Progress Made in Water Conservation in Texas

Report and Recommendations to the 87th Texas Legislature

Submitted by the

Water Conservation Advisory Council

www.savetexaswater.org

Karen Guz, Presiding Officer

[Date]

Water Conservation Advisory Council

[Date] [From 2018 WCAC Report]

The Honorable Greg Abbott
Governor of Texas

The Honorable Dan Patrick
Lieutenant Governor of Texas

The Honorable Joe Straus, III
Speaker of the Texas House of Representatives

Dear Sirs:

It is our honor as members of the Water Conservation Advisory Council (WCAC) to provide you with the sixth biennial report on progress made in water conservation in Texas.

The Council serves as a professional forum for the continuing development of water conservation resources, expertise, and progress evaluation of the highest quality for the benefit of Texas. In addition to their professional endeavors, the 23 members of the council, their designated alternates, and interested stakeholders have voluntarily dedicated countless time and effort to protecting water resources, reducing the consumption of water, eliminating the loss or waste of water, improving water use efficiency, and increasing the recycling and reuse of water.

Respectfully submitted on behalf of the 23 members of the Council,

[Signature]

Karen Guz
Presiding Officer, Water Conservation Advisory Council

c: The Honorable Charles Perry
Chairman, Senate Committee on Agriculture, Water, & Rural Affairs

The Honorable Lyle Larson
Chairman, House Natural Resources Committee

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Executive Summary

[From 2018 WCAC Report]

In 2007, the 80th Texas Legislature created the Water Conservation Advisory Council (WCAC) to provide the resource of a select group of professionals with expertise in water conservation. The Water Conservation Advisory Council operates under the following mission:

> *to establish a professional forum for the continuing development of water conservation resources, expertise, and progress evaluation of the highest quality for the benefit of Texas— its state leadership, regional and local governments, and the general public*.

The Water Conservation Advisory Council (the Council) is comprised of a unique set of perspectives, which provides a broad view of water conservation in Texas, examining where we have been and where we are to ensure a bright water future for Texas.

Since the last report to the legislature, three of the Council's recommendations have been incorporated into new legislation and policies. The Texas Legislature enacted the need for trained water loss auditors with the passing of House Bill 1573. Additionally, the legislature approved designation of a water conservation coordinator with House Bill 1648, and the addition of a non-voting member to regional water planning groups with Senate Bill 1511.

The Council, made up of its 23 members, their designated alternates, and numerous interested parties have contributed extensive time and effort by both participating at meetings and through the Council's workgroups, which include:

- Agricultural
- Commercial & Institutional
- Industrial
- Municipal
- Public Awareness
- Water Loss
- Wholesale Water Suppliers & Regional Water Authorities

The workgroups allow for focused efforts on specific water conservation initiatives and then report back to the Council with findings, initiatives, and outcomes. The Council utilizes these efforts to expand awareness on the importance of water stewardship by:

- hosting frequent guest presenters at their meetings
- posting white papers and guidance documents as online resources
- refining voluntary measures outlined in the Best Management Practices Guides
- monitoring implementation of water conservation strategies by water users included in regional water plans

- presenting seven Blue Legacy Awards showcasing champions of water conservation in Texas.

This sixth report to state leadership summarizes the Council's recent activities in relation to their seven statutory charges.

In addition, five legislative recommendations, summarized below, are included herein. These recommendations represent the majority opinion of the council members but do not necessarily reflect the views of each entity or interest group.

[Summary of Legislative Recommendations]

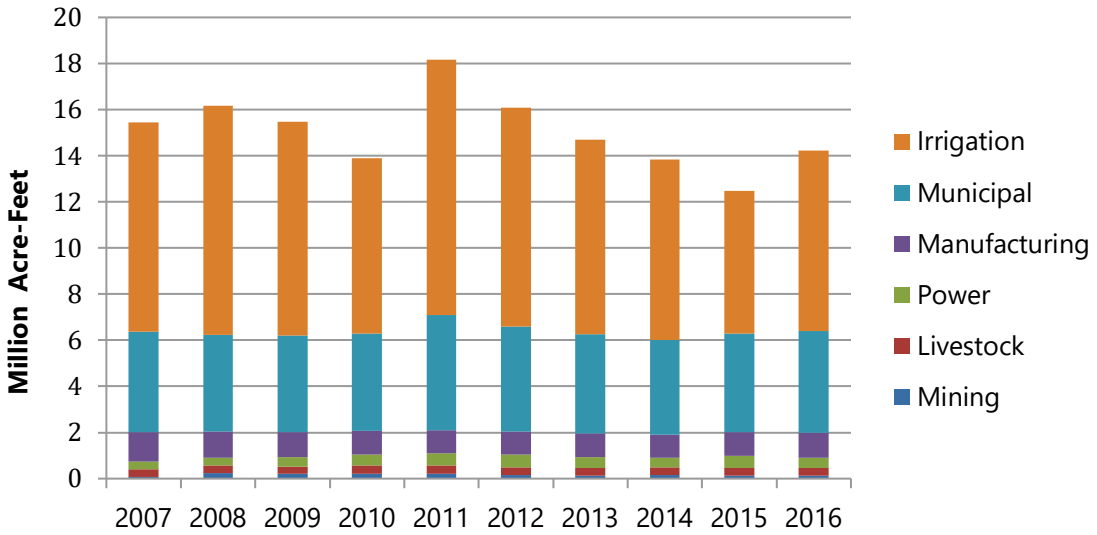
Legislative charges

Introduction

[From 2018 WCAC Report]

The WCAC was established in 2007 via passage of Senate Bill 3 and House Bill 4 and given seven charges relating to the development and the evaluation of progress regarding water conservation efforts in Texas. This is the sixth report to state leadership briefly addressing each charge and identifying key findings and recommendations.

As Texas continues to grow in population and thrive in terms of agricultural and industrial productivity, successful conservation of our water resources will be critical. Despite such growth over the last 10 years and because of dedicated conservation efforts, water use in Texas has remained relatively stable in many water use categories, fluctuating most notably with the statewide drought in 2011 (Figure 1). However, looking forward, water conservation efforts are even more important, as the population is projected to increase by 70 percent in that time, growing to over 51 million people. The current state water plan includes a variety of water management strategies to meet the difference between our existing supplies and future water demands, with water demand management (conservation) activities expected to provide 30 percent of new water needs by 2070[1].



[1] 2017 State Water Plan, available online at www.twdb.texas.gov/waterplanning/swp/2017.

Figure 1. 2016 Categorical Water Use in Texas for 2016[2]

Charge 1. Monitor trends in water conservation implementation

The WCAC has 23 members, appointed by TWDB, who represent major water use sectors and stakeholders in our state. The members representing the areas listed below have summarized findings and progress in their respective areas.

Agricultural Water Conservation

Irrigation of crops accounts for an estimated 54 percent of all water use in Texas, making it by far the largest water use category. Approximately 74 percent of all groundwater and 33 percent of surface water are used for agricultural irrigation. (TWDB 2017 estimates) As the largest water user, agricultural irrigation presents the state's best opportunity to achieve significant water use savings.

Over the past several decades, the major trends in agricultural water use efficiency have been: Advances in plant genetics to produce higher yields with less water; significant improvements in the efficiency of center pivot irrigation systems; increased use of subsurface drip systems; and, the widespread adoption of conservation tillage practices. While these trends are expected to continue, an emerging movement that is gaining ground is irrigation scheduling which employs a variety of techniques to more precisely apply water when and where it is needed.

Widespread adoption of best management practices like irrigation scheduling is key to agricultural water conservation. To accomplish that, farmers not only must be informed about the new technology and practices but also convinced that implementing these practices will have a positive impact on their net income. Education and demonstration projects like those conducted by the Texas Alliance for Water Conservation in the High Plains and the Texas Project for Ag Water Efficiency in the Rio Grande Valley provide an essential link between water conservation researchers and water users. The time, effort and money spent on cutting-edge research and developing BMPs is worthless without education and demonstration projects that help agricultural producers implement new conservation practices.

[2] Chart taken from Texas Water Use Estimates Report, available at: http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/data/2016TexasWaterUseEstimatesSummary.pdf?d=146433.800000028.

Groundwater Conservation Trends

The most extensive use of groundwater for irrigation is in the Texas High Plains which is one of the most important agricultural regions of the United States. It is highly dependent on water for irrigation from the Ogallala Aquifer at non-sustainable rates of use. Approximately 90 percent of the water withdrawn from the aquifer is used for agricultural irrigation. (Texas White Paper, 2018 Ogallala Summit[3])

Highly efficient low-pressure center pivot irrigation is now used on 78.9 percent of irrigated acres in Texas. (USDA 2018 Irrigation and Water Management Survey) This includes Low Elevation Spray Application (LESA); Low Energy Precision Application (LEPA); Mid-Elevation Spray Application (MESA) and Low Pressure In-Canopy (LPIC).

Improved irrigation management and scheduling tools are being developed using location targeted weather-based evapotranspiration estimates and in-field monitoring of soil and plant water stress. The adoption of soil moisture monitoring using sensors and telemetry units for irrigation scheduling is still relatively low but growing. A variety of sensor types and telemetry options are commercially available and are being promoted by industry sales efforts and cost-share programs by USDA-NRCS and others.

Drought tolerant crops such as cotton, sorghum and wheat are being included in rotation and "split pivot" strategies to balance with higher water demand crops. Variable rate irrigation systems are being developed which allow for in-field adjustment of water application according to localized soil water capacity and crop yield ability. Field trials of deficit irrigation for cotton have shown significant promise with one study finding reduced annual irrigation amounts of 28 percent with average yield reductions of only 9 percent compared to more common application strategies. (Himanshu, Sushil & Ale, Srinivasulu & Bordovsky, James & Darapuneni, Murali. (2019). Evaluation of crop-growth-stage-based deficit irrigation strategies for cotton production in the Southern High Plains. Agricultural Water Management. 225. 0.1016/j.agwat.2019.105782.)

Surface Water Conservation Trends

In the Lower Rio Grande Valley, there is a slow conversion to drip irrigation when the following conditions are met: (1) The value of crops being grown allow for investment in higher efficiency irrigation application; and (2) Where irrigation districts can provide smaller volumes of water over a longer time period as required for drip/pivot irrigation as opposed to large volumes provided quickly for flood/furrow irrigation.

[3] Report can be found at: http://ogallalawater.org/ogallala-summit-april-2018-texas-white-paper/

In addition, there is slow adoption of integrated data dashboards when they are economically viable, usually in concert with drip systems. There is also some adoption of raised beds, drip and plastic mulch in new citrus groves, which is largely driven by pest control concerns but with a side benefit of increased water conservation.

Increasing conversion to higher efficiency drip irrigation in the Lower Rio Grande Valley would require a large effort to redesign the water delivery infrastructure maintained by multiple irrigation districts delivering water across the region. Individual districts may not have the financial or technical capacity to undertake an effort to redesign and reconstruct their delivery infrastructure. Thus, districts are focusing on improvements to the systems in place to increase agricultural water use efficiency.

In the Upper Rio Grande Valley, irrigation scheduling using soil moisture sensors in pecan fields around El Paso has resulted in reduced number of irrigations from approximately 12 irrigations per year to 9 or 10 per year. In the El Paso County Water Improvement District No. 1 there are about 15,000 acres of pecans under irrigation and a reduction of two irrigations per year can potentially result in water savings of 6,250 acre-feet per year if adopted district wide.

Rangelands Water Conservation

Water loss is as much of an issue for rangelands as it is for other categories of water use. Through evapotranspiration and excessive rainfall runoff due to invasive brush, water is lost from aquifer recharge and the growth of grasses for grazing. Brush control is a proven best management practice for conserving rainfall for beneficial uses with the additional benefits of improving water quality in streams and reducing sedimentation in reservoirs that provide water for residential, commercial and industrial uses.

The 2017 State Water Plan adopted by TWDB includes 32 recommended brush control water management strategies in five regions (F, G, J, K, and M). Four regions (A, B, C, and O) recommended brush control as a water management strategy and nine regions (A, B, F, G, H, K, L, M, and O) included policy recommendations regarding brush control in their respective regional water plans.

The Texas Legislature, in 2011, replaced the state's brush control program with the Water Supply Enhancement Program, administered by the Texas State Soil and Water Conservation Board (TSSWCB), with the purpose of targeted control of brush species that are detrimental to water conservation.

The TSSWCB works through soil and water conservation districts to deliver technical assistance to landowners to implement brush control activities and financial incentives in the form of cost-sharing are provided to landowners implementing brush control activities on eligible acres

consistent with their resource management plan. However, the state has not provided funding for the program since Fiscal Year 2018 appropriations of $2.47 million, even though TSSWCB is statutorily required to operate the program.

When rain falls in Texas, 95 percent of the land upon which it falls is privately owned, much of it vast, open rangeland. All Texans are affected by what happens to that rainfall. Continued funding of the Water Supply Enhancement Program would assist private landowners with the cost of maintaining their land in ways that provide public benefits to all Texans.

Institutional and Commercial Water Conservation

A major challenge to accurately measure water use for Institutional and Commercial customers lies in the inconsistent definition of these user categories. Texas Administrative Code §288.1 provides the following definitions:

> Institutional use is the use of water by an establishment dedicated to public service, such as a school, university, church, hospital, or government facility, regardless of ownership.
>
> Commercial use is the use of water by a place of business, such as a hotel, restaurant, or office building but does not include multi-family residences or agricultural, industrial, or institutional users.

Although these definitions are in place, the billing systems used by utilities are often unable to separate these uses from other user categories. Developing a metric similar to per capita use associated with municipal use is also difficult because it requires site-specific 'population' information which depends on the type of facility and may be proprietary in nature.

To rectify this issue, the consistent use of definitions and billing codes of facilities are needed. Many cities across the nation, including several Texas cities, are using the ENERGY STAR Portfolio Manager Tool, part of the Better Buildings Challenge from the U.S. Department of Energy. The ENERGY STAR system is designed to define building type for energy conservation and the U.S. Environmental Protection Agency has developed a coding system to support this effort. Additionally, the North American Industrial Classification System (NAICS) is another coding system that works to monitor business and economic activities. Because the Portfolio Manager system was designed to monitor facility type with respect to energy use, it is also recommended for use by water utilities.

As part of monitoring trends, development of benchmark data for commercial and institutional water users. Examples of a benchmark would be gallons used per square foot or gallons per student for schools or gallons per room for hotels. Energy Star Portfolio Manager collects some

of this information. This benchmarking data collection would provide data to evaluate the relative efficiency of commercial and institutional facilities to others in the same category and to monitor water conservation efforts.

Manufacturing and Electric Power Generation Water Conservation

Texas ranks first in the nation in electric power production[4] and second for manufacturing output[5]. Because the sustainability of the Texas manufacturing sector is so highly dependent on water, manufacturers closely track and manage their water usage, file the required water conservation plans, complete the TWDB's annual water use survey, and seek out opportunities to conserve water on a consistent basis. An analysis[6] conducted in 2016 showed a reduction in water use per unit of output in manufacturing. As an example, over the last two decades, Texas refiners have reduced water usage by as much as 30 percent while output revenue has increased steadily. The combination of economic gains and water use efficiency is the result of innovation by many Texas industries.

Though each of the state's 27 complex and multi-operational refineries is unique, with distinct water needs and operations, water conservation has resulted from:

- evolving water management practices;
- water treatment and technology development;
- utilization of alternative sources;
- collaboration within the industrial sector; and
- cooperation at the local, regional, and state level.

Water consumption by industries is highly variable making it difficult to compare one water user to another. Future efforts should continue to explore opportunities for improved efficiency and development of water conservation best management practices appropriate for each facility. The sector should consider sharing non-proprietary information within their respective trade groups as a way of encouraging water conservation. The Council welcomes water users to share their successes and water metrics through case studies posted to the Council's online resource library to potentially accelerate efficiency gains.

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[4] Information can be found at the U.S. Energy Information Administration online at: https://www.eia.gov/state/

[5] State Manufacturing Data can be found at: http://www.nam.org/Data-And-Reports/State-Manufacturing-Data/

[6] Find Hoffman's examination of water use trends on savetexaswater.org. In addition, TWDB funded a review of past methodologies used to create water demand projections used in regional water planning, and the report will be posted at http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/0704830756ThermoelectricWaterProjection.pdf.

Municipal Water Conservation

Municipal water demands are expected to grow by as much 62% by 2070 eventually accounting for 39% of water used in Texas. This increase is primarily driven by strong population growth in several key regions in our state. Meeting municipal conservation targets will be critical as savings will account for 9.6% of water supply strategies by 2070.

Municipal usage is highly diverse stemming from single family, multi-family, commercial institutional and light industrial water consumption in cities and aggregated county areas. Fortunately a great deal of data is collected by TWDB on potential savings and progress in this water sector. Saving plans are quantified in TWDB Conservation Plans and documented in Conservation Annual Reports. Water Loss Audits provide regular data regarding savings progress from infrastructure and management improvements.

Updated Conservation Plans: (#) water utilities submitted updated Five Year Conservation Plans in 2019 on how conservation efforts will be deployed for approximately (#) municipal customers across Texas. For the first time these plans included designating a person as the Water Conservation Coordinator for the reporting entity. This was also the first time a new, free Conservation Planning Tool was available to both assist in selecting Best Management Practice (BMP) strategies and in making accurate savings estimates over time. [Insert any summary information we have on per capita target updates and BMP usage. Also do we have any idea how many reports included use of the new tool?]

Trends in Conservation Reports:

[Need data for this paragraph. Annual report summary update: hopefully continue to see declining per capita in total gpcd and residential gpcd]

Conservation Best Management Practices Guide: WCAC volunteers have been hard at work updating the Conservation Best Management Practices Guide so that the latest in conservation programming options could be included in municipal plans and reports.

- **Outdoor Watering Schedule BMP** was added to encourage communities to consider reasonable year-round limits on operation of irrigation systems which yield significant water savings.
- **Custom Rebate BMP** was added to guide incentives for commercial, institutional and industrial customers.

- **Enforcement of Irrigation Standards** was added to remind communities that enforcement of TCEQ irrigation efficiency standards provides consumer protections and water savings.
- **Utility Water Audit & Water Loss BMP** was added to update with the latest international best practices including seeking outside expertise for validity of audit data.
- **Plumbing Assistance for Economically Disadvantaged BMP** was added to provide guidance on how to simultaneously save water and provide assistance for those most in need

Table 1. Water conservation annual report data Update available?

	5-Year goal average†	2013 average	2014 average	2015 average	2016 average	2017 average
Total GPCD*	145	148	148	143	142	142
Residential GPCD	92	82	79	78	77	76
Water loss GPCD	17	20	20	18	17	18
Commercial, Institutional, & Other GPCD	NA‡	46	49	47	48	48
Percent water loss	10	13	13	13	12	12
Percent water reused	NA‡	6	7	10	6	5
Percent water saved	NA‡	6	9	14	15	12

*GPCD = gallons per capita per day; †based on 2014 conservation plans; ‡NA = not applicable

Table 2. Water conservation annual report activities

	2013	2014	2015	2016	2017
Meters replaced	326,305	364,875	359,957	312,914	344,340
Leaks repaired	96,991	140,976	110,387	108,684	101,543
Education programs	308	266	297	403	422
Drought plans activated	164	179	118	57	42

Water Loss Workgroup Efforts: Municipal water loss improvement represents a significant opportunity for both water savings and improved financial outcomes for utilities. In addition to updating the Water Loss Audit & Water Loss BMP, the group pursued two projects:

Water Audit Training Requirement Progress: It is a new requirement that water loss audits be completed by someone who has attended an approved TWDB Water Loss Audit Training. TWDB staff offered ____ workshops through-out Texas that were attended by approximately ____ individuals. An on-line training module was also launched to support this requirement. Training sessions were popular in every region and resulted in strong participation and engagement.

Audit Data Validity Pilot Recommendation: A legislative recommendation from the WCAC is that Texas pursue a Data Validity Pilot Program engaging volunteer utilities in efforts to improve their water loss audits by working with outside experts who review data inputs and conclusions. The goal of this effort is to ensure that our water loss audit reports are accurate and that audit conclusions guide investments that yield the best return on investment for citizens.

Wholesale Water Conservation

By definition, wholesale public water suppliers are entities that sells water to another for resale to the public for human consumption. Wholesale water suppliers face the challenge of making progress in conservation without having direct retail customers. As a result, providers frequently focus conservation efforts on general public outreach with the use of dedicated advertising campaigns, websites, social media, and newsletters. Suppliers are also developing programs and materials that directly support and assist their wholesale customers' conservation program efforts. Support for wholesale customers from the supplier can vary based on the dedicated resources and needs of the customer. Table 3 provides a summary of 55 wholesale suppliers' conservation activity in 2019 as reported to TWDB.

Table 3. Wholesale water supplier water conservation annual report data for 2019.

Population Served	Gallons of Water Produced	Gallons of Water Conserved	Gallons of Water Recycled	Water Savings Dollars	Education and Public Awareness Programs	Leak Detection and Water Loss Programs
7,902,453	670,859,970,591	51,042,553,406	40,516,858,879	$58,272,217	38	30

The following are examples of wholesale and regional water supplier conservation progress since the 2018 report:

- Wholesale water providers continue to encourage their contracting entities to adopt and implement water conservation plans and programs to reduce per capita and peak use demands. The Central Texas Water Supply Corporation recognizes the long-term goal to increase water efficiency and reduce the waste of water. They, along with San Jacinto River Authority (SJRA) and many other providers, recognize the limitations of being a wholesale provider and relying on their customers to have a direct connection with water users for significant conservation savings.
- Wholesale water providers are complying with Texas Administrative Code XXXX to require their customers to have a water conservation plan and to submit that plan to the provider for review and documentation. Subsequent wholesale contracts are also required to develop and provide a water conservation plan. The SJRA requires all of their customers to submit a plan to them even if they may not be required to do so per Texas Commission on Environmental Quality (TCEQ) or Texas Water Development Board (TWDB).
- Many wholesale water providers meet with their customers to communicate and coordinate conservation efforts. Sabine River Authority reviews their conservation plan with their customers at three annual Texas Clean Rivers Program Stakeholder Committee meetings. Upper Trinity Regional Water District (UTRWD) meets with a work group within their Customer Advisory Council to focus on conservation progress. In 2019, City of Dallas Water Utilities (DWU) Wholesale Services staff met individually with 9 wholesale customer to discuss conservation challenges and opportunities. They are continuing individual meetings on a regular basis to discuss ways they can assist their customers. The West Central Texas Municipal Water District communicates regularly with their member cities regarding water demands, conservation practices, operations and maintenance to ensure frugal use and minimal waste. Houston County Water Control Improvement District #1 (HCWCID) communicates to their wholesale customers on the importance to save water and provides promotional pamphlets. The Gulf Coast Water Authority (GCWA) meets with their customer representatives every year to share information and resources regarding conservation programs. It is noted that many smaller wholesale water providers and wholesale customer cities have limited resources, do not have dedicated conservation staff and some have trouble viewing water conservation as an important water supply strategy.
- Wholesale water providers support school education programs in various ways. The Brazos River Authority provided the Major Rivers program to 39 elementary schools across their basin in 2019. Guadalupe-Blanco River Authority (GBRA) provided 175 "Journey Through the Guadalupe River Basin" program kits that reached 4,400 4th grade students. They also have a "composition challenge" asking students to write about the importance of water and ways to conserve it and they recently received 1,550 responses from 21 schools. UTRWD collaborates with local partner agencies to distribute tree seedlings to 3rd grade students throughout the county to teach them the benefits of tress and the importance of water conservation and protection. Greater Texoma Utility

Authority (GTUA) provides TWDB Major Rivers Program school curriculum to 4th grade classes in schools in 5 counties and is recognized as their most successful conservation program.

- Wholesale water providers have challenges to document the effectiveness and water savings of conservation programs. GBRA serves customers that typically have multiple sources of water and the source of use is driven by hydrology. With conservation savings commonly measured by per-capita-use, it can be difficult to account for an accurate number of end users that receive their water.
- Wholesale water providers conduct and coordinate regional outreach efforts. The GTUA and WCTMD promote the "Water IQ: Know Your Water" program. UTRWD promotes the Water My Yard program and other conservation/watershed protection messages regionally through digital advertising, billboards, social media and video ads on YouTube and in theaters. Dallas Water Utilities collaborates with NTMWD and Tarrant Regional Water District on a regional water conservation public awareness campaign called "Water is Awesome" and encouraged users in the North Texas region to help "Keep Texas Water on Tap" in 2019. El Paso Water develops regional conservation campaigns that reach their entire service area via traditional media outlets and social media. The Red River Authority of Texas created the *50 Ways to Save Our Water* resource to share economical conservation practices that can be implemented in the home, schools and businesses. The GCWA launched the "Make Every Drop Count" campaign in spring 2019 to raise public awareness on outdoor water use during high-demand months.
- Wholesale water providers support their customers with education and learning opportunities. El Paso Water uses their TecH_2O facility for system water audit, back flow prevention and license irrigation classes for their wholesale customer employees. All four major water providers in the North Texas region worked together in 2019 to provide the 13th annual conservation symposium for their customer city employees.
- Wholesale water providers also work on their supply side conservation efforts. El Paso Water contracts with a TCEQ certified vendor to perform third-party verification twice a year on all water plant meters. Plans are being considered by HCWCID to recycle water from their wastewater treatment plant and they are looking at replacing meters and scheduling calibrations.
- Wholesale water providers are also promoting efficient water use for their agricultural customers. The WCTMWD promotes conservation tips in their water conservation plan and website for agricultural applications. GCWA has maintains a program to meter water use and incentivize conservation with their farming customers.

Charge 2. Monitor new technologies for possible inclusion in the Best Management Practices Guide

Charge 3. Monitor the effectiveness of the statewide water conservation public awareness program and associated local involvement in implementation of the program

Water conservation is the most cost-effective water management strategy to meet the state's water needs. Water conservation success, however, is achieved by end users who are equipped and willing to conserve. With a significant portion of Texas' future water supplies identified as coming from conservation, it is imperative that the public, or end users, become more aware of their source water supply, the need to conserve and motivated to practice water conservation in their daily routines.

While several successful water conservation campaigns exist in Texas at a local or utility level, and TWDB's Water IQ program provides important educational resources, a statewide water awareness campaign has not yet been developed, implemented and funded.

In a recent initiative by Texas Water Foundation, the need for a statewide water awareness campaign has been further discussed. Through philanthropic funding, statewide polling was conducted to determine the efficacy of a statewide campaign that engages and compliments local efforts. Statewide surveys conducted in January 2020 confirm that a statewide campaign is successful when it combines a sense of pride with action, and that respondents are more likely to react to messages that impact them on an individual, or local basis. Texas Water Foundation's initiative has developed into a prototype statewide water awareness campaign that will be piloting in local test markets in 2020.

Recognizing the importance that water conservation will play in Texas' future, and need to engage the public to achieve successful water conservation, the council supports the development and implementation of a statewide water awareness campaign. The development of a campaign would be a continuation of the efforts initiated by the statewide water conservation public awareness program that was created by the Texas Legislature in 2007 with the passage of Senate Bill 3 and House Bill 4.

Charge 4. Develop and implement a state water management resource library

The Council continues to develop and update best management practices for municipal and wholesale providers and for agricultural, commercial, and industrial users. These best management practices, available at www.savetexaswater.org , are voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and can be implemented within a specified timeframe. Recognition by the Texas Legislature of these best management practices on the Save Texas Water website would help water providers and users know where to learn more about efficient practices for long-term water supply. The second is the development of a resource library through www.savetexaswater.org , including resource documents and case studies.

In addition to developing and maintaining our online resources, several members of the Council are involved in a statewide dialogue on the creation of a centralized repository for water information and data. Rather than duplicate efforts, the Council may consider collaborating in this effort in the future. One opportunity for collaboration exists with Texas Water Foundation's development of an online, publicly available water resources library. This effort seeks to collect water related research, BMPs, educational tools and guides and could provide the Council with an online repository of resources.

Charge 5. Develop and implement a public recognition program for water conservation

Water conservation is critical to ensuring all Texans have an adequate water supply today and into the future. The efficient use of current water supplies is the most cost-effective water management strategy to meet this demand. The development and implementation of successful programs are critical to ensure, by 2070, the state meets the estimated 30 percent of the future water supplies are achieved in the form of conservation and demand management. ***Conserving water is an investment that benefits all Texans.***

To showcase examples of effective water stewardship occurring throughout Texas, the Water Conservation Advisory Council established the Blue Legacy Awards to recognize responsible management of our water resources. Members of the municipal, agricultural, and manufacturing water use sectors who have demonstrated a commitment to water conservation celebrated for their efforts as a recipient of this distinguished award. The Blue Legacy Awards are presented at premier events to elevate the importance and awareness of water

conservation related practices. Their success stories and photographs, as well as nomination packets, can be found on www.savetexaswater.org. The council presented the 2019 awards as part of Texas Water Day at the Capitol on March 13, 2019.

Charge 6. Monitor the implementation of water conservation strategies by water users included in regional water plans

Charge 7. Monitor target and goal guidelines for water conservation to be considered by the Texas Commission on Environmental Quality and Texas Water Development Board

Recommendations for legislation to advance water conservation in Texas

In 2015, the 84th Texas Legislature passed Senate Bill 551 directing the Council to include in their report "recommendations for legislation to advance water conservation in this state, which may include conservation through the reduction of the amount of water lost because of evaporation." Included herein are five legislative recommendations for consideration that represent the majority opinion of the council members but do not necessarily reflect the views of each entity or interest group[7].

1. Continue funding for the Texas Alliance for Water Conservation

[7] At the October 16, 2018 Council Meeting, twenty members voted to accept the report with some revisions while three members (Ms. Jennifer Allis, Texas Commission on Environmental Quality, Mr. Kevin Kluge, Texas Water Development Board, and Ms. Maria Martinez, federal agencies) abstained from voting.

The Council recommends that, subject to available state revenue for the 2022–2023 biennium, the Texas Legislature fund the Texas Alliance for Water Conservation promoting water conservation through best management practices and new technologies at $475,000 per year, through general revenue appropriations deposited to the Agricultural Water Conservation Fund and distributed through the TWDB's Agricultural Water Conservation Grants Program, and establish this level of annual funding through baseline general revenue appropriations to the TWDB in future years.

Background:

The Texas Alliance for Water Conservation (TAWC) located at Texas Tech University is a state-supported, agricultural producer demonstration and education project promoting water conservation through best management practices and technologies to improve sustainability and profitability in the Texas Southern High Plains. This project began in 2004 following the passage of Senate Bill 1053, which provided the Texas Water Development Board with the ability to provide grant funding to state agencies and political subdivisions, including the state university systems, for conservation projects and programs. The project initially received $6.2M in grant funding for an 8-year period (2005-2012, extended to 2013). In 2014, the Texas Legislature appropriated an additional $3.6M out of the Agricultural Water Conservation Fund for a 5-year period (2014-2019). Current funding has been extended to December 31, 2020 with a contract expiration date of August 31, 2021.

The Texas High Plains is one of the most important agricultural regions of the United States but is highly dependent on water for irrigation from the Ogallala Aquifer at non-sustainable rates of use. Approximately 90 percent of the water withdrawn from the aquifer is used for agricultural irrigation. TAWC education and demonstration projects are located in the heart of this region. Research efforts are constantly producing advances in technology and agricultural practices to conserve water. In order for those advances to result in more efficient or reduced water usage, users must be made aware of and implement new technologies and practices. TAWC is a vital link between researchers and agricultural water users. TAWC recruits agricultural producers to implement specific practices and technology, keep detailed multi-year records of costs and yields and then demonstrate the results to other producers. This peer-to-peer sharing of experience, data and results is highly effective in increasing the rate of adoption of water conserving best management practices. TAWC demonstration projects provide convincing proof of new methods that not only reduce water usage but also increase profitability for producers, which is a key factor in promoting adoption.

Much of TAWC's education and demonstration efforts have focused on conservation of the Ogallala Aquifer and the technologies that supply only what the crop needs at specific stages of development, thus creating significant water savings to real farm scenarios. TAWC has accumulated a 15-year database of calculated water use managed with crops and irrigation types that are representative of the Texas High Plains. The water-savings estimate depends partly on how much rain serves to replace irrigation in a given year. TAWC has utilized the crop water demand method since the project started in 2005. This consists of calculating the

difference between the volume of 100% crop water demand and the volume of irrigation applied for each field. A full irrigation rate would target 100% fulfillment of crop water demand, whereas a shortfall would constitute water saved. Those differences are summed over all fields in the project within a year. The amount of water saved is standardized on a depth basis by dividing volume by the total acreage. From 2005-2018, this method has demonstrated 4,019 acre-feet of annual savings in total irrigation potentially conserved. The number of acre-feet saved refers only to the 3,800 acres per year of producers' fields in the database.

A site-specific example is a demonstration comparing the results of flat rate (grower standard) irrigation to variable rate irrigation. Variable rate irrigation uses technology to match water application to the needs of crops based on a site's soil texture, slope, and crop yield potential. Over three growing seasons, 2017-2019, variable rate irrigation resulted in a 115 pound per acre increase in lint yield over conventional irrigation, with a water savings of 0.4 inches over the whole growing season. For a 100-acre cotton field, this would produce a water savings of 1,086,168 gallons while increasing the net return by $4,881. This type of information showing that conserving water can increase profits is a powerful means of increasing the adoption of best management practices.

TAWC has received over $3.2M in supplementary grants and participated in over 500 multi-state presentations and 7 international presentations. TAWC also received the 2012 Blue Legacy Award, 2013 American Water Resource Association's Integrated Water Resources Management Award, 2014 Texas Environmental Excellence Award in Agriculture, 2016 National Water & Energy Conservation Award, among others. Field days, field walks, the annual Water College, radio spots, e-newsletters, and social media reach at least 10,000 people per year. TAWC directs its messaging at water-use decision-makers among producers, ag consultants, and policymakers. TAWC contributes to the formal education of university students via an undergraduate ag water certificate and graduate studies in the areas of agronomy, soil management, irrigation technology, economics, and communications.

Renewed funding will allow TAWC to continue promoting water conservation and launch ***new thrusts*** to include **1)** field-scale demonstrations of minimum tillage and multi-species cover crops to enhance soil water retention, and **2)** options and guidelines for conversion from irrigated to rainfed cropping systems. TAWC will also communicate options in contract cattle grazing of cover crops and rainfed forages to enhance the value of land retired from irrigation. New investment in TAWC will expand the impact of technology transfer for water savings through tighter linkage with soil health and value-added land management. The Council supports TAWC's request for ***$475,000 per year*** to support the core operations and personnel to carry on administration, producer relations, education, event programing, and demonstrations. Supplementary grants will be obtained to support specific outreach objectives.

2. *Restore funding for the Texas Ag Water Efficiency Education and Demonstration Project facility.*

The Council recommends that, subject to available state revenue for the 2022-2023 biennium, the Texas Legislature fund the Texas Project for Ag Water Efficiency (AWE) for the education, research and development of agricultural water conservation initiatives at $200,000 per year, through general revenue appropriations deposited and distributed through the TWDB's Agricultural Water Conservation Grants Program, and establish this level of annual funding through baseline general revenue appropriations to the TWDB in future years.

Background:

From 2004 to 2015 the Texas Water Development Board's Agriculture Water Conservation Grants Program funded a project known as the Texas Project for Ag Water Efficiency. This project demonstrated the various types of surface-water irrigation on farms in the Lower Rio Grande Valley. The project assisted farmers in implementing conservation measures that would conserve water and maintain the economic viability of their farming practices. Out of these demonstrations, a number of operations were converted to more efficient irrigation practices both by the farmers and the districts.

A component of the project was the construction of a meter calibration and educational center named the *Texas Center for Ag Water Efficiency*. Its purpose is the demonstration, education and research of agricultural water conservation measures, tools and technologies. This million-dollar facility is the only one of its kind in Texas and one of only a handful nationwide. Water managers and employees from across the state utilized these facilities to educate personnel on the refinement of agricultural water measurement and delivery.

Multiple developments resulted from the work at the facility and have been adopted by several Rio Grande Valley irrigation districts as well as El Paso County Water Improvement District #1 and the Lower Colorado River Authority. An overview of these developments are as follows:

Gate development: Efficient low-cost canal gates for controlling water delivery were developed. These gates were designed to operate in open canal systems using solar or wind generated power, a necessity as many sites were without a power source.

Automation: Prototypes of these gates were designed and perfected to be utilized with a Supervisory Control and Data Acquisition (SCADA) system also developed at the facility. The SCADA development allowed for the automation of multiple gates throughout the district's delivery system to maximize the efficient delivery of water to farmers and cities served by the district. The facility being equipped with these auto-gates provides a vehicle for the demonstration of a fully automated and efficient district delivery system.

Telemetry: Our system was developed to meet the unique needs of monitoring and operation of delivery systems that are common for the surface water irrigation systems

of Texas. New telemetry hardware and software is constantly being developed but not necessarily targeting irrigation needs. The AWE facility is ideal for demonstrating and testing the viability of these systems for utilization in the agricultural irrigation industry.

Meter calibration: The AWE facility was designed to enable meter calibration for various types of metering devices used in irrigation. One of the major benefits that developed out of this facility was the ability to demonstrate each of the many devices in typical raw water conditions. Many meters simply will not function properly in raw water conditions as trash and hydrophilic vegetation fouls the mechanical components of standard meters. This facility allows for the demonstration of new devices to determine if in fact they will withstand the harsh raw water conditions typical to water diverters across the state.

Irrigation practices: Educational programs are a must to develop and encourage the use of improved irrigation practices. This facility is ideal for not only demonstration of different practices but in the education and presentation of new developments in surface water irrigation. We have partnered with the Texas A&M AgriLife Extension Service, Texas soil and water conservation districts and the United States Department of Agriculture Natural Resource Conservation Service to present programs important to the promotion of water conservation and practical methods of best management practices.

Additional educational programs: New telemetry hardware and software is constantly being developed but not necessarily targeting irrigation needs. The AWE facility is ideal for demonstrating and testing the viability of these systems for utilization in the agricultural irrigation industry. The facility is setup to educate the users on the best options for their needs but also could be used to demonstrate and educate the engineering community. This would better enable them to keep up to speed on the ever-changing systems available and to incorporate the new systems into their designs.

Built adjacent to the Harlingen Irrigation District's main pumping plant on land donated by the District, the facility is ideal and necessary for the development, research and education in new conservation and water management systems that will apply to the vast amount of unique conditions in Texas irrigation. The use of off-the-shelf products and programs are expensive and many times not economically feasible. They often fail to meet the needs of Texas irrigators and are subsequently rejected by them. This facility can help to build confidence and demonstrate the feasibility of new water conservation technologies. An additional plus for the developments from this project is the availability of the data.

During the active project period, the Harlingen Irrigation District hosted more than 20 workshops, seminars, and other such training events at the Rio Grande Center for Ag Water Efficiency. These educational opportunities allowed for water providers and agricultural producers to not only gain knowledge on developing technology and conservation strategies but also established a dialogue between the producers and water providers to further innovations. Four of the Blue Legacy Awards for agriculture have been awarded to recipients

related to this project. In addition, gate programing and construction plans, and all demonstration data is available at no cost, via TexasAWE.org[8], to entities across the state as they were all developed with public funds.

As irrigation with surface water is still the largest user of water in several areas of the state, this facility has the potential to play a significant role in the education, research and development of water conservation initiatives for irrigated agriculture. Despite initial investment, this facility is no longer being used to its full potential.

Restored funding will enable the maintenance, improvement and expansion of the mechanical and technological components of the facility; which in turn, will allow for the growth of educational and research opportunities. As innovative water conservation technologies continue to evolve, the vision for the Rio Grande Center for Ag Water Efficiency is to use the facility as a hub to demonstrate the relationship between effective on-farm and district delivery systems and educate both agricultural producers, water providers and project developers on proven water conservation technologies that are available to modernize their operations, with the Harlingen Irrigation District continuing to provide "in-kind" support in the form of labor, materials, and administrative oversite.

3. Maintain level of funding for TWDB's Agricultural Water Conservation Grant program.

The Council recommends that, subject to available state revenue for the 2022–2023 biennium, the Texas Legislature maintain the current level of $1,200,000 per year for Texas Water Development Board's Agricultural Water Conservation Grant Program, in addition to any funds appropriated specifically for the Texas Alliance for Water Conservation and the Texas Project for Ag Water Efficiency.

Background:

During the 86th Legislative Session, the appropriations act increased authorized dispersals through the Agricultural Water Conservation Grant Program from $600,000 to $1,200,000 per fiscal year.

The Agricultural Water Conservation Program promotes water conservation programs and projects throughout the state by supporting the implementation of water conservation water management strategies identified in the state and regional water plans. Previously funded activities include demonstrations of conservation practices, educational outreach, purchase and

[8] At the time of this draft, the Texas Project for Ag Water Efficiency's website is currently unavailable. Continued funding for the project would allow for the maintenance of the project's website as discussed in the recommendation.

installation of water use monitoring equipment, and irrigation-efficiency improvements. Funding recipients must report improvements in water use efficiency or water savings. Over the past five years, grant and loan recipients have reported approximately 350,000 acre-feet of water savings through the program.

The grant program offers funding through a competitive process at least once a year to state agencies and political subdivisions for agricultural water conservation programs and projects. Grant topics vary from year to year to address current issues in agricultural water conservation. Projects awarded funding must further water conservation in the state and support the implementation of water conservation management strategies in the state water plan. Specific evaluation criteria are listed in the request for applications.

The success of the program is quantified through annual water savings estimates reported by grant and loan recipients for five years after equipment installation and/or construction completion.

The program has collectively saved:

- 496,000-acre feet of water reported through 74 grant projects over the past 10 years.
- 79,000-acre feet of water reported through 10 loan projects over the past 10 years.

Examples of successful projects that implement irrigation conservation strategies include:

- Irrigation scheduling via the use of real-time soil moisture monitoring, remote system shutoff devices and other conservation tools in Regions A and O.
- Irrigation conservation demonstrations and outreach through the Texas Alliance for Water Conservation project, identified as a strategy in the Region O plan.
- Irrigation system improvements such as canal lining, canal-to-pipeline projects, SCADA systems, and automated canal gates in Region E, Region K, and Region M.
- Irrigation water use measurement throughout the state.

Agricultural Water Conservation Fund Projected Balance[9]

[9] Data as of 8/31/2019; Assumptions: offer up to $1,200,000 in annual grants; annual administrative costs associated with the program continue to be covered by general revenue; outstanding balance of $3,670,885 committed through existing grant project encumbrances; assumed demand for the agricultural loan program is $1,000,000 every other year after fiscal year 2020; and, 1.50 percent invest earnings rate.

Fiscal Year	Fund Balance	Investment Projections	Loan Origination	Total Loan Repayments	Grants Payable	Annual Grants	Fund Balance
2020	$7,826,581	$117,399	$2,000,000	$1,284,262	$3,670,885	$1,200,000	$2,357,357
2021	$2,357,357	$35,360	$-	$1,181,117	$-	$1,200,000	$2,373,834
2022	$2,373,834	$35,608	$1,000,000	$1,319,863	$-	$1,200,000	$1,529,305
2023	$1,529,305	$22,940	$-	$1,067,348	$-	$1,200,000	$1,419,592
2024	$1,419,592	$21,294	$1,000,000	$1,211,904	$-	$1,200,000	$452,791
2025	$452,791	$6,792	$-	$973,034	$-	$1,200,000	$232,616
2026	$232,616	$3,489	$-	$833,375	$-	$1,069,481	$-
2027	$-	$-	$-	$305,576	$-	$305,576	$-
2028	$-	$-	$-	$305,472	$-	$305,472	$-
2029	$-	$-	$-	$155,280	$-	$155,280	$-
2030	$-	$-	$-	$152,640	$-	$152,640	$-
2031	$-	$-	$-	$-	$-	$-	$-

4. Advancing Use of Data to Understand Trends in Water Use.

The request is for $200,000 in funding to be made available through TWDB to advance the understanding of municipal water and industrial use trends using available annual reporting data. This would fund a research project to explore how available TWDB water use data and economic and industrial output data available from public data bases can be used to develop the need analysis discussed below and how to set up this analysis on a continuing basis within the TWDB.

Objective:

The objective is to have a consulting firm or university use data reported by municipal providers and industrial users to:

- Better understand municipal seasonal as well as indoor and outdoor water use trends over time;
- Quantify municipal monthly per capita water use over time; and
- Examine Industrial monthly use patterns by NAICS code and geography and develop trend metrics based on gallons of water used by an appropriate denominator depicting output by that industrial sector.

The project would set up analytics that could be easily updated each year as new reports make new information available. An annual report on seasonal and indoor/outdoor water use patterns across regions and by water providers could be made available to help assess progress and update strategies.
Finally, the consultant or university would provide the TWDB with the tools to continue these trend analyses over time.

Background:

Currently, the Texas Water Development Board collects large amount of monthly and annual water use data from urban and industrial (mining, power, and manufacturing) water users. Only annual data has historically been used for TWDB projections of water use and by regional planning groups. What is missing is the examination of past data to develop trends in water efficiency including seasonal variations. Another trend analysis that is not being done in the amount of water used per unit of output for industrial operations and the impact of seasonal industrial use on water use patterns.
This type of information has been identified as needed by the TWDB planning staff, regional water planning groups, and the Texas Water Conservation Advisory Council. All information needed is available from public sources such as TWDB, Energy Information Administration, US Department of Commerce, the Texas Comptroller and related sources.

This type of data analysis will:

- Provide the TWDB with a statistical analysis of the effectiveness of seasonal and other conservation measures;
- Show how trends in water use per unit of output for industrial operation have changed over time, so better long-range projections can be made;
- Better quantify how water is used in the urban and industrial environment (Seasonal vs Other uses)
- Provide needed input to the Texas Water Conservation Advisory Council for its charge to: ***Monitor trends in water conservation implementation****; and*
- Provide better input data to the regional planning groups to make long term projections of water use.

Need:

One example of the need for trend analysis and the statistical analysis of monthly and seasonal water use can be illustrated by the fact that per capita water use has decreased from around 190 gallons per person per day in 1980 to 140 gallons per person per day by 2015. The TWDB analyzes the impact of plumbing codes on future water use but does not analyze historical seasonal water use trends.

Likewise, manufacturing water use has decreased but production is up. For Example, according to US Energy Information Administration, oil refining output has increased steadily over the last two decades, but total refining water use has decreased over that period. These trends need to be analyzed for all manufacturing sectors. Again, seasonal use by manufacturing is not analyzed.

Conclusion:

Trend and seasonal water use analysis is critical to advancing our understanding of changing water use patterns in Texas. The information is needed by the TWDB planning staff, the regional planning groups, and the Water Conservation Advisory Council. The project would develop a methodology to accomplish the above analysis and provide a set of data that would follow trends for the period of record starting in 1985. The consultant or university would then help the TWDB install the necessary tools and software to continue this analysis in the future.

5. Establish Level 1 Validation program for Water Loss Audits.

The Council recommends that, subject to available state revenue for the 2022-2023 biennium, the Texas Legislature appropriate $605,000 for the biennium to the TWDB to establish a program building on a water audit validation study being conducted by the TWDB. Under the guidance of the TWDB, level 1 validations would be conducted of water loss audits submitted by a group of 50 utilities volunteering to participate, establish a methodology for conducting level 1 validations, and establish a training program to certify validators. Preference for participation would be given to those utilities with a financial obligation to the State requiring that they complete a water loss audit. If more than 50 utilities apply to this program TWDB will work to ensure that a representative group of utilities is selected (ex. geographical, population, urban/rural, financial obligation)

Background:

Level 1 validation of water loss audits is a process by which the data used in a water loss audit is reviewed by a third party working with the submitting utility. Assessment scores are scores given

to 20 different data inputs in the water loss audit that provide an indication of how much confidence a utility or governing agency should have in the accuracy of that input. Level 1 validation works to ensure those scores are accurate, bringing in fresh eyes to review the audit.

This is crucial since water loss audits are used to make funding decisions, both by the State and by utilities. The validation ensures that best practices are being followed per industry guidance, increasing the efficacy of spending on reducing water loss and helping ensure that cost effective water loss measures are targeted.

The funding for this initiative includes all costs required to have a third party, hired by the TWDB, perform the validations, building on completed water loss audits from the participating utilities.

This program is intended to build upon a study currently underway by the TWDB to perform level 1 validations on at least six utilities of varying sizes. That study is exploring the framework required to establish a level 1 validation process in Texas. For the proposed initiative, the TWDB would be encouraged to include a variety of utilities, with consideration given to utility size, type, and whether the utility is rural or urban.

California implemented Level 1 validation of water loss audits, the percentage of submitted audits that contained unrealistic results, such as negative water losses, fell by over ten percent. Reported data validity scores also dropped by a median number of 13 points. Thus, the data accuracy improved, while overconfidence in the results of those audits decreased.

Level 1 validation would require training of on proper validation methodology according to the TWDB validation scoring matrix and would be separate from the training that the TWDB currently requires for submission of water loss audits. The validator cannot be the same person who completes the audit to prevent bias and to minimize unintentional omissions. For this recommendation, validation would be conducted by third party contractors. This funding would establish a framework for an ongoing validation effort.

Budget Outline:

Task	Cost
Program Announcement/Recruitment	$20,000
Provide on-going management of the program, including the development of a program management plan and associated schedule, marketing and outreach plan, regular team coordination calls for program management and documentation, internal progress tracking, internal task assignments and accountability, program management plan amendments, and course corrections as warranted.	
Development of a recruitment and retention plan, development of all communication materials in support of the recruitment plan.	

Manage water system recruitment and retention for the program.	
Level 1 Validation Process	$175,000
Receipt and review of supporting documentation	
Level 1 Validation session	
Utility-specific documentation	
Compilation and reporting of validation results	$40,000
Validation Certification	$250,000
Texas specific Level 1 Validation certification criteria	
Scheduling and administration of certification workshops	
Certification workshops	
Proctor/examinations/compilation of results	
Participation notification and reporting	
Training of TWDB staff for follow-on certification training	$20,000
Conduct "train the trainer" classes with TWDB staff	
TWDB staffing during validation and certification process	$100,000
On-going administration of the Program including ongoing management for training and technical assistance, subject matter experts, and regular progress reporting.	
Kickoff call to begin the process of Validation Training Program design.	
Host a webinar to prepare attendees for Level 1 Validation Process.	
Provide direct outreach to training participants to ensure they will bring appropriate representation of utility staff to events.	
Total	**$605,000**

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