

## Chapter 5C

### Water Conservation Recommendations

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Water conservation is defined by Texas Water Code §11.002(8) as “the development of water resources; and those practices, techniques and technologies that will reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.” Water conservation measures are long-term, permanent strategies to reduce water use.

Title 31 Texas Administrative Code (31 TAC) §357.34(g) requires the 2016 Plan to consolidate and present recommendations that may include Best Management Practices (BMPs) appropriate for the region. Further, for WUGs with identified water needs, conservation WMSs must be included as part of the WUGs list of strategies to meet shortages; or a summary of reasons must be provided in the plan for not including conservation WMSs must be provided.

Following Section 5C.1 is a discussion of water conservation practices and trends in the ETRWPA. This will be followed by a discussion in Section 5C.2 of water conservation plans in use by WUGs in the region, and BMPs in use currently or which could be implemented by WUGs.

Conservation WMSs identified for WUGs with needs are addressed in Chapter 5B within the discussions of WMSs for these WUGs. For WUGs with identified needs where conservation WMSs were not recommended, Section 5C.3 of this chapter includes a discussion of reasons for not making such recommendations.

## 5C.1 Water Conservation Practices and Trends in the East Texas Regional Water Planning Area

The ETRWPA water demand projections 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 three regulatory initiatives:

- The Water Saving Performance Standards for Plumbing Act, implemented by Texas in 1992. This act prohibits the sale, distribution, or importation of plumbing fixtures that do not meet certain low flow performance standards. House Bill 2667, implemented September 1, 2009, updated the water savings performance standards. For new fixtures, the average toilet flush volume is limited to 1.28 gallons, and the maximum showerhead flow is limited to 2.5 gallons per minute.
- A federal requirement that residential clothes washers manufactured on or after January 1, 2007, must achieve a water factor<sup>1</sup> of 9.5 gallons per cubic foot of capacity. For front-loading machines, the maximum integrated water factor<sup>2</sup> decreases to 4.5 gallons per cubic foot on March 7, 2015. For top-loading machines, the maximum integrated water factor decreases to 8.4 gallons per cubic foot on March 7, 2015, and 6.5 gallons per cubic foot on January 1, 2018.
- A federal requirement that residential dishwashers manufactured on or after May 30, 2013, must achieve water consumption of 5.0 gallons per cycle or less.

The “low flow plumbing fixture rules” measure assumes that all new construction will be built with water saving plumbing fixtures and that existing plumbing fixtures will

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<sup>1</sup> Total weighted per-cycle water consumption for the cold wash/cold rinse cycle divided by the clothes container capacity.

<sup>2</sup> Total weighted per-cycle water consumption for all wash cycles divided by the clothes container capacity.

be replaced over time with low flow fixtures. The “efficient new residential clothes washer standards” and “efficient new residential dishwasher standards” measures assume that all new construction will be built with efficient clothes washers and dishwashers and that existing clothes washers and dishwashers will be replaced over time with efficient appliances. On a regional basis, these regulatory initiatives are projected to reduce municipal water use by 11.3 percent (over 30,000 ac-ft per year) by year 2070. See Appendix 5C-D for volumetric water savings by county.

The ETRWPA is a water-rich region, and water conservation in the region is driven by economics and not by lack of water supply. The ETRWPG believes that water users in the ETRWPA will implement advanced water conservation measures (i.e., savings associated with active conservation measures) as economic conditions dictate to each individual user. Given the general abundance of accessible water supply to the water users in the ETRWPA, the ETRWPG believes the water conservation strategies included in this planning period represent an economically achievable level of conservation.

**5C.1.1 Water Use in the ETRWPA.** The State of Texas Water Conservation Implementation Task Force (WCITF) has set a statewide goal of an average per capita consumption of 140 gpcd. The WCITF also set a recommended goal for municipal water suppliers to have a minimum annual reduction of one percent in total gpcd until the entity achieves a total gpcd of 140 or less. Currently, over 25 percent of the municipal water users in the ETRWPA use less than 100 gallons per capita per day (gpcd) and 62 percent use less than the WCITF recommended 140 gpcd. Municipal use represents 14 to 17 percent of the total regional water demands, so the potential savings from advanced municipal conservation could be considered relatively small.

During the 2011 planning process, water production and sales surveys were sent to 65 WUGs in the ETRWPA with approximately 1,000 connections or more. Residential and total water production and water use were calculated from the survey responses. Median residential water use and median total water production for all but two of the responding 27 WUGs demonstrated water use below 140 gpcd. Median residential water

use for the region was calculated to be 68 gpcd. Based on total water production, median water use was 86 gpcd.

It must be recognized that long-term changes to water supplies can be brought on by impacts on water quality or quantity, or by changing economic conditions. Such changes could require additional emphasis on water conservation in the future. The need for additional water conservation will continue to be evaluated in future plans.

The base gpcds used to calculate demand projections in Chapter 2 are presented in Table 5C.1 for every WUG in the ETRWPA. The base gpcd was calculated by the TWDB using 2011 water use surveys, setting a minimum gpcd value of 60, and subtracting anticipated water efficiency savings.

**Table 5C.1 TWDB Base Per Capita Water Use in the East Texas Regional Water Planning Area by Water User Group**

Water User Group	Base GPCD	Water User Group	Base GPCD
ALTO	175	KIRBYVILLE	171
ALTO RURAL WSC	185	KOUNTZE	116
ANGELINA WSC	85	LILLY GROVE SUD	133
APPLEBY WSC	170	LINDALE	211
ARP	153	LINDALE RURAL WSC	78
ATHENS	192	LOVELADY	181
BEAUMONT	221	LUFKIN	158
BECKVILLE	132	LUMBERTON	112
BERRYVILLE	106	LUMBERTON MUD	90
BETHEL-ASH WSC	100	MEEKER MUD	124
BEVIL OAKS	99	MELROSE WSC	139
BRIDGE CITY	89	MURCHISON	148
BROWNSBORO	151	NACOGDOCHES	173
BURKE	182	NEDERLAND	125
CARTHAGE	222	NEW CHAPEL HILL	348
CENTER	304	NEW LONDON	322
CENTRAL WCID OF ANGELINA COUNTY	72	NEW SUMMERFIELD	122
CHALK HILL SUD	87	NEWTON	168
CHANDLER	161	NOME	115
CHINA	113	NOONDAY	185
COLMESNEIL	225	NORTH CHEROKEE WSC	118

**Table 5C.1 TWDB Base Per Capita Water Use in the East Texas Regional  
Water Planning Area by Water User Group (Cont.)**

Water User Group	Base GPCD	Water User Group	Base GPCD
CORRIGAN	121	NORTH HARDIN WSC	71
CRAFT-TURNEY WSC	93	ORANGE	129
CROCKETT	171	ORANGEFIELD WSC	89
CROSS ROADS SUD	83	PALESTINE	240
CRYSTAL SYSTEMS INC	291	PINEHURST	124
CUSHING	171	PINELAND	93
D&M WSC	137	PORT NECHES	102
DEAN WSC	153	REDLAND WSC	80
DIBOLL	127	ROSE CITY	154
EASTON	69	RUSK	159
ELDERVILLE WSC	60	RUSK RURAL WSC	100
ELKHART	164	SAN AUGUSTINE	228
FOUR PINES WSC	91	SILSBEE	127
FOUR WAY SUD	84	SOUR LAKE	139
GARRISON	210	SWIFT WSC	147
GILL WSC	113	TENAHA	171
GRAPELAND	133	TIMPSON	137
GROVES	133	TYLER	180
GROVETON	105	TYLER COUNTY WSC	113
HEMPHILL	220	VIDOR	190
HENDERSON	233	VIRGINIA HILL WSC	96
HUDSON	76	WALNUT GROVE WSC	120
HUDSON WSC	68	WALSTON SPRINGS WSC	100
HUNTINGTON	100	WELLS	153
IVANHOE	97	WEST GREGG SUD	86
IVANHOE NORTH	107	WEST HARDIN WSC	68
JACKSON WSC	91	WEST JEFFERSON COUNTY MWD	86
JACKSONVILLE	160	WEST ORANGE	146
JASPER	203	WHITEHOUSE	122
JASPER COUNTY WCID #1	77	WODEN WSC	119
JEFFERSON COUNTY WCID #10	87	WOODVILLE	315
JOAQUIN	147	ZAVALLA	101
KILGORE	202		

**5C.1.2 Water Loss in the ETRWPA.** Since 2003, retail public water utilities have been required to complete and submit a water loss audit form to the TWDB every five years. The second round of water loss audit reports was submitted to the TWDB by May 1, 2011. The TWDB compiled the data from these reports. The water audit reporting requirements follow the International Water Association (IWA) and American Water Works Association (AWWA) Water Loss Control Committee methodology.

The primary purposes of a water loss audit are to account for all of the water being used and to identify potential areas where water can be saved. Water audits track multiple sources of water loss that are commonly described as apparent loss and real loss. Apparent loss is water that was used but for which the utility did not receive compensation. Apparent losses are associated with customer meters under-registering, billing adjustment and waivers, and unauthorized consumption. Real loss is water that was physically lost from the system before it could be used, including main breaks and leaks, customer service line breaks and leaks, and storage overflows. The sum of the apparent loss and the real loss make up the total water loss for a utility.

In the ETRWPA, 142 public water suppliers submitted a water loss audit to TWDB. These water suppliers represent a retail service population of approximately 589,000 people, or about 55 percent of the regional population. Table 5C.2 shows a summary of reported 2010 water loss accounting for the ETRWPA.

**Table 5C.2 Reported 2010 Water Loss Accounting in the ETRWPA**

System Input Volume 49,264,397,900 100.0%	Authorized Consumption 40,762,451,765 82.7%	Billed Consumption 39,715,161,393 80.6%	Billed Metered 39,658,411,074 80.5%	Revenue Water 39,715,161,393 80.6%
			Billed Unmetered 56,750,319 0.1%	
		Unbilled Consumption 1,047,290,372 2.1%	Unbilled Metered 528,937,654 1.1%	Non-Revenue Water 9,550,301,736 19.4%
			Unbilled Unmetered 518,352,718 1.1%	
	Water Loss 8,503,222,510 17.3%	Apparent Loss 1,299,717,405 2.6%	Unauthorized Consumption 186,016,040 0.4%	
			Customer Meter Accuracy Loss 1,075,937,970 2.2%	
		Real Loss 7,211,368,309 14.6%	Systematic Data Handling Discrepancy 37,763,395 0.1%	
			Reported Breaks and Leaks 856,923,200 1.7%	
		Unreported Loss 6,375,337,625 12.9%		

Two problems with the reported water loss accounting data include:

- Misreported units. Several utilities appear to have misreported the units for their water loss data. In particular, two utilities reported water volumes in units of thousand gallons, when the volumes appear to be in units of gallons. These two discrepancies alone would reduce the reported overall 2010 system input volume in the ETRWPA from 49.3 billion gallons (229 gpcd) to 32.4 billion gallons (151 gpcd), which is much more in line with other historical water use data.
- Negative real water losses. Fourteen utilities reported negative real losses. The physical meaning of a negative water loss is that water is infiltrating into the distribution system, which is not realistic.

On a regional basis, the reported percentage of total water loss for the ETRWPA was 17.3 percent, with reported percentages for WUGs ranging from -1.3 percent to 57.6 percent. Based on these figures, it appears that enhanced water loss control programs may be a potentially feasible water conservation strategy for some WUGs in the East Texas Region.

## **5C.2 Water Conservation Plans**

The TCEQ requires water conservation plans for all municipal, industrial, and other non-irrigation water users with surface water rights of 1,000 ac-ft per year or more, all irrigation water users with surface water rights of 10,000 ac-ft per year or more, and all retail public water suppliers providing water service to 3,300 connections or more.<sup>[1]</sup> Water conservation plans are also required for all water users applying for a new or amended State water right and for entities seeking more than \$500,000 in State funding for water supply projects.

All conservation plans must specify quantifiable 5-year and 10-year conservation goals and targets. While these goals are not enforceable, they must be identified. Updated water conservation plans for WUGs in the region were to be submitted to the Executive



Director of the TCEQ and to the ETRWPG by May 1, 2014. Failure to submit a water conservation plan is a violation of the Texas Water Code, Section 11.1272 and the Texas Administrative Code, Section 288.30, and is subject to enforcement by the TCEQ.

In the ETRWPA, 30 entities hold municipal, industrial, or other non-irrigation surface water rights in excess of 1,000 ac-ft per year, four entities have irrigation water rights greater than 10,000 ac-ft per year, and 23 entities serve 3,300 connections or more. A list of the users in the ETRWPG required to submit water conservation plans is shown in Table 5C.3.

Other entities have contracts with regional and wholesale water providers for greater than 1,000 ac-ft per year. 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.

To assist entities in the ETRWPA with developing water conservation plans, model plans for municipal water users (wholesale or retail public water suppliers), industrial users and irrigation districts may be found in Appendices 5C-A through 5C-C. Additionally, model conservation plans are available on the TCEQ website at [http://www.tceq.state.tx.us/permitting/water\\_rights/conserves.html](http://www.tceq.state.tx.us/permitting/water_rights/conserves.html). Each of these model plans addresses the latest TCEQ requirements and is intended to be modified by each user to best reflect the activities appropriate to the entity.

**Table 5C.3 Water Users and Types of Use that are Required to Develop, Implement, and Submit Water Conservation Plans**

Entity	WUG	3,300 Connections or More	Non-Irrigation Water Right of 1,000 ac-ft/yr or More				Irrigation Water Right of 10,000 ac-ft/yr or More
			Municipal / Domestic	Industrial	Mining	Other	
Athens	Yes	•					
Beaumont	Yes	•	•				
Bridge City	Yes	•					
Carthage	Yes	•					
Center	Yes		•				
GM WSC	Yes	•					
Groves	Yes	•					
Henderson	Yes	•					
Jacksonville	Yes	•	•				
Jasper	Yes	•					
Kilgore	Yes	•					
Lake Livingston Water Supply & Sewer Service Company	Yes	•					
Lindale Rural WSC	Yes	•					
Lufkin	Yes	•	•	•			
Lumberton MUD	Yes	•					
Nacogdoches	Yes	•	•				
Nederland	Yes	•					
Orange	Yes	•					
Palestine	Yes	•					
Port Arthur	Yes	•					
Port Neches	Yes	•					
San Augustine	Yes		•				
Southern Utilities Company	Yes	•					
The Consolidated WSC	Yes	•					
Tyler	Yes	•	•	•			
Angelina & Neches River Authority	No		•	•			
Angelina-Nacogdoches WCID 1	No			•			
Athens Municipal Water Authority	No		•	•			
E I Dupont De Nemours & Co	No			•			
Entergy Texas Inc.	No			•			
Exxon Mobil Oil Co	No			•			
Houston Co WCID 1	No		•				
Independent Refining Corp	No			•			
Jefferson County Drainage District No 6	No					•	
Joe Broussard II et al	No						•
Lower Neches Valley Authority	No		•	•	•	•	•
Luminant Generation Co LLC	No			•			

**Table 5C.3 Water Users and Types of Use That are Required to Develop, Implement, and Submit Water Conservation Plans (Cont.)**

Entity	WUG	3,300 Connections or More	Non-Irrigation Water Right of 1,000 ac-ft/yr or More				Irrigation Water Right of 10,000 ac-ft/yr or More
			Municipal/ Domestic	Industrial	Mining	Other	
Luminant Mining Co LLC	No				•		
M Half Circle Ranch Company	No						•
Motiva Enterprises LLC	No			•			
Panola Co FWSD 1	No		•	•			
Premcor Refining Group Inc.	No			•			
Rowan Companies Inc.	No			•			
Sabine River Authority	No		•	•	•	•	•
Temple-Inland Forest Prod Corp/Georgia-Pacific LLC	No			•			
Texas Parks & Wildlife Dept.	No					•	
TPC Group LLC	No			•			
Union Oil Of California	No			•			
United States Department Of Energy	No				•		
Upper Neches River MWD	No		•				

NOTE: May not include applicants for new water rights or TWDB funding.

Implemented water conservation strategies vary by water user and are shown in Table 5C.4. This table lists water conservation strategies for individuals who have submitted water conservation plans as of February 20, 2015, or who have published water conservation plans on their web sites. The focus of the conservation activities for municipal water users in the ETRWPA are:

- Education and public awareness programs.
- Reduction of unaccounted for water through universal metering, water audits, maintenance and repair of water systems, and meter testing and repair.
- Water rate structures that discourage water waste.

Table 5C.5 summarizes water conservation measures implemented by the utilities for which water conservation plans were available.

Table 5C.4 Primary Water Conservation Strategies Documented in Water Conservation Plans

Entity	Plan Date	Primary Water Conservation Strategies								
		Plumbing Fixture Requirements	Reduce Water Loss/Leak Detection	Public Education/Awareness Programs	Pressure Control	Universal Metering or Meter Calibration or Replacement	Rate Structure Not Promoting Excessive use	Active Fixture Retrofit Program	Require/request wholesale customers to have conservation plan/conservation strategies	Other
		Passive Strategies	Active Conservation Strategies							
Angelina & Neches River Authority	2014		•	•		•	•		•	
Angelina-Nacogdoches WCID No.1	2009		•							
City of Beaumont	2014	•	•	•		•	•			
City of Bridge City	2010		•	•		•	•			•
City of Carthage	2005		•	•		•	•		•	•
City of Center	2014	•	•	•		•	•		•	•
City of Crockett	2014		•	•		•	•			•
City of Groves	2014		•	•			•			
City of Henderson	2010	•	•	•		•	•			•
City of Jacksonville	2014	•	•	•	•	•	•		•	•
City of Jasper	2009	•	•	•	•	•	•		•	
City of Kilgore	2009	•	•	•		•	•		•	•
City of Lindale	2009 <sup>a</sup>	•	•	•		•	•		•	•
City of Lufkin	2014	•	•	•		•	•		•	•
City of Nacogdoches	2012		•	•		•	•			
City of Nederland	2009	•	•	•	•	•	•		•	•
City of Orange	2009	•	•	•		•	•		•	•
City of Palestine	2014	•	•	•		•	•		•	•
City of Pineland	2014			•			•			•
City of Port Arthur	2014	•	•	•		•	•			•
City of Port Neches	2009	•	•	•	•	•	•			•

Table 5C.4 Primary Water Conservation Strategies Documented in Water Conservation Plans (Cont.)

Entity	Plan Date	Primary Water Conservation Strategies								
		Plumbing Fixture Requirements	Reduce Water Loss/Leak Detection	Public Education/Awareness Programs	Pressure Control	Universal Metering or Meter Calibration or Replacement	Rate Structure Not Promoting Excessive use	Active Fixture Retrofit Program	Require/request wholesale customers to have conservation plan/conservation strategies	Other
		Passive Strategies	Active Conservation Strategies							
City of Tyler	2014	•	•	•	•	•			•	•
Entergy Texas, Inc.	2014		•		•					
Houston Co WCID No.1	2014		•	•	•	•			•	
Lower Neches Valley Authority	2014		•	•		•	•		•	•
Sabine River Authority	2014		•	•		•			•	•
Southern Utilities Company	2014		•	•	•	•	•		•	•
Temple-Inland Forest Prod Corp/Georgia-Pacific LLC	2014		•							•
Upper Neches River MWD	2014	•	•	•		•			•	•

<sup>a</sup> Dated 1999 but updated with water use statistics through 2008.

**Table 5C.5 Summary of Measures in Water Conservation Plans**

Number of Plans That Include Measure	Measure
26	Public education (distribute materials, web site, school programs, news articles, conservation tips, etc.)
22	Routine observation for leaks/illegal connections by utility personnel and public
21	Meter testing and repair program or replacement program
20	Repair leaks as soon as practical
19	Universal metering
17	Require wholesale water customers to develop water conservation plans or adopt city programs
16	Conduct annual water audits
14	Consistency check on meter readings
13	Calibrate master meters annually or semiannually
13	Flat rate structure
12	Encourage retrofit of inefficient plumbing fixtures
10	Minimize real water losses by replacement of deteriorating water mains and appurtenances on an on-going basis
10	Track monthly production and sales records and unaccounted-for water
10	State fixture water use standards
9	Increasing block rate structure
8	Monitor and/or control system pressures
8	Adopt International Building/Plumbing Codes
8	Encourage water-efficient landscaping
7	Active leak detection program
7	Conduct water audits less frequently than annually
7	Recycling/reuse
5	Convert to AMR/AMI meter infrastructure
4	Water waste prohibition
3	Calibrate master meters less frequently than annually
3	Other ordinances (recirculate swimming pool water, insulation of hot-water piping for new construction, etc.)
2	Meters at all city facilities
2	Subbasin metering to identify areas with water losses
2	Canal inspection and maintenance
2	Technical assistance for conservation planning
2	Federal clothes washer standards
1	Track street cleaner water use
1	Measure night flows
1	Conservation grant program
1	Encourage smart irrigation controllers
1	State irrigation system rules
1	Golf course conservation
1	ICI conservation
1	Saltwater barrier
1	Restricted pumping hours
1	Computerized controls to improve water and production efficiency

## 5C.3 Recommended Water Conservation Strategies in the East Texas Regional Water Planning Area

Water conservation actions implemented as strategies would result in savings above that assumed for the TWDB water demand projections. The Texas Water Development Board Report 362,<sup>[2]</sup> published by the Water Conservation Implementation Task Force in November 2004, provides a review of best management practices (BMPs) for water conservation for municipal, industrial and agricultural water users. Since that time, the Water Conservation Advisory Council has worked with the TWDB and the TCEQ to develop new water conservation BMPs and to review and update the existing BMPs. Recommended water conservation strategies are presented by WUG type in the following sections.

**5C.3.1 Municipal Water Conservation Strategies.** Water conservation BMPs were evaluated for municipal WUGs that have a projected per capita water use greater than 140 gpcd and have either demonstrated needs in the planning period or recommended water management strategies that involve interbasin transfer. Evaluated water conservation practices included enhanced public and school education, water conservation pricing, and an enhanced water loss control program.

**Enhanced Public and School Education.** Enhanced public and school education would involve providing formal and indirect means of information on how to conserve water beyond current efforts. Education costs were applied to all of the entities meeting the above criteria. Assumptions made in evaluating the efficiency of this measure included restrictions that the annual budget spent on education would be limited to approximately \$1.50 per capita or per 1,000 gallons water conserved, whichever was most restrictive. The total budget available will be an indication as to the effectiveness of the program. Table 5C.6 indicated efficiencies assigned to various ranges of available budget.

**Table 5C.6 Water Conservation Efficiencies for Enhanced Public and School Education**

<b>Budget</b>		<b>Efficiency of Conservation</b>
<b>Low</b>	<b>High</b>	
\$1,500 (minimum)	\$14,999	1.5%
\$15,000	\$29,999	2.0%
\$30,000	\$44,999	2.5%
\$45,000	\$60,000 (maximum)	3.0%

**Water Conservation Pricing.** Water conservation pricing requires an increasing rate structure with increasing use. The minimum price increase between rate blocks should be 25 percent. For maximum effectiveness, the price increase between rate blocks should be at least 50 percent.<sup>[2]</sup> The effectiveness of this measure is, in part, determined by whether water conservation pricing is currently implemented.

Water conservation pricing will be most effective in areas where groundwater resources are becoming less available and require high expenditures in capital projects to supply water. Only those entities meeting the previous criteria and located in counties that are reaching the limits of groundwater were considered for this strategy. Where other recommended strategies were projected to cost less than \$1.50 per 1,000 gallons, the efficiency achieved is assumed to be 1.0 percent. A 2.0 percent efficiency is assumed where the recommended strategy cost exceeds \$1.50 per 1,000 gallons.

**Enhanced Water Loss Control Program.** An enhanced water loss control program involves committing more resources towards identifying and repairing leaks, replacing inaccurate water meters, minimizing billing errors, and replacing mains with chronic leakage. Utilities would strive to achieve target water loss percentages that depend on water system characteristics. For more rural utilities with fewer than 32 connections per mile of main, the target water loss is 18 percent of water entering the system (Table 5C.7). For more urban or suburban utilities with 32 or more connections per mile of main, the target water loss is 12 percent of water entering the system. For WUGs with



severe water loss, achieving the water loss target may involve replacing a substantial portion of the potable water transmission and distribution system.

**Table 5C.7 Enhanced Water Loss Control Program Targets**

Service Connections per Mile of Main	Water Loss Target (% of System Input)
Less than 32	18% or less
32 or more	12% or less

The projected total water savings is provided in Table 5C.8 for WUGs that have a projected per capita water use greater than 140 gpcd and have either demonstrated needs in the planning period or recommended water management strategies that involve interbasin transfer. Since Athens is primarily located in Region C, the recommended water conservation strategy for Athens is included in the *Region C Water Plan*.

**Table 5C.8 Water Conservation Savings for Selected WUGs**

Entity (County)	Amount Conserved (ac-ft per year)					
	2020	2030	2040	2050	2060	2070
Alto Rural WSC (Cherokee)	0	0	0	5	7	10
Beaumont (Jefferson)	0	3,238	5,341	7,047	8,579	9,966
Bullard (Smith/Cherokee)	11	24	30	38	47	56
Chandler (Henderson)	0	0	0	16	30	36
Crystal Systems Inc. (Smith)	4	9	12	15	19	22
Lindale (Smith)	8	17	22	28	34	41
Overton (Rusk/Smith)	0	0	97	167	223	269
Port Arthur (Jefferson/Orange)	4,992	7,450	8,516	9,616	10,340	9,767
Woodville (Tyler)	0	0	10	16	18	19
<b>TOTAL</b>	<b>5,015</b>	<b>10,738</b>	<b>14,029</b>	<b>16,949</b>	<b>19,297</b>	<b>20,186</b>

The following WUGs have water needs but use less than 140 gpcd:

- County-Other (Jasper)
- County-Other (Jefferson)
- D&M WSC (Nacogdoches)
- R-P-M WSC (Henderson/Smith)

In addition, seven WUGs are customers of the Lower Neches Valley Authority, a WWP with a recommended water management strategy involving an interbasin transfer. These WUGs are also projected to use less than 140 gpcd:

- County-Other (Jefferson)
- Groves (Jefferson)
- Jefferson County WCID #10 (Jefferson)
- Nederland (Jefferson)
- Nome (Jefferson)
- Port Neches (Jefferson)
- West Jefferson County MWD (Jefferson)

The WUGs listed above already use water in an efficient manner. It should be noted that, the water demand projections for these entities already include projected water savings from natural replacement of inefficient fixtures and appliances with high-efficiency toilets and showerheads, residential clothes washers, and residential dishwashers. For these WUGs, the “built-in” water savings from these measures is 7.8 percent of pre-savings water demand in 2020, increasing to 14.6 percent in 2070. For these reasons, no additional water conservation strategies are recommended for WUGs that use less than 140 gpcd.

**5C.3.2 Other Water User Groups.** Water conservation measures for other water user groups are described in the following sections.

**Manufacturing.** Industrial water users include large petrochemical industries as well as smaller local manufacturers. The current state of water conservation at existing manufacturing facilities is unknown. Conservation measures associated with industries are highly industry- and site-specific. For example, some industries can utilize brackish water supplies or wastewater effluent while others require only potable water. In addition, the future mix of industries is also unknown.

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. In the ETRWPA, where water is readily available, requiring costly changes to processes and equipment may not be practical and beneficial to the region. Finally, although it is expected that manufacturers will implement water conservation measures during the planning period, the ETRWPG does not have the industry- and site-specific information necessary to identify the current status of manufacturing water conservation or to say what measures should be implemented. In light of these considerations, the ETRWPG has not recommended water conservation strategies for manufacturing WUGs.

**Irrigation.** Most irrigation occurs in the lower parts of the Neches and Sabine Basins. Much of the irrigation water is delivered by canals and is used for rice farming along the coast. The Lower Neches Valley Authority is the largest provider of agricultural irrigation water in the ETRPWA. LNVA has implemented significant irrigation water conservation measures, including:

- Information and education program.
- Meter repair and replacement program
- Water billing based on water usage: In 2005, LNVA began billing rice farmers based on metered water use rather than farmed acreage. After implementation of this measure, average water consumption was reduced from 3.79 acre-feet per acre farmed in 2004 to 2.84 acre-feet per acre farmed in 2005, a reduction of about 25 percent.
- Canal water loss reduction: From 2009 to 2013, LNVA reduced its canal water loss from 25 percent to 14 percent through aggressive leak detection and repair along with vegetation control. This represents a reduction in canal water loss of more than 23,000 acre-feet per year.
- Neches River saltwater barrier: This measure is estimated to conserve an average of 200,000 acre-feet per year of stored, fresh water that does not have to be released to prevent saltwater intrusion into the river.

Individual farmers also apply measures such as minimization of water loss from on-farm water distribution, irrigation scheduling, land leveling, and tailwater recovery. As described above, significant increases in efficiency have already been achieved. In addition, the appropriate water conservation strategies for individual farms are site-specific. Although the ETRWPG encourages implementation of irrigation water conservation measures, it does not have the farm-specific information necessary to identify the current status of on-farm water conservation or to recommend what measures should be implemented. In light of these considerations, the ETRWPG has not recommended further water conservation strategies for irrigation WUGs.

**Other.** Steam-electric power, livestock, and mining WUGs account for about 11 to 14 percent of the total water demand in the ETRWPA during the planning period. The demand for steam-electric use is projected to grow from 7.2 to 11.5 percent of the demand during the 50-year period. The projections for steam-electric use were provided by the TWDB. Most of the demand will be consumed by new projects, which may include conservation in the projected water use. Livestock and mining comprise a total of 3 to 5 percent of the demand. The cost of water in these industries comprises a small percentage of the overall business cost, and it is not expected that these industries will see an economic benefit to water conservation. Based on these considerations, water conservation strategies have not been recommended for steam-electric, livestock and mining WUGs.