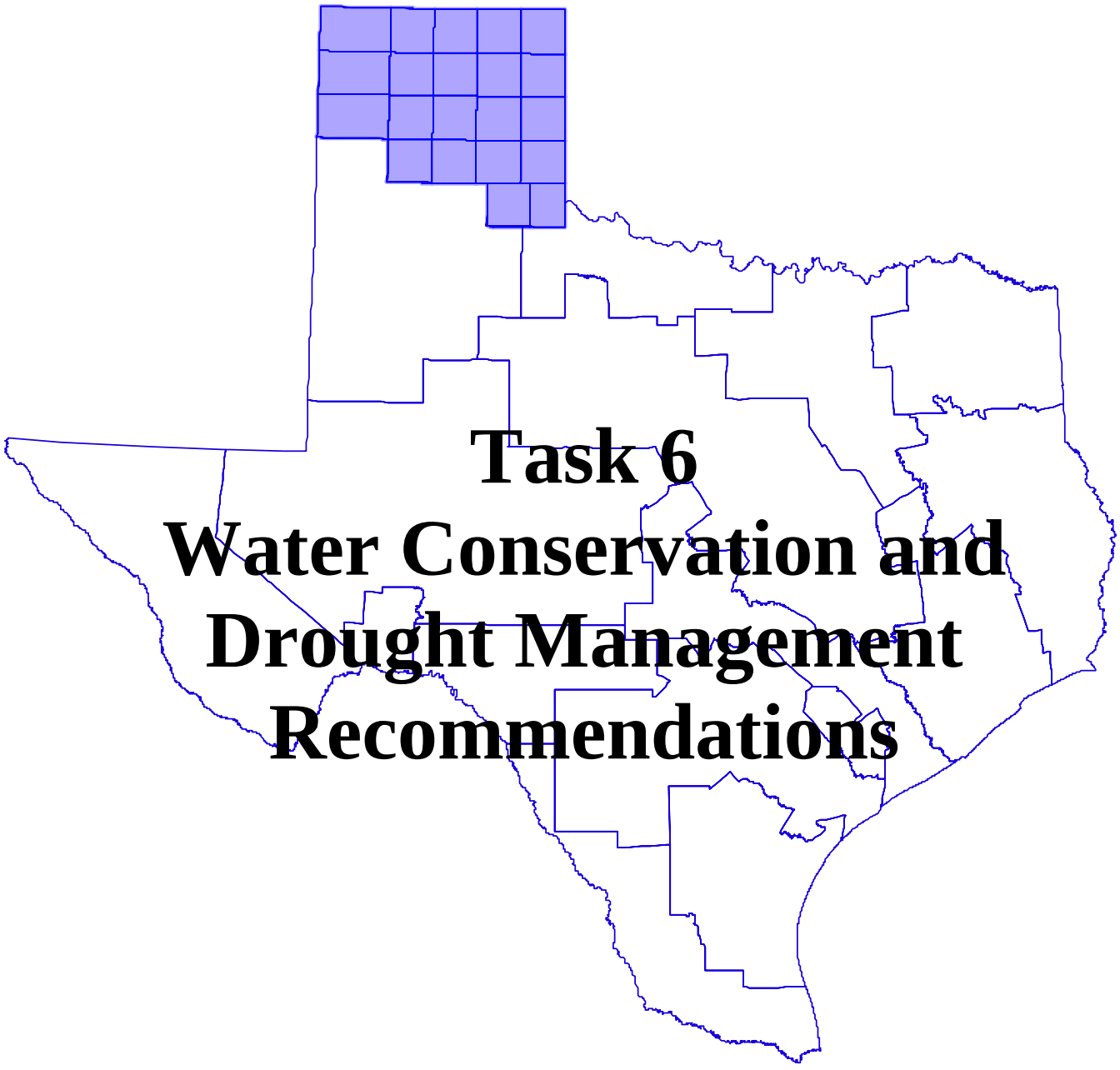

# Task 6
# Water Conservation and Drought Management Recommendations

## 6.1 Introduction

Water conservation is a potentially feasible water savings strategy that can be used to preserve the supplies of all existing water resources and must be considered for all water user groups with needs, or shortages, under SB2 guidelines. For municipalities and manufacturers, advanced drought planning and conservation can be used to protect their water supplies and increase reliability during drought conditions. Some of the demand projections developed for SB1 Planning incorporate an expected level of conservation to be implemented over the planning period. For municipal use, the assumed reductions in per capita water use are the result of the implementation of the State Water-Efficiency Plumbing Act. The Panhandle Water Planning Group chose to account conservation savings in the municipal sector for any new growth only. On a regional basis, this is less than a 1 percent reduction in municipal water use (less than 460 acre-feet per year) by year 2060. If the conservation savings through the Plumbing Code are applied to the full population, the reduction is approximately 6.5%, or 6,750 AFY, of the total municipal use in 2060. Additional municipal water savings may be expected as the Federal mandate for low flow clothes washing machines takes effect in 2007.

The PWPA encourages all water user groups to practice advanced conservation efforts to reduce water demand, not only during drought conditions, but as a goal in maintaining future supplies. The term "advanced" conservation means conservation techniques that go beyond implementation of the state's plumbing fixture requirements and beyond the adoption and implementation of water conservation education programs. Advanced conservation efforts for municipal users should include a 1% annual demand reduction in demand until the region reaches an average of 140 gpcd use. This demand management strategy will achieve this target sometime in the 2030 decade. All retail public water suppliers that are required to prepare and submit water conservation plans should establish targets for water conservation including specific goals for per-capita water user and for water loss programs using appropriate water conservation best-management practices (BMPs) or other water conservation techniques to achieve their targets and goals in an effort to increase efficiency in water use and achieve conservation as defined in Chapter 11 of the Texas Water Code.

Reductions in demands due to conservation were not specifically quantified by the TWDB for manufacturing, mining, irrigation and livestock needs. Conservation savings are incorporated into the implementation of new methods and technologies in livestock operations. For Livestock uses, any future reduction in demands due to the use of such technologies is already reflected in the projected demands as developed by regional agricultural experts and users. Agricultural conservation savings can be achieved through the implementation of demand reduction strategies as outlined in Chapter 4 and in this chapter. Steam electric power generation will achieve future conservation savings through the implementation and construction of more efficient generating facilities. In addition, steam electric power generation will practice conservation by utilizing reuse supplies for future demands.

SB1 requires each region's water plan to address drought management and conservation for each supply source within the region. This includes both groundwater and surface water. The PWPG believes that utilizing advanced water conservation measures (i.e.

savings associated with active conservation measures for municipal and industrial uses) will be implemented by local governing entities or water users as conditions arise. The PWPG feels that water conservation is an excellent source of meeting future water demands.

Currently, only two of the 56 municipal water users in the Panhandle have per capita water use less than 100 gallons per person per day and 13 entities are less than the Water Conservation Task Force recommended state average of 140 gallons per person per day. As shown in Table 6-1, the Panhandle regional gpcd numbers vary from a high of 334 to a low of 75 gpcd, both for County-Other water users, while the regional median is 169 and an average of 172 gpcd. Based on average GPCD use, a 1% annual decrease in municipal consumption would take nearly 20 years to reach the Conservation Taskforce recommended target of 140 gpcd. While municipal use represents approximately 5 percent of the total regional water demands in 2010, the potential savings from advanced municipal conservation compared to agricultural conservation are relatively small. However, conservation savings in the irrigated agriculture sector would provide significant amounts of savings and sustainability for the industry as aquifers in the region continue to decline.

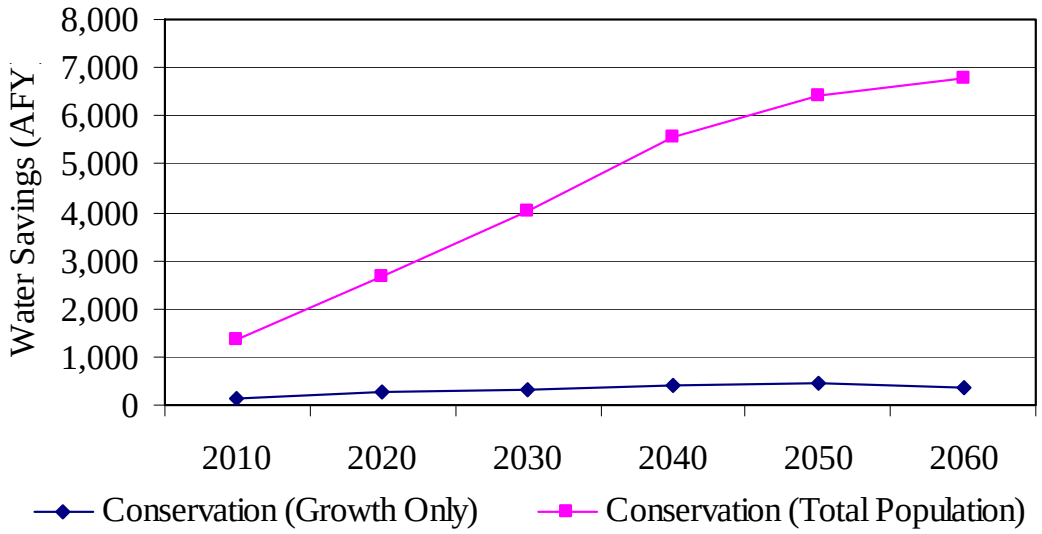


**Figure 6-1: Municipal Conservation Savings Resulting from State Water-Efficient Plumbing Act (AFY)**

Table 6-1 shows the 1980-2000 gallons per capita per day (gpcd) average for the recognized municipal user groups located in the Panhandle WPA. The statistical evaluation includes the uses for County-Other category which attempts to capture water use among communities with less than 500 in population. These demand numbers are compiled by the TWDB through water use surveys conducted annually of all retail and wholesale providers.

**Table 6-1: Municipal Water Users Gallons Per Capita Per Day**

| Municipal Water User | 20 year Average gpcd |
|---|---|
| Amarillo | 201 |
| Booker | 240 |
| Borger | 144 |
| Cactus | 183 |
| Canadian | 182 |
| Canyon | 153 |
| Childress | 188 |
| Clarendon | 199 |
| Claude | 176 |
| Dalhart | 230 |
| Dumas | 164 |
| Fritch | 160 |
| Groom | 215 |
| Gruver | 248 |
| High Texas Water Co. | 99 |
| Lake Tanglewood | 144 |
| Lefors | 141 |
| McLean | 204 |
| Memphis | 159 |
| Miami | 210 |
| Pampa | 169 |
| Panhandle | 197 |
| Perryton | 207 |
| Shamrock | 142 |
| Skellytown | 154 |
| Spearman | 201 |
| Stinnett | 165 |
| Stratford | 258 |
| Sunray | 213 |
| TCW Supply Co. | 255 |
| Texline* | 334 |
| Vega | 217 |
| Wellington | 182 |
| Wheeler | 189 |
| White Deer | 137 |
| REGIONAL STATISTICS (including County-Other) | |
| **Average GPCD** | 172 |
| **Median GPCD** | 169 |
| **Highest GPCD** | 334 |
| **Lowest GPCD** | 75 |

* Texline supplies commercial water to a local fertilizer plant that was not historically metered separately.

**Table 6-2: County-Other Water Users Gallons per Capita per Day**

| County | GPCD |
|---|---|
| Armstrong | 115 |
| Carson | 194 |
| Childress | 188 |
| Collingsworth | 233 |
| Dallam | 138 |
| Donley | 109 |
| Gray | 135 |
| Hall | 249 |
| Hansford | 171 |
| Hartley | 154 |
| Hemphill | 121 |
| Hutchinson | 163 |
| Lipscomb | 199 |
| Moore | 189 |
| Ochiltree | 132 |
| Oldham | 117 |
| Potter | 75 |
| Randall | 113 |
| Roberts | 125 |
| Sherman | 150 |
| Wheeler | 138 |

## 6.2 Agricultural Conservation

Agricultural conservation savings provide for a significant amount of water demand in the PWPA. According to TWDB and other agricultural conservation experts, the potential benefit of water conservation is most dramatically demonstrated in on-farm irrigation. While canal lining and other improvements to agricultural water transmission systems (which in some cases now lose one-third to one-half of water pumped due to leaks, seepage, and evapotranspiration) can avoid substantial water loss, the biggest water savings in the agricultural sector in the foreseeable future will be achieved through the application of five major on-farm irrigation water conservation practices. These five practices include: (1) Low Elevation Precision Application (LEPA) sprinklers, (2) surge flow furrow irrigation valves, (3) drip irrigation, (4) soil moisture measurement and irrigation scheduling, and (5) the use of on-farm underground water distribution pipelines. Working in conjunction with the USDA-NRCS, State Soil and Water Conservation Board, local soil and water conservation districts, and local groundwater conservation districts, many local experts assists farmers in maximizing irrigation efficiency.

The PWPA has contracted with Texas Agricultural Experiment Station and using local experts determined that the following conservation strategies be implemented in the area: (1) Use of North Plains Evapotranspiration Network (NPET), (2) Change in crop variety, (3) Irrigation Equipment Efficiency Improvements, (4) Change in crop type. (5) Implementation of Conservation Tillage Methods, (6) Precipitation Enhancement, and (7)

Conversion from irrigated to dryland. Using these strategies, Table 6.3 shows the potential conservation savings that could be achieved within the PWPA during the planning cycle:

**Table 6.3 Potential Agricultural Conservation Savings**

| Agricultural Conservation Savings (acre-feet/year) | | | | | | |
|---|---|---|---|---|---|---|
| | **2010** | **2020** | **2030** | **2040** | **2050** | **2060** |
| **Armstrong** | 911 | 1,150 | 1,389 | 1,628 | 1,867 | 2,030 |
| **Carson** | 7,593 | 9,641 | 11,688 | 13,735 | 15,783 | 17,224 |
| **Childress** | 803 | 1,014 | 1,224 | 1,435 | 1,645 | 1,796 |
| **Collingsworth** | 1,858 | 2,357 | 2,855 | 3,354 | 3,853 | 4,217 |
| **Dallam** | 21,104 | 27,177 | 33,249 | 39,322 | 45,395 | 49,895 |
| **Donley** | 1,545 | 1,960 | 2,376 | 2,792 | 3,207 | 3,509 |
| **Gray** | 2,213 | 2,789 | 3,365 | 3,941 | 4,517 | 4,910 |
| **Hall** | 1,691 | 2,123 | 2,555 | 2,988 | 3,420 | 3,726 |
| **Hansford** | 9,918 | 12,723 | 15,528 | 18,333 | 21,138 | 23,148 |
| **Hartley** | 18,540 | 23,909 | 29,278 | 34,646 | 40,015 | 44,034 |
| **Hemphill** | 86 | 107 | 127 | 148 | 168 | 181 |
| **Hutchinson** | 4,705 | 6,018 | 7,331 | 8,645 | 9,958 | 10,888 |
| **Lipscomb** | 1,027 | 1,313 | 1,600 | 1,886 | 2,173 | 2,383 |
| **Moore** | 12,914 | 16,480 | 20,045 | 23,610 | 27,176 | 29,764 |
| **Ochiltree** | 7,631 | 9,756 | 11,880 | 14,004 | 16,128 | 17,647 |
| **Oldham** | 365 | 469 | 573 | 677 | 781 | 856 |
| **Potter** | 487 | 632 | 777 | 923 | 1,068 | 1,178 |
| **Randall** | 7,478 | 9,509 | 11,539 | 13,570 | 15,600 | 17,021 |
| **Roberts** | 1,623 | 2,061 | 2,499 | 2,938 | 3,376 | 3,699 |
| **Sherman** | 19,260 | 24,883 | 30,506 | 36,129 | 41,752 | 45,904 |
| **Wheeler** | 741 | 928 | 1,116 | 1,304 | 1,492 | 1,620 |
| **TOTAL** | 122,492 | 156,998 | 191,503 | 226,008 | 260,513 | 285,630 |

Conservation for agricultural practices is summarized according to water management strategies. Assuming water savings is the primary criteria for prioritizing water conservation strategies, the strategies of changing crop variety and increased conservation tillage should be either dropped from consideration or assigned a low priority. Neither strategy generated significant water savings; in addition, the change in crop varieties was detrimental to gross crop receipts. It should be noted that the analysis of crop varieties is based on current available varieties. Research currently underway may provide improved varieties that are more water efficient with little negative effect on yield. If these improvements develop, the feasibility of this strategy would need to be reevaluated. Prioritizing the other five strategies will depend on the various decision variables, i.e., water savings, implementation costs and Regional impacts. The two strategies that yield the largest water savings, changing crop type and conversion to dryland, are projected to generate a significant negative impact to the Regional economy, -$235.85 and -$78.72 per ac-ft of water saved, respectively. The third leading water saving strategy, i.e., changing to more efficient irrigation systems, comes with the highest

estimated implementation cost, $41.12 per ac-ft of water saved. The remaining strategies of precipitation enhancement and irrigation scheduling appear to provide the potential of significant water savings while positively impacting the Regional economy.

## 6.3 Water Conservation Plans

The TCEQ defines water conservation as "A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water."

The TCEQ requires water conservation plans for all municipal and industrial water users with surface water rights of 1,000 acre-feet per year or more and irrigation water users with surface water rights of 10,000 acre-feet per year or more. Water conservation plans are also required for all water users applying for a State water right, and may also be required for entities seeking State funding for water supply projects. Recent legislation passed in 2003 requires all conservation plans to specify quantifiable 5-year and 10-year conservation goals and targets. While these goals are not enforceable, they must be identified. All updated water conservation plans were submitted to the Executive Director of the TCEQ by May 1, 2005.

In the PWPG area, 4 entities hold municipal or industrial rights in excess of 1,000 acre-feet per year and no entities have surface irrigation water rights greater than 10,000 acre-feet per year. Each of these entities is required to develop and submit to the TCEQ a water conservation plan. Several water users have contracts with regional water providers for water of 1,000 acre-feet per year or more. Presently, these water users are not required to develop water conservation plans unless the user is seeking State funding; however, a wholesale water provider may request that its customers prepare a conservation plan to assist in meeting the goals and targets of the wholesale water provider's plan. A list of the users in the PWPG required to submit water conservation plans is shown in Table 6-4.

There are numerous irrigation users pumping groundwater in excess of 10,000 acre-feet per year and these users are usually regulated through the local GCD which will issue well permits to these users. The GCD is required to submit a groundwater management plan to the TWDB for approval.

To assist entities in the PWPG area with developing water conservation plans, model plans for municipal water users (wholesale or retail public water suppliers), industrial users and irrigation districts are included in Appendix C. Each of these model plans address the latest TCEQ requirements and is intended to be modified by each user to best reflect the activities appropriate to the entity. In addition, a TWDB questionnaire for GCD development of a groundwater management plan is also included.

The focus of the conservation activities for municipal water users in the PWPG are:

- Education and public awareness programs,
- Reduction of unaccounted for water through water audits and maintenance of water systems, and

- Water rate structures that discourage water waste.

Industrial water users include manufacturing and processing industries as well as smaller local manufacturers. Conservation activities associated with industries are very site and industry-specific. Some industries can utilize brackish water supplies or wastewater effluent while others require only potable water. It is important in evaluating conservation strategies for industries to balance the water savings from conservation to economic benefits to the industry and the region.

**Table 6-4: Water Users in the PWPG that are Required to Prepare Water Conservation Plans**

| Municipal and Industrial Water Users | Irrigation Water Users |
|---|---|
| City of Amarillo | None in Region A |
| Canadian River Municipal Water Authority | |
| Greenbelt Municipal Water Authority | |
| Palo Duro River Authority | |

The focus of the conservation activities for industrial users is:

- Evaluation of water saving equipment and processes, and
- Water rate structures that discourage water waste.

## 6.4 Groundwater Conservation Districts

The Texas Legislature has established a process for local management of groundwater resources through Groundwater Conservation Districts (GCD). The districts are charged with managing groundwater by providing for the conservation, preservation, protection, recharging and prevention of waste of groundwater within their jurisdictions. An elected board governs these districts and establishes rules, programs and activities specifically designed to address local problems and opportunities. Texas Water Code §36.0015 states, in part, "Groundwater Conservation Districts created as provided by this chapter are the state's preferred method of groundwater management."

All GCDs are required to develop a groundwater management plan and submit it to the TWDB for certification. A newly created district is required to submit its management plan no later than two years after its creation. If a district requires a confirmation election after its creation, a management plan should be submitted no later than two years after the confirmation election (§356.3, Texas Administrative Code, relating to Required Management Plan). A groundwater management plan is a 10-year plan that describes a district's groundwater management goals. These goals include providing the most efficient use of groundwater, controlling and preventing waste of groundwater, controlling and preventing subsidence, addressing conjunctive surface water management issues, addressing natural resource issues, addressing drought conditions, and addressing conservation (§§356.5 and 356.6, Texas Administrative Code, relating to Management Plan and Plan Submittal, respectively).

There are currently five GCDs in operation in the Panhandle Planning Area. Their management plan goals and objectives are summarized as follows:

### 6.4.1 Collingsworth County Underground Water Conservation District (CCUWCD)

The District was created in November 1986 and covers the whole of Collingsworth County. The District is dominated by agricultural production. About 55 percent of the District is rangeland, 40 percent is cropland and the rest is urban, transportation or water areas. According to District records, there are slightly more than 300 active irrigation wells within the District. There are several municipal or public supply wells within the District. The remaining wells are non-permitted water supplies for household and livestock consumption. The District's overall management goal is to have 50 percent of the underground water supplies (saturated thickness) that was available in 2000 still available by 2050. The District's specific goals as outlined in their water management plan are listed below.

- Implement measures to provide for the conservation of the groundwater resources
- Provide for the most efficient use of groundwater
- Implement management strategies that will control and prevent waste and contamination of groundwater
- Implement strategies to address drought conditions

The District has specified the following management objectives in order to meet the goals stated above:

- Monitor static water levels in selected wells
- Conduct water quality analysis of selected wells
- Use the Seymour aquifer Groundwater Availability Model (GAM) to run scenarios for predicting future water supplies
- Publicize groundwater conservation issues and the need for efficient use of groundwater through local media
- Establish a water level depiction program for landowner tax purposes
- Monitor selected flowmeters on wells
- Identify and address local irrigation practices which are wasteful of groundwater resources
- Establish a procedure for receiving and processing public complaints
- Initiate and implement a program to identify, locate and obtain closures of abandoned wells
- Develop a drought contingency plan

### 6.4.2 Hemphill County Underground Water Conservation District

The Hemphill County Underground Water Conservation District (HCUWC) was created in 1995 and a management plan was adopted in 1999. The purpose of the District is to provide for the conservation, preservation, protection, recharging, and prevention of waste of the groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence within the defined boundary of the District. The purpose of the District will be achieved through rules, education programs, District-provided services, and through mutual cooperation of local, state, and federal agencies. The District will issue water well permits, collect groundwater information, perform water quality analyses, and provide well system tests and other services.

The primary goals of the District are to ensure that its activities are consistent with sound business practices, that the public interest will always be considered in District business, that impropriety shall be avoided to ensure and maintain public confidence in the District, and that the Board shall control and manage the affairs of the District lawfully, fairly, impartially, and in accordance with the stated purposes of the District.

The District has outlined the following management objectives in order to meet the above goals.

- Provide prompt and timely processing of all applications of water well permits to provide for efficient use of water.
- Reduce the waste of water as far as is reasonably and economically viable. Work with the Texas Railroad Commission (TRC) to monitor for waste of water and develop economical methods to prevent contamination.

### 6.4.3 North Plains Groundwater Conservation District No. 2

The North Plains Groundwater Conservation District No. 2 (NPGCD) was created in 1955. The District adopted a water management plan on August 18, 1998. The overall goal of the District is to ensure that its activities are consistent with sound business practices; that the interest of the public shall always be considered in conducting District business; that impropriety or the appearance of impropriety shall be avoided to ensure and maintain public confidence in the District; and that the Board shall control and manage the affairs of the District lawfully, fairly, impartially, and in accordance with the stated purposes of the District. The water management plan lists the following specific goals:

- Provide prompt and timely processing of all applications for water well permits
- Maintain a well completion/equipment information database toy include each permitted well completed
- Maintain the most accurate and representative database of water level elevation information possible
- Provide accurate and timely depletion information to the landowners of the District
- Develop readily available up-to-date water quantity reports to the general public
- Respond to all requests for information
- Maintain a water quality observation well network to provide adequate information to determine any change in water quality within the District in time to seek remedial or corrective action
- Provide water quality analysis within the capabilities of the District
- Enforce the Rules of the District to conserve and protect the quantity and quality of the resource to the best of the District's ability through the powers provided in Chapter 36 of Texas Water Code
- Take appropriate action within powers of the District to protect quality of the groundwater
- Reduce the waste of water

- Take appropriate action within the powers of the District to address any natural resource issue which would have an impact on the use or availability of groundwater in the District
- Support research and demonstration projects which will help protect the groundwater quality, reduce waste, and promote efficient use of water
- Continue to encourage water conservation
- Provide current information to the residents of the District about water conservation and protection
- Inform people within and outside the District about the goals, programs, duties and responsibilities of the District
- Continue to provide public school education material to schools in the District
- Provide prompt field service to all water users

The District has outlined the following management objectives in order to achieve the above goals:

- Complete administrative review process, including County Committee review and schedule for Board consideration within 60 days of application date
- Review well log and registration information for accuracy and enter information into databases within 5 working days of the receipt
- Annually field visit each observation well and obtain a static water level measurement from at least 80 percent of the wells, review the readings for accuracy (revisit observation wells if necessary to resolve any inaccuracies) and enter observation well tabulations in the water level database
- Prepare necessary information, receive IRS approval and mail depletion information to landowners by December 31 each year
- Update current water quality reports within 30 days after new data has been tabulated
- Within 5 days from the time a specific request is made, provide the requested information
- Collect, analyze, verify and enter results in the District water quality database
- Respond to all water quality requests for analysis within the capabilities of the District
- Ensure that all Rules of the District are enforced fairly and equitably within the District
- Maintain a constant awareness of the activities that may be or may become a threat to the quality of the groundwater
- Begin investigation of all complaints involving waste of water within three days of receiving the complaint
- Maintain a constant awareness of natural resources issue which would have an impact on use or availability of the groundwater
- Annually consider all research and demonstration projects and make decisions regarding the District's participation
- Annually contact at least two cities within the District to encourage and help develop a well head protection plan for their public water supply wells
- Encourage the use of or conversion to more efficient application methods

### 6.4.4 The High Plains Underground Water Conservation District No. 1

The High Plains Underground Water Conservation District No. 1 (HPUWCD) created its water management plan on August 11, 1998. This plan will remain in effect for a period of ten years, unless a revised is approved. The District consists of both groundwater and surface water resources. The ground water resources include the Ogallala, Cretaceous and Dockum Aquifers and the surface water resources include Lake Meredith, Lake Mackenzie, River Lake and Lake Alan Henry (currently used for recreation, but intended as water supply source for Lubbock in 25-35 years) as well as numerous playa lakes. The HPUWCD has jurisdiction in the Panhandle WPA in Potter and Randall Counties. The District has outlined the following goals under the water management plan:

- Continue to implement management strategies to protect and enhance water quality and enhance the quality of useable quality ground water by encouraging the most efficient use
- Continue to implement programs to protect the quality of the aquifer and to control and prevent the waste of ground water
- Continue to implement management strategies that provide public information/education opportunities to assist in accomplishing the above goals

The District states the following objectives as the means to achieve the above goals:

- Continue water level monitoring program
- Continue to update, publish and distribute county hydrologic atlases
- Continue to issue well permits according to District's spacing rules
- Continue to administer the low interest agricultural water conservation equipment loan program
- Continue pre-plant soil moisture monitoring program
- Continue potential evaportranspiration irrigation scheduling program
- Continue to provide laboratory services to residents
- Continue to assure proper closing, destruction, or re-equipping of abandoned or replaces wells under District rules
- Continue to enforce the District's rule on the closing of open or uncovered wells
- Monthly newsletter
- Continue to provide news releases to print and electronic media
- Continue to produce radio and TV public service announcements and distribute them to stations within the district
- Continue to make public presentations
- Continue to maintain public information boards at the District office
- Continue to design public information displays for use at fairs/meetings
- Continue to provide information via internet website
- Continue to sponsor classroom education programs
- Continue to make classroom presentations
- Continue to make audio-visual materials available to teachers

### 6.4.5 Panhandle Groundwater Conservation District

The Panhandle Groundwater Conservation District (PGCD) was created by legislature in 1955. It covers Carson, Donley, Gray, Roberts, and Wheeler counties and also parts of

Armstrong, Hutchinson, Hemphill, and Potter counties. The Panhandle Groundwater Conservation District adopted a water management plan on September 3, 2003. The plan will remain in effect for a period of ten years, unless it is revised before that period. The District's overall management standard is to have 50 percent of current supplies, or saturated thickness, still available 50 years after the first certification of this plan. Groundwater sources include the Ogallala aquifer and surface water sources include Lake Meredith and Lake Greenbelt. The PGCD has listed the following goals within its water management plan:

- Retain 50 percent of current supplies in 50 years (overall goal)
- Implement strategies that will provide the most efficient groundwater use
- Implement strategies that will control and prevent groundwater waste or contamination
- Implement strategies to address drought conditions
- Implement strategies to address conjunctive surface water management strategies
- Implement strategies that address natural resources issues which impact the use and availability of groundwater
- Improve operating efficiency and customer service
- Operate a rainfall enhancement program
- Control and prevention of subsidence

In order for the above goals to be achieved, the following objectives need to be fulfilled, per the District's water management plan:

- Develop a system for measurement and evaluation of groundwater supplies
- Develop a groundwater modeling capability
- Encourage efficient groundwater use by implementing various programs
- Take positive and prompt action to identify all reported wasteful practices
- Prevent waste by implementing PGCD rule 15 – "depletion"
- Control and prevent contamination of groundwater
- Continue and possibly expand groundwater conservation programs
- Conduct emergency response/drought contingency planning
- Evaluate the impact of surface water use on groundwater
- Monitor and report on impacts of endangered species on local groundwater resources
- Monitor the possible effects of pumping on White Deer Creek
- Strive to stabilize water measurement and sampling costs per well
- Continue to provide timely response to customer assistance requests
- Operate a rainfall enhancement program and plan future activities

## 6.5 Water Conservation Management Plans and Drought Contingency Plans

Because of the range of conditions that affected the more than 4,000 water utilities throughout the state in 1997, the Texas Legislature directed the TCEQ to adopt rules establishing common drought plan requirements for water suppliers. As a result, the TCEQ requires all wholesale public water suppliers, retail public water suppliers serving 3,300 connections or more, and irrigation districts to submit drought contingency plans. For all retail public water suppliers serving less than 3,300 connections, the drought contingency plans must be prepared and adopted no later than May 1, 2005, and shall be available for inspection upon request.

### 6.5.1 Drought Contingency Plans

Drought management is a temporary strategy to conserve available water supplies during times of drought or emergencies. This strategy is not recommended to meet long-term growth in demands, but rather acts as means to minimize the adverse impacts of water supply shortages during drought. The TCEQ requires drought contingency plans for wholesale and retail public water suppliers and irrigation districts. A drought contingency plan may also be required for entities seeking State funding for water projects.

Drought contingency plans typically identify different stages of drought and specific triggers and response for each stage. In addition, the plan must specify quantifiable targets for water use reductions for each stage, and a means and method for enforcement. As with the water conservation plans, drought contingency plans are to be updated and submitted to the TCEQ by May 1, 2005.

Model drought contingency plans were developed for the PWPG and are included in Appendix C. Each plan identifies four drought stages: mild, moderate, severe and emergency. Some plans also include a critical drought stage. The recommended responses range from notification of drought conditions and voluntary reductions in the "mild" stage to mandatory restrictions during an "emergency" stage. Each entity will select the trigger conditions for the different stages and the appropriate response.

### 6.5.2 Regional Drought Triggers

Thirteen drought contingency plans were submitted to the PWPG. Plans were summarized and used to create model plans. The majority of the submitted plans use trigger conditions based on the demands placed on the water distribution system. Of the plans reviewed one user based trigger actions on well levels, five based actions on storage reservoir levels and seven based actions on demands/consumption. A brief description of each plan is provided below, followed by a summary of the submitted plans in Table 6-5.

6.5.2.1 City of Amarillo

The City of Amarillo created a Drought Contingency Plan on April 10, 2001. The triggering criteria of this plan are based on prolonged conditions of no rain usually associated with hot summer like conditions, high water demands and the vulnerability of the water sources under drought conditions including unforeseen natural disasters, equipment failure and contamination problems. The trigger criteria are listed below.

- **Mild:** Total consumption has reached 80 percent of production capacity for five consecutive days **and/or** CRMWA has requested initiation of their stage I (mild water shortage) requirement **and/or** equipment failure causes reduction of capacity by 5 percent for 3 days when total consumption is at 80 percent production capacity.
- **Moderate:** Total consumption has reached 85 percent of production capacity for five consecutive days **and/or** CRMWA has requested initiation of their stage II (moderate water shortage) requirement **and/or** equipment failure causes reduction of capacity by 10 percent for 3 days when total consumption is at 80 percent production capacity.
- **Severe**: Total consumption has reached 90 percent of production capacity for five consecutive days **and/or** CRMWA has requested initiation of their stage III (mild water shortage) requirement **and/or** equipment failure causes reduction of capacity by 15 percent for 3 days when total consumption is at 80 percent production capacity.
- **Critical:** Total consumption has reached 95 percent of production capacity for five consecutive days **and/or** equipment failure causes reduction of capacity by 25 percent for 3 days when total consumption is at 70 percent production capacity.

6.5.2.2 City of Borger

The City of Borger adopted a Drought Contingency Plan by passing Ordinance No. O-015-99 on January 4, 2000, which amended Chapter 51, Texas Water Code. The goal of the plan is to regulate and/or prohibit non-essential water uses during times of water shortage or other water supply conditions. Trigger conditions are based on water use patterns, weather conditions and water production and delivering capabilities and are defined as follows:

- **Mild:** Continually falling treated water reservoir levels do not refill above 70 percent overnight and City personnel report this condition is likely to persist.
- **Moderate:** Continually falling treated water reservoir levels do not refill above 60 percent overnight and City personnel report this condition is likely to persist.
- **Severe:** Continually falling treated water reservoir levels do not refill above 50 percent overnight and City personnel report this condition is likely to persist.
- **Critical:** Continually falling treated water reservoir levels do not refill above 40 percent overnight and City personnel report this condition is likely to persist.
- **Emergency:** Major water line breaks, or pump or system failures occur **or** natural or man-made contamination of the water supply source occurs.

6.5.2.3 City of Canyon

Ordinance No. 730 resulted in the adoption of a Drought Contingency Plan by The City of Canyon. The Ordinance is aimed at establishing criteria for the initiation and termination of drought response stages; establishing restrictions on certain water uses; establishing penalties for the violation of and provisions for enforcement of these restrictions; establishing procedures for granting variances and providing severability and an effective date. The City of Canyon's triggering criteria are based on vulnerability of their water supply to shortages during drought conditions, periods of high water demand, and the potential for natural disasters, equipment failure, or contamination of the supply and are defined as follows:

- **Mild:** Total consumption has reached 65% of total production capacity for five consecutive days, **or** any combination of mechanical failures in production, transmission or distribution that reduces the total production capacity, or contamination of water supply.
- **Moderate:** Total consumption has reached 75% of total production capacity for five consecutive days, **or** any combination of mechanical failures in production, transmission or distribution that reduces the total production capacity, or contamination of water supply.
- **Severe:** Total consumption has reached 80% of total production capacity for five consecutive days, **or** any combination of mechanical failures in production, transmission or distribution that reduces the total production capacity, or contamination of water supply.
- **Critical:** Total consumption has reached 90% of total production capacity for five consecutive days, **or** any combination of mechanical failures in production, transmission or distribution that reduces the total production capacity, or contamination of water supply.
- **Emergency:** As conditions warrant, per the decision of City Manager

6.5.2.4 City of Dalhart

The City of Dalhart created a Drought Contingency Plan on August 24, 1999. Triggering criteria of this plan, as outlined below, are based on an analysis of the City's Water System consisting of 8 underground water wells and existing main pumping station.

- **Mild:** Dry weather conditions occur before and during the normal landscape growing season, annually from May 1 through September 30.
- **Moderate:** Total daily water demand equals or exceeds 90 percent of system capacity (5.7 million gallons) for three consecutive days, or equals or exceeds 95 percent of system capacity (6 million gallons) on a single day.
- **Severe:** Total daily water demand equals or exceeds 6 million gallons for three consecutive days, or equals or exceeds 100 percent of system capacity (6.3 million gallons) on a single day.
- **Emergency:** City Manager, Director of Public Works, Water Superintendent, or designee determines that an emergency exists due to equipment failure, causing loss of capacity to provide water service, or natural or man-made contamination of the water supply source or system.

6.5.2.5 City of Dumas

The Drought Contingency Plan for City of Dumas was created on June 28, 1999, but has not been adopted yet in the form of an Ordinance. The triggering conditions are based on the City's water demand exceeding the water supply, as outlined below.

- **Mild:** City's water demand exceeds 90 percent of the water production capacity, for three consecutive days.
- **Moderate:** City's water demand exceeds 95 percent of the water production capacity, for three consecutive days.
- **Severe:** City's water demand meets or exceeds the water production capacity for three consecutive days.
- **Critical:** City's water demand exceeds water production capacity by 5 percent for three consecutive days
- **Emergency:** The Mayor or designee determines that a water supply emergency exists due to an equipment failure, causing loss of capability to provide water service, or natural or man-made contamination of water supply source.

6.5.2.6 City of Higgins

The City of Higgins passed an Ordinance to adopt a Drought Contingency Plan on September 11, 2000. The triggering criteria are based on an imbalance of water supply and demand, as described briefly below.

- **Mild:** Specific capacity of City of Higgins well(s) is equal to or less than 90 percent of the well's original capacity or total daily water demand equals or exceeds 300 thousand gallons for three consecutive days.
- **Moderate:** Specific capacity of City of Higgins well(s) exceeds 90 percent of the well's original capacity for three days.
- **Severe:** Specific capacity of City of Higgins well(s) exceeds 95 percent of the well's original capacity for three days.
- **Critical:** System outage
- **Emergency:** Mayor or designee determines that a water supply emergency exists due to equipment failure, causing a loss of capability to provide water service or a natural or man-made contamination of the water supply source (s).

6.5.2.7 City of Pampa

The City of Pampa adopted Ordinance No. 1374 on February 12, 2002, resulting in the inclusion of a Drought Contingency Plan. Triggering conditions are based on water supply, and are detailed as follows:

- **Mild:** CRMWA informs Pampa that Lake Meredith has dropped to a projected three year future water supply level. Continuously falling water storage levels do not refill above 70 percent overnight.
- **Moderate:** CRMWA informs Pampa that Lake Meredith has dropped to a projected two year future water supply level. Continuously falling water storage levels do not refill above 50 percent overnight.

- **Severe:** CRMWA informs Pampa that Lake Meredith has dropped to a projected 1.5 year future water supply level. Continuously falling water storage levels do not refill above 40 percent overnight.
- **Emergency:** CRMWA informs Pampa of equipment failure, causing loss of capability to provide water services, or a natural or man-made contamination of the water supply source.

6.5.2.8 City of Shamrock

Ordinance 02-01 resulted in the adoption of a Drought Contingency Plan for the City of Shamrock on June 6, 2002. The triggering criteria are based on the vulnerability of the City of Shamrock's water supply to shortages during drought conditions, periods of high demand, and the potential for natural disasters, equipment failures, or contamination of the water supply. These criteria are described briefly below.

- **Mild:** Total consumption has reached 65 percent of the total production capacity for five consecutive days, or the Mayor determines that there is a mechanical failure that causes loss of capacity by a significant amount, or contamination of water supply.
- **Moderate:** Total consumption has reached 75 percent of the total production capacity for five consecutive days, or the Mayor determines that there is a mechanical failure that causes loss of capacity by a significant amount, or contamination of water supply.
- **Severe:** Total consumption has reached 80 percent of the total production capacity for five consecutive days, or the Mayor determines that there is a mechanical failure that causes loss of capacity by a significant amount, or contamination of water supply.
- **Critical:** Total consumption has reached 90 percent of the total production capacity for five consecutive days, or the Mayor determines that there is a mechanical failure that causes loss of capacity by a significant amount, or contamination of water supply.
- **Emergency:** Mayor determines that the water supply is in a state of emergency.

6.5.2.9 City of Turkey

The City of Turkey adopted a Drought Contingency Plan by the passage of Ordinance No. 0110 on October 11, 2001. The triggering criteria are based on water well location in a heavy use farming community, and are described briefly as follows:

- **Mild:** Combined storage in the reservoir equal to or less than 75 percent storage capacity.
- **Moderate:** Combined storage in the reservoir equal to or less than 50 percent storage capacity.
- **Severe:** Combined storage in the reservoir equal to or less than 25 percent storage capacity.
- **Emergency:** The City of Turkey determines that an equipment failure has caused loss of capability to provide water service.

6.5.2.10 City of Wellington

The City of Wellington adopted a Drought Contingency Plan on October 2, 2000. The triggering criteria are based on total system capacity and /or total gallons per day produced, as described below.

- **Mild:** Total daily water demand equals or exceeds 90 percent of system capacity for five consecutive days.
- **Moderate:** Total daily water demand equals or exceeds 95 percent of system capacity for three consecutive days.
- **Severe:** Total daily water demand equals or exceeds 100 percent of system capacity for three consecutive days.
- **Emergency:** Mayor or designee determines that an equipment failure caused a loss of capability to provide water service, or natural or man-made contamination of water supply source.

6.5.2.11 City of White Deer

The City of White Deer has adopted a Drought Contingency Plan. The triggering criteria are based on an analysis of the City's water system consisting of four underground water wells and one pump station with two 1,000 gallon pumps. These criteria are outlined as follows:

- **Mild:** Period of dry weather conditions during normal landscape growing season from May 1 through September 30.
- **Moderate:** Total daily water demand equals or exceeds 550 thousand gallons for three consecutive days, or equals or exceeds 625 thousand gallons on a single day.
- **Severe:** Total daily water demand equals or exceeds 575 thousand gallons for three consecutive days, or equals or exceeds 650 thousand gallons on a single day.
- **Critical:** Mayor or designee determines that an equipment failure has caused a loss of capacity to provide water service.

**Table 6-5: Type of Trigger Condition for Entities with Drought Contingency Plans in PWPA**

| Entity | Type Trigger Condition | |
|---|---|---|
| | Demand | Supply |
| **Carson County** | | |
| White Deer | X | |
| **Collingsworth County** | | |
| Wellington | X | |
| **Dallam County** | | |
| Dalhart | X | |
| **Gray County** | | |
| Pampa | | X |
| CRMWA | | X |
| **Hall County** | | |
| Turkey | | X |
| **Hartley County** | | |
| Dalhart | X | |
| **Hutchinson County** | | |
| Borger | | X |
| CRMWA | | X |
| **Lipsomb County** | | |
| Higgins | | X |
| **Moore County** | | |
| Dumas | X | |
| **Potter County** | | |
| Amarillo | X | X |
| CRMWA | | X |
| **Randall County** | | |
| Amarillo | X | X |
| CRMWA | | X |
| **Randall County** | | |
| Canyon | X | |
| **Roberts County** | | |
| CRMWA | | X |
| **Wheeler County** | | |
| Shamrock | X | |

Drought trigger conditions for surface water supply are customarily related to reservoir levels. The Panhandle Water Planning Group will be working with the regional operators of reservoirs to coordinate the trigger conditions. Trigger conditions which have been ascertained for the region's reservoirs as follows:

6.5.2.12 Canadian River Municipal Water Authority (Lake Meredith)

CRMWA adopted a Drought Contingency Plan on July 14, 1999 and the same was revised on January 15, 2003. The triggering conditions are based on CRMWA's Reservoir Operation Model, as briefly described below.

- **Mild:** CRMWA's Reservoir Operation Model projections show a three year future supply in Lake Meredith.
- **Moderate:** CRMWA's Reservoir Operation Model projections show a two year future supply in Lake Meredith.
- **Severe:** CRMWA's Reservoir Operation Model projections show a 1.5 year future supply in Lake Meredith.
- **Emergency:** CRMWA determines that an equipment failure has caused the loss of capability to provide water service, or natural or man-made contamination of the water supply source.

6.5.2.13 Greenbelt Municipal and Industrial Water Authority/Greenbelt Reservoir

The Board of Directors for Greenbelt Municipal and Industrial Water Authority passed a resolution adopting a Drought Contingency Plan on August 19, 1999. Triggering criteria are based on water storage levels in the Greenbelt Reservoir and are described as follows:

- **Mild:** Water storage level reaches an elevation of 2,637.
- **Moderate:** Water storage level reaches an elevation of 2,634 and daily flow or daily demand for water equals or exceeds 7.5 million gallons.
- **Severe:** Water storage level reaches an elevation of 2,631 and daily flow or daily demand for water equals or exceeds 7.5 million gallons.
- **Emergency:** Water storage level reaches an elevation of 2,628 and daily flow or daily demand for water equals or exceeds 7.5 million gallons, or there is an equipment failure, causing a failure to provide water service, or a natural or man-made contamination of water supply.

6.5.2.14 Palo Duro Reservoir

Palo Duro River Authority adopted a conservation plan for Palo Duro Creek Reservoir in May of 1987. Triggering criteria are based on water storage levels in Palo Duro Reservoir and are described as follows:

- **Mild:** Water storage level reaches an elevation of 2,876 feet.
- **Moderate:** Water storage level varies between 2,876 and 2,864 feet.
- **Severe:** Water storage level drops below 2,864 feet.

- **Emergency:** One or more of the major pumps or transmission line in the raw or treated water supply systems should fail, impairing the capability of the delivery system.

**Table 6-6: Reservoirs in the Panhandle Region Planning Area**

| Condition | Reservoir Capacity | | |
|---|---|---|---|
| | Greenbelt Reservoir | Lake Meredith | Palo Duro Reservoir |
| Mild | 75% | 75% | 75% |
| Moderate | 66% | 66% | 66% |
| Severe | 50% | 50% | 50% |

## 6.6 Water Conservation Recommendations

### 6.6.1 Water-Saving Plumbing Fixture Program

The Texas Legislature created the Water-Savings Plumbing Fixture Program on January 1, 1992 to promote water conservation. Manufacturers of plumbing fixtures sold in Texas must comply with the Environmental Performance Standards for Plumbing Fixtures, which requires all plumbing fixtures such as showerheads, toilets and faucets sold in Texas to conform with specific water use efficiency standards.

Because more water is used in the bathroom than any other place in the home, water-efficient plumbing fixtures play an integral role in reducing water consumption, wastewater production, and consumers' water bills. It is estimated that switching to water-efficient fixtures can save the average household between $50 and $100 per year on water and sewer bills. Many hotels and office buildings find that water-efficient fixtures can save 20 percent on water and wastewater costs.

### 6.6.2 Water Conservation Best Management Practices

The 78th Texas Legislature under Senate Bill 1094 created the Texas Water Conservation Implementation Task Force and charged the group with reviewing, evaluating, and recommending optimum levels of water use efficiency and conservation for the state. TWDB Report 362, Water Conservation Best Management Practices Guide was prepared in partial fulfillment of this charge. The Guide is organized into three sections, for municipal, industrial, and agricultural water user groups with a total of 55 Best Management Practices (BMPs). Each BMP has several elements that describe the efficiency measures, implementation techniques, schedule of implementation, scope, water savings estimating procedures, cost effectiveness considerations, and references to assist end-users in implementation. This document can be accessed at the following TWDB web site:

http://www.twdb.state.tx.us/assistance/conservation/TaskForceDocs/WCITFBMPGuide.pdf

### 6.6.3 Water Conservation Tips

The TWDB provides a significant amount of information and services pertaining to water conservation that can be accessed at:

http://www.twdb.state.tx.us/assistance/conservation/consindex.asp .

Likewise, Water Conservation Tips were developed by the TCEQ's Clean Texas 2000.

## 6.7 Model Water Conservation Plan

Model Water Conservation Plans for municipal, industrial and irrigation water users were developed for the PWPA and are found in Appendix C. These can be obtained through the Texas Water Development Board planning website. General model water conservation plan forms are also available from TCEQ in WordPerfect and PDF formats. You can receive a print copy of a form from TCEQ by calling 512/239-4691 or by email to wras@tceq.state.tx.us.