The occurrence of second crop production provides an additional demand for water. Information will be obtained from a number of sources including stakeholders and the FSA on the production and harvest of ratoon crops.

**Estimated Impacts of the Farm Bill and Other Policy**

The impacts of the proposed Farm Bill may guide trends in agricultural production. Insight into this and other policy will be considered when making decisions regarding the potential for increased production throughout the planning period through 2060.

**Development of Demand Projections from Collected Data**

The data amassed above will be assembled using the spreadsheet format in *Appendix A* in order to develop irrigation usage by crop. The resulting demands will be a composite of all of the available data as well as the experience of people in the field. The refined usage per acre for the individual crops will still be entered into a similar spreadsheet to the one that was used previously, and new demands will be calculated based on projected acres as in the past.

Attachment A  
WEST WHARTON COUNTY (Region P)  
Agricultural Water Use By Category

Water Use Category	1995 - 2000 Average NASS	in Region P (%)	1st Crop Irrigated (%)	1st Crop Land	1st Crop Irrigation Rate (m/acre)	1st Crop Irrigation Rate (ac-ft/ac)	1st Crop % Conduit Loss	1st Crop Conduit Loss Rate (ac-ft/ac)	1st Crop Total Water Use Rate (ac-ft/ac)	1st Crop Demand (ac-ft)	2nd Crop % Average Land Planted	2nd Crop Planted (acres)	2nd Crop % Water Use Rate (ac-ft/ac)	2nd Crop Water Use Rate (ac-ft/ac)	2nd Crop Total Water Demand (ac-ft)	Year 2000 Total Water Demand (ac-ft)	% of Region P Demand (%)
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RICE	58,083	42%	10%	24,395	31	2.58	35%	1.39	2.92	9,695	65%	16,345	75%	2.98	27,056	13.1%
Groundwater Source			90%	21,956	28	2.33	20%	0.58	2.92	64,037	65%	14,271	65%	1.90	27,056	75.2%
Surface Water Source			10%	2,440	31	2.58	35%	1.39	3.97	9,695	85%	2,074	75%	2.98	6,181	15.876

COTTON	Irrigated crop	70,383	29%	20,411	8	0.67	8	0.67	2,721	Rice Overall Water Use Rate (ac-ft/1st crop acres)		1.90	1.23	2.53	6,181	15,876	13.1%
										groundwater	surface water						
CORN	Irrigated crop	45,333	19%	8,613	8	0.67	8	0.67	1,723	4.15	4.38	1.90	1.23	2.53	6,181	15,876	13.1%
MIL0 (= Sorghum)	Irrigated crop	72,433	52%	37,665	6	0.50	6	0.50	1,883	4.15	4.38	1.90	1.23	2.53	6,181	15,876	13.1%
SOYBEANS	Irrigated crop	14,250	19%	3,767	6	0.50	6	0.50	1,883	4.15	4.38	1.90	1.23	2.53	6,181	15,876	13.1%
TURFGRASS	Irrigated crop	9,300	14%	1,300	30	2.50	6	0.50	338	4.15	4.38	1.90	1.23	2.53	6,181	15,876	13.1%

TOTAL IRRIGATION																
36,805	acres															

WATERFOWL HABITAT	5%	1,220	6	0.50	610	0.50	610	0.50	1,000	0.50	1,000	0.50	1,000	0.8%	610	0.5%
AQUACULTURE		200	60	5.00	1,000	5.00	1,000	5.00	1,000	5.00	1,000	5.00	1,000	0.8%	1,000	0.8%
LIVESTOCK *		13,000		0.028	364	0.028	364	0.028	364	0.028	364	0.028	364	0.3%	364	0.3%
MUNICIPAL														1.9%	2,294	1.9%
MANUFACTURING														0.04%	49	0.04%
POWER COOLING														0%	0	0%
MINING														0.003%	4	0.003%
TOTALS														100%	121,205	100%

Sum = 118,494  
(Irrigation + Watertowl + Aquaculture)

\* Note: LIVESTOCK water demand = (# head of livestock) \* (25 gallons water per head per day) \* (365 days per year) \* (1 acre-foot per 325,851 gallons)  
Loss Rate = (Diversion Rate) \* (% Loss)

Attachment A	JACKSON COUNTY (Region P) Agricultural Water Use By Category																	
Water Use Category	1995 - 2000 Average NASS Acreage (acres)	% Acres in Region P (%)	1st Crop % Acres Irrigated (%)	1st Crop Land Planted (acres)	1st Crop Irrigation Rate (in/acre)	1st Crop Irrigation Rate (ac-ft/ac)	1st Crop % Conduit Loss (% / acre)	1st Crop Conduit Loss Rate (ac-ft/ac)	1st Crop Total Water Use Rate (ac-ft/ac)	1st Crop Total Water Demand (ac-ft)	2nd Crop % Acreage ( % of 1st crop)	2nd Crop Land Planted (acres)	2nd Crop % Water Use Rate ( % of 1st crop)	2nd Crop Water Use Rate (ac-ft/ac)	2nd Crop Water Use Rate (ac-ft/1st crop ac)	2nd Crop Total Water Demand (ac-ft)	Total Water Demand (ac-ft)	% of Region P Demand (%)
RICE	22,317	100%																
Groundwater Source			95%	21,201	31	2.58	20%	0.65	3.23	68,461	25%	5,300	65%	2.10	0.52	11,125	79,586	86.5%
Surface Water Source			5%	1,116	34	2.83	35%	1.53	4.36	4,864	40%	446	75%	3.27	1.31	1,459	6,323	6.9%
Rice Overall Water Use Rate (ac-ft/1st crop acres)																		
groundwater 3.75																		
surface water 5.67																		
combined 3.85																		
COTTON	31,100	100%	5%	1,555	8	0.67			0.67	1,037							1,037	1.1%
CORN	52,350	100%																
Irrigated crop			2%	1,047	8	0.67			0.67	698							698	0.8%
MILO (= Sorghum)	30,517	100%																
Irrigated crop			0%	0	6	0.50			0.50	0							0	0.0%
SOYBEANS	9,517	100%																
Irrigated crop			0%	0	6	0.50			0.50	0							0	0.0%
TURFGRASS				0	60	5.00			5.00	0							0	0.0%
TOTAL IRRIGATION				2,602	acres												87,644	95.3%
WATERFOWL HABITAT			2%	446	6	0.50			0.50	223							223	0.2%
AQUACULTURE				200	50.4	4.20			4.20	840							840	0.9%
LIVESTOCK *				26,000		0.028	10%	0.003	0.03	801							801	0.9%
MUNICIPAL																	1,815	2.0%
MANUFACTURING																	560	0.6%
POWER COOLING																	0	0.0%
MINING																	110	0.1%
TOTALS																	91,993	100%

Total Irrigation Planning Value  
 (Irrigation + Waterfowl + Aquaculture)  
 Sum = 88,707

\* Note: LIVESTOCK water demand = (# head of livestock) \* (25 gallons water per head per day) \* (365 days per year) \* (1 acre-foot per 325,851 gallons)

Loss Rate = (Diversion Rate) \* ( % Loss)

Attachment A

LAVACA COUNTY (Region P)  
Agricultural Water Use By Category

Water Use Category	1995 - 2000 Average NASS	in Region P	% Acres Irrigated	1st Crop Land	1st Crop Irrigation Rate	1st Crop Conduit Loss	1st Crop Conduit Loss Rate	1st Crop Use Rate	1st Crop Total Water Demand	2nd Crop % Average Land Planted	2nd Crop % Water Use Rate	2nd Crop Water Use Rate	2nd Crop Total Water Demand	Total Water Demand of Region (%)
RICE	2,917	100%	95.5%	2,785	31	2.83	35%	1.53	4.36	25%	75%	3.27	1,462	59.1%
Groundwater Source									3.23			2.10	0.52	10.456
Surface Water Source			4.5%	131	34	2.83			4.36	0%	0	3.27	0.00	572
COTTON	0	100%	20%	0	8	0.67			0.67			3.75	0	62.4%
Irrigated crop									0.67			groundwater	4.36	
CORN	6,833	100%	0%	0	8	0.67			0.67			combined	3.78	0
Irrigated crop									0.67			surface water	4.36	0
MIL0 (= Sorghum)	1,433	100%	0%	0	6	0.50			0.50				0	0.0%
Irrigated crop									0.50				0	0.0%
SOYBEANS	0	100%	25%	0	6	0.50			0.50				0	0.0%
Irrigated crop									0.50				0	0.0%
TURFGRASS	0	100%		0	60	5.00			5.00				0	0.0%
Irrigated crop									5.00				0	0.0%
TOTAL IRRIGATION				2,917	acres								11,028	62.4%
WATERFOWL HABITAT	3%			88	6	0.50			0.50				44	0.2%
AQUACULTURE	100	50	4.20	4.20	4.20	4.20			4.20				420	2.4%
LIVESTOCK *	90,000	0.028	10%	0.003	0.03	2,772			2,772				44	0.2%
MUNICIPAL													3,074	17.4%
MANUFACTURING													319	1.8%
POWER COOLING													0	0.0%
MINING													30	0.2%
TOTALS													17,687	100%

Sum = 11,492  
(Irrigation + Watertow + Aquaculture)

\* Note: LIVESTOCK water demand = (# head of livestock) \* (25 gallons water per head per day) \* (365 days per year) \* (1 acre-foot per 325,851 gallons)  
Loss Rate = (Diversion Rate) \* (% Loss)

Attachment A	Lavaca Regional Water Planning Area Summary Water Use Data by County									
	Total Water Demand			Total Acres Planted			Region P Total		Region P	
Water Use Category	Wharton Co. (ac-ft)	Jackson Co. (ac-ft)	Lavaca Co. (ac-ft)	Wharton Co. (acres)	Jackson Co. (acres)	Lavaca Co. (acres)	% Water Demand (%)	Water Demand (ac-ft)	Water Use Rate (all 3 counties) (ac-ft/ac)	
RICE										
Groundwater Source	91,092	79,586	10,456	36,227	26,501	3,482	78.5%	181,135	2.74	avg. all rice
Surface Water Source	15,876	6,323	572	4,513	1,562	131	9.9%	22,771	3.67	2.82
							88.3%			
COTTON Irrigated crop	2,721	1,037	0	4,082	1,555	0	1.6%	3,758		
CORN Irrigated crop	1,723	698	0	2,584	1,047	0	1.0%	2,421		
MILO Irrigated crop	1,883	0	0	3,767	0	0	0.8%	1,883		
SOYBEAN Irrigated crop	338	0	0	677	0	0	0.1%	338		
TURFGRASS	3,250	0	0	1,300	0	0	1.4%	3,250		
TOTAL IRRIGATION	116,885	87,644	11,028	53,149	30,665	3,613	93.4%	215,557		
WATERFOWL HABITAT	610	223	44				0.4%	877		
AQUACULTURE	1,000	840	420				1.0%	2,260		
TOTAL IRRIGATION	118,494	88,707	11,492				94.7%	218,693		
PLANNING VALUE										
LIVESTOCK *	364	801	2,772				1.7%	3,937		
MUNICIPAL	2,294	1,815	3,074				3.1%	7,183		
MANUFACTURING	49	560	319				0.4%	928		
POWER COOLING	0	0	0				0.0%	0		
MINING	4	110	30				0.1%	144		
TOTALS	121,205	91,993	17,687				100%	230,886		

\* Note: LIVESTOCK water demand = (# head of livestock) \* (25 gallons water per head per day) \* (365 days per year) \* (1 acre-foot per 325,851 gallons)

Attachment A	Region P Summary Rice Irrigation Water Use Rates (acre-feet / 1st crop acres) *								Overall Water Use Rates (ac-ft/acre)
	Groundwater Use Rates				Surface Water Use Rates				
County	canal loss (%)	1st crop total	2nd crop total	1st & 2nd combined	canal loss (%)	1st crop total	2nd crop total	1st & 2nd combined	
West Wharton	20%	2.92	1.90	4.15	35%	3.97	2.98	6.51	4.38
Jackson	20%	3.23	2.10	3.75	35%	4.36	3.27	5.67	3.85
Lavaca	20%	3.23	2.10	3.75	35%	4.36	3.27	4.36	3.78
Total Region P	-	3.08	1.96	3.94	-	4.10	3.03	6.18	4.11

\* Note: Water Use Rate = water demand / acres planted



Attachment B																	
Program yield = 49,426																	
Texas Planted Rice Acreage (FSA CERTIFIED)																	
Tx. Base Acres = 585,807																	
Long and Medium Grain																	
County	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Base Acres (10-12-07) (8-1-06)	% of Base Planted 2007
Chambers	26,509	29,932	28,217	20,906	20,411	21,672	17,197	11,432	13,438	13,202	10,937	16,024	12,792	8,088	8,180	57,563	14%
Brazoria	29,205	32,701	29,975	16,818	21,888	18,718	17,163	15,279	14,077	10,395	15,748	15,976	12,997	11,461	61,783	61,783	19%
Jackson	25,435	30,920	27,560	25,235	20,521	20,128	18,355	16,208	14,953	14,005	13,057	14,734	12,713	9,929	10,115	44,663	23%
Jefferson	30,685	33,849	32,324	26,102	24,947	24,422	18,519	18,575	18,389	15,037	19,954	19,355	14,234	14,112	60,281	60,281	23%
Wharton	53,205	63,433	61,118	58,930	50,737	57,530	52,205	50,520	49,958	41,664	53,413	50,678	35,417	34,928	98,381	98,381	36%
Liberty	19,781	23,854	19,386	11,071	14,074	14,328	8,740	12,705	9,714	7,949	10,475	9,381	5,440	4,387	50,419	50,419	9%
Colorado	34,513	41,783	37,551	36,200	36,091	33,522	31,136	32,110	30,734	28,572	33,273	30,903	25,465	26,517	57,654	57,654	46%
Harris	8,441	9,363	8,095	6,654	6,484	4,875	2,957	1,975	2,083	1,664	1,522	1,067	195	192	17,982	17,982	1%
Calhoun	4,189	5,682	4,875	4,760	2,511	3,851	3,164	1,568	1,468	1,897	2,488	2,439	2,767	2,086	11,602	11,602	18%
Fort Bend	9,934	11,499	11,207	9,418	10,680	10,179	9,006	8,894	8,652	6,071	7,933	6,409	4,496	4,925	20,720	20,720	24%
Matagorda	28,515	35,409	30,246	26,692	26,814	30,518	28,598	23,036	24,958	24,516	18,878	23,672	21,863	16,913	55,314	55,314	31%
Victoria	3,486	4,190	3,824	2,775	2,941	3,302	2,401	1,937	1,748	1,247	1,356	1,705	564		7,132	7,132	0%
Lavaca	3,487	4,040	3,572	3,703	2,682	2,452	2,006	2,523	1,746	1,790	1,582	2,189	1,804	1,039	7,622	7,622	14%
Galveston	3,929	3,780	2,993	2,144	2,110	1,993	1,590	1,360	768	1,166	781	847	314	300	10,484	10,484	3%
Orange	2,053	1,520	1,301	732	750	2,248	362	531	354	682	0	90			2,264	2,264	0%
Austin	2,323	3,172	2,366	2,479	2,878	2,702	2,435	2,601	1,694	1,684	2,313	2,359	904	1,003	4,995	4,995	23%
Bowie	1,700	1,459	1,600	1,600	1,136	1,538	1,030	1,435	1,287	1,332	1,510	2,054	608	284			
Red River	1,020	1,000	1,050	47	951	1,100	709	965	1,017	587	639	639	440				
Waller	6,528	7,343	6,785	5,677	6,741	6,694	6,142	6,206	6,951	7,038	7,168	7,868	7,672	298	6,038	6,038	38%
Hardin	585	752	463	714	899	1,185	1,052	1,093	801	633	738	762	235	670	1,555	1,555	43%
Hopkins	670	0	600	750	700	1,563	1,141	1,562	1,473	1,034	713	0					
Robertson													87	81	159		
Lamar																	
<b>Total</b>	<b>296,193</b>	<b>345,680</b>	<b>315,108</b>	<b>263,407</b>	<b>256,944</b>	<b>271,989</b>	<b>246,227</b>	<b>211,241</b>	<b>213,703</b>	<b>204,880</b>	<b>171,953</b>	<b>216,810</b>	<b>201,024</b>	<b>147,549</b>	<b>143,298</b>	<b>585,807</b>	<b>24%</b>
2007 Acreage includes 10,894 organic acres																	

## County Call List

### COKE COUNTY

*Neil Hudgins*  
Coastal Bend GCD  
PO Box 341  
Wharton, TX 77488  
979.531.1412

### COLORADO COUNTY

*Rudy Drlik*  
1627 County Road 169  
Garwood, TX 77442  
979.758.3602

### JACKSON COUNTY

*Dwayne Vincent*  
FSA  
361.782.7151  
dwayne.vincent@tx.usda.gov

*Hal Koop*  
1202 S. Gilbert St.  
Edna, TX 77957  
361.782.2229 (h) or 361.782.1280 (c)

*Gary Skalicky*, Chairperson  
P. O. Box 104  
Ganado, Texas 77962  
361.771.2680

*David Sappington*, Vice-Chairperson  
1292 County Road 312  
Edna, Texas 77957  
361.782.6743

*Matthew Joey Bures*, Voting Member  
5352 State Highway 172  
Ganado, Texas 77962  
(Bures Farms, 14384 State HWY 111 S, Ganado, TX 77962, 361.771.3940)\*

Linda Ann Chanek, Advisor  
2060 County Road 238  
Ganado, Texas 77962  
361.771.2279

### LAVACA COUNTY

*Lawrence Campbell (and Committee)*  
FSA  
361.798.3277  
lawrence.campbell@tx.usda.gov

*Chris Janak*  
NRCS  
310 S La Grange St.  
Hallettsville, TX 77964  
361.798.3279

*Dean Schmidt*  
13476 FM 530  
Hallettsville, TX 77964  
361.798.4619

*Jimmy Cardiff*  
1847 County Road 14  
Hallettsville, TX 77964  
361.798.4344

*Mary Schroeder*, Chairperson  
876 County Road 214  
Hallettsville, Texas 77964  
361.798.5293

*David Bobuslan, Sr.*, Vice-Chairperson  
5729 FM 532  
Moulton, Texas 77975  
361.596.4451

*Gary L. Kusak*, Voting Member  
1184 County Road 297  
Shiner, Texas 77984  
(100 S. Main St, Moulton, TX 77975, 361.596.4813)\*

*Thomas Perez*, Advisor  
578 County Road 263  
Moulton, Texas 77975  
361.596.4988

## **WHARTON COUNTY**

*John Williams*  
FSA  
979.532.0567  
john.williams@tx.usda.gov

*Ross Glaze*  
55 Frels St  
El Campo, TX  
979.543.9479

*William Garrett*  
4014 N FM 441  
El Campo, TX 77437  
979.578.9473

*Thomas (Tommy) Carol*  
[undisclosed] FM 1300  
El Campo, TX 77437  
979.543.7831

*Layton Raun*  
611 China St.  
El Camp, TX 77437  
979.543.5769 (h) or 979.541.3467 (c)

*Lynn Cox*  
1509 Michael St.  
El Campo, TX 77437  
979.543.7941

*Steven M. Goetsch*, Chairperson  
RR 2 Box 176  
El Campo, Texas 77437  
979.543.5038

*Anthony Kresta*, Vice-Chairperson  
RR 1 Box 162  
El Camp, Texas 77437  
(Listed in Ganado, 361.771.3877)\*

*Henry J. Hlavinka, Jr.*, Voting Member  
P. O. Box 972  
East Bernard, Texas 77435  
(Hlavinka Equipment Co., HWY 90A, East Bernard, TX 77435, 281.342.2481 or 3709 HWY 59 S., East Bernard, TX  
77435, 281.342.5527)\*  
(Boettcher Hlavinka Building, 116 Pietzsch St, East Bernard, TX 77435, 979.335.6031)\*

**\*Estimation based on internet findings. Presumed valid; but will need to confirm, either by calling directly or inquiring with the designated.**

Minutes of Lavaca Regional Water Planning Group  
February 25, 2008  
Edna, Texas

A meeting of the Lavaca Regional Water Planning Group was held in the Meeting Room of the Lavaca-Navidad River Authority Office Complex, 4631 FM 3131, located approximately seven (7) miles east of Edna, Jackson County, Texas off FM 3131 on Monday, February 25, 2008 at 1:30 p.m.

Voting Group Members present were: Chairman Judge Harrison Stafford II, Calvin Bonzer, Patrick Brzozowski, John Butschek, Jack Maloney, Richard Ottis, L. G. Raun, Dean Schmidt, Robert Shoemate, David E. Wagner, Larry Waits, Ed Weinheimer, and Bob Weiss.

Absent Voting Group Members were: Gerald Clark, Roy Griffin, Pat Hertz, and Philip Miller.

Also present were: David Meeseey, Texas Water Development Board, Mark Lowry and Jason Afinowicz of Turner Collie & Braden, David Myers, Lavaca County Groundwater Conservation District, Neil Hudgins of Coastal Bend/Coastal Plains Groundwater Conservation District, Max Castaneda and Rene Marroquin of the City of Corpus Christi, Larry Svetlik, Josh Harper, Gary Skalicky, Lynn Cox, Ronald Kubecka, LNRA Board President, and Karen Gregory, LNRA staff.

Chairman Stafford called the meeting to order.

### **Public Comments**

There were no public comments.

### **Minutes**

The minutes of the September 10, 2007 meeting were reviewed. Weinheimer moved the minutes be approved as presented. Brzozowski seconded the motion. Motion passed.

### **Election of Officers**

Raun moved to re-elect Stafford, Chairman, Weiss, Vice-Chairman, and Brzozowski, Secretary of the Lavaca Regional Water Planning Group. Ottis seconded the motion. Motion passed.

### **Appointment of New Voting Member**

Wagner introduced Tommy Brandenberger of Hallettsville as a prospective LRWPG voting member to replace Morkovsky. Wagner moved to elect Tommy Brandenberger to the Lavaca Regional Water Planning Group as a voting member. Raun seconded the motion. Motion passed.

### **Committee Assignments**

Brzozowski moved to approve Committees as follows:

*Agriculture Committee:* Shoemate, Schmidt, Raun, Weinheimer, Brzozowski

*Scoping Committee:* Brzozowski, Raun, Maloney, Weiss.

Raun seconded the motion. Motion passed.

### **Agriculture Committee Report**

Lowry presented the planned methodology for the agricultural demands task. The calculations for projected water usage will be composed of 1) planted crop acreage data from the Farm Service Agency (FSA), Coastal Bend Groundwater Conservation District (GCD), the Garwood Irrigation Company (Garwood), and local input, 2) source water information from Coastal Bend GCD, Garwood, and the South Texas Watermaster, 3) irrigation rate information from Coastal Bend GCD and Garwood, and 4) policy considerations from the proposed Farm Bill if available as well as other events that affect the rice market.

### **Methodology for Revising Water Demands**

Raun moved to approve methodology for revising water demands for rice irrigation and authorize presentation of approved methodology to Texas Water Development Board for approval. Waits seconded the motion. Motion passed.

### **RFP from the Texas Water Development Board**

Brzozowski moved to authorize TCB to participate with the approved scoping committee in preparing a Scope of Work for completion of a Regional Water Plan for the Lavaca Regional Water Planning Group. This scope will be made available for consideration and approval at the May 19, 2008 meeting. Butschek seconded the motion. Motion passed.

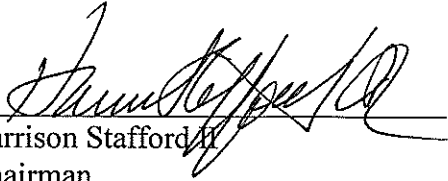
### **Authorize Scoping Committee**

Weinheimer moved to authorize the Scoping Committee to work with Turner Collie Braden to develop draft scope for presentation to the Lavaca Regional Water Planning Group. Ottis seconded the motion. Motion passed.

The meeting was recessed at 2:40 p.m.

The meeting was reconvened at 2:50 p.m. to discuss agriculture water demands.

The meeting adjourned at 2:50 p.m.

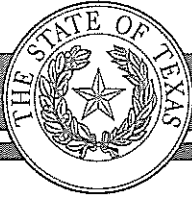
A handwritten signature in black ink, appearing to read "Harrison Stafford", is written over a horizontal line. The signature is cursive and somewhat stylized.

Harrison Stafford  
Chairman

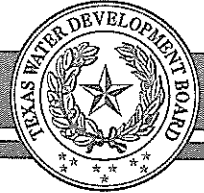
## **Appendix B**

### **TWDB Approval of Methodology**





# TEXAS WATER DEVELOPMENT BOARD



James E. Herring, *Chairman*  
Lewis H. McMahan, *Member*  
Edward G. Vaughan, *Member*

J. Kevin Ward  
*Executive Administrator*

Jack Hunt, *Vice Chairman*  
Thomas Weir Labatt III, *Member*  
Joe M. Crutcher, *Member*

RECEIVED  
JUN 16 2008

LAVACA NAVIDAD RIVER AUTHORITY

June 4, 2008

The Honorable Harrison Stafford, II  
Chairman, Lavaca Regional Water Planning Group  
c/o Lavaca-Navidad River Authority  
P.O. Box 429  
Edna, Texas 77957

Re: Proposed Methodology for Developing Irrigation Water Demands

Dear Judge Stafford:

At the Lavaca (Region P) Regional Water Planning group meeting on February 25, 2008 and in subsequent electronic correspondence between your consultants and the Texas Water Development Board (TWDB), the group requested permission to use a modified irrigation water demand methodology in the current phase of regional water planning. Approval by the Executive Administrator for use of region-specific water demand methodology is required by the regional planning grant contract between the TWDB and the political subdivision for your planning group.

After a review of the proposed methodology by our Water Planning Research and Analysis Section, the TWDB agrees that it is an appropriate tool for your region to use during the current planning cycle. Use of this methodology is approved for development of the 2011 Region P plan. Adoption of final demand projections by the planning group must be consistent with TAC §357.5(d)(2) and is subject to approval by the TWDB.

We appreciate your ongoing commitment to regional water planning. If you have any questions, please contact Mr. David Meeseey, Regional Water Planning Manager, at (512) 936-0852.

Sincerely,

  
J. Kevin Ward  
Executive Administrator

LNRA PERMANENT FILE

FROM: copy DATE: 6/16/08 BY: copy  
1200  
1200  
769  
TO FILE: copy Harrison  
Stafford

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## **Appendix C**

### **FSA**

**Appendix C-1**  
**FSA Rice Acreage**

Texas Planted Rice Acreage (FSA CERTIFIED)	Tx. Base Acres =		585,807												
County	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	(8-1-06) 2006	(10-12-07) 2007
Chambers	26,509	29,932	28,217	20,906	20,411	21,672	17,197	11,432	13,438	13,202	10,937	16,024	12,792	8,088	8,180
Brazoria	29,205	32,701	29,975	16,818	21,888	18,718	19,241	17,163	15,279	14,077	10,395	15,748	15,976	12,997	11,461
Jackson	25,435	30,920	27,560	25,235	20,521	20,128	18,355	16,208	14,953	14,005	13,057	14,734	12,713	9,929	10,115
Jefferson	30,685	33,849	32,324	26,102	24,947	24,422	22,655	18,519	18,575	18,389	15,037	19,954	19,355	14,234	14,112
Wharton	53,205	63,433	61,118	58,930	50,737	57,530	55,253	52,205	50,520	49,958	41,664	53,413	50,678	35,417	34,928
Liberty	19,781	23,854	19,386	11,071	14,074	18,706	14,328	8,740	12,705	9,714	7,949	10,475	9,381	5,440	4,387
Colorado	34,513	41,783	37,551	36,200	36,091	35,698	33,522	31,136	32,110	30,734	28,572	33,273	30,903	25,465	26,517
Harris	8,441	9,363	8,095	6,654	6,484	6,187	4,875	2,957	1,975	2,083	1,664	1,522	1,067	195	192
Calhoun	4,189	5,682	4,875	4,760	2,511	3,851	3,164	1,568	1,468	1,498	1,897	2,488	2,439	2,767	2,086
Fort Bend	9,934	11,499	11,207	9,418	10,680	10,179	9,006	8,894	8,652	8,615	6,071	7,933	6,409	4,496	4,925
Matagorda	28,515	35,409	30,246	26,692	26,814	30,518	28,598	23,036	24,958	24,516	18,878	23,672	21,863	18,075	16,913
Victoria	3,486	4,190	3,824	2,775	2,941	3,302	2,401	1,937	1,977	1,748	1,247	1,356	1,705	564	
Lavaca	3,487	4,040	3,572	3,703	2,682	2,452	2,006	2,523	1,746	1,790	1,582	2,189	1,804	1,039	1,029
Galveston	3,929	3,780	2,993	2,144	2,110	1,993	1,590	1,360	768	1,166	781	847	833	314	300
Orange	2,053	1,520	1,301	732	750	2,248	362	531	354	682	0	90			
Austin	2,323	3,172	2,366	2,479	2,878	2,673	2,702	2,435	2,601	1,694	1,684	2,313	2,359	904	1,003
Bowie	1,700	1,459	1,600	1,600	1,136	1,329	1,538	1,030	1,435	1,287	1,332	1,510	2,054	608	284
Red River	1,020	1,000	1,050	47	951	941	1,100	709	965	1,017	587	639	639	440	
Waller	6,528	7,343	6,785	5,677	6,741	6,694	6,142	6,206	6,951	7,038	7,168	7,868	7,672	6,260	6,038
Hardin	585	752	463	714	899	1,185	1,052	1,093	801	633	738	762	298	235	670
Hopkins	670	0	600	750	700	1,563	1,141	1,562	1,473	1,034	713	0			
Robertson													87	81	159
Lamar															
<b>Total</b>	<b>296,193</b>	<b>345,680</b>	<b>315,108</b>	<b>263,407</b>	<b>256,944</b>	<b>271,989</b>	<b>246,227</b>	<b>211,241</b>	<b>213,703</b>	<b>204,880</b>	<b>171,953</b>	<b>216,810</b>	<b>201,024</b>	<b>147,549</b>	<b>143,298</b>

**Appendix C-2**

**FSA Irrigated and Non-Irrigated Acreage**



Jackson, Lavaca, and Wharton Counties Listed Acreage																								
Crop	2000			2001			2002			2003			2004			2005			2006			2007		
	Irr.	Non-Irr.	Total	Irr.	Non-Irr.	Total	Irr.	Non-Irr.	Total	Irr.	Non-Irr.	Total	Irr.	Non-Irr.	Total	Irr.	Non-Irr.	Total	Irr.	Non-Irr.	Total			
Aquaculture	0	94	94	0	140	140	0	446	446	0	528	528	117	1,886	2,003	119	2,189	2,309	4	2,518	2,522	5	2,883	2,888
Corn	48	82,466	82,514	0	94,950	94,950	0	105,565	105,565	3,162	97,328	100,490	130	76,250	76,381	50	97,357	97,407	2,625	112,580	115,204	1,170	154,237	155,407
Cotton	0	137,284	137,284	0	116,130	116,130	0	96,409	96,409	1,986	100,017	102,003	0	114,824	114,824	291	115,330	115,621	526	105,214	105,739	0	65,076	65,076
Nursery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0
Pasture / Hay	0	247,695	247,695	0	198,379	198,379	0	323,370	323,370	199	307,828	308,027	113	289,190	289,302	0	308,781	308,781	0	338,955	338,955	0	324,354	324,354
Rice	0	74,869	74,869	0	73,322	73,322	0	65,684	65,684	0	61,555	61,555	0	70,185	70,185	0	66,158	66,158	0	46,385	46,385	0	46,072	46,072
Sorghum	0	98,777	98,777	0	93,450	93,450	0	94,663	94,663	948	98,429	99,376	0	79,582	79,582	104	58,681	58,785	569	57,507	58,076	0	75,783	75,783
Soybeans	0	23,744	23,744	0	34,505	34,505	0	33,143	33,143	585	14,128	14,713	665	33,844	34,509	315	30,939	31,254	482	21,807	22,288	0	6,330	6,330
Turfgrass	0	2,501	2,501	0	3,732	3,732	67	4,556	4,622	0	5,007	5,007	0	5,129	5,129	0	4,538	4,538	0	5,050	5,050	0	4,998	4,998
Waterfowl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total:</b>	<b>48</b>	<b>667,428</b>	<b>667,476</b>	<b>0</b>	<b>614,608</b>	<b>614,608</b>	<b>67</b>	<b>723,836</b>	<b>723,903</b>	<b>6,879</b>	<b>684,819</b>	<b>691,698</b>	<b>1,025</b>	<b>670,889</b>	<b>671,914</b>	<b>879</b>	<b>683,974</b>	<b>684,853</b>	<b>4,205</b>	<b>690,019</b>	<b>694,224</b>	<b>1,175</b>	<b>679,732</b>	<b>680,906</b>

**Appendix D**  
**CBGCD Data**



**Appendix D-1**

**2005 (LRWPA) Wharton Usage**

2005 CBGCD Water Demands by Usage for Wharton County (Region P)													
Use	Month												Total
	January	February	March	April	May	June	July	August	September	October	November	December	
Aquaculture	4.8	20.8	32.8	41.3	73.6	115.7	123.9	122.3	180.7	275.4	42.4	41.8	1,075.4
Commercial	2.1	2.1	2.2	2.2	2.5	2.6	2.5	2.4	2.2	2.1	2.2	2.0	27.0
Cotton	0.0	0.0	0.0	0.0	323.7	1,058.9	627.8	165.9	0.0	0.0	0.0	0.0	2,176.3
Corn	0.0	0.0	0.0	22.1	131.4	882.6	311.7	0.0	0.0	0.0	0.0	0.0	1,347.8
Industrial	0.0	0.0	0.0	0.0	0.0	0.8	1.7	1.5	1.8	1.5	1.6	1.9	10.8
Livestock	11.7	5.8	2.5	2.5	27.9	3.8	1.4	0.8	0.8	2.9	2.2	7.5	69.7
Milo	0.0	0.0	0.0	0.0	201.6	169.7	0.0	0.0	0.0	0.0	0.0	0.0	371.3
Municipal	144.5	135.0	165.6	161.7	172.4	222.4	206.4	232.1	228.3	212.9	156.0	144.5	2,181.7
Nursery	69.2	53.0	113.9	175.2	154.3	191.8	450.2	182.0	188.6	120.3	85.7	74.7	1,859.0
Pasture/hay	0.0	0.0	0.0	121.1	189.2	528.5	700.7	312.5	289.5	19.0	8.7	0.0	2,169.0
Soybeans	0.0	0.0	0.0	6.1	243.2	615.8	398.8	35.5	0.0	0.0	0.0	0.0	1,299.3
Turfgrass	0.0	0.0	95.8	125.7	125.7	196.8	164.6	124.6	156.6	193.1	7.4	5.3	1,195.6
Waterfowl	555.3	15.0	0.0	6.6	13.1	0.0	4.6	175.5	335.5	962.4	387.4	306.5	2,761.8
1st crop rice	0.0	0.0	1,377.9	5,736.5	10,744.5	15,115.2	12,746.6	2,518.8	132.4	75.0	0.0	0.0	48,446.9
2nd crop rice	0.0	0.0	0.0	0.0	0.0	0.0	124.3	4,676.8	4,094.8	1,031.3	45.0	0.0	9,972.1
Total rice	0.0	0.0	1,377.9	5,736.5	10,744.5	15,115.2	12,870.8	7,195.6	4,227.2	1,106.3	45.0	0.0	58,419.0
Rice (metered)	0.0	0.0	0.0	175.4	237.3	401.8	420.8	66.6	75.1	0.0	0.0	0.0	1,377.1
Rice (gpm est.)	0.0	0.0	1,377.9	5,496.1	10,407.2	14,561.4	12,325.0	7,084.0	4,152.1	1,104.3	45.0	0.0	56,552.9
Rice (fuel est.)	0.0	0.0	0.0	65.0	100.0	152.0	125.0	45.0	0.0	2.0	0.0	0.0	489.0

2005 CBGCB Water Demands by Usage Category for Wharton County (Region P)														
Use	Month												Annual Total	%
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Non-agricultural	146.6	137.0	167.8	164.0	174.8	225.8	210.6	235.9	232.3	216.5	159.8	148.4	2,219.4	3.0
Rice	0.0	0.0	1,377.9	5,736.5	10,744.5	15,115.2	12,870.8	7,195.6	4,227.2	1,106.3	45.0	0.0	58,419.0	77.9
Other agriculture	640.9	94.6	245.0	500.5	1,483.7	3,763.5	2,783.8	1,119.0	1,151.6	1,573.1	533.7	435.9	14,325.3	19.1
Total	787.5	231.7	1,790.6	6,400.9	12,403.0	19,104.5	15,865.1	8,550.6	5,611.1	2,895.9	738.5	584.3	74,963.7	100.0

\*All values given are in units of acre-feet.

**Appendix D-2**

**2006 (LRWPA) Wharton Data**

2006 CBGCD Demands for Wharton County (Region P)																					
Use <sup>1</sup>	Crop																		Total		
	Crop 1			Crop 2			Crop 3			Crop 4			Crop 5			Crop 6			Usage ac-ft	Acreage	ac-ft / ac
	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac			
Aquaculture	3989.7	586.0	6.8	15.1	20.0	0.8	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	4,004.8	606.0	6.6
Commercial	37.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	37.0	0.0	---
Cotton	186.4	304.0	0.6	553.1	530.0	1.0	151.3	127.0	1.2	127.3	97.0	1.3	0.0	0.0	---	0.0	0.0	---	1,018.1	1,058.0	1.0
Corn	3386.4	4039.0	0.8	676.0	636.0	1.1	490.9	332.0	1.5	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	4,553.3	5,007.0	0.9
Industrial	21.3	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	21.3	0.0	---
Livestock	64.9	0.0	---	5.8	0.0	---	0.0	0.0	---	16.3	0.0	---	0.0	0.0	---	0.0	0.0	---	86.9	0.0	---
Milo	366.4	368.0	1.0	291.6	286.0	1.0	344.4	389.0	0.9	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	1,002.4	1,043.0	1.0
Municipal	2118.7	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	2,118.7	0.0	---
Nursery	1729.9	18.0	96.1	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	1,729.9	18.0	96.1
Pasture/hay	2628.3	3395.0	0.8	759.5	848.0	0.9	122.5	240.0	0.5	0.0	0.0	---	55.0	30.0	1.8	0.0	0.0	---	3,565.3	4,513.0	0.8
Soybeans	580.2	1191.0	0.5	331.7	589.0	0.6	223.5	273.0	0.8	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	1,135.3	2,053.0	0.6
Turfgrass	894.4	420.0	2.1	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	894.4	420.0	2.1
Waterfowl	2267.4	1020.0	2.2	494.1	831.0	0.6	1,335.4	1,080.0	1.2	16.0	11.0	1.5	0.0	0.0	---	0.0	0.0	---	4,112.9	2,942.0	1.4
1st crop rice	24686.5	9005.0	2.7	4605.2	1,539.0	3.0	360.0	120.0	3.0	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	29,651.8	10,664.0	2.8
2nd crop rice	0.0	0.0	---	6236.7	4,370.0	1.4	1,517.6	1,360.0	1.1	411.3	177.0	2.3	0.0	0.0	---	0.0	0.0	---	8,165.7	5,907.0	1.4
Total rice	24686.5	9005.0	2.7	10842.0	5,909.0	1.8	1,877.6	1,480.0	1.3	411.3	177.0	2.3	0.0	0.0	---	0.0	0.0	---	37,817.4	10,664.0	3.5
Rice (metered)	15419.6	5651.0	2.7	6961.6	3,791.0	1.8	1,046.0	985.0	1.1	240.0	120.0	2.0	0.0	0.0	---	0.0	0.0	---	23,667.2	10,547.0	2.2
Rice (gpm est.)	9266.9	3354.0	2.8	3880.3	2,118.0	1.8	831.7	495.0	1.7	171.3	57.0	3.0	0.0	0.0	---	0.0	0.0	---	14,150.2	6,024.0	2.3
Rice (fuel est.)	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---

2006 CBGCD Demands for Wharton County (Region P)																					
Use	Crop																		Total		
	Crop 1			Crop 2			Crop 3			Crop 4			Crop 5			Crop 6			Usage ac-ft	Acreage	ac-ft / ac
	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac	Usage ac-ft	Acreage	ac-ft / ac			
Non-agricultural	2177.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	0.0	0.0	---	2,177.0	0.0	---
Rice	24686.5	9005.0	2.7	10842.0	5,909.0	1.8	1,877.6	1,480.0	1.3	411.3	177.0	2.3	0.0	0.0	---	0.0	0.0	---	37,817.4	16,571.0	2.3
Other agriculture	16094.0	11341.0	1.4	3126.8	3,740.0	0.8	2,667.9	2,441.0	1.1	159.5	108.0	1.5	55.0	30.0	1.8	0.0	0.0	---	22,103.3	17,660.0	1.3
Total	42957.5	20346.0	2.1	13968.8	9,649.0	1.4	4,545.6	3,921.0	1.2	570.9	285.0	2.0	55.0	30.0	1.8	0.0	0.0	---	62,097.7	34,231.0	1.8

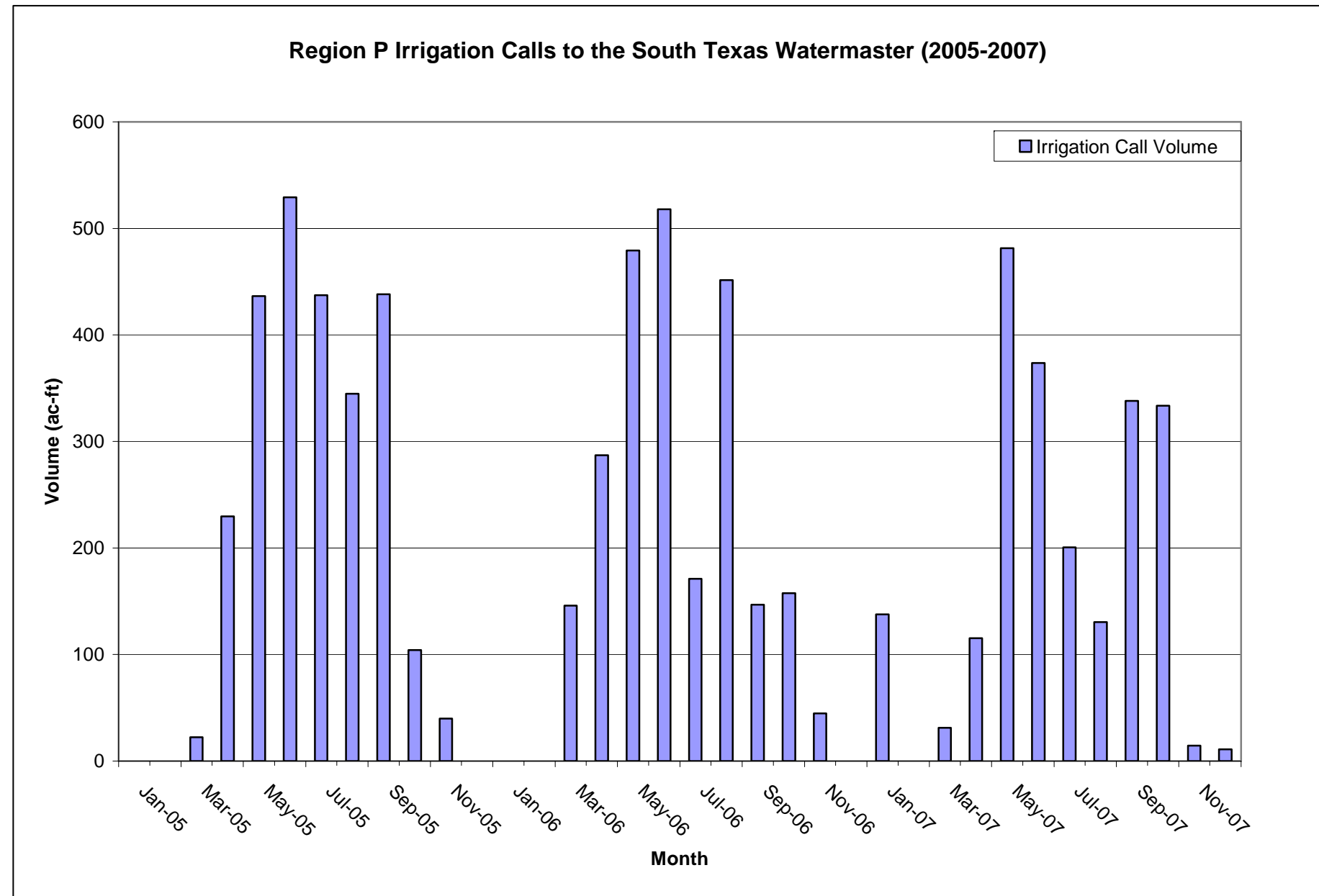
<sup>1</sup> Acreages were not provided for most of the records for nurseries, resulting in distorted values for usage per acre.

## **Appendix E**

### **2005 – 2007 LRWPA Surface Water Irrigation Calls to STWM**

Monthly Irrigation Calls	
Month	Volume (ac-ft)
Jan-05	0.00
Feb-05	0.00
Mar-05	22.39
Apr-05	229.54
May-05	436.43
Jun-05	529.14
Jul-05	437.21
Aug-05	344.75
Sep-05	438.26
Oct-05	104.17
Nov-05	39.77
Dec-05	0.00
Jan-06	0.00
Feb-06	0.00
Mar-06	145.83
Apr-06	287.06
May-06	479.25
Jun-06	517.97
Jul-06	171.09
Aug-06	451.54
Sep-06	146.72
Oct-06	157.46
Nov-06	44.74
Dec-06	0.00
Jan-07	137.76
Feb-07	0.00
Mar-07	31.19
Apr-07	115.38
May-07	481.39
Jun-07	373.68
Jul-07	200.47
Aug-07	130.34
Sep-07	338.07
Oct-07	333.49
Nov-07	14.40
Dec-07	11.05

Annual Irrigation Calls	
Year	Volume (ac-ft)
2005	2581.64
2006	2401.65
2007	2167.23



## **Appendix F**

### **Garwood Total Demand**

<b>Garwood Total Demand Including ROR and STO</b>			
<b>Year</b>	<b>Water Demand (ac-ft)</b>	<b>Acreage</b>	
		<b>LRWPA</b>	<b>Reg K.</b>
1999	71,450	3,017	13,582
2000	83,247	2,470	12,599
2001	77,777	2,025	13,715
2002	78,058	2,265	12,042
2003	73,676	2,244	10,931
2004	77,990	2,569	15,125
2005	85,072	3,618	12,129
<b>Average</b>	<b>78,181</b>	<b>2,601</b>	<b>12,875</b>

Percent Area in LRWPA:	20.2
Percent Area in Region K:	79.8
Average Demand LRWPA:	15,794 ac-ft/ac
Average Demand Region K:	62,387 ac-ft/ac



**Appendix G**

**Year 2010 Demands  
LRWPA Water Use by County**

WEST WHARTON COUNTY (Region P)																			
Agricultural Water Use By Category																			
Water Use Category	2000 - 2005 Average FSA Acreage (acres)	% Acres in Region P (%)	1st Crop % Acres Irrigated (%)	1st Crop Land Planted (acres)	1st Crop Irrigation Rate (in/acre)	1st Crop Irrigation Rate (ac-ft/ac)	1st Crop % Conduit Loss (% / acre)	1st Crop Conduit Loss Rate (ac-ft/ac)	1st Crop Total Water Use Rate (ac-ft/ac)	1st Crop Total Water Demand (ac-ft)	2nd Crop % Acreage (% of 1st crop)	2nd Crop Land Planted (acres)	2nd Crop % Water Use Rate (% of 1st crop)	2nd Crop Water Use Rate (ac-ft/ac)	2nd Crop Water Use Rate (ac-ft/1st crop ac)	2nd Crop Total Water Demand (ac-ft)	Year 2000 Total Water Demand (ac-ft)	% of Region P Demand (%)	
RICE	53,413	63%		33,686								18,659							
Groundwater Source			90%	30,317	33	2.78	0%	0.00	2.78	84,308	55%	16,793	50%	1.38	0.77	23,218	107,526	71.8%	
Surface Water Source			10%	3,369	49	4.09	0%	0.00	4.09	13,778	55%	1,866	50%	2.03	1.13	3,794	17,572	11.7%	
Rice Overall Water Use Rate (ac-ft/1st crop acres)																		84%	
groundwater																	3.55		
surface water																	5.22	5,262	3.5%
combined																	3.71		
COTTON	76,697	36%	20%	27,340	12	0.96			0.96	5,262									
Irrigated crop				5,468															
CORN	38,544	51%	30%	19,789	11	0.91			0.91	5,399									
Irrigated crop				5,937															
MILO (= Sorghum)	58,662	81%	10%	47,281	12	0.96			0.96	4,544									
Irrigated crop				4,728															
SOYBEANS	18,673	89%	25%	16,683	7	0.55			0.55	2,306									
Irrigated crop				4,171															
TURFGRASS	3,994	5%		201	26	2.13			2.13	429									
TOTAL IRRIGATION				54,191	acres												143,037	95.6%	
WATERFOWL HABITAT			5%	1,684	17	1.40			1.40	2,355									
AQUACULTURE				650	79.3	6.61			6.61	4,296									
TOTALS																	149,688	100%	
Total Irrigation Planning Value (Irrigation + Waterfowl + Aquaculture)																	Sum =	149,688	

JACKSON COUNTY (Region P)																			
Agricultural Water Use By Category																			
Water Use Category	2000 - 2005 Average FSA Acreage (acres)	% Acres in Region P (%)	1st Crop % Acres Irrigated (%)	1st Crop Land Planted (acres)	1st Crop Irrigation Rate (in/acre)	1st Crop Irrigation Rate (ac-ft/ac)	1st Crop % Conduit Loss (% / acre)	1st Crop Conduit Loss Rate (ac-ft/ac)	1st Crop Total Water Use Rate (ac-ft/ac)	1st Crop Total Water Demand (ac-ft)	2nd Crop % Acreage (% of 1st crop)	2nd Crop Land Planted (acres)	2nd Crop % Water Use Rate (% of 1st crop)	2nd Crop Water Use Rate (ac-ft/ac)	2nd Crop Water Use Rate (ac-ft/1st crop ac)	2nd Crop Total Water Demand (ac-ft)	Total Water Demand (ac-ft)	% of Region P Demand (%)	
RICE	14,374	100%		14,374								3,701							
Groundwater Source			95%	13,655	31	2.58	20%	0.65	3.23	44,095	25%	3,414	65%	2.10	0.52	7,165	51,261	85.7%	
Surface Water Source			5%	719	34	2.83	35%	1.53	4.36	3,133	40%	287	75%	3.27	1.31	940	4,073	6.8%	
Rice Overall Water Use Rate (ac-ft/1st crop acres)																		93%	
groundwater																	3.75		
surface water																	5.67	1,233	2.1%
combined																	3.85		
COTTON	36,989	100%	5%	1,849	8	0.67			0.67	1,233									
Irrigated crop																			
CORN	49,071	100%	2%	981	8	0.67			0.67	654									
Irrigated crop																			
MILO (= Sorghum)	26,988	100%	0%	0	6	0.50			0.50	0									
Irrigated crop																			
SOYBEANS	9,620	100%	0%	0	6	0.50			0.50	0									
Irrigated crop																			
TURFGRASS	261			261	60	5.00			5.00	1,304									
TOTAL IRRIGATION				17,466	acres												58,524	97.9%	
WATERFOWL HABITAT			2%	287	6	0.50			0.50	144									
AQUACULTURE				270	50.4	4.20			4.20	1,133									
TOTALS																	59,801	100%	
Total Irrigation Planning Value (Irrigation + Waterfowl + Aquaculture)																	Sum =	59,801	

LAVACA COUNTY (Region P) Agricultural Water Use By Category																			
Water Use Category	2000 - 2005 Average FSA Acreage (acres)	% Acres in Region P (%)	1st Crop % Acres Irrigated (%)	1st Crop Land Planted (acres)	1st Crop Irrigation Rate (in/acre)	1st Crop Irrigation Rate (ac-ft/ac)	1st Crop % Conduit Loss (% / acre)	1st Crop Conduit Loss Rate (ac-ft/ac)	1st Crop Total Water Use Rate (ac-ft/ac)	1st Crop Total Water Demand (ac-ft)	2nd Crop % Acreage (% of 1st crop)	2nd Crop Land Planted (acres)	2nd Crop % Water Use Rate (% of 1st crop)	2nd Crop Water Use Rate (ac-ft/ac)	2nd Crop Water Use Rate (ac-ft/1st crop ac)	2nd Crop Total Water Demand (ac-ft)	Total Water Demand (ac-ft)	% of Region P Demand (%)	
RICE	2,189	100%		2,189								523							
Groundwater Source			95.5%	2,090	31	2.58	20%	0.65	3.23	6,751	25%	523	65%	2.10	0.52	1,097	7,848	93.9%	
Surface Water Source			4.5%	99	34	2.83	35%	1.53	4.36	429	0%	0	75%	3.27	0.00	0	429	5.1%	
Rice Overall Water Use Rate (ac-ft/1st crop acres)																		99%	
groundwater																	3.75		
surface water																	4.36	3	0.0%
combined																	3.78	0	0.0%
COTTON	25	100%	20%	5	8	0.67			0.67	3									
Irrigated crop																			
CORN	5,269	100%	0%	0	8	0.67			0.67	0									
Irrigated crop																			
MILO (= Sorghum)	1,789	100%	0%	0	6	0.50			0.50	0									
Irrigated crop																			
SOYBEANS	351	100%	25%	88	6	0.50			0.50	44									
Irrigated crop																			
TURFGRASS	0	100%		0	60	5.00			5.00	0									
TOTAL IRRIGATION				2,282	acres												8,324	99.6%	
Total Irrigation Planning Value (Irrigation + Waterfowl + Aquaculture)																			
WATERFOWL HABITAT			3%	66	6	0.50			0.50	33									
AQUACULTURE				0	60.0	5.00			5.00	0									
TOTALS																	8,357	100%	
Sum =																	8,357		

Lavaca Regional Water Planning Area Summary Water Use Data by County										
Water Use Category	Total Water Demand			Total Acres Planted			Region P Total		Region P Water Use Rate	
	Wharton Co. (ac-ft)	Jackson Co. (ac-ft)	Lavaca Co. (ac-ft)	Wharton Co. (acres)	Jackson Co. (acres)	Lavaca Co. (acres)	% Water Demand (%)	Water Demand (ac-ft)	(all 3 counties) (ac-ft/ac)	
RICE										
Groundwater Source	107,526	51,261	7,848	47,110	17,069	2,613	76.5%	166,634	2.49	avg. all rice
Surface Water Source	17,572	4,073	429	5,234	1,006	99	10.1%	22,074	3.48	2.58
							86.6%	188,708		
COTTON Irrigated crop	5,262	1,233	3	5,468	1,849	5	3.0%	6,498		
CORN Irrigated crop	5,399	654	0	5,937	981	0	2.8%	6,053		
MILK Irrigated crop	4,544	0	0	4,728	0	0	2.1%	4,544		
SOYBEAN Irrigated crop	2,306	0	44	4,171	0	88	1.1%	2,350		
TURFGRASS	429	1,304	0	201	261	0	0.8%	1,732		
TOTAL IRRIGATION	143,037	58,524	8,324	72,849	21,167	2,805	96.3%	209,885		
WATERFOWL HABITAT	2,355	144	33				1.2%	2,531		
AQUACULTURE	4,296	1,133	0				2.5%	5,430		
TOTAL IRRIGATION	149,688	59,801	8,357				100.0%	217,846		
PLANNING VALUE										
TOTALS	149,688	59,801	8,357				100%	217,846		

\* Note: LIVESTOCK water demand = (# head of livestock) \* (25 gallons water per head per day) \* (365 days per year) \* (1 acre-foot per 325,851 gallons)

Region P Summary Rice Irrigation Water Use Rates (acre-feet / 1st crop acres) *							
County	Groundwater Use Rates			Surface Water Use Rates			Overall Water Use Rates (ac-ft/acre)
	1st crop total	2nd crop total	1st & 2nd combined	1st crop total	2nd crop total	1st & 2nd combined	
West Wharton	2.78	1.38	3.55	4.09	2.03	5.22	3.71
Jackson	3.23	2.10	3.75	4.36	3.27	5.67	3.85
Lavaca	3.23	2.10	3.75	4.36	3.27	4.36	3.78
Total Region P	2.93	1.52	3.62	4.14	2.20	5.27	3.76

\* Note: Water Use Rate = water demand / acres planted

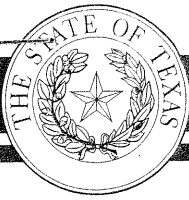
## **Appendix H**

### **Water Use Comparison to Prior RWPs**

Water Use Comparison to Prior RWPs												
Crop	2001 RWP				2006 RWP				Current			
	Jackson (ac-ft)	Lavaca (ac-ft)	LRWPA Wharton (ac-ft)	Total (ac-ft)	Jackson (ac-ft)	Lavaca (ac-ft)	LRWPA Wharton (ac-ft)	Total (ac-ft)	Jackson (ac-ft)	Lavaca (ac-ft)	LRWPA Wharton (ac-ft)	Total (ac-ft)
Aquaculture	0	0	0	0	840	420	1,000	2,260	1,133	0	4,296	5,430
Corn	11,802	1,649	1,737	15,187	698	0	1,723	2,421	654	0	5,399	6,053
Cotton	3,346	0	2,486	5,832	1,037	0	2,721	3,758	1,233	3	5,262	6,498
Sorghum	1,990	93	1,994	4,077	0	0	1,883	1,883	0	0	4,544	4,544
Soybeans	875	0	344	1,219	0	0	338	338	0	44	2,306	2,350
Turfgrass	500	250	5,000	5,750	0	0	3,250	3,250	1,304	0	429	1,732
Waterfowl	360	56	387	802	223	44	610	877	144	33	2,355	2,531
1st Crop Rice												
GW	54,577	8,432	47,540	110,549	68,461	8,995	64,037	141,492	44,095	6,751	84,308	135,153
SW	8,697	1,344	17,340	27,381	4,864	572	9,695	15,131	3,133	429	13,778	17,340
2nd Crop Rice												
GW	22,922	3,541	19,967	46,430	11,125	1,462	27,056	39,642	7,165	1,097	23,218	31,481
SW	3,044	470	6,069	9,583	1,459	0	6,181	7,640	940	0	3,794	4,734
<b>Total</b>	<b>108,114</b>	<b>15,833</b>	<b>102,863</b>	<b>226,810</b>	<b>88,707</b>	<b>11,492</b>	<b>118,494</b>	<b>218,693</b>	<b>59,801</b>	<b>8,357</b>	<b>149,688</b>	<b>217,846</b>

## **Appendix I**

### **TWDB Comments on Region-Specific Study Report**



# TEXAS WATER DEVELOPMENT BOARD



James E. Herring, *Chairman*  
Lewis H. McMahan, *Member*  
Edward G. Vaughan, *Member*

J. Kevin Ward  
*Executive Administrator*

Jack Hunt, *Vice Chairman*  
Thomas Weir Labatt III, *Member*  
Joe M. Crutcher, *Member*

February 20, 2009

Mr. Patrick Brzozowski  
General Manager  
Lavaca-Navidad River Authority  
P.O. Box 429  
Edna, Texas 79720

Re: Region P, Region-Specific Studies Contract for Regional Water Planning between the Texas Water Development Board (TWDB) and the Lavaca-Navidad River Authority (LNRA), TWDB Contract No. 0704830701, Draft Final Study Report Comments.

Dear Mr. Brzozowski:

*Patrick*  
Staff members of TWDB have completed a review of the Draft Final Study Report under TWDB Contract No. 0704830701. As stated in the above-referenced contract, LNRA will consider incorporating Draft Final Study Report comments, shown in Attachment 1, as well as other comments received, into the Final Study Report. In accordance with paragraph F, Article III, Section II of the contract, a copy of these TWDB Executive Administrator comments as well as a written summary of how the Draft Final Study Report was revised in response must be included in all the Final Study Report documents, for example, as an appendix.

TWDB looks forward to receiving one (1) electronic copy of all files, one electronic copy of each Final Study Report in Portable Document Format (PDF), and nine (9) bound double-sided copies of each Final Study Report to the TWDB Executive Administrator no later than the contract Final Study Report Deadline (April 30, 2009 for most reports). Please also transfer copies of all data and reports generated by the planning process and used in developing the Final Study Report to the TWDB Executive Administrator no later than the contract Final Study Report Deadline.

As a reminder, if any portion of the Final Study Report is to be included in a 2011 regional water plan it will be reviewed as part of the Initially Prepared Plan for meeting all statutory and agency rule requirements regarding the preparation of regional water plans.

If you have any questions concerning this contract, please contact David Meesey, TWDB's Regional Water Planning Section Manager for this study at (512) 936-0852.

Sincerely,

Carolyn L. Brittin  
Deputy Executive Administrator  
Water Resources Planning and Information

Enclosures  
Attachment 1

c: David Meesey, TWDB

### *Our Mission*

*To provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas.*

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## ATTACHMENT 1

TWDB Contract No. 0704830701

### Region P, Region-Specific Contract Study

#### 1) Agricultural Water Demand Analysis

#### TWDB Comments on Draft Final Region-Specific Study Report

1. Task 1 (#3) of the contract scope of work states “develop a methodology for revision to demand numbers”. In the Executive Summary of the report, please provide a description of the process to develop current estimates, including any parameters, data, models, and assumptions used, and how the methodology differs from that used in the 2006 Lavaca Regional Water Plan.
2. Please note that TWDB’s acceptance of a final report for this study does not constitute approval of any revised population or water demand projections contained therein. The formal procedure for requesting revised projections is stated in TAC 357.5 (d) (2):  
“Before requesting a revision to the population and water demand projections, the regional water planning group shall discuss the issue at a public meeting for which notice has been posted pursuant to the Open Meetings Act in addition to being published on the internet and mailed at least 14 days before the meeting to every person or entity that has requested notice of regional water planning group activities. The public will be able to submit oral or written comment at the meeting and written comments for 14 days following the meeting. The regional water planning group will summarize the public comments received in its request for projection revisions. Within 45 days of receipt of a request from a regional water planning group for revision of population or water demand projections, the executive administrator shall consult with the requesting regional water planning group and respond to their request.”

All requested revisions which receive the consensus recommendation of the Texas Water Development Board, Texas Department of Agriculture, Texas Commission on Environmental Quality, and Texas Parks and Wildlife Department, will then be presented for consideration of Board approval at the next scheduled meeting.

3. The contract scope of work Task 1 (#6) requires the contractor to “conduct one workshop in each county of the region, assemble input from all of the workshops and prepare minutes of the meetings”. Please document input received from workshop attendees and include minutes of the meetings in the final report.