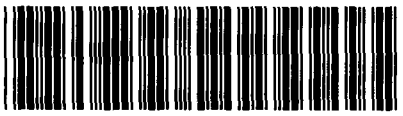

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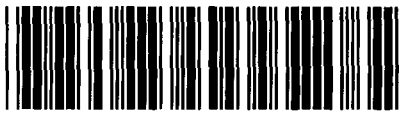

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PUC DOCKET NO. 49189
SOAH DOCKET NO. 473-19-6297.WS

APPLICATION OF THE CITY OF AUSTIN FOR AUTHORITY TO CHANGE THE WATER AND WASTEWATER RATES FOR NORTH AUSTIN MUNICIPAL UTILITY DISTRICT NO. 1, NORTHTOWN MUNICIPAL UTILITY DISTRICT, TRAVIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 10, AND WELLS BRANCH MUNICIPAL UTILITY DISTRICT IN WILLIAMSON AND TRAVIS COUNTIES	§	BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS

DIRECT TESTIMONY

OF

DAVID MALISH, P.E.

ON BEHALF OF DISTRICTS / INTERVENORS

EXHIBIT DIST-2

NOVEMBER 7, 2019

173

PUC DOCKET NO. 49189
SOAH DOCKET NO. 473-19-6297.WS

DIRECT TESTIMONY OF DAVID MALISH, P.E.

WITNESS FOR INTERVENORS / DISTRICTS

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DIRECT TESTIMONY
OF DAVID MALISH, P.E. WITNESS FOR
PETITIONERS

I. INTRODUCTION, POSITION, AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND CURRENT EMPLOYMENT POSITION.

A. My name is David Malish, P.E. My business address is 1101 S. Capital of Texas Highway, Building D, Austin, Texas 78746. I am Vice-President of Murfee Engineering Company, Inc., which offers services for a full range of civil and environmental engineering services. Headquartered in Austin, Texas, Murfee specializes in water and wastewater infrastructure, erosion and sedimentation control, environmental engineering, hydrology and water quality, municipal engineering, special district engineering, land development, construction management, and project management.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I received my Bachelor of Science degree from the University of Texas at Austin in 1973 and subsequently received my Master of Science in Environmental Health Engineering from the University of Texas at Austin in 1975. After graduating from undergraduate school at the University of Texas I went to work briefly for the firm of Freese and Nichols in Fort Worth, Texas. I primarily worked on conceptual design of dam spillways and developed flow rating cures for various existing structures. I also wrote and executed stream hydraulic models for the preliminary design of a series of five small dams situated within the City of Lubbock. I returned to graduate school at the University of Texas after three months at Freese and Nichols. After completing graduate school at the University of Texas in 1975 I immediately went to work for Radian Corporation in Austin, Texas. The type of work which I did varied widely in subject and scope. However, my primary work was in the primary design and cost estimated for numerous wastewater treatment plants throughout the United States in support of the preparation of environmental impact statements. I also served as a technical representative of the US Environmental Protection Agency ("US EPA") to Scandinavia and Northern Europe to identify and import specific

wastewater treatment technologies for the removal and/or control of heavy metals in industrial wastewaters. On other projects I worked with the chemical engineers and the chemist researching the characteristics of power plant sulfur dioxide scrubber sludge and identified and evaluated potential alternative for ultimate disposal. One unique alternative which I investigated was mixing the sulfur dioxide sludge with mine tailings (culm) as a possible structural fill material for reinjection into abandoned mines in an effort to control future subsidence. I also worked on the former Federal Energy Administration's project investigating alternatives for the strategic storage of petroleum in response to the 1973 embargo.

In 1978, I partnered with other environmental engineers and founded the SUMX Corporation in Austin, Texas. This company was engaged in development of ambient air monitoring systems, chemistry research, and civil engineering projects. Initially I was in charge of site development for locations of ambient air monitoring systems throughout the country. For the US EPA, I visited and inspected approximately 60 small water supply systems throughout the states of Wyoming and South Dakota primarily to offer consulting advice on improving disinfection practices. On another project for the US EPA, I investigated corrosion in potable water systems and prepared technical information transfer reports for resolving corrosion issues. These reports were eventually edited by the faculty at the University of Florida and published as a Noyes Publication entitled Corrosion Prevention and Control in Water Treatment and Supply Systems (1985).

On another project, while at SUMX, I was awarded a contract with the former US Department of Energy to design, construct, operate and evaluate an energy integrated farm system for both waste stabilization and cost recovery through methane generation and fuel alcohol production. This was a four-year design, build, and demonstration project. The research site was a hog farm located just outside Austin in Del Valle. The objective of this project was basically to convert hog manure to methane gas and then use that methane gas to heat and light the hog barns, grind the feed grain, and also as a heat source for the production of a fuel grade alcohol as a direct use in a farm pickup. For this project I designed an automated hog manure collection system, an anaerobic digester, and a methane gas cleaning, collection, and storage facility for later use through the farm. The fuel alcohol production facility was actually designed by others but utilized the methane gas produced from the facilities I designed. This project was highly successful and used

as a research and demonstration facility by the US Department of Energy for about five years before the farm was purchased for the construction of the new Del Valle high school

Following the success of this project, I worked with the Agency for International Development as a consultant to the American Farm School in Thessalonica, Greece to assist in the design of a waste stabilization and methane production and recovery facility for a dairy cattle operation on the school farm. The methane gas from this facility was to be used as an energy source for pasteurizing the milk. After visiting the site, I prepared a design manual for the manure collection system as well as an anaerobic digester with gas production and recovery facilities for use of the American Farm School staff, which was similar to the system designed and constructed in Del Valle. Shortly after this engagement, I joined Murfee Engineering Company, Inc. ("MEC") as Vice-President.

I currently serve as the Vice-President of MEC specializing primarily in providing district engineering services to special utility districts. I am also in charge of the preparation of detailed plans and specification for all water and wastewater facilities designed by MEC. I have personally been responsible for the design of numerous water and wastewater treatment plants, as well as pump stations, lift stations, water distribution and transmission mains, both ground and elevated storage facilities, collector and interceptor lines, and force mains, which my résumé partially identifies. My responsibilities also include preparation and processing of municipal wastewater discharge as well as land application permits in support of the wastewater treatment facilities. I have also been responsible for the preparation of numerous special district consent to creation documents, and bond order application reports. I continually and routinely provide professional district engineering services to about a half-dozen districts in the Austin area. I have attached my résumé as Exhibit DM-1.

Q. WHAT ARE YOUR RESPONSIBILITIES IN YOUR CURRENT POSITION?

A. As Vice-President and partner of MEC, I am responsible for the planning and preparation of detailed plans and specifications for major water and wastewater infrastructure projects serving municipalities. I am also responsible for providing district engineering services for special districts including municipal utility districts and water control improvement districts. I currently represent over twenty special districts providing a full range of District engineering services.

Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS ("PUCT" OR "COMMISSION") OR THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY?

A. Yes. On several occasions I have provided both oral and written testimony before the Texas Commission on Environmental Quality for a range of issues including numerous municipal wastewater treatment permits and standard costs evaluations for decertification of utility CCNs. I also testified in the prior appeal of the wholesale water and wastewater rates of the City of Austin dba Austin Water ("City" or "AWU").

Q. WHAT EXHIBITS HAVE YOU PREPARED IN SUPPORT OF YOUR TESTIMONY?

A. My direct testimony and supporting exhibits, identified as Exhibit DM-1 through Exhibit DM-7, were prepared by me or under my direction, supervision, or control and are true and correct to the best of my knowledge.

Q. WHAT HAVE YOU REVIEWED IN ORDER TO PREPARE YOUR TESTIMONY AND RENDER YOUR OPINIONS?

A. I reviewed the City's pre-filed direct testimony and exhibits pertaining to Water Treatment Plant No. 4 ("WTP4") and the City's Reclaimed Water System. I reviewed the City's responses to Districts' discovery requests that were provided to me by counsel for the Districts. I reviewed the pleadings that have been filed in this matter. I reviewed data and reports that are available on the City's website. I also reviewed the City's testimony and exhibits that the City presented in Docket No. 42857 to try to justify its expenditures for WTP4 and the Reclaimed Water System. I also reviewed wholesale water purchase data from each of the Districts.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am testifying on behalf of North Austin Municipal Utility District No. 1, Northtown Municipal Utility District, Travis County Water Control and Improvement District No. 10, and Wells Branch Municipal Utility District (collectively, "Intervenors" or "Districts").

II. PURPOSE OF DIRECT TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I focused my testimony on the reasonableness of Water Treatment Plant No. 4, now called the Beryl Handcox, Sr. Water Plant (or "WTP4"), reclaimed water costs, and the City's water loss.

III. WATER TREATMENT PLANT NO. 4

Q. ACCORDING TO DAVID ANDERS, WTP4 HAS BEEN ONLINE SINCE 2014 AND DURING THE TEST YEAR (2018), WAS USED AND USEFUL FOR TREATMENT OF WATER PROVIDED TO AWU CUSTOMERS, INCLUDING THE DISTRICTS. PLEASE EXPLAIN WHETHER YOU AGREE OR DISAGREE WITH MR. ANDERS AND WHY.

A. No, I do not agree with Mr. Anders. As City witness Teresa Lutes testified on behalf of the City of Austin in Docket No. 42857, the treatment plant capacity of the Ullrich water treatment plant ("WTP") is 167 million gallons per day ("MGD") and for the Davis WTP is 118 MGD for a combined water treatment capacity of 285 MGD. She also testified that the City's peak day demand of 235 MGD occurred in 2011, which is significantly less than the combined capacity of the Ullrich and Davis WTPs. Peak day demand is the metric used in the design of water treatment plants.

In addition, the demand from the Districts has actually decreased since the City placed WTP4 online. The Districts have responded positively to and implemented the City of Austin's water conservation plan and use restrictions. I have prepared Exhibit DM-2, which provides a summary of historical annual water purchases for each District for both pre- and post-construction of the WTP4.

The Districts collectively purchased an average of approximately 5.55 MGD, or 6,217 acre-feet per year (ac-ft/yr) from the City for the pre-WTP4 period. Their average annual water purchase has decreased to 4.87 MGD, or 5,455 ac-ft/yr, since WTP4 has come on line, which has resulted in a reduction in water demand of over 12%. Based on my review of the City's records, the City has not experienced a peak day demand since 2011 and water demands remain well below the treatment capacity of the City's Ullrich and Davis WTPs, at nearly 50% of their combined treatment capacity excluding WTP4. As the Districts collective water demands have decreased by an average of over 12 percent, the Districts have essentially given back approximately 0.68 MGD in water treatment capacity to the City, which has positively contributed to reduced demands on the City's facilities. In addition, the Districts' water demands represent only approximately 3.7 percent of the City's current demand and only about 1.7 percent of the combined capacity of the Ullrich and Davis WTPs.

My Exhibit DM-3 shows that the Districts' average annual water purchases, their demand on the City water treatment plants, have decreased significantly -- ranging from 7.5% to 16.9% reduction for the Districts. As the Districts are essentially built-out, I do not anticipate any significant increase in future water demand from the Districts. The Districts will never use the additional capacity provided by WTP4.

Finally, Travis County Water Control and Improvement District No. 10 ("WCID 10")gets water from the City's Ullrich WTP, which is literally across Red Bud Trail from WCID 10's pump station. WCID 10 will never get water from WTP4, which is geographically across Lake Austin from the District. The Districts have already financed all facilities required by the City of Austin, both internal and external, and the Districts should not finance through increased rates the additional facilities the City has added to support the growth and expansion of the City of Austin system.

Q. WERE COSTS FROM WTP4 DISALLOWED IN THE PRIOR RATE CASE?

A. Yes. David Anders stated in his testimony that during the prior hearing, the plant was still under construction and not used and useful, but now it is a "critical component of providing water

service to *all* of AW's customers" including AW's wholesale customers.[1] However, as I just stated, none of the Districts actually receive any benefit from the additional water treatment capacity of WTP4, so it is not used or useful to the Districts.

Q. MR. ANDERS STATES THAT WTP4 IS A CRITICAL COMPONENT OF PROVIDING WATER SERVICE TO ALL AWU'S CUSTOMERS, DOES THAT INCLUDE THE DISTRICTS?

A. The statements by Mr. Anders and the other City witnesses regarding the usefulness of WTP4 are not supported by the facts. No City customers, including the Districts, need the extra water treatment plant capacity of WTP4. The City does not explain how there is any actual or indirect benefit to the Districts.

Q. SO WTP4 HAS NO "SIGNIFICANT BENEFITS FOR THE DISTRICTS?

A. In my professional opinion, no. Each of the Districts is either built out entirely or over ninety percent built out based on developable land and the quantity of water needed to service the remaining development is negligible. Municipal utility districts emerged in the Austin area in response to public demand that growth pay for itself. The City agreed and stated that once the Districts completed and paid its pro rata share of all projects identified in the Utility Construction Contract, the City would be obligated to ensure that adequate water distribution, wastewater collection, and treatment capacity would be reserved to serve all land within the Districts. The City currently maintains adequate water supplies to serve the District at full build out without the additional water treatment plant capacity of WTP4.

IV. RECLAIMED WATER

Q. WERE RECLAIMED WATER COSTS ALSO DISALLOWED IN THE PRIOR RATE CASE?

A. Yes, the Administrative Law Judges ("ALJs") agreed with the Districts and Commission Staff that the City unfairly burdens the water and wastewater utilities with the costs used to subsidize the reclaimed water utility and that the Districts did not share in any reclaimed water

[1] *See* Statement of Intent to Change Rates and Tariffs at 52, Direct Testimony of David Anders at 39.

revenues. More importantly, the ALJs agreed that reclaimed water was not necessary to provide service to the Districts. Ultimately, the Commission agreed and disallowed this cost. To my knowledge, nothing has changed in the interim - the Districts still do not receive any of the reclaimed water into their distribution systems. As confirmed in Mr. Coonan's testimony, the Districts do not have access to the reclaimed water system,[2] as no pipe is available to deliver this water to the Districts. Therefore, I believe the reclaimed water system remains unreasonable and unnecessary for the provision of water and sewer service to the Districts.

Q. WHY IS AWU PUTTING RECLAIMED WATER COSTS BACK IN THIS RATE FILING?

A. City witnesses claim that by reusing just 4,465 ac-ft/yr, the reclaimed water system "extends" the City's available water supply by a sufficient amount as to protect the City from additional charges from LCRA. However, the amount of reclaimed water available to the reclaimed water customers is an insignificant amount of water. Most important, as I show below, the City is not in danger of exceeding its contract limit of 201,000 ac-ft per year within the next ten years or even longer.

The total amount of reclaimed water represents approximately three percent of the annual water sold and only benefits those reclaimed water customers that receive the subsidized water. The water demands of the Districts represent approximately 3.7 percent of the City's water demand, and the Districts have essentially given back an average of 680,000 gallons per day (gpd) through water conservation since WTP4 came online. The Districts' pro-rata share of the reclaimed water, based on total water demand, would be approximately 165 ac-ft/year, which is 3.7 % of 4,465 ac-ft/yr or less than 0.150 MGD. However, through their own conservation efforts, the Districts have conserved and given back to the City's available water supply more than 4.5 times their share of the reclaimed water supply since WTP4 came on line. The Districts' conservation efforts expanded the City's available water supply much more than the City's reclaimed water program.

[2] *See* Statement of Intent to Change Rates and Tariffs at 352, Direct Testimony of Stephen J. Coonan at 7.

Q. MR. ANDERS CLAIMS THAT THE RECLAIMED WATER SYSTEM BENEFIT ALL CUSTOMERS. HOW DOES THIS SYSTEM BENEFIT THE DISTRICTS?

A. It does not benefit any City water and sewer customers other than the actual customers of the reclaimed water system. It does not benefit the Districts. First, the reclaimed water system is far from being "a cost-effective water source" as Mr. Anders claimed, as it does not support itself. All of the customers not receiving reclaimed water subsidize the system that benefits only the customers of the reclaimed water. The reclaimed water system does not lower the cost for the other customers of the City's water or wastewater service. In fact, water rates for all other customers, including the Districts, are higher than necessary due to the subsidy of the reclaimed water system.

Also, the reclaimed water system is not necessary to develop needed, additional water supply. My table below shows the amount of water that the City diverted for distribution to customers since the last rate case. The City's demand has not increased.

	A	B	C	D	E	F
Year	Annual Volume (gallons)	Annual Volume (acre-feet)	Annual Volume (acre-feet)	Total Water Diversions (acre-feet)	Annual Volume Water Loss (acre-feet)	Water Loss %
2011	52,823,662,000	162,120				
2012	47,094,082,000	144,536				
2013	45,901,736,000	140,877				
2014	43,239,355,300	132,706	128,939	137,027	17,299	13.42
2015	43,480,893,300	133,447	137,322	139,175	20,645	15.94
2016	44,661,178,167	137,069	140,115	142,895	15,592	13.87
2017	47,371,407,787	145,387	148,441	149,199	18,892	15.43
2018			147,314	148,612	18,802	15.49

Column A is from Austin Water – Gallons of Water Pumped Per Capita on the City's website at https://data.austintexas.gov/Utilities-and-City-Services/Austin-Water-Gallons-of-Water-Pumped-per-Capita/wfm8-s7zc, which I have enclosed as Exhibit DM-3. Column B is my conversion of

those volumes from gallons to acre-feet. Column C is the volume pumped as the City reported in its Texas Water Development Board Annual Reports, which the City produced in response to the Districts' 10th RFI, which I have attached as Exhibit DM-4. Column D is from the City's report entitled Utility Profile & Water Conservation Plan for Municipal and Wholesale Water Use, Developed to Meet Requirements Outlined in 30 TAC § 288.2 and § 288.5, dated May 1, 2019, which I have attached as Exhibit DM-5.

Q. WHAT IS THE SIGNIFICANCE OF THE VOLUMES IN YOUR TABLE?

A. The table shows that Austin's demand for water has been relatively constant over the past five years, trending slightly higher. However, the demand remains significantly less than what the City used in the drought year of 2011, and it remains significantly less than (approximately one half) of the treatment capacity of the Ullrich and Davis WTP. Also it should be noted that the water loss, or unaccounted for water, in column E is in the range of the 16,000 to 20,000 acre-feet. The amount of reuse water generated by the City of Austin represents only a fraction of the City's water loss. In other words, the routine water loss in the City's system overwhelms the quantity of reuse water generated.

Q. HOW DOES THIS COMPARE TO THE CITY'S ESTIMATED WATER SUPPLY REQUIREMENTS FOR THE NEXT TEN YEARS?

A. As shown on page 6 of the City's report included in Exhibit DM-5, the City anticipates its water supply demand will only be 160,941 acre-feet in 2029… ten years from now. This demand amount ten years from now is still less than the demand during the 2011 drought year. More important to this rate case, the anticipated water demand in 10 years is still significantly less than the LCRA "trigger" of 201,000 acre-feet for two consecutive years as mentioned on page 8 of Mr. Coonan's testimony. The reclaimed water system does not provide a more cost-effective water supply for the City.

Q. HOW DID YOU COME TO THAT CONCLUSION?

A. As Mr. Coonan stated on page 13 of his testimony, the City reuses only 4,465 acre-feet of water per year. At the LCRA rate for diverted water of $145 per acre-foot, the cost of buying raw water to provide the 4,465 ac-ft/yr to those reclaimed water users would be $647,425, if the City had to buy that water from LCRA. However, under the City's contract with LCRA, the City does

not have to make that payment until its annual diversion exceeds 201,000 acre-feet for two consecutive years. Even if you had the approximately 4,500 acre-feet of water to the approximately 161,000 acre-feet that the City projects it will divert ten years from now in 2029, the amount that the City anticipates it will divert is still significantly less than the 201,000 acre-foot LCRA trigger for additional charges.

Q. MR. COONAN TESTIFIES THAT THE CITY INTENDS TO EXPAND THE USE OF THE RECLAIMED WATER SYSTEM TO AS MUCH AS 54,600 ACRE-FEET PER YEAR AS DETAILED IN THE CITY'S WATER FORWARD PLAN. ACCORDING TO THAT PLAN, WHEN DOES THE CITY PROJECT IT WILL BE ABLE TO PROVIDE THIS AMOUNT OF RECLAIMED WATER?

A. According to the City's study, not until the year 2115[3] … not during the test year adjusted for known and measurable changes… but in almost 100 years from now.

Q. WHAT BENEFITS DO THE DISTRICTS RECEIVE FROM THE RECLAIMED WATER SYSTEM?

A. None. Mr. Anders' statement that reclaimed water "extends AW's current water supply portfolio and enhances the total amount of water available to all customers" is simply untrue as it pertains to the Districts. Likewise, Mr. Coonan's label that it is "prudent" and Mr. Giardina's statement that it is a benefit to "all" are not supported by the facts. Their statements are, at best, an exaggeration. There is no evidence that the cost is reasonable in comparison to the insignificant amount of "freed up" water or new water resources created or that the reclaimed water will meet future water supply needs. What the evidence does show is that the peak demand was in 2011 and the amount AWU diverts annually is not increasing at a rate that makes the cost of the reclaimed water system reasonable or necessary to create a new supply. Both Mr. Anders and Mr. Coonan concede that the District system are not connected to the reclaimed water system.

[3] *A Water Plan for the Next 100 Years*, Austin Water (Nov. 2018) at 11.

Q. DO YOU AGREE WITH MR. COONAN'S ANALYSIS THAT THE DISTRICTS BENEFITED BY HOW AWU RESPONDED TO LCRA'S WOULD-BE CURTAILMENT IN 2011?

A. Not at all. Like Mr. Coonan's testimony about the potential effects of climate change or climate "uncertainty," what LCRA might have done, but did not in fact do, is entirely speculative and does not make reclaimed water a reasonable or necessary cost to pass on to the Districts. It does not reflect the cost of actual water or wastewater services. In addition, Mr. Coonan stated that the Districts would benefit from the reduced curtailment required of only 6%. However, as I have shown above, the Districts have already reduced their water consumption use by over 12 percent.

Q. IS THE CITY REQUIRED TO HAVE A RECLAIMED WATER PROGRAM?

A. No. Mr. Coonan admits that the Regional Water Planning process does not require the implementation of a reclaimed water system.

Q. HAS THE CITY PERFORMED ANY KIND OF COST/BENEFIT ANALYSIS TO JUSTIFY THE AMOUNT SPENT SUBSIDIZING THE RECLAIMED WATER PROGRAM?

A. I am not aware of any City cost/benefit analysis to show that the cost of the reclaimed water system is outweighed by the benefit to any customers, including the Districts. I believe it would be more prudent to address the water loss problem, which appears to be excessive. Undoubtedly, the cost of unaccounted for water is allocated to all customers.

Q. DOES THE CITY OF AUSTIN PROVIDE ADEQUATE WATER SERVICE TO THE FOUR DISTRICTS?

A. The City does not provide adequate pressure service to North Austin MUD No 1, to a portion of the Wells Branch MUD, or to Travis Co. WCID No. 10. For example, in about 1998, the City operations staff recognized that the City incorrectly oversized the City's Martin Hill water storage tank and was unable to maintain a chlorine residual in the tank due to slow water demand, or turnover. Rather than re-chlorinate the water, as is common industry practice, the City chose to lower the operation level from 1080 feet mean sea level (MSL) to eventually 980 feet MSL. As a result, the City was unable to provide water to portions of both North Austin MUD and Wells

Branch MUD at the State's minimum domestic pressure of 35 psi. Due to the City's failure to provide adequate pressure, the two affected districts, at their sole expense, designed and constructed their own pressure system, including the installation of in-line booster stations to restore and maintain pressure. The City did not cost participate in design or construction of any of the projects and does not operate or maintain any of the facilities within the districts. The districts, not the City, provide all operation, maintenance, and electrical costs for the pressure system.

The City also does not provide water at pressure to WCID 10. Exhibit DM-6 is the monthly reporting of the water pressure at the City's supply point to the District. To ensure sufficient pressure within its District, WCID 10 supplies its own storage and pressure system. WCID 10 does not use any of the City's ground storage tanks, elevated storage tanks, pressure pumps, or any of the City's pressure system.

V. WATER LOSS

Q. IN SCHEDULE V-4, MR. GONZALES REFERENCES SOMETHING CALLED THE INFRASTRUCTURE LEAKAGE INDEX. WHAT IS AN INFRASTRUCTURE LEAKAGE INDEX?

A. According to the Texas Water Development Board's Water Loss Audit Manual, the infrastructure leaking index, or ILI, is a performance indicator or benchmarking tool that allows utility managers to compare the utility's water losses to an ideal low level of water loss. It is a ratio between the system's annual water loss and a theoretical, ideal low level of water loss, often called the unavoidable annual real loss. I have attached an excerpt of the Texas Water Development Board's Water Loss Audit Manual as Exhibit DM-7 that discusses ILI in more detail.

Q. WHAT DOES AN ILI OF 3.0 INDICATE?

A. An ILI of 3.0 would indicate that the water system's actual water loss is 3 times greater than the ideal, low level water loss.

Q. ON TABLE 25-2 OF THE WATER UTILITY COST MODEL, THE CITY USED 3.0 PERCENT FOR THE SYSTEM'S WATER LOSS OR UNACCOUNTED FOR WATER. WHAT IS THE CITY'S AVERAGE PERCENTAGE WATER LOSS?

A. According to the City's self-reporting of its annual water loss to the Texas Water Development Board as shown in Exhibit DM-4, the water losses were 13.42%, 15.94%, 13.87%, 15.43%, and 15.49% for the years 20114-2018. For the last five years, the City has averaged a water loss of 14.83%. The City's water loss was not 3.0%.

Q. WHAT WAS THE CITY'S ILI RATIO?

A. According to the same self-reporting data, the City's ILI was 3.88, 3.30, 4.21, and 3.95 for the years 2015-2018. The City's adjusted ILI was 3.65, 3.1, 3.95, and 3.65 for those same years 2015-2018. The City did not report ILI or adjusted ILI in 2014.

VI. CONCLUSION

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. For now. Additional discovery or other information may be received between now and the hearing on the merits. I reserve the right to amend, modify, or supplement my testimony if additional data or information becomes available.

EXHIBIT DM-1

Murfee Engineering Company, Inc.

DAVID MALISH, P.E.

CURRENT POSITION:

Vice President, Murfee Engineering Company, Inc.

EDUCATION:

Bachelor of Science, Civil Engineering (1973)
University of Texas at Austin

Master of Science, Environmental Health Engineering (1975)
University of Texas at Austin

REGISTRATIONS:

Registered Professional Engineer – Texas #47757
Registered Professional Engineer – New Mexico #13018
Registered Professional Engineer – Mississippi #15012
Registered Professional Engineer – Colorado #36007
Registered Professional Engineer – Georgia #027249
Registered Professional Engineer – Alabama #27245

PROFESSIONAL AFFILIATIONS:

Member, National Society of Professional Engineers
Member, American Society of Civil Engineers
City of Austin Water and Wastewater Commission (1990-1994)
Member, Water Environment Federation
Member, American Water Works Association
Member, Austin Contractors and Engineers Association
Member, Texas Water Conservation Association

ENGINEERING WORK HISTORY:

Summer 1973	Design Engineer in Training Freese & Nichols, Inc. Fort Worth, Texas
1975 – 1978	Research Engineer in Training Radian Corporation Austin, Texas
1978 – 1982	Research and Design Engineer SumX Corporation Austin, Texas
1982 – Present	Vice President – Design Engineer Murfee Engineering Company, Inc. Austin, Texas

EXHIBIT DM-1

Murfee Engineering Company, Inc.

UTILITY DESIGN RELATED EXPERIENCE:

- Project Director for the Windermere Wastewater Treatment Plant and expansion.
- Project Director for the Forest Creek Wastewater Treatment Facility.
- Design engineer responsible for the preparation of plans for the Cottonwood Wastewater Treatment Plant (MBR).
- Design engineer for Plaza on the Lake Wastewater Treatment Plant.
- Project Director for the preparation and processing of twelve wastewater permit applications, amendments, and renewals.
- Recently prepared designs for two water pressure booster stations for the North Austin MUD No. 1.
- Responsible for the preparation of detailed design and specifications for improvements to the 8,000 gpm Travis County MUD #4 surface water intake structure.
- Project director and primary design engineer for the reconstruction of the Rattan Creek Lift Station and force main.
- Responsible for the design of the 250,000 gallon elevated Travis County WCID #20 storage tank along Bee Cave Road, Travis County, Texas.
- Project Director for the redesign/relocation of the Lake Creek Lift Station.
- Responsible for the design of the 400,000 gallon Lower Colorado River Authority (LCRA) elevated storage tank along Bee Cave Road, Travis County, Texas.
- Project Director for the design of the 800,000 gallon per day Travis County WCID #20 surface water treatment plant in Travis County, Texas
- District engineer for North Austin MUD No. 1 - 1987 to present.
- Responsible for the design of the groundwater production and treatment facilities for the New Mexico Border Crossing facilities in Dona Ana County, N.M.
- Developed water and sewer master plan for continued expansion of the Wells Branch Municipal Utility District System in Travis and Williamson County, Texas. Developed water and wastewater master plan for continued expansion of the North Austin Municipal Utility District system in Travis & Williamson County, TX.
- Project Director for the design of the 520 gpm surface water intake structure and expansion for the Travis County WCID #20 Development in Austin, Texas.
- Design Engineer for 0.1 MGD South Barton Creek Wastewater Treatment Plant.
- Design engineer for three Carrizo-Wilcox potable water supply wells in Lee County, Texas.
- Design Engineer for two LCRA water supply wells in Bastrop County.

EXHIBIT DM-1

Murfee Engineering Company, Inc.

WASTEWATER PERMITS & PERMIT RENEWAL EXPERIENCE:

- Plaza on the Lake Wastewater Treatment Plant Permit
- West Travis County MUD No. 5, WWTP Permit
- West Travis County MUD No. 5, WWTP Permit Amendments
- West Travis County MUD No. 5, WWTP Permit Renewal
- LCRA – Lake Pointe WWTP Minor Amendment
- LCRA – Lake Pointe WWTP Effluent Reuse Authorizations (TCEQ Rule 210)
- LCRA – Lake Pointe WWTP Major Amendment and Renewal
- Dessau Utilities, Inc. Wastewater Treatment Plant Permit Renewal
- Travis County MUD No. 2 Wastewater Treatment Plant Permit Renewal
- North Travis County MUD No. 5, Wastewater Treatment Plant Permit
- Riverplace MUD Wastewater Treatment Plant Permit Amendment/Renewal
- Lynnwood Wastewater Treatment Plant Permit
- Salt Lick Wastewater Treatment Permit
- Lake Travis ISD Hudson Bend Middle School Wastewater Treatment Plant Permit
- Windermere Utility Company, Inc. Wastewater Treatment Plant Permit Renewal
- Windermere Utility Company, Inc. Forest Creek WWTP Permit Renewal and Amendment
- Travis County MUD No. 16 Wastewater Treatment Plant Permit
- XS Ranch MUD Wastewater Treatment Plant Permit
- Travis County MUD No. 4 Major Permit Amendment
- Travis County MUD No. 4 Renewals
- Travis County MUD No. 4 South WWTP Permit and Renewal
- Niederwald Wastewater Treatment Plant Permit
- Wilbarger MUD No. 2 NE Travis County WWTP Renewal
- XS Ranch VI, Ltd. WWTP Permit Major Amendment

EXHIBIT DM-2

Purchased Water Summary
Average Annual Water Purchase

Period	FY	Average Annual Water Purchased (1000 gallons) NAMUD	Wells Branch	WCID#10	Northtown MUD	Total Annual Average	Water Purchase Reduction
Pre WTP #4	2011 2012 2013 2014	381,145.3	469,561.4	877,784.8	297,188.5	2,025,679.9 (5.55 MGD) (6,217 AC-FT/YR)	12.3%
Post WTP #4	2015 2016 2017 2018 2019	316,824.2	434,515.2	763,743.7	262,203.6	1,777,286.7 (4.87 MGD) (5.455 AC-FT/YR)	

EXHIBIT DM-2

North Austin MUD No 1
Historical Water Purchase Summary

Period	FY	Water Purchased 1000 gallons	Average 1000 gallons	Reduction
	2011	485,778.0		
	2012	390,510.0		
Pre WTP #4			381,145.3	
	2013	345,417.0		
	2014	302,876.1		
				16.90%
	2015	292,619.8		
	2016	308,169.5		
Post WTP #4	2017	343,211.8	316,824.2	
	2018	337,349.4		
	2019	302,770.6		

EXHIBIT DM-2

Northtown MUD
Historical Water Purchase Summary

Period	FY	Water Purchased 1000 gallons	Average 1000 gallons	Reduction
Pre WTP #4	2011	328,599.0	297,188.5	
	2012	295,128.0		
	2013	293,218.0		
	2014	271,809.0		
				13.3%
Post WTP #4	2015	272,951.0	262,203.6	
	2016	283,173.0		
	2017	290,710.0		
	2018	283,518.4		
	2019	180,665.4		

EXHIBIT DM-2

Travis County WC&ID No 10
Historical Water Purchase Summary

Period	FY	Water Purchased 1000 gallons	Average 1000 gallons	Reduction
Pre WTP #4	2011	1,032,750.0	877,784.8	
	2012	880,300.0		
	2013	842,195.0		
	2014	755,894.0		
				13.0%
Post WTP #4	2015	669,875.1	763,743.7	
	2016	775,472.6		
	2017	812,326.9		
	2018	817,608.0		
	2019	743,437.0		

EXHIBIT DM-2

Wells Branch MUD
Historical Water Purchase Summary

Period	FY	Water Purchased 1000 gallons	Average 1000 gallons	Reduction
	2011	533,364.0		
	2012	459,179.0		
Pre WTP #4			469,561.4	
	2013	460,673.4		
	2014	425,029.0		
				7.5%
	2015	423,543.0		
	2016	439,919.0		
Post WTP #4	2017	473,577.8	434,515.2	
	2018	450,606.0		
	2019	384,931.0		

EXHIBIT DM-3

data.austintexas.gov
the official City of Austin open data portal

[redacted] Visualize Export API

Austin Water - Gallons of Water Pumped per Capita

Utilities And City Services

Average total gallons of water pumped per capita

[redacted]
More

Updated July 29, 2019 Data Provided by Austin Water

About this Dataset

Updated
July 29, 2019

Data Last Updated: October 12, 2018
Metadata Last Updated: July 29, 2019
Date Created: August 24, 2015

Views: **743**
Downloads: **1,561**

Data Provided by: Austin Water
Dataset Owner: Patricia Gentry Andrade

[redacted]

Imagine Austin (30 - Year horizon) Primary Priority

Primary Priority: Sustainable Water

Strategic Plan Outcome (3-5 year horizon) Primary

Primary Strategic Outcome: N/A

Digital Object Identifer (DOI)

DOI Number: https://doi.org/10.26000/037.000008

Additional Information

Department: Austin Water
Frequency: Annually

Show More

What's in this Dataset?

Rows: **24**
Columns: **4**

Columns in this Dataset

Column Name	Description	API
FiscalYear		Number #
Pumpage		Number #
Water Service Population		Number #
Pumpage per capita per day		Number #

Table Preview

View Data Create Visualization

FiscalYear	Pumpage	Water Service Population	Pumpage per capita per day
2,010	43,827,360,000	875,936	137
2,011	52,823,662,000	891,997	162
2,009	53,331,329,600	872,628	167
2,008	53,086,075,799	853,843	170
2,012	47,094,082,000	907,161	142
1,996	45,818,995,265	649,660	193
1,995	39,485,284,858	630,997	171
2,005	51,373,931,437	799,966	176
2,003	51,110,853,373	774,969	181
2,007	45,867,662,567	834,647	151
2,000	52,326,072,112	738,229	194
1,998	46,668,516,691	688,660	186
2,016	44,661,178,167	1,026,601	122
1,997	42,802,218,907	668,876	75

< Previous Next >

Showing Rows 1-14 out of 24

[redacted]

EXHIBIT DM-3

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[redacted]

Austin Water - Gallons of Water Pumped per Capita

[redacted] Visualize Export API

Utilities And City Services

Average total gallons of water pumped per capita

[redacted]
More

Updated July 29, 2019 Data Provided by Austin Water

About this Dataset

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Data Provided by
Austin Water

Dataset Owner
Patricia Genty Andrade

[redacted]

Imagine Austin (30 - Year horizon) Primary Priority

Primary Priority: Sustainable Water

Strategic Plan Outcome (3-5 year horizon) Primary

Primary Strategic Outcome: N/A

Digital Object Identifer (DOI)

DOI Number: [illegible]

Additional Information

Department: Austin Water
Frequency: Annually

Show More

What's in this Dataset?

Rows
24

Columns
4

Columns in this Dataset

Column Name	Description	Type	
FiscalYear		Number	#
Pumpage		Number	#
Water Service Population		Number	#
Pumpage per capita per day		Number	#

Table Preview

View Data Create Visualization

FiscalYear	Pumpage	Water Service Population	Pumpage per capita per day
2,013	45 901 736 000	928,026	136
2,017	47 371 407,787	1,033,024	126
2,004	48,468 969,212	786,594	169
2,015	43 480 893,300	977 491	122
2 014	43,239 355 300	951 329	125
1 999	46 604,542 024	709 029	180
2 001	50,184,846,041	754 470	182
2 006	56 602 598 744	815 085	190
2 002	50,883,135 913	767,296	182
2,018		1 057,558	

< Previous Next > Showing Rows 15-24 out of 24

[redacted]

EXHIBIT DM-4

AW Districts 10-14, Attachment 1

TEXAS WATER DEVELOPMENT BOARD
P.O. BOX 13231, CAPITOL STATION
AUSTIN, TX 78711-3231

2014 Water Audit Report

A. Water Utility General Information

1. Water Utility Name: City of Austin Water & Wastewater
2. Contact:
   - 2a. Name: Dan Strub
   - 2b. Telephone #: (512) 972-0349
   - 2c. Email Address: dan.strub@austintexas.gov
3. Reporting Period: From 1/1/2014 To 12/31/2014
4. Source Water Utilization, percentage: Surface Water 100 % Ground Water 0 %
5. Population Served:
   - 5a. Retail Population Served: 896,363
   - 5b. Wholesale Population Served: 54,966
6. Utility's Length of Main Lines, miles: 3,793.00 — Assessment Scale: 5
7. Number of Wholesale Connections Served: 50
8. Total Retail Metered Connections: 218,198
9. Service Connection Density (Number of retail service connections / miles of main lines): 57.53
10. Average Yearly System Operating Pressure (psi): 77.3 — Assessment Scale: 5
11. Volume Units of Measure: Gallons

B. System Input Volume

12. Produced Water: 29,148,336,469 gallons — Assessment Scale: 4
13. Production Meter Accuracy (enter percentage): 100.00 % — Assessment Scale: 4
14. Corrected Input Volume: 29,148,336,469 gallons
15. Total Water Purchased: 15,443,172,848 gallons — Assessment Scale: 4
16. Total Wholesale Water Sales: 2,579,530,487 gallons — Assessment Scale: 5
17. **Total System Input Volume**: 42,011,978,830 gallons

(Corrected input volume, plus imported water, minus exported water)

AW Districts 10-14, Attachment 1

			Assessment Scale
C. Authorized Consumption			
18. Billed Metered	36,171,058,100	gallons	3
19. Billed Unmetered	3,339,880	gallons	4
20. Unbilled Metered	52,411,165	gallons	2
21. Unbilled Unmetered	148,700,040	gallons	4
22. Total Authorized Consumption	36,375,509,185	gallons	
D. Water Losses			
23. Water Losses (Line 17 minus Line 22)	5,636,469,645	gallons	
E. Apparent Losses			
24. Average Customer Meter Accuracy (Enter percentage)	97.90	%	3
25. Customer Meter Accuracy Loss	775,885,822	gallons	
26. Systematic Data Handling Discrepancy	0	gallons	4
27. Unauthorized Consumption	105,029,947	gallons	4
28. Total Apparent Losses	880,915,769	gallons	
F. Real Losses			
29. Reported Breaks and Leaks (Estimated volume of leaks & breaks repaired during the audit period)	34,257,090	gallons	5
30. Unreported Loss (Includes all unknown water loss)	4,721,296,786	gallons	3
31. Total Real Losses	4,755,553,876	gallons	

(Line 29, plus Line 30)	5,636,469,645 gallons	
32. Water Losses (Apparent + Real) (Line 28 plus Line 31) = Line 23	5,837,580,850 gallons	
33. Non-revenue Water (Water Losses + Unbilled Authorized Consumption) (Line 32, plus Line 20, plus Line 21)		
G. Technical Performance Indicator for Apparent Loss		
34. Apparent Losses Normalized (Apparent Loss Volume / # of Retail Service Connections/365)	11 gallons	
H. Technical Performance Indicators for Real Loss		
35. Real Loss Volume (Line 31)	gallons 4,755,553,876	
36. Unavoidable Annual Real Losses, volume (calculated)	1,501,347,153 gallons	
37. Infrastructure Leakage Index (calculated) (Equals real loss volume divided by unavoidable annual real losses)	3.16750	
38. Real Losses Normalized (Real Loss Volume / # of Service Connections / 365) (This indicator applies if service connection density is greater than or equal to 32 / mile)	60 gallons	
39. Real Losses Normalized (Real Loss Volume/Miles of Main Lines/365) (This indicator applies if service connection density is less than 32/mile)	0 gallons	
		Assessment Scale
I. Financial Performance Indicators		
40. Total Apparent Losses (Line 28)	880,915,769 gallons	
41. Retail Price of Water	$0.00560	5
42. Cost of Apparent Losses (Apparent loss volume multiplied by retail cost of water, Line 40 x Line 41)	$4,933,128.31	
43. Total Real Losses (Line 31)	4,755,553,875.56	
44. Variable Production Cost of Water* (*Note: in case of water shortage, real losses might be valued at the retail price of water instead of the variable production cost.)	$0.00040	4
45. Cost of Real Losses (Real Loss multiplied by variable production cost of water, Line 43 x Line 44)	$1,911,732.66	

	AW Districts 10-14, Attachment 1
46. Total Assessment Scale	68
47. Total Cost Impact of Apparent and Real Losses	$6,844,860.97
48. Comments	Since system input volume is no longer water produced by treatment plants, but instead, raw water withdrawn from sources, the production meter accuracy is set to 100% to conform with raw water withdrawals, and water used in treatment process is included in unbilled unmetered water total
	%
49. Total Water Loss %	13.42
50. GPCD (Gallons Per Capita Per Day) Input	128.41
51. GPCD (Gallons Per Capita Per Day) Loss	17.23

EXHIBIT DM-4

AW Districts 10-14, Attachment 2

TEXAS WATER DEVELOPMENT BOARD

P.O. BOX 13231, CAPITOL STATION

AUSTIN, TX 78711-3231

2015 WATER AUDIT REPORT

A. Water Utility General Information

1. Water Utility Name: CITY OF AUSTIN WATER & WASTEWATER

1a. Regional Water Planning Area: K

1b. Address: PO BOX 1088
AUSTIN, TX 78767-1088

2. Contact Information

2a. Name: Dan Strub

2b. Telephone Number: (512) 972-0349

2c. Email Address: dan.strub@austintexas.gov

3. Reporting Period

3a. Start Date: 01/01/2015

3b. End Date: 12/31/2015

4. Source Water Utilization

	%
4a. Surface Water	100
4b. Ground Water	0

5. Population Served

		Assessment Scale
5a. Retail Population Served	926,624	
5b. Wholesale Population Served	56,822	

6. Utility's Length of Main Lines

	miles	
	3,760.00	5

7. Total Retail Metered Connections - Active and Inactive: 221,040 — 5

8. Number of Wholesale Connections Served	51		
9. Service Connection Density	58.79	connections per mile	
10. Average Yearly System Operating Pressure	77.3	psi	5
11. Volume Units of Measure	Gallons		
B. System Input Volume			
12. Volume of Water Intake	31,837,585,749	gallons	
13. Produced Water	43,982,995,733	gallons	4.5
13a. Production Meter Accuracy	98.3	%	4.5
13b. Corrected Input Volume	44,743,637,572	gallons	
14. Total Treated Purchased Water	880,000	gallons	4.5
14a. Treated Purchased Water Meter Accuracy	100.0	%	2
14b. Corrected Treated Purchased Water Volume	880,000	gallons	
	2,538,933,179	gallons	4.5

AW Districts 10-14, Attachment 2

15. Total Treated Wholesale Water Sales

%

5

100.0

15a. Treated Wholesale Water Meter Accuracy

gallons

15b. Corrected Treated Wholesale Water Sales Volume

2,538,933,179

16. Total System Input Volume

gallons

Line 13b + Line 14b - Line 15b

42,205,584,393

Assessment Scale

C. Authorized Consumption

gallons

3.5

17. Billed Metered

35,375,189,200

4

gallons

18. Billed Unmetered

3,211,226

2

gallons

19. Unbilled Metered

58,760,178

20. Unbilled Unmetered

gallons

4

41,595,245

21. Total Authorized Consumption

gallons

35,478,755,849

D. Water Losses

22. Water Losses

gallons

6,726,828,544

Line 16 - Line 21

E. Apparent Losses

23. Average Customer Meter Accuracy	97.90	%	3
24. Customer Meter Accuracy Loss	758,814,069	gallons	
25. Systematic Data Handling Discrepancy	1	gallons	4
26. Unauthorized Consumption	105,513,961	gallons	4
27. Total Apparent Losses	864,328,031	gallons	

F. Real Losses

28. Reported Breaks and Leaks	61,222,350	gallons	5
29. Unreported Loss	5,801,278,163	gallons	3
30. Total Real Losses Line 28 + Line 29	5,862,500,513	gallons	
31. Total Water Losses Line 27 + Line 30	6,726,828,544	gallons	
32. Non-Revenue Water Line 31 + Line 19 + Line 20	6,827,183,967	gallons	

G. Technical Performance Indicator for Apparent Loss

33. Apparent Losses Normalized Line 27 / Line 7 / 365	10.71	gallons lost per connection per day

H. Technical Performance Indicators for Real Loss

		gallons
34. Real Loss Volume Line 30	5,862,500,513	
35. Unavoidable Annual Real Losses Volume		gallons
(5.41 * Line 6 + (Line 7 * 0.15)) * 365 * Line 10	1,509,408,035	
36. Infrastructure Leakage Index		I.L.I
Line 34 / Line 35	3.88	
37. Real Losses Normalized - Service Connections		
Line 34 / Line 7 / 365	72.66	gallons lost per connection per day
38. Real Losses Normalized - Main Lines		
Line 34 / Line 6 / 365	0.00	gallons lost per mile per day

I. Financial Performance Indicators

		Assessment Scale
39. Total Apparent Losses		gallons
Line 27	864,328,031	
40. Retail Price of Water		$/gallons
	0.00562	5
41. Cost of Apparent Losses		
Line 39 x Line 40	$4,857,523.53	
42. Total Real Losses		gallons
Line 30	5,862,500,513	

43. Variable Production Cost of Water		$/gallons	
	0.00040		3
44. Cost of Real Losses			
Line 42 x Line 43	$2,356,725.21		
45. Total Cost Impact of Apparent and Real Losses			
Line 41 + Line 44	$7,214,248.74		
46. Total Assessment Score	80.5		
J. System Losses and Gallons Per Capita per Day (GPCD)			
47. Total Water Loss - Percentage	15.94	%	
48. GPCD Input			
Line 16 / Line 5a / 365	125		
49. GPCD Loss			
Line 31 / Line 5a / 365	20		
K. Wholesale Factor Adjustments			
50. Percent of Treated Wholesale Water Traveling through General Distribution System	100.00	%	
51. Volume of Treated Wholesale Water Traveling through General Distribution System	2,538,933,179	gallons	
(Line 50/100) * Line 15b			
52. Wholesale Factor			
Line 15b / (Line 13b + Line 14b)	0.06		
53. Adjusted Real Loss Volume	5,510,750,482	gallons	
((1 - Line 52) x (Line 30 * Line 50 / 100)) +			
54. Adjusted Cost of Real Losses	$2,215,321.70		
((1 - Line 52) x (Line 44 * Line 50 / 100)) +			

	AW Districts 10-14, Attachment 2	
55. Adjusted Total Water Loss Volume	6,323,218,831	gallons
((1 - Line 52) x (Line 31 * Line 50 / 100)) +		
56. Adjusted Total Cost Impact of Apparent and Real Losses	$6,781,393.82	
((1 - Line 52) x (Line 45 * Line 50 / 100)) +		
57. Adjusted Real Loss Per Connection	68.3	
((1 - Line 52) x (Line 37 * Line 50 / 100)) + (Line 37 - (Line 37 * Line 50/100))		gallons lost per connection per day
58. Adjusted Real Loss Per Mile	0	
((1 - Line 52) x (Line 38 * Line 50 / 100)) + (Line 38 - (Line 38 * Line 50/100))		gallons lost per mile per day
59. Adjusted Infrastructure Leakage Index	3.65	I.L.I
((1 - Line 52) x (Line 36 * Line 50 / 100)) +		%
60. Adjusted Total Water Loss - Percentage	14.98	
((1 - Line 52) x (Line 47 * Line 50 / 100)) +		
61. Adjusted GPCD Loss	19	
((1 - Line 52) x (Line 49 * Line 50 / 100)) +		

Comments

EXHIBIT DM-4

AW Districts 10-14, Attachment 3

TEXAS WATER DEVELOPMENT BOARD
P.O. BOX 13231, CAPITOL STATION
AUSTIN, TX 78711-3231
2016 WATER AUDIT REPORT

A. Water Utility General Information

1. Water Utility Name: CITY OF AUSTIN WATER & WASTEWATER
   1a. Regional Water Planning Area: K
   1b. Address: PO BOX 1088
   AUSTIN, TX 78767-1088
2. Contact Information
   2a. Name: Dan Strub
   2b. Telephone Number: (512) 972-0349
   2c. Email Address: dan.strub@austintexas.gov
3. Reporting Period
   3a. Start Date: 01/01/2016
   3b. End Date: 12/31/2016
4. Source Water Utilization

4a. Surface Water	100	%
4b. Ground Water	0	%

5. Population Served

5a. Retail Population Served	954,648	
5b. Wholesale Population Served	58,540	

6. Utility's Length of Main Lines

			Assessment Scale
	3,837.00	miles	5

7. Total Retail Metered Connections - Active and Inactive

	225,070	5

8. Number of Wholesale Connections Served	50		
9. Service Connection Density	58.66	connections per mile	
10. Average Yearly System Operating Pressure	77.3	psi	5
11. Volume Units of Measure	Gallons		
B. System Input Volume			
12. Volume of Water Intake	46,383,425,801	gallons	
13. Produced Water	44,923,142,000	gallons	4.5
13a. Production Meter Accuracy	98.4	%	4.5
13b. Corrected Input Volume	45,653,599,594	gallons	
14. Total Treated Purchased Water	1,494,000	gallons	4.5
14a. Treated Purchased Water Meter Accuracy	100.0	%	2
14b. Corrected Treated Purchased Water Volume	1,494,000	gallons	2
	2,527,643,397	gallons	2

AW Districts 10-14, Attachment 3

15. Total Treated Wholesale Water Sales

%

5

15a. Treated Wholesale Water Meter Accuracy

100.0

15b. Corrected Treated Wholesale Water Sales Volume

gallons

2,527,643,397

16. Total System Input Volume

gallons

Line 13b + Line 14b - Line 15b

43,127,450,197

Assessment Scale

C. Authorized Consumption

17. Billed Metered

gallons

36,909,267,600

3.5

18. Billed Unmetered

gallons

100,906,542

4

19. Unbilled Metered

gallons

59,103,870

2

20. Unbilled Unmetered

gallons

78,256,141

4

21. Total Authorized Consumption

gallons

37,147,534,153

D. Water Losses

22. Water Losses

gallons

5,979,916,044

Line 16 - Line 21

AW Districts 10-14, Attachment 3

E. Apparent Losses

23. Average Customer Meter Accuracy	97.90	%	3
24. Customer Meter Accuracy Loss	791,720,755	gallons	
25. Systematic Data Handling Discrepancy	0	gallons	4
26. Unauthorized Consumption	107,818,625	gallons	4
27. Total Apparent Losses	899,539,381	gallons	

F. Real Losses

28. Reported Breaks and Leaks	42,984,350	gallons	5
29. Unreported Loss	5,037,392,313	gallons	3
30. Total Real Losses Line 28 + Line 29	5,080,376,663	gallons	
31. Total Water Losses Line 27 + Line 30	5,979,916,044	gallons	
32. Non-Revenue Water Line 31 + Line 19 + Line 20	6,117,276,055	gallons	

G. Technical Performance Indicator for Apparent Loss

33. Apparent Losses Normalized Line 27 / Line 7 / 365	10.95	gallons lost per connection per day

H. Technical Performance Indicators for Real Loss

34. Real Loss Volume Line 30	5,080,376,663	gallons
35. Unavoidable Annual Real Losses Volume (5.41 * Line 6 + (Line 7 * 0.15)) * 365 * Line 10	1,538,217,015	gallons
36. Infrastructure Leakage Index Line 34 / Line 35	3.30	I.L.I
37. Real Losses Normalized - Service Connections Line 34 / Line 7 / 365	61.84	gallons lost per connection per day
38. Real Losses Normalized - Main Lines Line 34 / Line 6 / 365	0.00	gallons lost per mile per day

I. Financial Performance Indicators

		Assessment Scale
39. Total Apparent Losses Line 27	899,539,381	gallons
40. Retail Price of Water	0.00565	$/gallons 5
41. Cost of Apparent Losses Line 39 x Line 40	$5,082,397.50	
42. Total Real Losses Line 30	5,080,376,663	gallons

43. Variable Production Cost of Water		$/gallons	
	0.00046		4
44. Cost of Real Losses			
Line 42 x Line 43	$2,331,892.89		
45. Total Cost Impact of Apparent and Real Losses			
Line 41 + Line 44	$7,414,290.39		
46. Total Assessment Score	79		
J. System Losses and Gallons Per Capita per Day (GPCD)			
47. Total Water Loss - Percentage	13.87	%	
48. GPCD Input			
Line 16 / Line 5a / 365	124		
49. GPCD Loss			
Line 31 / Line 5a / 365	17		
K. Wholesale Factor Adjustments			
50. Percent of Treated Wholesale Water Traveling through General Distribution System	100.00	%	
51. Volume of Treated Wholesale Water Traveling through General Distribution System	2,527,643,397	gallons	
(Line 50/100) * Line 15b			
52. Wholesale Factor			
Line 15b / (Line 13b + Line 14b)	0.06		
53. Adjusted Real Loss Volume	4,775,554,063	gallons	
((1 - Line 52) x (Line 30 * Line 50 / 100)) +			
54. Adjusted Cost of Real Losses	$2,191,979.32		
((1 - Line 52) x (Line 44 * Line 50 / 100)) +			

AW Districts 10-14, Attachment 3

55. Adjusted Total Water Loss Volume
5,621,121,081 gallons

((1 - Line 52) x (Line 31 * Line 50 / 100)) +

56. Adjusted Total Cost Impact of Apparent and Real Losses
$6,969,432.97

((1 - Line 52) x (Line 45 * Line 50 / 100)) +

57. Adjusted Real Loss Per Connection
58.13 gallons lost per connection per day

((1 - Line 52) x (Line 37 * Line 50 / 100)) +
(Line 37 - (Line 37 * Line 50/100))

58. Adjusted Real Loss Per Mile
0 gallons lost per mile per day

((1 - Line 52) x (Line 38 * Line 50 / 100)) +
(Line 38 - (Line 38 * Line 50/100))

59. Adjusted Infrastructure Leakage Index
3.1 I.L.I

((1 - Line 52) x (Line 36 * Line 50 / 100)) +

60. Adjusted Total Water Loss - Percentage
13.04 %

((1 - Line 52) x (Line 47 * Line 50 / 100)) +

61. Adjusted GPCD Loss
16

((1 - Line 52) x (Line 49 * Line 50 / 100)) +

Comments

EXHIBIT DM-4

AW Districts 10-14, Attachment 4

TEXAS WATER DEVELOPMENT BOARD

P.O. BOX 13231, CAPITOL STATION

AUSTIN, TX 78711-3231

2017 WATER AUDIT REPORT

A. Water Utility General Information

1. Water Utility Name: CITY OF AUSTIN WATER & WASTEWATER

1a. Regional Water Planning Area: K

1b. Address: PO BOX 1088
AUSTIN, TX 78767-1088

2. Contact Information

2a. Name: Dan Strub

2b. Telephone Number: (512) 972-0349

2c. Email Address: dan.strub@austintexas.gov

3. Reporting Period

3a. Start Date: 01/01/2017

3b. End Date: 12/31/2017

4. Source Water Utilization

	%
4a. Surface Water	100
4b. Ground Water	0

5. Population Served

		Assessment Scale
5a. Retail Population Served	975,086	
5b. Wholesale Population Served	64,055	

6. Utility's Length of Main Lines

	miles	
	3,848.00	5

7. Total Retail Metered Connections - Active and Inactive

229,071	5

AW Districts 10-14, Attachment 4

8. Number of Wholesale Connections Served	50		
9. Service Connection Density	59.53	connections per mile	
10. Average Yearly System Operating Pressure	77.3	psi	5
11. Volume Units of Measure	Gallons		
B. System Input Volume			
12. Volume of Water Intake	48,455,640,371	gallons	
13. Produced Water	47,592,529,787	gallons	4.5
13a. Production Meter Accuracy	98.4	%	4.5
13b. Corrected Input Volume	48,366,392,060	gallons	
14. Total Treated Purchased Water	689,000	gallons	4.5
14a. Treated Purchased Water Meter Accuracy	100.0	%	2
14b. Corrected Treated Purchased Water Volume	689,000	gallons	
	2,829,946,400	gallons	2

15. Total Treated Wholesale Water Sales	AW Districts 10-14, Attachment 4	
15a. Treated Wholesale Water Meter Accuracy	100.0	% 5
15b. Corrected Treated Wholesale Water Sales Volume	2,829,946,400	gallons
16. Total System Input Volume Line 13b + Line 14b - Line 15b	45,537,134,660	gallons

		Assessment Scale
C. Authorized Consumption		
17. Billed Metered	37,909,491,100	gallons 3.5
18. Billed Unmetered	4,595,913	gallons 4
19. Unbilled Metered	54,684,090	gallons 2
20. Unbilled Unmetered	92,728,311	gallons 4
21. Total Authorized Consumption	38,061,499,414	gallons
D. Water Losses		
22. Water Losses Line 16 - Line 21	7,475,635,246	gallons

AW Districts 10-14, Attachment 4

E. Apparent Losses

23. Average Customer Meter Accuracy	97.90	%	3
24. Customer Meter Accuracy Loss	813,176,009	gallons	
25. Systematic Data Handling Discrepancy	1	gallons	4
26. Unauthorized Consumption	113,813,522	gallons	4
27. Total Apparent Losses	926,989,532	gallons	

F. Real Losses

28. Reported Breaks and Leaks	77,863,939	gallons	5
29. Unreported Loss	6,470,781,775	gallons	3
30. Total Real Losses Line 28 + Line 29	6,548,645,714	gallons	
31. Total Water Losses Line 27 + Line 30	7,475,635,246	gallons	
32. Non-Revenue Water Line 31 + Line 19 + Line 20	7,623,047,647	gallons	

G. Technical Performance Indicator for Apparent Loss

33. Apparent Losses Normalized Line 27 / Line 7 / 365	11.09	gallons lost per connection per day

H. Technical Performance Indicators for Real Loss

34. Real Loss Volume Line 30	6,548,645,714	gallons
35. Unavoidable Annual Real Losses Volume (5.41 * Line 6 + (Line 7 * 0.15)) * 365 * Line 10	1,556,828,992	gallons
36. Infrastructure Leakage Index Line 34 / Line 35	4.21	I.L.I
37. Real Losses Normalized - Service Connections Line 34 / Line 7 / 365	78.32	gallons lost per connection per day
38. Real Losses Normalized - Main Lines Line 34 / Line 6 / 365	0.00	gallons lost per mile per day

I. Financial Performance Indicators

		Assessment Scale
39. Total Apparent Losses Line 27	926,989,532	gallons
40. Retail Price of Water	0.00584	$/gallons 5
41. Cost of Apparent Losses Line 39 x Line 40	$5,413,618.87	
42. Total Real Losses Line 30	6,548,645,714	gallons

43. Variable Production Cost of Water		$/gallons	
	0.00037		4
44. Cost of Real Losses			
Line 42 x Line 43	$2,422,998.91		
45. Total Cost Impact of Apparent and Real Losses			
Line 41 + Line 44	$7,836,617.78		
46. Total Assessment Score	79		
J. System Losses and Gallons Per Capita per Day (GPCD)			
47. Total Water Loss - Percentage		%	
	16.42		
48. GPCD Input			
Line 16 / Line 5a / 365	128		
49. GPCD Loss			
Line 31 / Line 5a / 365	21		
K. Wholesale Factor Adjustments			
50. Percent of Treated Wholesale Water Traveling through General Distribution System	100.00	%	
51. Volume of Treated Wholesale Water Traveling through General Distribution System	2,829,946,400	gallons	
(Line 50/100) * Line 15b			
52. Wholesale Factor			
Line 15b / (Line 13b + Line 14b)	0.06		
53. Adjusted Real Loss Volume	6,155,726,971	gallons	
((1 - Line 52) x (Line 30 * Line 50 / 100)) +			
54. Adjusted Cost of Real Losses	$2,277,618.98		
((1 - Line 52) x (Line 44 * Line 50 / 100)) +			

	AW Districts 10-14, Attachment 4	
55. Adjusted Total Water Loss Volume	7,027,097,131	gallons
((1 - Line 52) x (Line 31 * Line 50 / 100)) +		
56. Adjusted Total Cost Impact of Apparent and Real Losses	$7,366,420.71	
((1 - Line 52) x (Line 45 * Line 50 / 100)) +		
57. Adjusted Real Loss Per Connection	73.62	
((1 - Line 52) x (Line 37 * Line 50 / 100)) + (Line 37 - (Line 37 * Line 50/100))		gallons lost per connection per day
58. Adjusted Real Loss Per Mile	0	
((1 - Line 52) x (Line 38 * Line 50 / 100)) + (Line 38 - (Line 38 * Line 50/100))		gallons lost per mile per day
59. Adjusted Infrastructure Leakage Index	3.95	I.L.I
((1 - Line 52) x (Line 36 * Line 50 / 100)) +		%
60. Adjusted Total Water Loss - Percentage	15.43	
((1 - Line 52) x (Line 47 * Line 50 / 100)) +		
61. Adjusted GPCD Loss	20	
((1 - Line 52) x (Line 49 * Line 50 / 100)) +		

Comments

EXHIBIT DM-4

TEXAS WATER DEVELOPMENT BOARD
P.O. BOX 13231, CAPITOL STATION
AUSTIN, TX 78711-3231
2018 WATER AUDIT REPORT

A. Water Utility General Information

1. Water Utility Name: CITY OF AUSTIN WATER & WASTEWATER

1a. Regional Water Planning Area: K

1b. Address: PO BOX 1088
AUSTIN, TX 78767-1088

2. Contact Information

2a. Name: dan strub

Have you completed Water Loss Auditor Training?
(●) Yes
( ) No

2b. Telephone Number: (512) 972-0349

2c. Email Address: dan.strub@ci.austin.tx.us

3. Reporting Period

3a. Start Date: 01/01/2018

3b. End Date: 12/31/2018

4. Source Water Utilization

4a. Surface Water	100 %
4b. Ground Water	0 %

5. Population Served

5a. Retail Population Served	999,960

			Assessment Scale
5b. Wholesale Population Served	61,319		
6. Utility's Length of Main Lines	3,929.78	miles	4.5
7. Total Retail Metered Connections - Active and Inactive	235,382		5
8. Number of Wholesale Connections Served	49		
9. Service Connection Density	59.90	connections per mile	
10. Average Yearly System Operating Pressure	77.3	psi	4.5
11. Volume Units of Measure	Gallons		
B. System Input Volume			
12. Volume of Water Intake	48,426,059,616	gallons	
13. Produced Water	47,231,243,268	gallons	3.5
13a. Production Meter Accuracy	98.4	%	3.5
13b. Corrected Input Volume	47,999,230,963	gallons	
14. Total Treated Purchased Water	940,000	gallons	2.5
14a. Treated Purchased Water Meter Accuracy	100.0	%	

AW Districts 10-14, Attachment 5

			0.5
14b. Corrected Treated Purchased Water Volume	940,000	gallons	
	2,385,015,400	gallons	4
15. Total Treated Wholesale Water Sales			
		%	0.5
15a. Treated Wholesale Water Meter Accuracy	100.0		
15b. Corrected Treated Wholesale Water Sales Volume	2,385,015,400	gallons	
16. Total System Input Volume			
		gallons	
Line 13b + Line 14b - Line 15b	45,615,155,563		

		Assessment Scale
C. Authorized Consumption		
	gallons	3.5
17. Billed Metered	38,442,953,800	
	gallons	5
18. Billed Unmetered	2,687,789	
	gallons	5
19. Unbilled Metered	59,572,555	
20. Unbilled Unmetered		

AW Districts 10-14, Attachment 5

	45,179,594	gallons	5
21. Total Authorized Consumption			
	38,550,393,738	gallons	
D. Water Losses			
22. Water Losses			
Line 16 - Line 21	7,064,761,825	gallons	
E. Apparent Losses			
23. Average Customer Meter Accuracy	97.90	%	4
24. Customer Meter Accuracy Loss	824,619,029	gallons	
25. Systematic Data Handling Discrepancy	1	gallons	2.5
26. Unauthorized Consumption	114,037,889	gallons	2.5
27. Total Apparent Losses	938,656,919	gallons	
F. Real Losses			
28. Reported Breaks and Leaks	89,113,730	gallons	5
29. Unreported Loss	6,036,991,176	gallons	4
30. Total Real Losses	6,126,104,906	gallons	
Line 28 + Line 29			
31. Total Water Losses			
Line 27 + Line 30	7,064,761,825	gallons	

AW Districts 10-14, Attachment 5

32. Non-Revenue Water

		gallons
Line 31 + Line 19 + Line 20	7,169,513,974	

G. Technical Performance Indicator for Apparent Loss

33. Apparent Losses Normalized

	10.93	gallons lost per connection per day
Line 27 / Line 7 / 365		

H. Technical Performance Indicators for Real Loss

		gallons
34. Real Loss Volume Line 30	6,126,104,906	

35. Unavoidable Annual Real Losses Volume

		gallons
(5.41 * Line 6 + (Line 7 * 0.15)) * 365 * Line 10	1,596,021,184	

36. Infrastructure Leakage Index		I.L.I
Line 34 / Line 35	3.84	

37. Real Losses Normalized - Service Connections

	71.30	gallons lost per connection per day
Line 34 / Line 7 / 365		

38. Real Losses Normalized - Main Lines

	0.00	gallons lost per mile per day
Line 34 / Line 6 / 365		

I. Financial Performance Indicators

Assessment Scale

39. Total Apparent Losses

		gallons
Line 27	938,656,919	

40. Retail Price of Water

AW Districts 10-14, Attachment 5

		$/gallons	
			4.5
	0.00558		
41. Cost of Apparent Losses			
Line 39 x Line 40	$5,237,705.61		
42. Total Real Losses		gallons	
Line 30	6,126,104,906		
43. Variable Production Cost of Water		$/gallons	
	0.00039		2.5
44. Cost of Real Losses			
Line 42 x Line 43	$2,364,676.49		
45. Total Cost Impact of Apparent and Real Losses			
Line 41 + Line 44	$7,602,382.10		
46. Total Assessment Score	72		

J. System Losses and Gallons Per Capita per Day (GPCD)

47. Total Water Loss - Percentage		%
	15.49	
48. GPCD Input	125	
Line 16 / Line 5a / 365		
49. GPCD Loss	19	
Line 31 / Line 5a / 365		

K. Wholesale Factor Adjustments

	100.00	
50. Percent of Treated Wholesale Water Traveling through General Distribution System		%
51. Volume of Treated Wholesale Water Traveling through General Distribution System	2,385,015,400	gallons
(Line 50/100) * Line 15b		
52. Wholesale Factor	0.05	

Line 15b / (Line 13b + Line 14b)		
53. Adjusted Real Loss Volume	5,819,799,661	gallons
((1 - Line 52) x (Line 30 * Line 50 / 100)) +		
54. Adjusted Cost of Real Losses	$2,246,442.67	
((1 - Line 52) x (Line 44 * Line 50 / 100)) +		
55. Adjusted Total Water Loss Volume	6,711,523,734	gallons
((1 - Line 52) x (Line 31 * Line 50 / 100)) +		
56. Adjusted Total Cost Impact of Apparent and Real Losses	$7,222,263.00	
((1 - Line 52) x (Line 45 * Line 50 / 100)) +		
57. Adjusted Real Loss Per Connection	67.74	gallons lost per connection per day
((1 - Line 52) x (Line 37 * Line 50 / 100)) + (Line 37 - (Line 37 * Line 50/100))		
58. Adjusted Real Loss Per Mile	0	gallons lost per mile per day
((1 - Line 52) x (Line 38 * Line 50 / 100)) + (Line 38 - (Line 38 * Line 50/100))		
59. Adjusted Infrastructure Leakage Index	3.65	I.L.I
((1 - Line 52) x (Line 36 * Line 50 / 100)) +		
60. Adjusted Total Water Loss - Percentage	14.72	%
((1 - Line 52) x (Line 47 * Line 50 / 100)) +		
61. Adjusted GPCD Loss	18	
((1 - Line 52) x (Line 49 * Line 50 / 100)) +		

Comments

EXHIBIT DM-5

Austin WATER

Utility Profile & Water Conservation Plan for Municipal and Wholesale Water Use

Developed to Meet Requirements
Outlined in 30 TAC § 288.2 and § 288.5

May 1, 2019

Austin Water
City of Austin, Texas
PWS # TX2270001

EXHIBIT DM-5

Austin WATER

Utility Profile & Water Conservation Plan

Name:	**City of Austin Water Utility**
Address:	625 East 10th St. Suite 615 Austin, TX 78701
Telephone:	(512) 974-2199 **Fax:** (512) 974-3504
Water Right Number:	14-5471
Regional Water Planning Group:	Region K
Form Completed By:	Drema Gross
Title:	Water Conservation Division Manager
Phone:	(512) 974-2787
Person Responsible for Implementing Conservation Program:	Drema Gross
Signature:	Drema Gross
Date:	4·24·2019

EXHIBIT DM-5

Austin WATER

Utility Profile & Water Conservation Plan

TABLE OF CONTENTS

EXHIBIT DM-5

Austin WATER

Utility Profile & Water Conservation Plan

Austin Water prepared this Utility Profile & Water Conservation Plan for Municipal and Wholesale Water Use to comply with Title 30 Texas Administrative Code §288.2 and 288.5. The utility profile is used to convey information about the City of Austin's (the City's) water and wastewater system to the Texas Commission on Environmental Quality (TCEQ). The water conservation plan provides an overview of Austin's current and future water conservation initiatives within the framework recommended by forms TCEQ-10218 and 20162.

UTILITY PROFILE

POPULATION & SERVICE AREA DATA

The City's service area includes City retail customers and wholesale customers. Several wholesale customers' service areas extend outside the City's service area because of the wholesale customer's infrastructure design and layout, operational limitations, or water supply demands.

Current Service Area Data			
	Retail	**Wholesale**	**Total**
Water Service Area Size (*square miles*)			
	242.98	Wholesale Service: 32.74 Emergency Service Only: 13.40 Total: 46.14	289.12
Current Population Served			
Water Service	1,015,642	62,280	1,077,922
Wastewater Service	993,054	55,320	1,048,374

Historical Population Served			
	Water - Retail	**Water - Wholesale**	**Wastewater***
2018	994,752	60,999	1,026,203
2017	973,338	59,686	1,003,476
2016	954,648	58,540	977,053
2015	926,624	56,822	947,943
2014	896,363	54,966	917,416

*Wastewater served population includes retail and wholesale estimates

Projected Service Area Population			
	Water - Retail	**Water - Wholesale**	**Wastewater**
2020	1,050,239	51,393	1,071,212
2030	1,280,236	62,648	1,305,802
2040	1,510,239	67,521	1,533,707
2050	1,731,187	77,399	1,758,088
2060	1,963,397	87,781	1,993,907

Service area size was determined through a Geographic Information System process identifying served parcels.

Historical and current served population is based on the City Demographer's estimate of the City's population (*within the City's limited and full purpose jurisdictions*) and the population of the surrounding counties. This estimate is updated annually. Projected population is estimated by using growth rate projections developed by city demographer for total served water population in 2016 for the Water Forward planning project. The same growth rate is applied to retail served water population and total served wastewater population.

Appendix A includes a map showing Austin Water's retail service area, emergency water service area, wholesale service area, and Certificate of Convenience and Necessity (CCN) area.

CUSTOMER DATA

Customer Connections

The table below shows the current number of active connections for treated water users.

Current Number of Active Connections			
	Metered	**Not-Metered**	**Total**
Residential*	217,579	0	217,579
Single-Family	*211,190*	*0*	*211,190*
Multi-Family	*6,389*	*0*	*6,389*
Commercial	17,354	0	17,354
Industrial (*Large Volume*)	9	0	9
Institutional	440	0	440
Agriculture	0	0	0
Other (*Wholesale*)	48	0	48

* Includes multi-family use

The table below shows the number of new connections per year for treated water users for the most recent three calendar years.

Number of New Connections for the Past Three Calendar Years			
	2016	**2017**	**2018**
Residential*	3,464	3,118	3,983
Single-Family	*2,873*	*3,150*	*3,907*
Multi-Family	*591*	*-32*	*76*
Commercial	-178	148	333
Industrial (*Large Volume*)	0	1	0
Institutional (*University of Texas*)	0	0	0
Agriculture	0	0	0
Other (*Wholesale*)	-1	0	-1

* Includes multi-family use

EXHIBIT DM-5

High Volume Customers

The table below shows annual water use for the five highest volume customers of Austin Water in the previous calendar year.

Usage by High Volume Retail Customers in CY 2018			
	Customer Name	**Usage** (*1,000 gallons/year*)	**Treated or Raw Water**
1	Samsung	2,280,138	Treated
2	Travis County WCID #10	*758,978*	Treated
3	NXP USA, INC	570,423	Treated
4	Wells Branch MUD	438,910	Treated
5	University of Texas	340,839	Treated

Wholesale Customers

All water delivered to wholesale contracts is treated water. Following is a list of City wholesale customers, the contracted amount of potable water, and their annual use for CY 2018.

Wholesale Customer Contracts and Water Usage		
Wholesale Customer	**Contracted Amount** (*acre-feet*)	**Water Delivered in CY18** (*acre-feet*)
Water & Wastewater		
City of Manor	1,680.22	0.01
City of Rollingwood	1,120.14	369.39
City of Sunset Valley	715.77	269.56
North Austin MUD #1	no contractual limitation	958.05
Northtown MUD	no contractual limitation	798.24
Southwest Water Company -Mid-Tex	970.46 Phase 1 1,576.99 Phase 2	146.13
Wells Branch MUD	no contractual limitation	1,346.97
Water Only		
Aqua Texas-Morningside	52.42	6.55
Aqua Texas - Nighthawk WSC	42.70	42.23
Aqua Texas-Rivercrest	1,120.14	364.93
Creedmoor-Maha WSC	838.76	203.02
High Valley WSC	683.29	16.19
Marsha WSC	55.24	40.19
Southwest Water Company - Windermere	2,240.29	2.11
Travis County WCID #10	3,360.43	2,329.22
Village of San Leanna	325.83	13.25
Water Emergency		
Travis County MUD #4	no contractual limitations	0
Travis County WCID 17	no contractual limitations	0

EXHIBIT DM-5

WATER USE DATA FOR SERVICE AREA

In the following two tables, the first shows the total amount of raw water delivered at point of diversion(s) from Austin's water treatment plants for the previous five years for all water uses and the second shows the total amount of water diverted for municipal use. The data was determined from a master meter located at the point of diversion.

Monthly Diversions for All Water Uses (*in acre-feet*)					
	2014	**2015**	**2016**	**2017**	**2018**
January	9,760	9,684	10,135	10,641	11,072
February	8,947	8,731	10,122	9,879	9,537
March	9,960	9,884	10,990	11,259	11,290
April	10,868	10,487	10,558	11,613	11,655
May	11,897	10,261	10,862	13,100	13,540
June	11,519	10,798	12,226	13,394	14,324
July	13,341	14,148	15,441	15,838	15,244
August	15,254	16,604	13,685	14,941	16,835
September	12,630	14,279	13,256	13,428	12,422
October	12,911	13,793	13,706	12,759	11,545
November	10,270	10,420	11,237	11,611	10,539
December	9,672	10,087	10,677	10,737	10,608
TOTALS	**137,027**	**139,175**	**142,895**	**149,199**	**148,612**

Total Amount of Water Diverted for Municipal Use (*in acre-feet*)	
Year	**Total Water Diversions**
CY 2014	137,027
CY 2015	139,175
CY 2016	142,895
CY 2017	149,199
CY 2018	148,612

The table below shows historical water sales over the past five calendar years broken out by customer category.

Historical Water Sales (*in thousand gallons*)					
	CY 2014	**CY 2015**	**CY 2016**	**CY 2017**	**CY 2018**
Residential	22,806,058.4	22,262,116.1	22,975,702.4	23,554,450.2	23,569,603.2
Single-Family	*14,228,606.7*	*13,555,634.2*	*13,621,856.3*	*13,964,121.1*	*14,055,144.0*
Multi-Family	*8,577,451.7*	*8,706,481.9*	*9,353,846.1*	*9,590,329.1*	*9,514,459.2*
Commercial	10,373,327.2	9,338,981.8	9,819,033.5	9,984,837.7	10,571,262.4
Industrial *Large Volume*	2,578,067.6	2,779,436.2	3,067,259.0	3,267,871.2	3,301,733.7
Institutional	413,604.9	994,655.1	1,047,272.7	1,102,332.0	1,000,354.5

Wholesale	2,581,324.8	2,339,004.1	2,476,472.3	2,640,391.4	2,250,345.3
Agriculture	0	0	0	0	0
TOTALS	**38,752,382.9**	**37,714,193.3**	**39,385,739.9**	**40,549,882.5**	**40,693,299.1**

WATER SUPPLY SYSTEM DATA

Water Supply Sources

Austin Water receives 100 percent surface water from the Colorado River through a combination of run-of-river water rights granted by the State of Texas and a water supply contract with the Lower Colorado River Authority (LCRA).

In 1999, the City secured a firm water supply totaling 325,000 acre-feet/year (AF/yr) through a key water supply contract with the LCRA using stored water in the Highland Lakes and other sources to back up Austin's run-of-river water rights, which are among the oldest in the basin. Under this 1999 agreement, which amended a previous 1987 agreement, Austin prepaid the LCRA for reservation and use fees. Future water use payments to the LCRA will be triggered when Austin's annual average use for two consecutive calendar years exceeds 201,000 AF/yr. This has provided a conservation incentive for Austin, as the year after this trigger is reached, the City will begin paying for water diversion amounts above 150,000 AF/yr. The term of the 1999 agreement extends through the year 2050 with an option for the City to renew the agreement for an additional 50-year period through the year 2100.

In 2007, the City entered into a supplemental water supply agreement with the LCRA for an additional 250,000 AF/yr of firm water to be planned and purchased at a future time, likely incrementally, for future needs beyond the 1999 contract's 325,000 AF/yr level.

Treatment & Distribution System

For more than 100 years, Austin Water, the city-owned water utility, has been committed to providing clean, safe, reliable, high-quality, sustainable, and affordable water to its customers. Austin Water owns and operates three major surface water treatment plants (WTPs) – Davis and Ullrich, which draw water from Lake Austin, and Handcox (*formerly WTP4*), which draws water from Lake Travis.

These WTPs currently have a combined water treatment capacity of 335 million gallons per day (MGD), including 14 MG of elevated and 158 MG of ground storage capacity. Less than 3 percent of filter backwash is recycled to the head of the plants. The system comprises 3,929 miles of water mains, 9 major pressure zones, 47 water pumping stations and local boosters, and 38 city-maintained reservoirs with 176 million gallons of effective storage capacity. The table on the next page has a summary of current plant capacities.

Austin Water Treatment Plants & Capacity		
Plant Name	**Year Constructed**	**Treatment Capacity** *(million gallons/day)*
Davis	1954	118[a]
Ullrich	1969	167[b]
Handcox (WTP4)	2014	50[c]
Total		**335**

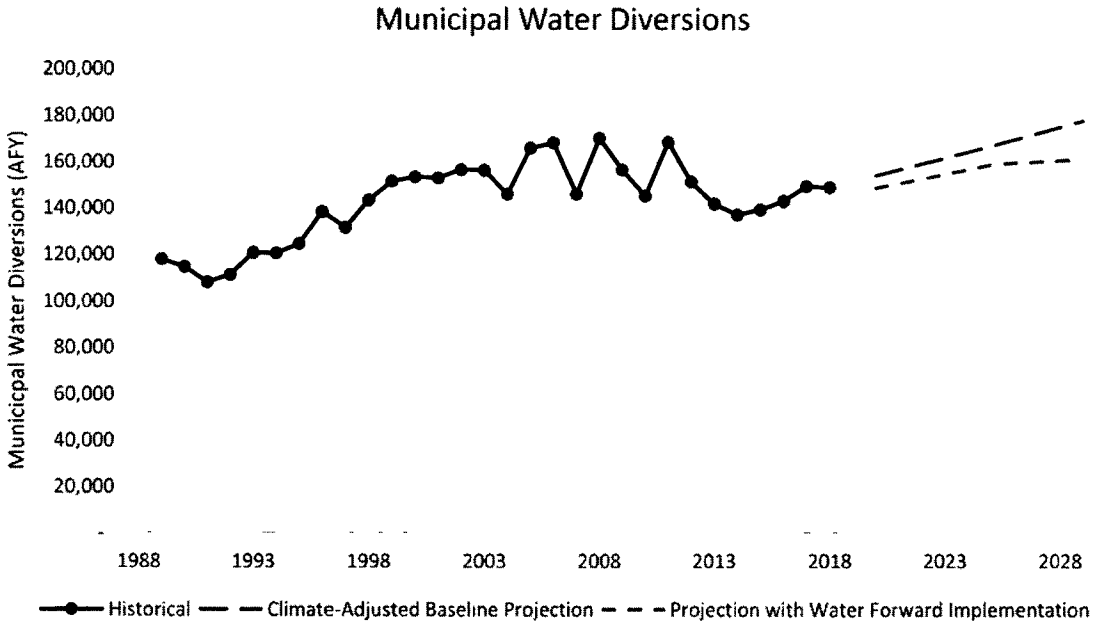
a) Expanded in 1963, 1977, 1987, and 1999.
b) Modernized in 1993 to meet the higher standards of the Safe Drinking Water Act and expanded in 1987 and 2000. Capacity expansion from 100 to 167 MGD completed in 2008.
c) Capacity can be expanded to 300 MGD over time

Projected Water Demands

Projected water supply demands for the City's service area over the next ten years are shown in the table below and the chart on the following page. They are based on population trends, historical water use, economic growth, and expected conservation savings.

Projected diversions were estimated using baseline future water demands and estimated Water Forward strategy savings developed as part of the Water Forward process. The baseline future water demands were developed from an average of 2013, 2014, and 2015 water consumption and represent future conditions based on demographic projections of population, housing, and employment in Austin, along with projected passive conservation. A climate adjustment factor was applied to the baseline future water demands. Savings from Water Forward strategies, which would be expected to reduce demand for potable water, were subtracted from the climate-adjusted baseline demand to generate projected diversions.

Estimated Water Supply Requirements for the Next Ten Years		
	Population	**Projected Diversions (*acre-feet*)**
CY 2020	1,101,632	148,444
CY 2021	1,123,665	150,375
CY 2022	1,146,138	152,345
CY 2023	1,169,061	154,355
CY 2024	1,192,442	156,405
CY 2025	1,216,291	158,486
CY 2026	1,240,617	159,191
CY 2027	1,265,429	159,733
CY 2028	1,290,738	160,316
CY 2029	1,316,553	160,941



WASTEWATER SYSTEM DATA

The design capacity of the Austin Water wastewater treatment plants is currently 152 million gallons per day (MGD).

The City has two major wastewater treatment plants that provide wastewater treatment for approximately 97 percent of City customers: Walnut Creek (Walnut Creek) Wastewater Treatment Plant (WWTP) and South Austin Regional (SAR) WWTP. Both Walnut Creek and SAR discharge most of their treated effluent to the Colorado River. Some of the treated effluent from these plants is used as reclaimed water for golf course irrigation, cooling tower, and other non-potable uses.

The City also has a major wastewater treatment facility that handles biosolids (*Hornsby Bend WWTP*). Sludge is transferred to the Hornsby Bend Biosolids Management Facility for composting and subsequent production of an EPA-approved, nutrient-rich compost known as Dillo Dirt™, which is used in Austin parks and sold to the public.

In addition to the major plants, the City has eight small wastewater treatment plants that serve small areas in their vicinity and has an ownership interest in the Brushy Creek Regional Wastewater System. Together they serve the remaining three percent of City customers. Most of these plants discharge their treated effluent to the Colorado River. The Brushy Creek Regional Wastewater System, however, discharges to the San Gabriel River, a tributary of the Brazos River. Others irrigate golf courses and do not discharge to the surface waters.

The City is the owner or has an ownership interest of all these wastewater plants. Austin Water operates and maintains all the plants except for the Brushy Creek Regional Wastewater Treatment Plant, which is operated by the Brazos River Authority. This plant only provides wastewater treatment for a very small portion of City retail customers.

Appendix B shows the wastewater treatment plant permits. Appendix C shows a map of the large wastewater treatment plants, and Appendix D shows a map of the small wastewater treatment plants.

Use of Treated Effluent

Walnut Creek Wastewater Treatment Plant uses approximately 2.85 million gallons per day (MGD) of treated effluent for plant washdown and chlorination/dechlorination.

South Austin Regional (SAR) Wastewater Treatment Plant uses approximately 2.28 MGD of treated effluent for plant washdown and chlorination/dechlorination.

Hornsby Bend uses an additional 0.5 MGD of treated effluent from SAR. Also, Hornsby Bend does on-site irrigation from an on-site pond system (*not treated effluent from the plants*).

Reclaimed Water System

Austin Water's reclaimed water program began in 1974, when the Williamson Creek Wastewater Treatment Plant provided effluent for irrigation at the adjacent Jimmy Clay Golf Course. Since then, the reclaimed system has grown considerably. Now, more than 63 miles of reclaimed water mains and water lines run in specially colored purple pipes beneath Austin streets - and that length continues to increase.

Using reclaimed water benefits the potable water system by reducing demand for potable water for non-potable uses, including irrigation, cooling tower makeup, ornamental ponds, manufacturing, and toilet flushing. The water is clear with no odor and has been treated for virtually any use not requiring higher-quality drinking water.

The City's Water Reclamation Initiative, enacted in 1990, accelerated expansion of the reclaimed water system by establishing it as a key program for meeting current and future non-potable water demands. Highlights of this system expansion include:

- 2010 - the 51st Street Tower, which serves the central Austin area, was brought online.
- 2011 - the reclaimed system was expanded to Austin Bergstrom International Airport, which is anticipated to save 25 million gallons of drinking water annually.
- 2012 - reclaimed water "filling stations" were created so tanker trucks could use this water for irrigation, road construction, dust control, and utility location.
- 2015 - began implementation of a requirement that new commercial developments or redevelopments within 250 feet of a reclaimed water main must connect for irrigation, cooling and other significant non-potable water uses.

- 2017 - the Capitol Complex Reclaimed Water Main Project, serving in and around the state capitol, was completed.
- 2018 - the Junction 420 Main serving downtown Austin was completed.

The reclaimed water initiative, which is an integral part of Austin's water conservation program, saves on average about 1.4 billion gallons of drinking water each year. With the adoption of Water Forward, Austin's integrated water resource plan, the reclaimed water system is anticipated to see further expansion.

Wastewater Data for Service Area

Austin Water's wastewater system serves approximately 97 percent of the City's water system service area. The treated volume includes those wholesale wastewater customers that receive wastewater service by the City. The table below shows the monthly volume of wastewater treated at Walnut Creek and SAR WWTPs over the past five years.

Monthly Volume of Wastewater Treated (*in thousand gallons*)					
	2014	**2015**	**2016**	**2017**	**2018**
January	2,958,857	3,588,744	3,302,821	3,517,409	3,018,927
February	2,616,069	2,916,689	2,843,328	3,027,088	2,730,428
March	2,958,363	3,727,607	3,549,427	3,480,629	3,253,296
April	2,863,012	3,135,223	3,589,162	3,197,467	3,076,612
May	3,250,590	5,284,639	4,105,590	3,122,297	3,211,043
June	3,166,813	4,157,666	3,715,438	3,131,600	2,880,580
July	3,020,524	3,182,701	3,053,643	2,963,453	2,990,358
August	2,861,121	2,936,836	3,676,794	3,544,360	2,715,917
September	3,124,872	2,826,702	3,083,104	3,115,341	3,126,416
October	2,943,382	3,264,236	2,901,655	3,118,339	3,764,817
November	3,060,340	3,733,212	2,865,503	2,757,564	3,235,879
December	2,924,309	3,766,459	2,958,663	2,998,574	3,716,573
TOTALS	**35,748,250**	**42,520,714**	**39,645,128**	**37,974,121**	**37,720,846**

WATER CONSERVATION PLAN FOR MUNICIPAL & WHOLESALE WATER USE

This plan provides information about Austin's water conservation efforts, including a brief history of Austin's conservation program, current integrated water resource planning efforts and upcoming programs, and five- and ten-year water savings goals.

CONSERVATION PROGRAM HISTORY

Austin's water conservation program began in 1983, with an ordinance allowing the City to implement temporary water use restrictions in response to infrastructure constraints. At that time, Austin viewed water demand management primarily as a crisis response tool rather than an ongoing conservation strategy. Since the 1980s, as water demand increased with significant population growth and resulting land development, Austin began to focus on using water conservation measures as a means of extending the available water supply, lowering greenhouse gas emissions, and extending infrastructure capacity.

Initially, Austin's conservation program focused more on rebates and incentives, such as toilet rebates and rain barrel distribution, to achieve high volumes of water savings and/or provide customer water use education. Over time, measures such as toilet retrofits and clothes washer rebates reached saturation and were phased out.

In 2007, Austin strengthened and prioritized its conservation focus with the adoption of a City Council-created water conservation task force's recommendations for strategies to reduce peak day water use by one percent per year for ten years. This was anticipated to result in a 25 million gallon per day reduction from peak use by 2017. In 2010, a second task force proposed additional water use reduction measures beyond the 2007 recommendations. This led to City Council adopting a resolution to reduce water use to no more than 140 gallons per capita per day by 2020.

Austin's proactivity in embracing water conservation as a core value and setting ambitious conservation goals coupled with a resounding response from Austin residents has produced a dramatic decline in water use:

- Total gallons per capita per day water use fell from 190 in fiscal year (FY) 2006 to 138 in FY 2013 to 126 in FY 2018. This meant the goal of reaching 140 GPCD was met seven years ahead of schedule.
- The goal set in 2007 to reduce peak daily water demand by one percent per year over ten years was also met early and in less than half the time despite unprecedented population growth.
- Overall water use has significantly declined since 2006 despite approximately 240,000 new residents being added to Austin Water's service area. Total pumpage dropped from 56.6 billion gallons in FY 2006 to 48.5 billion gallons in FY 2018.

In 2016, Austin's conservation program was recognized as best in the state on the Texas Water Conservation Scorecard. The Texas Living Waters Project, a collaboration of conservation groups working to ensure fresh water in our state, conducted an in-depth analysis and developed the ranking system for water conservation efforts of more than 300 water utilities in Texas. The Scorecard relied on publicly accessible information from water conservation plans and reports, water loss audits, utility websites, and other such sources.

The recent historic drought led to progressively more focus on implementing measures to sharply reduce discretionary outdoor water use. As a mature program, Austin is currently looking at measures to help it achieve aggressive conservation goals such as embedding conservation into new development, piloting new water saving technologies, increasing reclaimed and alternative water use, reducing system water loss, and addressing sectors with high potential water savings.

CURRENT CONSERVATION PROGRAM STRATEGIES

Water Use Management

Austin Water's Conservation Division implements and enforces a comprehensive Water Conservation Code (*Chapter 6-4 of City Code*) that applies to all retail water customers. This code includes a baseline Conservation Stage with some of the strongest year-round water use restrictions in the country.

One of its largest water savings and peak day water use reduction measures is a restriction, adopted in 2016, limiting the use of automatic irrigation systems to no more than once a week for up to fifteen hours and hose-end sprinklers to no more than twice a week for up to thirty hours. This schedule gives more efficient irrigation methods more time to water. This code includes time of day restrictions that allow irrigation to occur only before 10:00 a.m. or after 7:00 p.m. on a designated outdoor water use day unless a hand-held hose or bucket is used. It also contains prohibitions on water waste, which include failing to repair a controllable leak, operating an irrigation system with excessive pressure that creates misting, allowing water to spray onto or over a paved surface, and allowing irrigation water to run off into the street or pond in parking lots or paved areas.

If customers have a newly installed landscape that needs additional watering days to become established, they must apply for a variance from the mandatory watering schedule. To qualify for this variance, the landscape must be a Xeriscape and the installed plants must be low or very low water use xeric varieties selected from Austin Water's approved plant list.

Additional water use restrictions during Conservation Stage include commercial power/pressure washing equipment efficiency requirements, time of day limits on operating commercial patio misters, and requirements that restaurants serve water only on request and lodging facilities offer towel/linen reuse programs.

Mandatory Efficiency Inspections

To help promote water savings in the commercial sector, the Water Conservation Code includes requirements for the following efficiency inspections, which became effective in 2013:

- *Commercial Facility Irrigation Inspection*
  - Commercial, multi-family and City facilities one acre in size or larger must complete an irrigation evaluation every two years. This evaluation, which must be completed by an Austin Water Authorized Irrigation Inspector, includes a station by station inspection to look for water waste violations. If a violation is found, the customer must turn off the affected portion of the system until repairs are made.
- *Commercial Vehicle Wash Facility Efficiency Inspection*
  - Commercial, multi-family and City facilities with vehicle wash equipment that uses potable water must complete an annual efficiency inspection conducted by a Texas-licensed plumber. Only vehicles wash facilities that have successfully completed this inspection are allowed to operate.

To further promote water savings by commercial customers, Austin Water's Conservation Division implements an additional efficiency inspection, which was approved by City Council in 2017, as part of the adoption of local amendments to the 2015 Uniform Mechanical Code §1126.0(5) and 1226.0.1:

- *Cooling Tower Efficiency Program*
  - All properties with cooling towers must register their towers and submit annual inspection reports performed by an independent third-party Texas-licensed mechanical or chemical engineer or a person holding a TDLR Texas Air Conditioning and Refrigeration License (*Class A*) with a combined endorsement for process cooling and refrigeration. Registration information helps to identify potential water-saving upgrades and rebates and promotes reclaimed and alternative on-site sources of water for cooling tower make-up and other non-potable water demands.

Rebates, Incentives, and Free Tools

Austin Water has developed a wide variety of water conservation programs targeted to all customer classes. Along with rebate programs and financial incentives, the City offers free indoor and outdoor conservation tools to help its single-family (SF), Multi-family (MF), and Commercial, Industrial and Institutional (CII) customers save water. Residential retail customers of Austin's wholesale customers are eligible to participate in many of these programs.

An overview of Austin's current program offerings is summarized below:

- ***3C Business Challenge*** *(CII)* – The 3C Business Challenge is a "desktop" water-efficiency self-auditing tool that helps CII customers evaluate how water is used at their

facilities. Austin Water staff review submitted checklists, recommend ways to improve water efficiency, and suggest rebates to help with costs for water-efficient upgrades.

- ***Free Digital Home Water Use Reports*** *(SF)* - Austin Water has contracted with Dropcountr, Inc., to offer free home digital water use reports to its residential customers. These reports, which are available by mobile app and/or by internet, can help residents save both water and money by providing historical water use and rate tiers, comparisons to similar and efficient homes, water saving tips and links to applicable rebate programs.

- ***WaterWise Partnership Program*** *(CII)* - Austin Water offers free tools and recognition to businesses that show their commitment to conservation by using water-efficient measures and practices.

- ***Free Water Conservation Tools*** *(SF)* - Free tools available to residential customers include water-efficient showerheads that use 1.5 gallons per minute (GPM), kitchen faucet aerators that use 1.5 GPM and bathroom faucet aerators that use 0.5 GPM. To help save water outdoors, customers may pick up free soil moisture meters from Austin Water or check out a digital hose timer or sunlight calculator from the Austin Public Library.

- ***Free Irrigation System Evaluations*** *(SF)* - To promote outdoor water savings, qualifying customers may receive free irrigation system evaluations performed by a licensed irrigator from Austin Water. Customers must have an in-ground sprinkler system that has used either more than 25,000 gallons in one month or more than 20,000 gallons in two consecutive months during the current irrigation season. These evaluations can help residents set an efficient watering schedule and identify the need for system repairs and upgrades. Austin Water also provides information and templates to customers wishing to perform a self-audit of their irrigation systems.

- ***Bucks for Business Rebate*** *(CII)* – Commercial customers can receive rebates of up to $100,000 for equipment and process upgrades that save water and exceed water-efficiency requirements. Rebates under this program include but are not limited to air conditioner (AC) condensate recovery systems, ozone treatment systems for large commercial laundry facilities, cooling tower efficiency upgrades, process water reuse and recycling systems.

- ***Commercial Kitchen Rebate*** *(CII)* – This program offers rebates ranging from $40 to $2,500 for each eligible item installed to help with costs for replacing commercial food service equipment with more water-efficient models, such as Environmental Protection Agency (EPA) WaterSense / ENERGY STAR® labeled commercial kitchen equipment.

- ***Irrigation Upgrade Rebate*** *(SF)* Provides up to $400 to residential customers for making water-efficient improvements to an existing irrigation system. New systems and expansions to existing systems are not eligible for this program.

- ***Irrigation System Improvement Rebate*** *(CII / MF)* – Commercial and multi-family customers may receive up to $5,000 for installing a central-computer irrigation controller system. Additional rebates are available for installing flow sensors, multi-stream nozzles, and master valves.

- ***Landscape Survival Tools Rebate*** *(SF)* – Residents can receive up to $120 *($40 for mulch, $50 for compost, and $30 for core aeration service*) for taking steps to help retain soil moisture, which can help to keep a yard healthy while saving water.

- ***Low-Income Efficiency Programs*** *(SF / MF)* – Austin Water collaborates with Austin Energy (*AE*) to provide free high-efficiency faucet aerators and showerheads to low-income customers through AE's Weatherization Assistance Program. AW also partners with AE to provide free high-efficiency faucet aerators and showerheads to multi-family facilities with low income tenants through AE's Multi-family Efficiency Program.

- ***Pool Cover Rebate*** *(SF)* – Residential customers can receive a rebate for half of the purchase price up to $50 for a new manual pool cover, or up to $200 for a new permanent, mechanical pool cover. A properly fitted pool cover can reduce water lost to evaporation and lower pool maintenance costs.

- ***Pressure Regulating Valve Rebate*** *(SF / MF)* – Residential customers can receive up to $100 and multi-family customers can receive up to $500 for the purchase and installation of a Pressure Regulating Valve (PRV). Qualifying properties must have an initial water pressure of 80 pounds per square inch or higher without a PRV installed. A PRV can reduce water waste by lowering water pressure and prevent damage to pipes and water fixtures from undue wear.

- ***Rainwater Harvesting Rebate*** *(SF / MF / CII)* – Residential, multi-family, and commercial customers who install equipment for capturing rainwater can receive $0.50 per gallon of capacity for non-pressurized systems and $1.00 per gallon for pressurized systems up to half of the equipment cost up to a $5,000 per site maximum.

- ***Water Efficiency Audit Rebate*** *(CII)* – Commercial customers may receive 75 percent of the cost up to $5,000 for an independent audit of their facility to identify potential water and cost savings. Audited facilities must be separately metered and use at least 100,000 gallons of water a year to qualify.

- ***Watering Timer Rebate*** *(SF)* – Residents can receive 50 percent of the purchase price up to $40 for purchasing up to two hose timers. These timers, which are easily added to existing hose-end sprinklers, provide customers with more control over hose-end watering and make it easier to comply with the watering schedule.

- ***WaterWise Landscape Rebate*** *(SF / MF HOAs)* – For converting turf grass to native plant beds, residential customers may receive $35 for every 100 square feet converted (*500 square foot minimum*) up to a maximum rebate of $1,750. Multi-family homeowner associations may receive $25 for every 100 square feet converted (*1,000 square foot minimum*) up to $5,000.

- ***WaterWise Rainscape Rebate*** *(SF / Schools)* – Residents and schools can receive $0.30 per square foot converted (*100 square foot minimum*) up to $500 for installing landscape features, such as berms, terraces, swales, rain gardens, porous pavement, to keep rainwater on the property.

Rebates and financial incentives are tied to specific conservation goals, such as the reduction of peak-day demand from outdoor usage that results in increased treatment capacity and distribution costs, or the reduction of average-day demand (*year-round indoor and commercial use*) to avoid the costs of developing additional, long-term water supplies. For detailed information about each program, please see http://www.austintexas.gov/department/water-conservation-rebates.

Best Management Practices

Austin Water implements a wide range of Best Management Practices (BMPs) in its water conservation program as tools to reduce water use to meet city / state conservation goals, reduce peak daily demand, delay increases in water supply costs, and maintain the city's reputation for environmental stewardship as a core value.

The table below provides a summary showing how Austin Water's conservation programs correspond to the 26 BMPs for municipal water users found in the Texas Water Development Board's 2013 *Water Conservation Best Management Practices* guide found at https://www.twdb.texas.gov/conservation/BMPs/Mun/index.asp.

BMP	Implementation Components
Conservation Coordinator	Austin has a dedicated Water Conservation Division with 20 staff, including a Water Conservation Division Manager who serves as Conservation Coordinator. Staff responsibilities include customer service, research, data analysis, program planning, regulatory compliance, and enforcement.
Cost Effective Analysis	For current and potential conservation programs, Austin quantifies actual or estimated savings using various calculators, tracking tools, and national/state guidance to determine potential cost/benefit and effectiveness towards achieving conservation goals. Conservation efforts may also be specifically directed to high use sectors, customer groups or water use categories with the highest potential for water savings. Programs with less than a favorable cost/benefit ratio may still be used on a temporary or pilot basis to evaluate or promote new or innovative technology, penetrate hard-to-

	reach markets, increase public awareness, or achieve water savings faster in response to drought or other water shortage. Austin continually evaluates programs to determine whether they should be modified, phased out, or new programs implemented. Changes are generally based on updated cost benefit analysis, new studies and information, federal manufacturing requirements, promotion of innovative technology, penetration of hard to reach markets, integrated water resource planning, or changes in codes and ordinances.
Water Survey for Single-Family & Multi-Family Customers	Austin offers a variety of free tools and educational materials to help residents evaluate their water use and look for areas where efficiency improvements can be made. These include water use and irrigation runtime calculators, free Dropcountr digital home water use reports, free showerheads & faucet aerators, free irrigation system evaluations by licensed irrigators from Austin Water, templates for irrigation system self-audits, checkout of digital hose timers and sunlight calculators through the public library system, information on leak detection & repair, and rebates/incentives for improving water efficiency.
Water Conservation Pricing	Austin has a five-tiered inclining block rate structure for single-family residential customers that is among the steepest in the country and has resulted in a dramatic reduction in the amount of water sold at the highest tiers. Commercial and multi-family customers are encouraged to save water during the irrigation season through peak and off-peak rates. For more detailed information, please see page 32-33 of this report.
Wholesale Agency Assistance Programs	Austin provides technical assistance with conservation efforts as requested by its wholesale customers. Retail customers of Austin's wholesale customers are eligible to participate in most of Austin's conservation rebate and incentive programs. Wholesale customers have individual water rates established through contracts. New, amended, extended, or renewed wholesale water supply contracts must include language stating that the wholesale customer will adhere to Austin's water management ordinance and establish a conservation program similar to the one enforced by Austin.
Metering of All New Connections and Retrofit of Existing Connections	Austin universally meters all customers and routinely tests meters for accuracy. In January 2016, Austin Water launched an Advanced Metering Infrastructure (AMI) Steering Committee, charged with the responsibility of evaluating, recommending and directing actions to implement AMI for the Austin Water service area. Austin Water has been conducting several AMI pilot projects to study how AMI will change the behavior of utility customers and how to use AMI to improve Austin Water's customer services.

System Water Audit and Water Loss	Austin Water conducts annual Water Loss Audits according to Texas Water Development Board methodology and has dedicated one FTE specifically for addressing water loss. It routinely analyzes consumption data for zero-reads and suspicious patterns for City retail customers and wholesale master meters. In 2012, Austin launched an ongoing program to replace and upgrade aging water lines. It uses acoustic technology to inspect more than 500 miles of water lines for leaks each year. Austin Water has also initiated an accelerated leak response and repair program that has proven highly successful. For more detailed information about Austin's water loss reduction efforts, please see pages 27-29 of this report.
Athletic Field Conservation	Austin Water meets regularly with Austin Independent School District (AISD) facilities staff to discuss system efficiency upgrades and participation in available irrigation system central controller rebates. Austin has used data loggers on water meters to identify flows that would indicate leaks and worked with AISD staff on leak reduction efforts. Austin Water has also helped fund water efficiency audits for seven highest water using campuses.
Golf Course Conservation	None of Austin's golf courses use treated drinking water for irrigation and most use reclaimed water from Austin's purple pipe system. Austin Water also offers rebates of up to $5,000 to commercial and multi-family customers for irrigation system improvements including: central computer irrigation controller systems; master valves; flow sensors; and multi-trajectory rotor nozzles.
Landscape Irrigation Conservation and Incentives	Austin Water enforces a mandatory year-round watering schedule for all customers that limits use of automatic irrigation to no more than once a week and hose-end sprinklers to no more than twice a week Commercial, multi-family and City facilities one acre in size or larger must complete an irrigation system efficiency inspection every two years. Rebates are available to residential customers for improving irrigation system efficiency, replacing turf, and installing mulch/compost/core aeration service. Rebates for installing a central irrigation controller system are available to commercial, industrial, and institutional customers. Austin Water offers an annual WaterWise Irrigation Professional Seminar that provides continuing education credits toward license renewal for licensed irrigators. Covered topics include water-efficient irrigation systems, water conservation programs, the mandatory watering schedule, electrical troubleshooting, irrigation auditing, and turf grass watering requirements.
Park Conservation	Austin Water has installed smart meters at ten of Austin's Parks and Recreation Department (PARD) facilities so that the Aquatics and Athletics divisions can better track and understand water consumption with the goal of reducing overall operating costs. Austin Water has also helped fund water efficiency audits at eight PARD

	facilities and provided rebates to PARD for water efficiency upgrades at multiple Aquatics facilities. Austin Water provides reclaimed water for park conservation. It also offers rebates of up to $5,000 to commercial and multi-family customers for irrigation system improvements including: central computer irrigation controller systems; master valves; flow sensors; and multi-trajectory rotor nozzles.
Residential Landscape Irrigation Evaluations	Austin Water offers free irrigation system evaluations by licensed irrigators to residential customers to help them use their systems more efficiently. To qualify, the customer must have used more than 25,000 gallons in one month or more than 20,000 gallons in two consecutive months during the current irrigation season. It also makes information about how to perform a self-audit of a system available online. City code requires commercial, multi-family, and City municipal facilities one-acre or larger in size to have an evaluation of any permanently installed irrigation system performed every two years by an Austin Water Authorized Irrigation Inspector.
Public Information	In addition to press releases, Austin regularly advertises in local newspapers, and on radio and television stations. It also communicates conservation information through its website, e-newsletters, and a variety of social media. Austin also offers a speaker's bureau that gives presentations to area groups and provides staff/materials to promote water efficiency at festivals and other events. For more detailed information, please see pages 29-32 of this report.
School Education	For elementary students, Austin provides the Dowser Dan musical program which focuses on conservation education. In partnership with the Colorado River Alliance (CRA), Austin Independent School District, and other local entities, Austin Water, is proud to expand its current set of youth education programs to include the Texas Colorado River Mobile Learning Experience. For more detailed information, please see page 29 of this report.
Partnerships with Nonprofit Organizations	Grow Green, which is a partnership between the City of Austin and the Texas AgriLife Extension Services, offers fact sheets with landscaping design, installation, and maintenance recommendations. It also provides a Native and Adaptive Plant Guide with information about plants that thrive in the Central Texas climate. Austin Water partners with Austin Energy and Texas Gas to provide low income residential and multi-family customers holistic water and energy efficiency evaluations, free high efficiency water and energy fixtures, and other assistance to save water and energy and their associated costs.
Conservation Programs for Industrial, Commercial,	Austin offers many rebate/incentive programs to help its industrial, commercial, and institutional customers reduce their water use through water efficiency audits, equipment and process equipment upgrades, and use of alternative water sources. For more detailed information about program offerings, please see pages 12-15 of this

and Institutional Accounts	report. Austin City Code requires Industrial, Commercial, and Institutional facilities one-acre or larger in size to have an evaluation of any permanently installed irrigation system performed every two years by an Austin Water Authorized Irrigation Inspector. Austin Water and the Lower Colorado River Authority hold an annual free water conservation technical workshop in September for industrial, commercial and institutional customers and facility managers and engineers on water saving measures, technologies, and rebate programs. The City of Austin created the nation's first green building program in 1990. Austin Energy Green Building (AEGB) is now the nation's most successful sustainable building program. AEGB encourages the design and construction of more sustainable homes and buildings by using an Austin-specific rating system for energy and water efficiency above the baseline code requirements. Certain scores above the baseline code are required through zoning ordinances for new development in high growth areas. In 2010, Austin adopted the Innovative Commercial Landscape Ordinance, which serves as both a water quality and conservation tool. This change to the land development code requires new commercial developments to direct stormwater to an area at least 50 percent of the size of the required landscape. Means for conveying stormwater to landscapes vary and range from passive to active methods, several of which can count towards receiving water quality credit. To limit non-essential irrigation, commercial customers may choose whether to install permanent irrigation in the peripheral regions of the property, and undisturbed vegetation will count towards the "50 percent requirement."
Residential Clothes Washer Incentive Program	No longer actively implemented due to market penetration of EnergyStar labeled efficient washers. Austin Water began offering the residential WashWise Rebate in 1998. It modified the program over the years to adjust for new equipment, technologies, and pricing. According to the BMP Guide, utilities should design residential clothes washer incentive programs so as to increase market share of efficient clothes washers to at least 20 percent by the end of the second year of implementation. It also recommends that utilities periodically analyze several factors, including local vendor inventories and types of machines for sale; determining local and state market sales; and surveying customers about the types of machines they have. If this reveals that a rebate program has become ineffective, even if the number of rebates issued is high, the BMP Guide endorses adjusting or eliminating the program to ensure proper water savings investment instead of a reward for free ridership. Conservation staff conducted a search of area retailers' websites in February and March 2013, to determine efficiency of machines readily available in Austin. This search found approximately 80 percent of clothes washers to be water-efficient according to the Consortium for Energy Efficiency (CEE) Clothes Washer Qualifying

	Product List published in February 2013. A customer survey administered in 2012 also indicated that water-efficient washers had become commonplace. This survey, done by the National Research Center as part of Austin's participation in the Alliance for Water Efficiency's Residential End Uses of Water Study Update, went out to a random sample of Austin Water residential customers. Of the 118 returned surveys, 65.5 percent of customers reported having a water and energy efficient (Energy Star) clothes washer in their home. Of the 83.6 percent of respondents who reported that their households have taken actions to conserve water in the last several years, 41 percent reported having installed a water-efficient clothes washer as one of the actions taken. Changes in market conditions that resulted in better availability of water-efficient washing machines and the presence of stronger federal efficiency standards, led Austin Water to determine that this rebate was no longer a significant tool for promoting water-efficiency. The residential WashWise Rebate ended in June 2013.
Residential Toilet Replacement Program	No longer actively implementing this program after reaching market saturation. Beginning in the 1990s, Austin Water offered both rebate and voucher programs to encourage residents in homes built prior to 1992 to replace existing toilets that used more than 1.6 gallons per flush (gpf) with water-efficient models. With the Free Toilet Program, customers could receive vouchers that allowed them to pick up free high-efficiency toilets from the City's contracted vendor while the Toilet Rebate Program provided rebates of up to $200 per toilet to assist with the purchase and installation of WaterSense labeled toilets. Both programs proved very popular and resulted in accelerating replacement of about 93,000 toilets in single-family homes and about 62,000 in multi-family residences. Based on national replacement rate and end use data, combined with program participation, Austin Water estimated that 80 percent of residential and 88 percent of multi-family toilets had been replaced by the end of 2010. Additionally, revisions to Austin's plumbing code that became effective in October 2010 required all toilets installed in new construction or in retrofits to use no more than 1.28 gpf. As a result, Austin Water ended its toilet replacement programs by the end of FY 2011.
Showerhead, Aerator, and Toilet Flapper Retrofit	Austin Water offers free showerheads, in regular and soap-up valve models, which use 1.5 gallons per minute. Customers may also receive free bathroom faucet aerators that use 0.5 gallons per minute and kitchen faucet aerators that use 1.5 gallons per minute. These materials are available at the Water Conservation office and at various community outreach events.
Water Wise Landscape Design and Conversion Programs	Austin offers three rebate programs – the Landscape Survival Tools Rebate, the WaterWise Landscape Rebate, and the WaterWise Rainscape Rebate - to encourage customers to make regionally appropriate plant selections and reduce water used on landscapes. For more information about these rebates, please see pages 12-15 of this report.

	To encourage water-efficient choices when installing new turf or landscape vegetation, customers may receive a variance from Austin's once a week watering schedule to allow extra watering during the establishment period only if the new landscape is a Xeriscape. To qualify, plants must be listed as either "low water usage" or "very low water usage" on the Austin Water Xeriscape Plant list. Plant material at mature growth must cover at least 50 percent of the new landscape's area. Austin Water also worked with the Home Builders Association of Greater Austin to develop and introduce their Sensible Landscaping for Central Texas guide for homebuilders and homeowners. This guidance document includes information about landscape design, regionally appropriate plant selection, landscape and soil management, as well as irrigation design and maintenance. It contains a manual, checklists, and other resource materials to help developers and homeowners in making water-efficient landscape choices. All Home Builders Association of Greater Austin members have adopted these voluntary guidelines and provide this landscape option to new home buyers.
New Construction Graywater	In recent years, Austin revised its plumbing code and permitting process to make it easier to install gray water collection systems. It also developed guidance manuals to assist customers in selecting, designing and installing onsite water reuse systems, and meeting the City's permitting requirements related to these systems. With the adoption of the Water Forward integrated water resource plan, Austin is now prioritizing development of alternative water incentives and ordinances to encourage installation of alternative water systems and require dual plumbing in new commercial developments.
Rainwater Harvesting and Condensate Reuse	Austin Water began its rainwater harvesting offerings, with a program that sold rainbarrels directly to the public at a subsidized price. This program was discontinued in early 2009 due to the increased availability of rainbarrels by local vendors, operational expenses in relation to water savings, and the carbon footprint created from shipping the barrels to Austin. It also initially offered two rebate programs: a Rainbarrel Rebate for rainbarrel purchases and a Rainwater Harvesting Rebate for larger systems. In July 2010, these programs were combined into one capacity-based program to encourage installation of larger capacity systems. The current rebate is for up to $5,000 per site (*lifetime limit*). Air conditioning condensate recovery and reuse systems in industrial, commercial and institutional facilities are eligible for rebates under the "Bucks for Business" rebate program.
Water Reuse	Austin Water's reclaimed water program began in 1974 and has grown considerably since then. Now, more than 63 miles of reclaimed water mains and water lines run beneath Austin streets - and that length continues to increase. The reclaimed water

	initiative, an integral part of Austin's water conservation program, saves on average about 1.4 billion gallons of drinking water each year. For more detailed information about Austin's reclaimed program, please see pages 8-9 of this report.
Prohibition on Wasting Water	Since the 1990s, Austin's City Code has included prohibitions on water waste. Austin currently implements and enforces the following year-round water restrictions: - Customers may water only on assigned day(s) based on street address: *Residential:* ▪ Hose-end Sprinklers – up to twice a week before 10am and/or after 7pm ▪ Automatic Irrigation – once a week before 10am and/or after 7pm (Residential customers may also water a second day with a hose-end sprinkler) *Commercial / Multi-family / Public Schools* ▪ Hose-end Sprinklers or Automatic Irrigation – once a week before 10 am and/or after 7pm - Wasting water is prohibited, including: ▪ Failing to repair a controllable leak, including a broken sprinkler head, a broken or leaking pipe, or a leaking valve. ▪ Operating a permanently installed irrigation system with a broken head; a head that is out of adjustment where the arc of the spray head is over a street, parking area, or other impervious surface; or a head that is misting because of high water pressure ▪ Allowing water to run off a property so that a trail of water extends into a street, parking area, or other impervious surface for 50 feet or more ▪ Allowing water to pond to a depth greater than ¼ inch in a street, parking area, or other impervious surface - Additional restrictions: ▪ Home vehicle washing allowed if an auto shut-off hose or bucket is used ▪ Charity car washes may only be held at a commercial carwash ▪ Ornamental fountains must recirculate water ▪ Restaurants may not serve water unless requested by a customer ▪ Lodging facilities must offer a towel/linen reuse program ▪ Patio misters at commercial properties (*including restaurants and bars*) may only operate between 4 pm and midnight ▪ Commercial power / pressure washing equipment must meet efficiency requirements ▪ Commercial efficiency inspections required for irrigation systems at properties over one acre, vehicle wash facilities and cooling towers Water Conservation's dedicated enforcement staff follow a rotating patrol schedule to look for violations. Violations are handled administratively as a fine on the customer's water bill. For detailed information about the water use restrictions, please see http://www.austintexas.gov/department/watering-restrictions.

Conservation Ordinance Planning and Development	Austin Water's Conservation Division implements a comprehensive conservation code (*Chapter 6-4 of City Code*), with the goal of balancing conservation of the water supply with the desire to sustain the local economy and the natural surroundings, tree canopy and vegetation that are unique to Austin. The public, organizations, and businesses are encouraged to take part in code revision processes by attending workshops to discuss how the City should regulate water use and providing input on proposed measures. The following are examples of ordinances adopted by Austin's City Council to address water efficiency: ***2007*** – Year-round prohibition on automatic irrigation system use between 10 a.m. and 7 p.m. – No more than 2X week residential watering May thru Sept; commercial year-round ***2008*** – Submeters required in new multi-family and mixed-use facilities – HET urinals (0.5 gpf) required for new construction and retrofits – Commercial food waste and garbage disposal units prohibited – Liquid ring surgical and dental vacuum pumps prohibited – New or replacement cooling towers must achieve at least 5 cycles of concentration and have conductivity controllers, makeup and blowdown meters, overflow alarms, drift eliminators – Car wash equipment efficiency and facility certification requirements – Automatic irrigation system design standards for new commercial and multi-family residential properties – Commercial landscape soil depth and plant requirements adopted ***2010*** – HET 1.28 gpf toilets required for facilities built or renovated on or after Oct 1, 2010; waterless urinals allowed – Innovative Commercial Landscape Ordinance requiring new commercial developments to capture storm water to prevent runoff and for landscape irrigation. ***2011*** – Stormwater retention and irrigation required for new commercial properties ***2012*** – Year-round 2X week watering schedule for all customers – Mandatory reclaimed water hook-up [implemented May 2015] – Revised rate structure to compress residential rate tiers including 5th Tier to now apply to residential use above 20,000 gallons per month – Mandatory irrigation system audits every two years for commercial/multi-family/city properties over one acre – Mandatory annual vehicle wash facility efficiency assessment for commercial, multi-family and city facilities

	– Administrative enforcement process/penalties for water use violations – Water may be served only on demand at restaurants and hotels must have towel/linen exchange programs ***2016*** – Year round 1X week for automatic irrigation systems **2017** – New commercial and multifamily facilities must install AC condensate capture and use systems, install steam boilers with steam condensate return systems, and reuse cooling tower blowdown for on-site non-potable water demands or provide at least 10% of the cooling tower's make-up water from on-site alternative water sources **2018** – Cooling tower registration and inspection requirement

Alliance for Water Efficiency G480 Leaderboard

In July 2018, Austin's conservation program achieved a Platinum rating on the Alliance for Water Efficiency G480 Leaderboard. The G480 Water Conservation Program Operation and Management Standard is part of the American Water Works Association's G-series of voluntary management standards that demonstrate outcome-oriented practices and policies that go above established regulations and set a benchmark for excellence, including:

- Dedicated staff for conservation efforts (*point of contact*),
- Conservation planning,
- Integrated resources planning,
- Public information and education,
- Water waste ordinance,
- Universal metering practices,
- Non-promotional water rate,
- Monthly or bimonthly billing based on metered use,
- Landscape efficiency program, and
- Water loss control program.

As an independent industry advocate, the Alliance for Water Efficiency evaluates submissions from member agencies and awards platinum, gold, or silver recognition to indicate level of compliance with AWWA's G480 standard. Austin's grade of Platinum indicates 100 percent compliance with all recommended best practices for an effective conservation program. Austin Water became the fifth agency in the nation to complete the rigorous recognition process, the third to achieve Platinum rating, and the largest participating agency to date. Please see http://www.allianceforwaterefficiency.org/g480leaderboard.aspx for more information about the G480 Leaderboard.

Program Quantification & Evaluation

Austin Water quantifies and documents actual or estimated water savings for its various conservation measures and incentive programs to determine their potential cost/benefit and

effectiveness towards achieving the city's conservation goals. This includes the development of "digests" for each program and use of the information in the Alliance for Water Efficiency Conservation Tracking Tool. Some of the estimated water savings are based on national studies, but increasingly more are based on local Austin-specific information. Depending upon the age and specificity of the study or research to the Austin area, the digest information is ranked according to confidence level and the frequency in which the information needs to be reviewed and updated. The digests are "living" documents that are always in the process of being updated as new studies or information become available, or to reflect changes in the program or the city's codes and ordinances. Information from the digests is also used to determine whether to add, modify, or terminate a program.

WATER FORWARD: AUSTIN'S INTEGRATED WATER RESOURCE PLAN

On November 29, 2018, after more than three years of public input, Austin's City Council adopted Water Forward, a long-term integrated water resources plan to manage Austin's water resources over the next 100 years. This plan was in response to a 2014 task force recommendation that emerged from the historic 2008-2016 drought where cumulative inflows to the Highland Lakes were lower than the worst drought of record which occurred 1947–1957. During the 2008-2016 drought, lakes that supply Austin's drinking water fell to historically low levels. Climate scientists also projected that the Central Texas region would see longer, deeper periods of drought punctuated by heavy rain events resulting from a changing climate. In response, Austin began in 2015 to develop a plan to address the long term need to increase sustainability, reliability, and diversity of Austin's water supplies.

Water Forward's guiding principles include:

- Recognizing that the Colorado River is Austin's core supply, continue a strong relationship between the City and the LCRA to ensure its reliability;
- Continuing Austin's focus on water conservation and water use efficiency;
- Continuing to protect Austin's natural environment;
- Aligning with other City planning efforts, such as the Imagine Austin comprehensive plan priority program "Sustainably Manage our Water Resources"; and
- Strengthening long-term sustainability, reliability, and diversity of Austin's water supply through maximizing local water resources.

Water Forward Demand Reduction and Reuse Strategies

The Water Forward plan was developed using a holistic planning approach that balances multiple objectives such as water reliability, social, environmental, and economic benefits, and ease of implementation. A major component of Water Forward is the development and implementation of both new and expanded demand management and reuse strategies that include, but are not limited to:

- New ordinances to require dual plumbing and onsite reuse in new larger commercial and multi-family development,
- New landscape transformation ordinances,
- New ordinances requiring water use information submittal from new development (benchmarking),
- Expansion of existing centralized reclaimed water system connection requirements,
- Expanding existing alternative water, landscape transformation, and irrigation system efficiency rebates,
- Deployment of advanced metering infrastructure (AMI), and
- Reducing losses from pipes in the utility's water distribution system by enhancing current water loss reduction programs.

Austin Water is leading the implementation of Water Forward. The Water Forward adaptive management plan will guide implementation timelines with the flexibility to change to address possible uncertainties in the future.

To view the complete Water Forward plan and get detailed information about the planning process, please visit http://austintexas.gov/waterforward.

WATER CONSERVATION GOALS

The Water Forward strategies listed above are complementary to Austin's current extensive list of water conservation programs and incentives. The conservation goals in the table below were developed using Water Forward savings estimates and GPCD projections generated by the Water Forward Disaggregated Demand Model. The goals represent the projected short-term savings from the initial development and implementation of the Water Forward strategies expected to come online over the next five and ten years, as well as ongoing conservation and reuse programs.

Five- & Ten-Year Goals for Water Savings from Conservation				
	Historic 5-Year Average	2018 Baseline	2024 Goal	2029 Goal
Total GPCD	126	126	119	106
Residential GPCD	67	65	61	55

Water demand can fluctuate greatly depending on weather conditions. Hot and dry years typically raise demand while colder and wetter years lower it. The water savings goals in this Conservation Plan reflect reductions in water use resulting from year-round Conservation Stage measures and conservation programming rather than drought response efforts.

WATER LOSS CONTROL

Austin Water has undertaken a comprehensive effort to manage water loss resulting from leaks, reduce non-revenue water, and improve the quality of data in water loss estimates.

Leak Detection & Repair

Austin Water has staff that performs leak detection, and it also contracts for leak detection services to locate subsurface leaks in the water distribution system. Through these efforts, Austin Water uses acoustic technology to inspect more than 500 miles of water lines for leaks each year. In addition, Austin Water has piloted satellite leak detection to search for leaks on a system-wide basis and uses smart ball technology to search for leaks inside of large transmission mains.

To ensure the reliability of Austin's water distribution system, Austin Water has implemented "Renewing Austin", an ongoing program to replace and upgrade aging water lines. The program targets mains with a history of leakage incidents for replacement, instead of repeatedly fixing small sections of the mains as leaks occur.

Austin Water has also initiated an accelerated leak response and repair program, which included adding additional staff, that has proven highly successful, with most leaks now repaired in one day or less and about 90 percent of emergency leaks responded to within three hours.

Unaccounted-For Water Uses (*Non-Revenue Water Uses*)

Austin Water implemented a comprehensive plan to reduce non-revenue retail water use. It routinely analyzes consumption data for zero-reads and suspicious patterns for City retail customers and wholesale master meters. Austin Water coordinates with City of Austin Utilities Revenue Measurement Control staff to investigate meter tampering and water theft. Additionally, theft from City hydrants can be reported to Austin 3-1-1, as advertised on numerous water hydrants in areas with high construction traffic. Finally, all unmetered water drawn from hydrants and used by other City departments is tracked and reported to Austin Water.

WATER LOSS GOALS

It is expected that water loss percentages will fluctuate annually with weather and demand conditions, and that some fluctuation will result from improved data collection. Austin Water conducts annual Water Loss Audits according to Texas Water Development Board methodology and has made significant progress in reducing non-revenue water while improving data validity scores. Austin Water has dedicated one FTE specifically for addressing water loss.

The table on the following page shows water loss, which is the difference between water diverted or treated and water delivered or sold, over the past five years.

Historical Water Loss			
	Amount *(billion gallons)*	**Infrastructure Leakage Index**	**Loss in Gallons Per Capita per Day**
2018	7.064	3.84	19.4
2017	7.464	4.21	21.0
2016	5.973	3.31	17.1
2015	6.713	3.88	19.8
2014	5.636	3.17	17.2

The five-year averages for Water Loss gallons per capita per day (GPCD) and Infrastructure Leakage Index (ILI) used the water loss audits from FY 2014 through CY 2018. They were calculated using the retail population and with all sales to wholesale customers subtracted out of water produced and water billed.

Five- & Ten-Year Water Loss Reduction Goals				
	Historic 5-year Average	**Baseline**	**CY 2024 Goal**	**CY 2029 Goal**
Water Loss *(GPCD)*	18.9	19.3	11	11
Infrastructure Leakage Index	3.68	3.84	2.6	2.4

Austin Water has chosen to provide the ILI instead of percentage losses. Austin Water considers percentage losses to be a poor performance measurement, as it is driven by total consumption more than losses, and therefore can provide trends that are misleading when considering water loss. It is also important to note that water loss is not driven by population like water use, so losses per capita per day is also a poor performance measure.

RECORD MANAGEMENT SYSTEM FOR CITY RETAIL CUSTOMERS & WHOLESALE MASTER METERS

Daily water pumping records are maintained at the treatment facilities. The City maintains records of water distribution and sales through a central billing system which segregates water sales into Single-family Residential, Multi-family, Commercial, Wholesale, and Large Volume Industrial user classes which are then charged different rates for water and wastewater services.

The Customer Care and Billing database (CC&B) provides a central location for water billing information. Austin Water also maintains a wholesale database that allows for monitoring compliance with wholesale customer contract provisions. A separate database, IPS, serves as the database of record asset management and tracking work orders and service requests. IPS interfaces with Geographic Information System information to allow mapping of utility distribution lines, hydrants and meters, and to geographically track service requests.

METERING DEVICES

Austin Water's customer meters are specified to be accurate upon installation between 98.5 and 101.5 percent for the majority of flow ranges, dropping to 95-101 percent at the lowest edge of the flow range. Each meter of 1½ inches or larger is tested before installation, and 10 percent of the smaller meters are tested. Three inch or larger meters are tested routinely through a contract with a private firm. A study of the accuracy of installed meters two inches and smaller has shown an average accuracy of just under 98 percent. Small meters are replaced when a problem is suspected as replacement is more cost effective than repair for two inch and smaller meters.

For wholesale customers, Austin Water staff annually tests master meters that are three inches and above. The accuracy range considered acceptable for these meters varies according to the specifics of each wholesale customer's contract but are generally required to be within a ± 1.5 percent accuracy range. Wholesale customer master meters of less than three inches are periodically replaced by Austin Water staff.

UNIVERSAL METERING

Austin Water universally meters all customers. Wholesale customers have one or more master meters. All master meters are routinely tested as part of their contract with the City.

CONTINUING PUBLIC EDUCATION & INFORMATION

With one of the most extensive water conservation programs in the nation, Austin plays a leadership role in conservation at the regional, state, and national levels, and shares experiences and resources with other water providers to promote conservation innovation and effectiveness. Austin Water uses public education and community outreach as a means of encouraging participation in water conservation programs and incentives, as well as to build awareness about water use restrictions.

School Education Programs

Austin Water offers the *Dowser Dan* musical program, which targets kindergarten through fourth grade students in areas served by Austin Water. This program educates children and teachers about water conservation through a 45-minute presentation and accompanying worksheets and materials. The *Dowser Dan* program, which began in the 1990s, reaches approximately 16,000 students each year.

In 2015, the Texas Colorado River Rolling Exhibit, also known as the Mobile River, was launched in partnership with the Austin Independent School District, Austin Water, and the Colorado River Alliance. The Mobile River, which is housed inside a 40-foot trailer and functions as a mobile science museum, features interactive exhibits and hands-on activities.

Advertisements / Program Marketing / Branding

Advertising provides citizens with information about water conservation and programs available to encourage water conservation. Austin Water regularly places advertisements in the *Austin American-Statesman* newspaper as well as in neighborhood newspapers, local radio, television stations, and social media. Local celebrities have appeared in several television and radio commercials to promote the watering schedule and discourage the waste of water. Additionally, information is provided directly to customers in utility bills and through direct mail outs to high water users.

In 2016, Austin Water developed new branding protocols and templates to use as tools for creating consistent messaging. This was done as part of an effort to ensure all program applications and informational materials have a similar look and feel across utility divisions, are streamlined, contain up to date information, and use plain language to improve readability. The Water Conservation Division updated its program applications and guidelines to provide clear information about program requirements and developed checklists to help customers meet all program requirements.

Electronic Newsletters

In March 2004, Austin Water's Conservation Division began the "WaterWise Newsletter" as part of an effort to communicate more regularly with customers and increase participation in water conservation initiatives. The newsletter is distributed electronically to a database of approximately 30,000 customers. Customer email addresses are collected from program applications and information requests, and visitors to the Water Conservation website are encouraged to self-subscribe by providing an email address.

In 2013, Austin Water launched the "WaterWise Commercial Newsletter" with conservation information related to commercial, industrial and institutional customers.

Workshops, Presentations and Outreach Programs

Austin Water offers free workshops to educate the public on water conservation techniques and available programs. The Industrial, Commercial and Institutional Water Conservation Technical Workshop, which is put on jointly by Austin Water and the Lower Colorado River Authority, is an annual technical workshop on water saving measures, technologies, and rebate programs for industrial, commercial and institutional customers, facility managers and engineers.

Residential customers may attend "Controller 101" Workshops, which are free hands-on workshops provided by Austin Water to review how irrigation controllers work and to find out about hidden features that can help save water and money. The Irrigation System Maintenance for Efficiency Workshop teaches basic maintenance skills to maximize performance and efficiency of irrigation systems to manage landscapes and to reduce watering costs.

The WaterWise Irrigation Professional Seminars include information on water-efficient irrigation systems, water conservation programs, the mandatory watering schedule, electrical troubleshooting, irrigation auditing, and turf grass-watering requirements. This seminar provides continuing education credits toward license renewal for licensed irrigators.

Austin Water is a member of the Central Texas Water Efficiency Network, a coalition of regional water agencies and water advocacy groups, which meets to share information and promote water efficiency education, legislation, programs, technologies, and all other integral components of water conservation to have a regional impact on water supplies and use. This network organizes the annual Central Texas Water Conservation Symposium, a one-day regional event aimed at providing conservation education to about 160 water professionals each year.

Austin Water also participates in festivals, school events, and informational fairs by providing staff and materials to promote water conservation. In 2009, Austin Water developed a Water Conservation Speakers Bureau, which allows area groups to schedule Austin Water staff members to speak on topics including, but not limited to, conservation measures, irrigation, leak detection, and water waste. Each year, Austin Water typically participates in more than 100 events and programs.

Web Page / Social Networking

Austin Water provides a wide range of water conservation information on its website, www.WaterWiseAustin.org. All water conservation programs offered by the City, including the various rebate and free water use audit programs, are described on the website. For customer convenience, program applications are also available on-line. Tips on strategies for reducing indoor and outdoor water use are provided for both businesses and residents.

Austin Water incorporates social media into its communication efforts by providing updates on conservation-related topics via Facebook, Twitter, Instagram, Nextdoor, and YouTube. From attention-getting graphics, informative videos, and a personable approach, Austin Water is able to capture a wide audience. Currently, Austin Water has over 7,600 followers on Twitter, over 830 on Instagram, and almost 4,700 on Facebook.

Evaluation of Education & Outreach Efforts

In 2018, Austin Water set a goal to improve the utility's scores on the J.D. Power Water Utility Residential Customer Satisfaction Study to be higher than the regional average (*with a long-term goal to be the regional leader*) for each topic surveyed. The utility created a team to develop metrics for measuring effectiveness of efforts taken to obtain this goal. This team determined that initial focus should be on Communications. Communications was selected because customer awareness was determined as a factor of each survey topic. Recent J.D. Power study results showed the frequency of utility communication was "just right", while at the same time revealing lack of awareness about the utility and its services. Austin Water's Public Information Office (PIO)

intends to produce messaging that is simple, retainable, and effective to work towards the final goal.

Based on its research, the team decided to focus on increasing the number of social media impressions per month to evaluate its impact on the Communications score. Social media is an interactive and flexible format that can offer real-time feedback on communications. It also allows for rapid updates in quickly changing conditions. This metric complements on-going PIO efforts to expand the reach of its social media presence.

An impression is broadly defined as any interaction between a piece of content and an audience member. Key performance indicators for measuring social media impressions include both traffic data and numbers for each of the following:

- Clicks,
- Likes,
- Shares,
- Comments,
- Brand mentions,
- Profile visits,
- Active followers,
- Total followers, and
- Times of reposts.

Austin Water PIO is monitoring the number of impressions on Facebook, Twitter, and Instagram over an 18- to 24-month period and will compare the results against each J.D. Power Communications wave score. For this metric, AW defines impressions as a total summation of the reach on Facebook, and impressions on Twitter and Instagram. Facebook reach is defined as number of viewed posts. Twitter Impressions are defined as the number of times a picture has been viewed. Instagram Impressions are defined as the total number of interactions or engagement

NON-PROMOTIONAL WATER RATE STRUCTURE

To keep costs affordable for essential uses while discouraging excessive use, Austin Water has a five-tiered inclining block rate structure for single-family residential customers. This inclining rate structure, which is among the steepest in the country, has resulted in a dramatic reduction in the amount of water sold at the highest tiers.

Commercial and multi-family customers are encouraged to conserve water during the irrigation season through peak and off-peak rates, as illustrated in the table below.

Austin Water Volumetric Rate Structure *(effective May 1, 2018)*

Amount Used	**Volume Unit Charge** *(per 1,000 gallons)*
Single Family Residential	
0-2,000 gallons	$2.89
2,001-6,000 gallons	$4.81
6,001-11,000 gallons	$8.34
11,001-20,000 gallons	$12.70
Over 20,000 gallons	$14.21

Multi-Family	
Off Peak (November-June)	$4.53
Peak (July-October)	$5.00
Commercial	
Off Peak (November-June)	$5.27
Peak (July-October)	$5.66

Wholesale customers and several large volume/industrial customers have individual rates established through negotiated contracts.

RESERVOIR SYSTEMS OPERATIONS PLAN

LCRA owns and operates the key water supply reservoirs in the region, lakes Travis and Buchanan. LCRA operates these reservoirs in accordance with its state-approved Water Management Plan. This plan, which governs operation of the Highland Lakes to supply water to users throughout the lower Colorado River basin, is reviewed periodically to keep pace with growing water demands and improved information. It was first approved in 1989, and has been updated in 1991, 1992, 1999, 2010, and 2015.

A link to the current plan, which enables LCRA to adapt its operations as water supply conditions change, is available at https://www.lcra.org/water/water-supply-planning/water-management-plan-for-lower-colorado-river-basin/Pages/default.aspx.

Both Lake Austin and Lady Bird Lake, also on the lower Colorado River, are owned by the City of Austin and are operated as pass-through pools.

CONTRACT REQUIREMENTS FOR SUCCESSIVE CUSTOMER CONSERVATION

All new, amended, extended, or renewed wholesale water supply contracts must include language stating that the wholesale customer will adhere to the City's water management ordinance and establish a water conservation program similar to the one enforced by the City. Enforcement of these ordinances is the responsibility of the entities receiving City wholesale water. The City is willing to assist as requested by the wholesale entity.

All new, amended, extended, or renewed wholesale water supply contracts are required to include language stating that each successive wholesale customer develop and implement a water conservation plan or water conservation measures using the applicable elements of 30 TAC Chapter 288. However, all City wholesale customers only resell City wholesale water to their retail customers. The City's wholesale customers do not sell City wholesale water to another utility that then resells the water to its retail customers (i.e. successive wholesale customers). Therefore; the requirement related to successive wholesale customers does not apply to the City.