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COMPLAINT OF CERTAIN MEMBERS OF RIO ANCHO HOMEOWNERS ASSOCIATION AGAINST AQUA TEXAS, INC.	**§**	**BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS**

DIRECT TESTIMONY AND ATTACHMENTS

OF

WILLIAM PEÑA, P.E.

ON BEHALF OF

AQUA TEXAS, INC.

May 21, 2021

DIRECT TESTIMONY AND ATTACHMENTS OF

WILLIAM PEÑA, P.E.

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DIRECT TESTIMONY OF WILLIAM PEÑA, P.E.

ON BEHALF OF

AQUA TEXAS, INC.

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is William Peña, P.E. My business address is 301 Denali Pass, Suite 3, Cedar Park, Texas 78613.

Q. What is your present position?

A. Principal and Project Manager for Green Civil Design, LLC. I have held this position since 2017.

Q. What are some of the primary services you provide as part of your job responsibilities with Green Civil Design, LLC?

A. Our firm provides professional engineering services to water and wastewater providers. I manage and design all phases of our projects, including preliminary, design, permitting, bidding, and construction administration for a wide range of water, wastewater, and municipal projects. My experience also includes planning, funding assistance, fee studies, and water modeling.

II. PROFESSIONAL TRAINING AND EXPERIENCE

Q. Please describe your educational and professional background.

A. I have been a licensed professional engineer in the State of Texas, license number 87858, specializing in civil engineering for over 25 years. I received a Bachelor of Science in Civil Engineering from Texas A&M University. During the course of my professional career, I have attended a number of training classes and seminars related to water and wastewater utility design, operations, rates and management. I am also affiliated with the American Water Works Association and Water Environment Association of Texas.

Q. Please further describe your professional experience.

A. I have over twenty-five years of diverse project experience in the water, wastewater, and municipal field. I have led the planning and design of numerous larger water and wastewater facility projects in the Central Texas area, including Williamson and Travis Counties. I have been the District Engineer for Travis County Water Control and Improvement District ("WCID") No. 17 since December 2017 and provided engineering services to them since 2001 through previous employment. I have also provided planning, design, and other consulting services for Travis County WCID Point Venture, City of Lampasas, City of Copperas Cove, City of Greenville, and other Texas municipalities. For several of these entities, I have prepared overall water system master planning, which includes analyzing historical water usage and

identifying the necessary capital improvements to serve the area into the future and through build-out. In addition, I have completed several TCEQ Texas Land Application Permits for wastewater treatment systems that are required to dispose of all effluent through irrigation. A part of this process involves evaluating the identified tracts to be used for irrigation to determine the amount of water that can be applied and used by the associated crop on a daily and/or monthly basis. A copy of my resume is attached as **WP-1**.

Q. Have you previously testified as an expert witness in a regulatory or court proceeding?

A. No.

III. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide information for consideration in this matter in response to certain issues raised by Complainants and included in the issues referred by the PUC Commissioners in their November 5, 2020 Preliminary Order. Specifically, I will discuss some of the information the Preliminary Order specifies must be addressed in this hearing about Aqua Texas, Inc.'s ("Aqua") Rio Ancho Subdivision water system (PWS ID No. 0270141) ("Rio Ancho System" or the "System") and Aqua's water-use restrictions imposed for the Rio Ancho System

during the relevant time period (*i.e.*, July 20, 2018 through July 20, 2020). I will also address some of the issues discussed by the Complainants' witnesses in their prefiled direct testimony and exhibits.

Q. Are you providing any attachments with your testimony?

A. Yes. Attached as **WP-1** is a copy of my current resume, attached as **WP-2** is the Rio Ancho Water System Summary, attached as **WP-3** is the Rio Ancho Water System Historical Water Usage table, attached as **WP-4** is the Rio Ancho Water System Water Needs table, attached as **WP-5** is an excerpt showing Historical Water Use from the Travis County WCID No. 17 Water Capital Recovery Fee Study 2018 Update, and attached as **WP-6** is a copy of the TWDB 2020 Biennial Report to the 87th Texas Legislature on Water Use of Texas Utilities.

Q. Are you familiar with the manner in which WP-5 was created and maintained?

A. Yes.

Q. Was that record made at or near the time of each act, event, condition, opinion, or diagnosis set forth in the records, made by, or from information transmitted by, persons with knowledge of the matters set forth, and kept in the course of regularly conducted business activity?

A. Yes.

Q. Is WP-5 an exact duplicate of the original record?

A. Yes.

Q. Please summarize your testimony.

A. With the System improvements made in 2020, the System exceeds TCEQ minimum capacity requirements and is projected to through build-out. The current system is adequate to provide a continuous and adequate supply of water to Rio Ancho System customers for all reasonable uses if the outdoor water use is restricted to 1,523 gpd per Lot per irrigation day. Further, from July 20, 2018 through July 20, 2020, Aqua reasonably, appropriately, and properly imposed water-use restrictions on Rio Ancho System customers in accordance with Aqua's TCEQ-approved drought contingency plan that applies to the Rio Ancho System. Aqua continues that practice today. The Complainants' testimony and evidence does not change my conclusions.

Q. On what do you base the opinions in your testimony?

A. I base the opinions expressed in this testimony on my knowledge and experience, my personal knowledge of Aqua's Rio Ancho System, my review of documentation related to the Rio Ancho System included as exhibits to my testimony and that of other Aqua witnesses, my experience with water system and drought contingency

plan issues, interchanges with Aqua's Rio Ancho System operations team, my knowledge of Aqua's management of the Rio Ancho System, and my knowledge of the design plans and specifications for the Rio Ancho System facilities. I have also considered the information produced by other parties during discovery and the information included with the Complainants' prefiled direct testimony and exhibits.

Q. When did Aqua Texas, Inc. retain you to assist with this case?

A. April 26, 2021.

Q. Are you being compensated for your participation in this case?

A. Yes.

IV. ISSUE NOS. 4 AND 5: RIO ANCHO SYSTEM WATER SUPPLY

Q. What actions have you taken to become familiar with Aqua's Rio Ancho System facilities?

A. I visited the Rio Ancho System on May 5, 2021. I personally viewed each above-ground component of the system as part of the preparation for my testimony. I reviewed the construction plans, dated 2009, for the original plant construction, the construction plans, dated 2020, for the expansion of the pump station and installation of the second hydropneumatic tank, TCEQ approval letters for system

improvements, Aqua Texas' User Drought Contingency Plan, and several historical water usage documents.

Q. Would you please describe the facilities that comprise the Rio Ancho System?

A. As shown in **WP-2,** Rio Ancho Water System Summary, the Rio Ancho System facilities include three ground water wells, two ground storage tanks with a usable volume of 42,000-gallons each, three 200 gpm booster pumps, a chlorine gas disinfection system, two 3,000-gallon hydropneumatic pressure tanks, and a water distribution system that consists of 8-inch and 6-inch piping. During my May 5, 2021 site visit I was able to confirm the size of the ground storage tanks and hydropneumatic pressure tanks. Also, during my site visit I was able to acquire the nameplate information for each of the booster pumps and the maximum operating pressure, which I was able to use with the manufacturer's pump data sheet to confirm the rated flow rate of the booster pumps. TCEQ approval letters for the Rio Ancho System facilities provided to me for review by Aqua are included in **SF-15**.

Q. Would you please describe the water sources Aqua uses for its Rio Ancho System?

A. The Rio Ancho System is supplied by 3 groundwater wells. Each is at an approximate depth of 400-feet and draws water from the Trinity Aquifer. The TCEQ approval date and rated capacity for each is listed on **WP-2**, Rio Ancho Water

System Summary, showing a total rated capacity of 125 gpm. Interview of the operators on May 5, 2021 confirmed that the total pumping capacity from these 3 wells currently ranges from 121 – 128 gpm. Wells #1 and #2 are located in Burnet County and the Central Texas Groundwater Conservation District (CTGCD). The Rio Ancho Water System holds an Operating Permit from CTGCD for Wells #1 and #2 which limits the total annual production to 81.65 ac-ft. Well #3 is located in Williamson County outside the CTGCD but draws water from the same aquifer.

Q. What was the daily and monthly peak demand for Rio Ancho System customers from July 20, 2018 through July 20, 2020?

A. The historical water production for this System for 2018 through 2020 is included on **WP-3**, Historical Water Production, along with charts summarizing the data. During the time period from July 2018 through July 2020 a monthly peak occurred in July 2019 with a total of 4,319,000-gallons pumped, equating to 1,035 gallons per day (gpd) per connection. For this same period a daily peak occurred in August 2019 with usage of 172,571 gpd, equating to 1,150 gpd/connection. There was a relatively large increase in usage after 2018. From 2018 to 2019 the average daily usage per connection increased by 29% and the peak day use per connection increased by 44%.

Q. What has the daily and monthly peak demand for Rio Ancho System customers been since July 20, 2020?

A. During the time period form August 2020 through December 2020 the monthly and daily peak demands both occurred in August 2020. The monthly peak was 4,003,000-gallons, equating to 872 gpd/connection. The daily peak was 132,570 gpd, equating to 875 gpd/connection.

Q. What would you consider reasonable Rio Ancho System customer water uses?

A. Indoor, or domestic, uses including water for consumption, washing and for toilets used in a responsible way is reasonable. This includes minimizing wastefulness through repairing running or leaking toilets, not leaving sinks running when not in use, and using water saving fixtures where practical. What constitutes responsible and reasonable outdoor uses is relative to the area and capacity of the source water. In general, I consider reasonable water use to be that which does not exceed the pro-rata capacity of the source (or what is mandated by the regulatory agency) and is used in a responsible and non-wasteful manner so that the source is maintained. The amount of water used in the summers of 2019 and 2020 was at or above levels I've seen for more urban systems with a surface water source (lake) that is substantially less limited than the groundwater source for this area. As an example, Travis County WCID No. 17 serves a relatively affluent area west of Austin that has seen over the previous 5-years an average daily water use of 364 gpd/connection

and a peak day of 820 gpd/connection. *See* **WP-5**. The Rio Ancho system averaged 529 gpd/connection in 2019 and 510 gpd/connection in 2020, with a peak day use of 1,150 gpd/connection in 2019 and 967 gpd/connection in 2020. *See* **WP-3**.

Q. Are you familiar with 16 TAC § 24.205(1)?

A. Yes.

Q. What does 16 TAC § 24.205(1) say?

A. 16 TAC § 24.205(l) says: "The water system quantity and quality requirements of the TCEQ shall be the minimum standards for determining the sufficiency of production, treatment, storage, transmission, and distribution facilities of water suppliers and the safety of the water supplied for household usage. Additional capacity shall be provided to meet the reasonable local demand characteristics of the service area, including reasonable quantities of water for outside usage and livestock."

Q. Would you please describe what the TCEQ water system quantity and quality requirements were for the Rio Ancho System between July 20, 2018 and July 20, 2020?

A. The minimum TCEQ requirements are contained in 30 TAC § 290.45(b)(1)(C) for Community Water Systems with between 50 and 250 connections. The relevant

requirements included in this Section include those for well capacity, water storage volume, booster pump capacity, and hydropneumatic pressure tank volume. These are included on **WP-2**, Rio Ancho Water System Summary.

Q. Have you formed an opinion about whether the Rio Ancho System met the TCEQ water system quantity and quality requirements between July 20, 2018 and July 20, 2020?

A. Yes.

Q. What is your opinion about whether the Rio Ancho System met the TCEQ water system quantity and quality requirements between July 20, 2018 and July 20, 2020?

A. Prior to February 2020, the Rio Ancho System met the TCEQ minimum requirements for well capacity, booster pumps and water storage volume, but was slightly deficient in hydropneumatic pressure tank volume (96%) for a 6 month period from August 2019 through January 2020. Aqua made improvements to the System in 2019, which included a second ground storage tank, replacement of the booster pumps with larger capacity pumps, and installation of a second hydropneumatic pressure tank. These improvements brought the hydropneumatic pressure tank above the minimum TCEQ requirements in February 2020. This is summarized on **WP-2**, Rio Ancho Water System Summary.

Q. Has there been any change since July 20, 2020 as to whether the Rio Ancho System meets the applicable TCEQ water system quantity and quality requirements?

A. No. The System still meets minimum TCEQ requirements. The existing System will also meet minimum TCEQ requirements when serving the anticipated build-out condition of 207 Lots or Connections. At projected build-out the existing wells will be at 101% of the minimum requirement, water storage volume will be at 203% of the minimum requirement, and the booster pump and hydropneumatic pressure tank capacity will both be at 145% of the minimum requirement.

Q. Have you formed an opinion about what the reasonable local demand characteristics of the Rio Ancho System service area were between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock?

A. Yes.

Q. What is your opinion about what the reasonable local demand characteristics of the Rio Ancho System service area were between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock?

A. Clearly, that the System must be adequate to supply household usage, or domestic usage. Further, some amount of water must also be made available for outside usage. But the water source and its capacity need to be considered in what is determined to be a reasonable quantity of water for outside usage. The Trinity Aquifer, supplying groundwater to this area, is a limited resource that must be managed if it is to be sustained. It will not support irrigation of non-native turf grasses over 100% of each Lot or the Service Area. Providing for an annual average use of 400 gpd/connection or Lot and a peak day use of 800 gpd/connection is reasonable. This annual average of 400 gpd/connection is approximately that seen by local municipalities and is approximately twice the State average (according to the TWDB). *See* **WP-6**. A peak day use of 800 gpd/connection would provide for a peaking factor in the summer months of 2.

I have estimated the average domestic water use for this System to be 229 gpd/connection based on an average of the water used during the winter months of 2018/2019 and 2019/2020, as shown in **WP-4**, Water Needs. The estimated domestic water use is illustrated versus the historic total water use in the graphs included in **WP-3**, Historical Water Production.

As shown in **WP-4**, Water Needs, I calculated the typical water requirement to maintain a non-native turf grass, such as or similar to St. Augustine, for each month of the year. An annual total of 8.85-inches of irrigation is needed, in addition to average rainfall, to maintain the grass at a "normal" stress level. The peak water

requirement occurs in July at 1.92-inches of irrigation needed. I then calculated the corresponding monthly water use based on assumptions of the area of each Lot that is being irrigated and that the System is serving the projected build-out of 207 Lots. I calculated the peak daily and peak hour flow rates assuming that irrigation occurs in accordance with the Aqua Twice Weekly Watering Schedule. I then added the estimated water usage for irrigation to that for domestic usage to calculate an estimated total water usage, obtaining estimated average daily, peak daily, and peak hour flow rates.

Using these calculations, I estimate that the average Lot in the Rio Ancho System, with an approximate domestic use of 229 gpd, can use 1,523 gpd per Lot per irrigation day for outdoor use and maintain an annual average 400 gpd/connection and peak day use of 742 gpd/connection. This equates to providing the typical peak of 1.92-inches needed in July to an area of 11,300 square feet per Lot (or approximately 40% of the typical Lot's yard). Combined with the typical 2,500 square feet being irrigated by the septic drainfield totals 13,800 square feet (or 0.32-acres) per Lot. This amount of water could also be spread out to a larger area if native grasses and plants are used.

If each of the ultimate 207 Lots were to irrigate non-native grasses over 100% of their yard it would require a total annual well production of 152 ac-ft/yr., exceeding that allowable by the CTGCD. An alternative would be to utilize native grasses, such as Buffalo Grass, that according to the Texas Cooperative Extension

in a typical year do not require any irrigation to remain alive and a lower amount of water than non-native varieties to stay green through the summer.

Q. Have you formed an opinion about what capacity was needed to meet the reasonable local demand characteristics of the Rio Ancho System service area between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock?

A. Yes.

Q. What is your opinion about what capacity was needed to meet the reasonable local demand characteristics of the Rio Ancho System service area between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock?

A. **WP-4**, Water Needs, shows this calculation with a summary provided showing the capacity needed for each System component compared to the existing capacity of that component. This shows a total annual well production needed of 92.8 ac-ft/yr, well capacity needed of 106 gpm, storage capacity needed of 80,933-gallons, and a booster pump capacity needed of 510 gpm.

Q. Have you formed an opinion about whether the Rio Ancho System had the capacity needed to meet the reasonable local demand characteristics of the Rio

Ancho System service area between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock?

A. Yes.

Q. What is your opinion about whether the Rio Ancho System had the capacity needed to meet the reasonable local demand characteristics of the Rio Ancho System service area between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock?

A. In my opinion, the existing System has the capacity to meet reasonable local demand characteristics for existing conditions as well as conditions at the projected build-out of 207 Lots. As shown in **WP-4**, Water Needs, the existing System capacity for each component exceeds that calculated to be needed for 207 Lots. The system has had this capacity since at least April 2020 when the second ground storage tank and hydropneumatic pressure tank were online and serving the System.

Q. Have you formed an opinion about whether the Rio Ancho System facilities provided sufficient capacity to meet the reasonable local demand characteristics of the Rio Ancho System service area between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock, under 16 TAC § 24.205(1)?

A. Yes.

Q. What is your opinion about whether the Rio Ancho System facilities provided sufficient capacity to meet the reasonable local demand characteristics of the Rio Ancho System service area between July 20, 2018 and July 20, 2020, including reasonable quantities of water for outside usage and livestock, under 16 TAC § 24.205(1)?

A. To the best of my knowledge, the System has provided sufficient capacity to meet reasonable local demand characteristics since at least April 2020. Based on interviews of Aqua staff, repairs needed to malfunctioning equipment or components were made in a timely manner. Unreasonable outside water use is the issue.

Q. Were the Rio Ancho System facilities adequate to provide a continuous and adequate supply of water to Rio Ancho System customers for all reasonable customer uses from July 20, 2018 through July 20, 2020?

A. Yes. The System has and continues to exceed TCEQ minimum criteria since February 2020. The System is also adequate to provide an annual average of 400 gpd/LUE and a peak day flow of approximately 800 gpd/LUE at projected full build-out conditions of 207 Lots which should be adequate for all reasonable customer uses.

Q. Has there been any change since July 20, 2020 as to whether the Rio Ancho System facilities meet the reasonable local demand characteristics of the Rio Ancho System service area, including reasonable quantities of water for outside usage and livestock, under 16 TAC § 24.205(1)?

A. No. To the best of my knowledge, there have been no changes.

Q. Have you reviewed the testimony and evidence filed by the Complainants in this matter about Aqua's Rio Ancho System facilities and formed an opinion about that information?

A. Yes.

Q. Have you reviewed the prefiled testimony of Complainant witness Donald G. Rauschuber, P.E.?

A. I have reviewed the testimony of Don Rauschuber. Mr. Rauschuber recommends in his testimony that System improvements be constructed to provide "a minimum factor of 2.0 times each respective TCEQ minimum requirement." He also includes a recommended capacity for each System component in Exhibit DGR-3 of his testimony. I generally agree with Mr. Rauschuber's sizing methodology, but it assumes that the level of water use seen in the past several years will continue and then sizes the System components to meet that demand. I believe the peak water use, during the growing season, should decrease and that if it does the existing

System components will support an adequate level of service through projected build-out of the development. With the improvements to the System completed in early 2020 (installing larger booster pumps, a second ground storage tank and a second hydropneumatic pressure tank), the capacity of the booster pumps and hydropneumatic pressure tanks meet those recommended by Mr. Rauschuber and the well and ground storage tank capacity are at approximately 65% of his recommendation.

Q. What facilities or water sources would Aqua need to add to the Rio Ancho System to make it conform to the recommendation of Complainant witness Donald G. Rauschuber, P.E.?

A. With the improvements recently completed that included the addition of a second ground storage tank, higher capacity booster pumps, and a second hydropneumatic pressure tank the existing System meets Mr. Rauschuber's recommendations for booster pump and hydropneumatic pressure tank capacity. To meet his recommendations for well and storage tank capacity 2 additional wells and 1 additional 42,000-gallon ground storage tank would be needed.

Q. Approximately what would those additions cost?

A. The construction cost for the additional wells and ground storage tank would be approximately $500,000, including associated piping, electrical and other

appurtenances. Land costs continue to increase, but I estimate that would add another $200,000 to the cost, bringing the total to approximately $700,000.

Q. Are those additions feasible for Aqua to perform?

A. There is not land available for an additional well(s) in this development on the property owned by Aqua, so installation of additional well(s) would require Aqua to acquire additional land.

Q. Have you reviewed the prefiled testimony of Complainant witness David Meyers?

A. I have reviewed the testimony of David Meyers. Mr. Meyers calculates that the system would supply 575 gpm to meet the needs of the development during the twice weekly watering schedule, and that the storage tanks would drain after 3 hours and 20 minutes. I also calculated projected demand, shown in **WP-4**, Water Needs, and estimate a peak hour flow of 501 gpm when supplying irrigation and that the volume in the storage tanks would sustain this over the assumed 3 hours and 30 minute irrigation cycle duration per Lot. Our differences come down to assumptions of how much will be irrigated and for what duration. I assumed that the volume of irrigation would be that needed to meet the needs for a non-native carpet grass (*i.e.* St. Augustine or similar) during July and that 11,300 sf (or 0.26-ac) of each Lot is being irrigated. This area combined with the typical 2,500 sf being irrigated by the

septic system's drainfield totals 13,800 sf (or 0.32-ac) per Lot. I believe my assumptions are more reasonable, and therefore, so are the results of my demand calculations.

Q. What is your opinion about the information Complainants have presented to support their contention that Aqua has not constructed Rio Ancho System facilities that are adequate to meet the reasonable local demand characteristics of the Rio Ancho System service aera, including reasonable quantities of water for outside usage and livestock, under 16 TAC § 24.205(1)?

A. I do not think it is reasonable in this area being served by the Trinity Aquifer to irrigate the entirety of each Lot's yard with non-native grasses, as Complainants suggest. This level of outdoor water use will exceed the limits set by the CTGCD and exhaust this water resource. My opinion is that it is reasonable to support a portion of each Lot's yard with non-native grasses (or equivalent use), which would allow for higher use/traffic activities in those areas, and for lot owners to plant native grasses and plants in the remaining portions.

Q. Have you formed an opinion about whether Aqua needs to add facilities or water sources to its Rio Ancho System to make it adequate to supply continuous and adequate water service to customers?

A. Yes.

Q. What is your opinion about whether Aqua needs to add facilities or water sources to its Rio Ancho System to make it adequate to supply continuous and adequate water service to customers?

A. The Rio Ancho System facilities are adequate to supply continuous and adequate water service to customers at the levels discussed. This includes following the prescribed Twice Weekly Watering Schedule and restricting the amount of outdoor water usage to 1,523 gpd per Lot per irrigation day. The existing System exceeds the minimum TCEQ capacity requirements and allow for reasonable outdoor use. There is a limited ability to drill additional wells in Burnet County without exceeding the limits established by CTGCD. Land availability in Williamson County for a well site is limited and costly.

V. ISSUE NOS. 6, 7, and 8: WATER-USE RESTRICTIONS

Q. What is a drought contingency plan?

A. TCEQ requires that retail public water suppliers develop a drought contingency plan (DCP) and update it at a minimum of every 5-years or when new or updated information is available. Retail public water suppliers with 3,300 or more connections are required to submit the DCP for TCEQ approval. Those with less than 3,300 connections are required to make it available for TCEQ inspection. The purpose of the DCP is to ensure that the System is capable of providing adequate

service (including the volume and quality of water produced and the ability to maintain a minimum system pressure) during periods of drought, reductions in the water supply capacity, or periods of abnormally high usage. It sets in place procedures to try and ensure that adequate water quality and quantity for essential uses is available. The DCP will contain Stages that correspond to certain system and/or environmental conditions, such as the percent capacity being reached of particular components of the system and/or if levels of the source water are reached. Increasingly stringent usage restrictions are placed on the customers dependent on which Stage is reached.

Q. Have you reviewed Aqua's drought contingency plans applicable to the Rio Ancho System in effect between July 20, 2018 and July 20, 2020?

A. Yes. A copy of the Aqua drought contingency plans in effect for its Rio Ancho System between July 20, 2018 and July 20, 2020 are included with the testimony of Mr. Scot Foltz, Aqua's Environmental Compliance Manager, as **SF-6** and **SF-7**.

Q. What is your understanding about whether Aqua imposed restrictions on water usage by Rio Ancho System customers in the Rio Ancho subdivision between July 20, 2018 and July 20, 2020?

A. It is my understanding based on Mr. Foltz's testimony and copies of notices sent to customers that the Rio Ancho System was placed into Stage 2 restrictions in 2018, Stage 3 restrictions in 2019, and Stage 3 restrictions in 2020.

Q. Was Aqua's imposition of restrictions on water usage by Rio Ancho System customers in the Rio Ancho subdivision between July 20, 2018 and July 20, 2020 in accordance with Aqua's drought contingency plan and reasonable?

A. It appears to me that the imposed restrictions followed the adopted DCP. It is very common for local municipalities and other public water systems to impose annual irrigation restrictions to maintain system functionality and conserve water. Most that I am aware of use an annual restriction to twice a week irrigation, but some restrict as far as once a week. For example, City of Austin is currently under a year-round once per week irrigation schedule.

Q. Have you formed an opinion about whether Aqua has "used water-use restrictions in lieu of providing facilities which meet the minimum capacity requirements of 30 TAC §§ 290.38 through 290.275, or reasonable local demand characteristics during normal use periods, or when Aqua Texas is not making all immediate and necessary efforts to repair or replace malfunctioning equipment under 16 TAC § 24.205(2)" as set forth in Preliminary Order Issue No. 7?

A. Yes.

Q. What is your opinion about the question posed in Preliminary Order Issue No. 7?

A. To the best of my knowledge, based on interviews with Aqua staff and review of Mr. Foltz's testimony, Aqua made any necessary system repairs in a timely fashion, followed the adopted DCP, and it is my opinion that the need to implement water use restrictions was prompted by the manner in which customers were using water for irrigation.

Q. Have you formed an opinion about whether Aqua has "directly or indirectly demanded, charged, or collected any rate or charge, or imposed any classifications, practices, rules, or regulations different from those prescribed in Aqua's approved tariff filed with the Commission under 16 TAC § 24.25(a)" as set forth in Preliminary Order Issue No. 8?

A. Yes.

Q. What is your opinion about the question posed in Preliminary Order Issue No. 8?

A. To the best of my knowledge Aqua has followed the approved tariff filed with the Commission.

Q. Have you formed an opinion about whether the PUC should take any action in response to the Complaint at issue in this docket?

A. Yes.

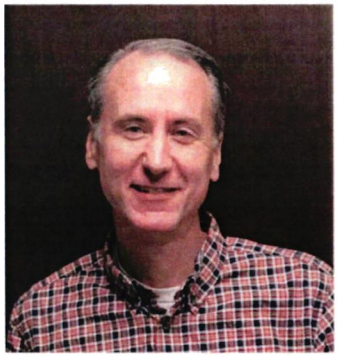
Q. What is your opinion about whether the PUC should take any action in response to the Complaint at issue in this docket?

A. The PUC should take no action in response to the Complaint. If outdoor water use is restricted to 1,523 gpd per Lot per irrigation day, the System will remain adequate to provide a continuous and adequate supply of water to the projected ultimate 207 Rio Ancho System customers. For all these reasons, the Commission should not require any Aqua actions in response to the Complaint.

Q. Does this conclude your prefiled direct testimony?

A. Yes, it does. However, I reserve the right to supplement my prefiled direct testimony with additional information as it may become available.

William Peña, P.E.



Texas P.E. License: # 87858

Bachelor of Science, 1995
Civil Engineering,
Texas A&M University

Affilliations
American Water Works Association
Water Environment Assoc. of TX

Contact:
301 Denali Pass, Suite 3
Cedar Park, TX 78613
Office: 512-640-6590, ext. 1002
Email: wpena@greencivildesign.com

QUALIFICATION SUMMARY

William Peña has over 25-years of diverse project experience in the water, wastewter and municipal field. He has managed and designed all phases of projects including preliminary, design, permitting, bidding, and construction administration for a wide range of water, wastewater, and municipal projects. His experience also includes planning, funding assistance, fee studies, and water modeling.

RELEVANT CAREER EXPERIENCE

Water Projects

Mr. Peña has been the Project Manager and Engineer for numerous water improvement projects in the Central Texas region. These have included water treatment plants, pump stations, storage tanks, and transmission and distribution lines, including the following recent projects:

- Mansfield WTP 12 MGD (Existing 6 MGD and Approved Plans for Expansion to 12 MGD), Travis County WCID 17.
- Eck Lane Water Treatment Plant Improvements, Travis County WCID 17.
- Point Venture WTP Expansion, 0.5 MGD to 1.0 MGD, Travis County WCID Point Venture.
- Santa Rita Pump Station, Williamson County MUD 19.
- Various Water Transmission Main Improvements.

Planning & Consulting Projects

Mr. Peña has completed a large number of planning projects and other District Engineer tasks. These have included funding assistance, overall system studies, capital improvement plans, producing standard construction details, and reviewing developer construction plans.

- Travis County WCID 17 - District Engineer since December 2017.
- Travis County WCID 17 - Water Capital Improvement Plan and Impact Fee Study: 2006, 2013 and 2018.
- Travis County WCID 17 - Flintrock Wastewater System Capital Improvement Plan and Impact Fee Study: 2010, 2015 and 2020.
- City of Copperas Cove - City Wide Water System Study: 2012 and 2016.

Employment History

1996 - 1997	Huffcut & Assoc. (Acquired by Pape Dawson): Graduate Engineer
1997 - 2001	Haynie Consulting: Engineer
2001 - 2017	River City Engineering (Acquired by Trihydro): Project Manager and Austin Office Manager
2017 - Present	Green Civil Design: Principal and Project Manager

Attachment
WP-1

WP-2
TEXAS AQUA
RIO ANCHO WATER SYSTEM SUMMARY

EXISTING SYSTEM COMPONENTS

Wells	**125**	**gpm**
Well #1	45	gpm (TCEQ Ltr 8/31/2010)
Well #2	40	gpm (TCEQ Ltr 7/2/2015)
Well #3	40	gpm (TCEQ Ltr 7/2/2015)
Ground Storage	**84,000**	**gal**
GST #1	42,000	gal (2009 Construction Plans)
GST #2	42,000	gal (TCEQ Ltr 3/19/2020 states 43,000 gal but usable is 42,000 gal)
Booster Pumps	**600**	**gpm**
Booster Pumps	3	200 gpm Pumps (Goulds Model 3656 with 7 - 5/8" impeller, 15 HP, operating at max of 185' head (80 psi))
Hydropneumatic Tanks	**6,000**	**gal**
Tank # 1	3,000	gal (2009 Construction Plans)
Tank # 2	3,000	gal (2020 Construction Plans)

SYSTEM CAPACITY VS TCEQ REQUIREMENTS

TCEQ Minimum Requirement [a]	2019 Connections: TCEQ Min. Rqmt.	2019 156 System Capacity		2019 Capacity/ Min. rqmt.	2021 Connections: TCEQ Min. Rqmt.	2021 168 System Capacity		2021 Capacity/ Min. rqmt.	Build-Out Connections: TCEQ Min. Rqmt.	Build-Out 207 System Capacity		Build-Out Capacity/ Min. rqmt.
Well Capacity: 0.6 gpm/connection	94	125	gpm	134%	101	125	gpm	124%	124	125	gpm	101%
Storage: 200 gal/connection	31,200	42,000	gal	135%	33,600	84,000	gal	250%	41,400	84,000	gal	203%
Booster Pumps: 2.0 gpm/connection	312	450	gpm	144%	336	600	gpm	179%	414	600	gpm	145%
Hydro. Tanks: 20 gal/connection	3,120	3,000	gal	96%	3,360	6,000	gal	179%	4,140	6,000	gal	145%

a. Section 290.45(b)(1)(C), Community Water Systems with 50 to 250 connections

Attachment
WP-2

Attachment
WP-3

WP-3
RIO ANCHO WATER SYSTEM
HISTORICAL WATER PRODUCTION

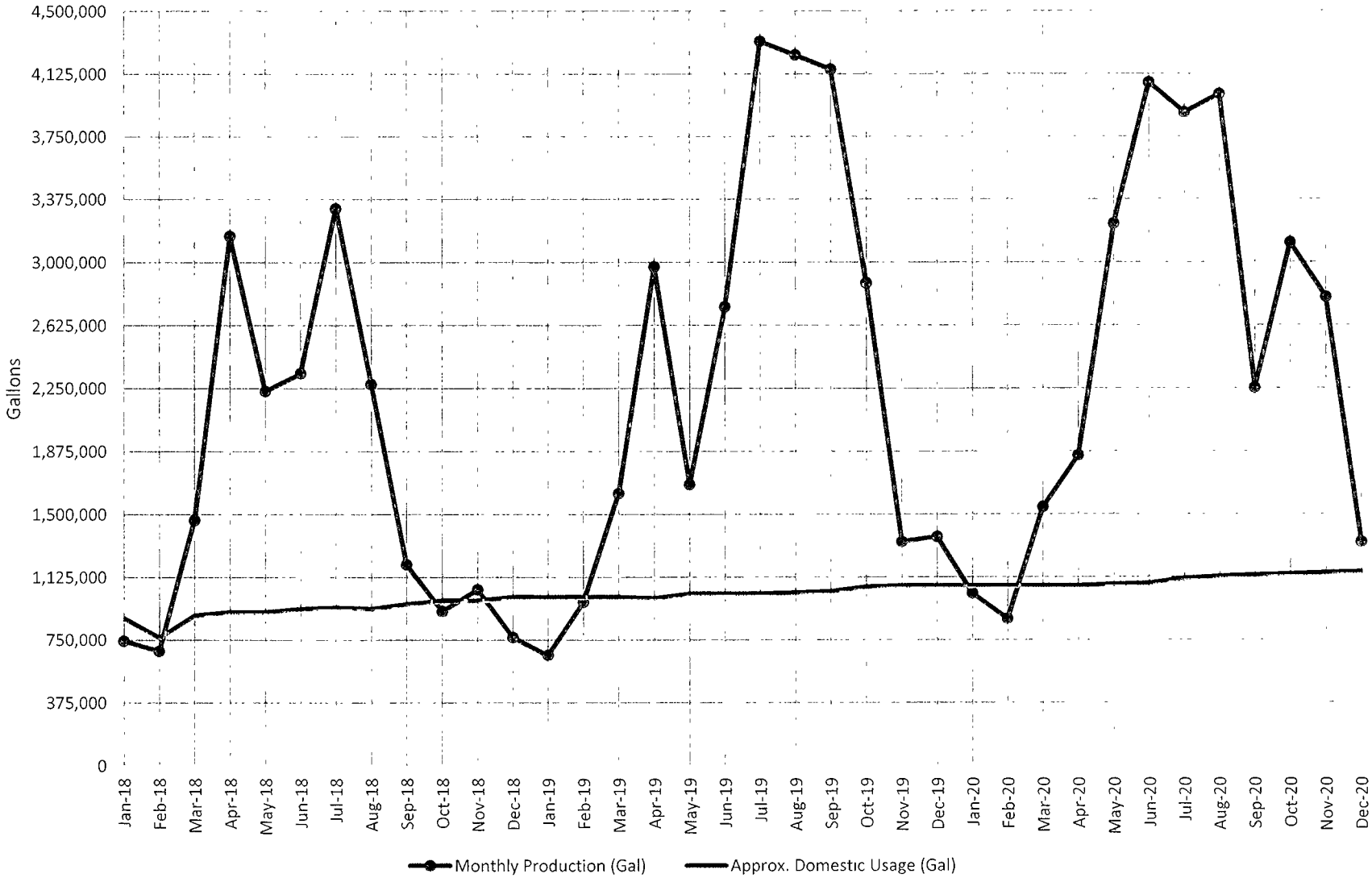
		Groundwater Pumped													
		Jan (Gal)	Feb (Gal)	March (Gal)	April (Gal)	May (Gal)	June (Gal)	July (Gal)	August (Gal)	Sept (Gal)	Oct (Gal)	Nov (Gal)	Dec (Gal)	TOTAL (Gallons)	TOTAL (Ac-Ft)
2018	Well #1	172,000	130,000	655,000	1,152,000	807,000	781,000	1,400,000	1,036,000	628,000	470,000	642,000	388,000	8,261,000	25.35
	Well #2	292,000	217,000	726,000	1,476,000	859,000	1,036,000	1,423,000	1,093,000	538,000	353,000	351,000	355,000	8,719,000	26.76
	Subtotal - CTGCD	**464,000**	**347,000**	**1,381,000**	**2,628,000**	**1,666,000**	**1,817,000**	**2,823,000**	**2,129,000**	**1,166,000**	**823,000**	**993,000**	**743,000**	**16,980,000**	**52.11**
	Well #3	279,000	335,000	83,000	527,000	567,000	521,000	495,000	145,000	34,000	97,000	57,000	21,000		
	Total Pumped	743,000	682,000	1,464,000	3,155,000	2,233,000	2,338,000	3,318,000	2,274,000	1,200,000	920,000	1,050,000	764,000	**20,141,000**	**61.81**
	Peak Day (GPD)	28,800	31,000	81,000	112,875	99,000	91,429	119,400	96,000	77,750	46,400	47,143	27,143		
	Connections	128	111	130	133	133	136	137	136	140	143	143	146	135	
	GPD/Connection	187	219	402	847	600	614	865	597	306	230	262	169	410	
	Peak Day/Conn	225	279	623	849	744	672	872	706	555	324	330	186		

		Groundwater Pumped													
		Jan (Gal)	Feb (Gal)	March (Gal)	April (Gal)	May (Gal)	June (Gal)	July (Gal)	August (Gal)	Sept (Gal)	Oct (Gal)	Nov (Gal)	Dec (Gal)	TOTAL (Gallons)	TOTAL (Ac-Ft)
2019	Well #1	292,000	338,000	557,000	1,153,000	798,000	727,000	1,594,000	1,365,000	1,112,000	510,000	535,000	506,000	9,487,000	29.11
	Well #2	267,000	311,000	522,000	1,523,000	379,000	982,000	1,740,000	1,400,000	1,216,000	508,000	512,000	490,000	9,850,000	30.23
	Subtotal - CTGCD	**559,000**	**649,000**	**1,079,000**	**2,676,000**	**1,177,000**	**1,709,000**	**3,334,000**	**2,765,000**	**2,328,000**	**1,018,000**	**1,047,000**	**996,000**	**19,337,000**	**59.34**
	Well #3	98,000	325,000	545,000	296,000	501,000	1,024,000	985,000	1,472,000	1,825,000	1,857,000	289,000	370,000		
	Total Pumped	657,000	974,000	1,624,000	2,972,000	1,678,000	2,733,000	4,319,000	4,237,000	4,153,000	2,875,000	1,336,000	1,366,000	**28,924,000**	**88.76**
	Peak Day (GPD)	34,857	35,875	80,889	130,000	97,286	132,400	156,600	172,571	157,667	112,571	54,286	53,857		
	Connections	146	146	146	145	149	149	149	150	151	155	156	156	150	
	GPD/Connection	145	238	397	732	402	655	1035	1009	982	662	306	282	529	
	Peak Day/Conn	239	246	554	897	653	889	1,051	1,150	1,044	726	348	345		

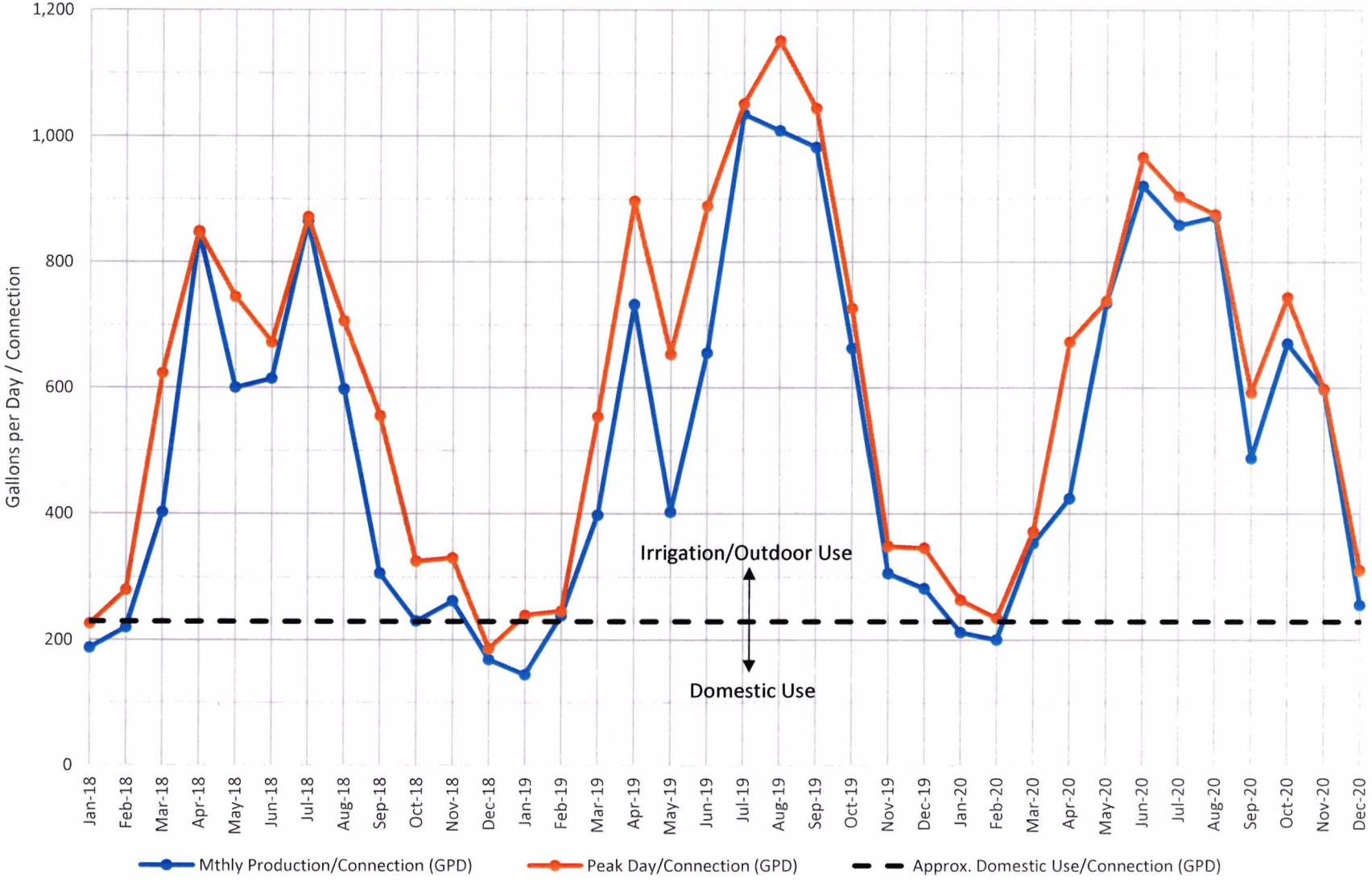
		Groundwater Pumped													
		Jan (Gal)	Feb (Gal)	March (Gal)	April (Gal)	May (Gal)	June (Gal)	July (Gal)	August (Gal)	Sept (Gal)	Oct (Gal)	Nov (Gal)	Dec (Gal)	TOTAL (Gallons)	TOTAL (Ac-Ft)
2020	Well #1	424,000	439,000	150,000	658,000	1,131,000	1,458,000	1,315,000	1,423,000	407,000	949,000	890,000	442,000	9,686,000	29.73
	Well #2	416,000	436,000	915,000	668,000	995,000	1,173,000	1,202,700	1,245,000	913,000	1,101,000	957,000	477,000	10,498,700	32.22
	Subtotal - CTGCD	**840,000**	**875,000**	**1,065,000**	**1,326,000**	**2,126,000**	**2,631,000**	**2,517,700**	**2,668,000**	**1,320,000**	**2,050,000**	**1,847,000**	**919,000**	**20,184,700**	**61.94**
	Well #3	186,000	0	477,000	525,000	1,102,000	1,442,000	1,376,000	1,335,000	932,000	1,065,000	943,000	414,000		
	Total Pumped	1,026,000	875,000	1,542,000	1,851,000	3,228,000	4,073,000	3,893,700	4,003,000	2,252,000	3,115,000	2,790,000	1,333,000	**29,981,700**	**92.01**
	Peak Day (GPD)	41,143	36,571	57,857	105,000	115,857	152,714	146,386	143,571	97,625	123,429	99,857	52,143		
	Connections	156	156	156	156	157	158	162	164	165	166	167	168	161	
	GPD/Connection	212	200	353	424	734	921	858	872	487	670	597	256	510	
	Peak Day/Conn	264	234	371	673	738	967	904	875	592	744	598	310		

Usage data from Aqua Texas records

WP-3
RIO ANCHO WATER SYSTEM
HISTORICAL WATER PRODUCTION



WP-3
RIO ANCHO WATER SYSTEM
HISTORICAL WATER PRODUCTION PER CONNECTION



WP-4

RIO ANCHO WATER SYSTEM

WATER NEEDS

GIVEN:

Total Number of Lots:	**207**	
Number of Irrigation Groups:	3	per Aqua Twice Weekly Water Schedule
Max. Number of Lots Irrigating:	69	per day
Number of Irrigation Days:	2	per week (per Aqua Twice Weekly Water Schedule)
Average Irrigatable Land:	28,250	sf / Lot (per Typical Lot Characteristics Table)

ASSUMPTIONS:

Average Irrigation Duration per Lot:	3.5	hours (total irrigation run time)
Amount of Land Irrigated:	**40%**	**of Irrigatable Land = 11,300 sf / Lot**
Turf Coefficient, Tc:	0.6	Warm Season Turf (i.e. St. Augustine) = 0.6; Cool Season Turf (i.e. Rye) = 0.8
Turf Grass Quality Factor, Qf:	0.6	Normal Stress (See Agrilife Information)
Irrigation System Efficiency:	90%	

DOMESTIC WATER REQUIREMENT:

Calculated by taking the average water produced for November through January, when irrigation and outside water usage is typically lowest

	Nov-18	Dec-18	Jan-19	Nov-19	Dec-19	Jan-20
Gallons/Day per Connection	262	169	145	306	282	212

Data from Historical Water Usage Table

Average Domestic Usage: 229 gpd/connection = 0.159 gpm/connection

Avg Domestic Usage for Scenario of	**207 Lots =**	**47,472 gpd =**	**33.0 gpm**

Attachment

WP-4

WP-4

RIO ANCHO WATER SYSTEM

WATER NEEDS

TURF WATER REQUIREMENT:

Turf Water Requirement = (ETo - Precipitation) x Tc x Qf / Efficiency

From Texas A&M Agrilife Extension

ETo: Potential Evapotranspiration. Defined as evapotranspiration of a 4" tall grass growing in a deep soil under well watered conditions Texas A&M Agrilife Extension.

Tc: Turf Coefficient

Efficiency: Efficiency of irrigation system.

Qf: Quality Factor. To account for not wanting "maximum production of grass clippings. Instead, we want to maintain a healthy, attractive turf with as little water as possible." - Texas A&M Agrilife Extension.

Stress Level	None	Low	Normal	High	Very High
Qf	1.0	0.8	0.6	0.5	0.4

Average Monthly Turf Water Requirement (inches)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (in)	2.27	2.72	4.34	5.27	6.39	7.15	7.22	7.25	5.57	4.38	2.74	2.21	57.51
Precipitation (in)	2.63	1.54	3.18	2.33	4.99	3.49	2.43	2.64	3.82	3.75	2.88	2.32	35.98
Net (in)	-0.36	1.18	1.16	2.94	1.40	3.66	4.79	4.61	1.75	0.63	-0.14	-0.11	21.53
Net Turf (in)	0.00	1.18	1.16	2.94	1.40	3.66	4.79	4.61	1.75	0.63	0.00	0.00	22.13
Turf Rqmt (in)	**0.00**	**0.47**	**0.46**	**1.18**	**0.56**	**1.46**	**1.92**	**1.85**	**0.70**	**0.25**	**0.00**	**0.00**	**8.85**

ETo: Potential Evapotranspiration. Data obtained for Austin Area from Texas A&M Agrilife Extension.

Precipitation: 20-year average for Austin Area (2001 through 2020). Data obtained from National Oceanic & Atmospheric Administration.

Net: ETo - Precipitation

Net Turf: Net Turf equal to Net with negative values (surplus rain months) removed.

Peak Turf Water Requirement - July (Utilizing highest turf water requirement month)

Each Lot:

Avg Daily Irrigation Usage: 435 gpd/Lot (using 11,300 sf/Lot irrigated & 1.92 in of irrigation for month)

Peak Daily Irrigation: **1,523 gal/Lot** (volume used on days irrigating, using 2 irrigation days/week)

Peak Hour Irrigation: **7.3 gpm/Lot Irrigating** (Using 3.50 hrs irrigation system run time)

System for Scenario of 207 Lots:

Avg Irrigation Usage: 2,792,828 gal for Month = 90,091 gpd

Peak Daily Irrigation: **105,106 gpd** (assuming 69 Lots irrigating on any one day)

Peak Hour Irrigation: **501 gpm** (assuming 69 Lots irrigating on any one day)

WP-4

RIO ANCHO WATER SYSTEM

WATER NEEDS

TOTAL WATER REQUIREMENT:

	Domestic		Irrigation		Total	
	Monthly (gal)	Avg Daily (gpd)	Monthly (gal)	Avg Daily (gpd)	Monthly (gal)	Avg Daily (gpd)
January	1,471,632	47,472	0	0	1,471,632	47,472
February	1,329,216	47,472	689,397	24,621	2,018,613	72,093
March	1,471,632	47,472	676,857	21,834	2,148,489	69,306
April	1,424,160	47,472	1,715,910	57,197	3,140,070	104,669
May	1,471,632	47,472	818,003	26,387	2,289,635	73,859
June	1,424,160	47,472	2,134,097	71,137	3,558,257	118,609
July	1,471,632	47,472	2,792,828	90,091	4,264,460	137,563
August	1,471,632	47,472	2,691,033	86,808	4,162,665	134,280
September	1,424,160	47,472	1,022,722	34,091	2,446,882	81,563
October	1,471,632	47,472	369,195	11,910	1,840,827	59,382
November	1,424,160	47,472	0	0	1,424,160	47,472
December	1,471,632	47,472	0	0	1,471,632	47,472
Total (ac-ft)	**53.2**		**39.6**		**92.8**	

	System		Per Lot
Annual Avg.	**82,812 gpd =**	**58 gpm**	**400 gpd/connection**
Peak Daily:	**152,578 gpd =**	**106 gpm**	**737 gpd/connection**
Peak Hour*:	**510 gpm**		**2.47 gpm/connection**

*Assumes 30% of avg. domestic flow rate occuring during irrigation

SYSTEM CAPACITY NEEDS:

Component	Unit	Min. Needed	Existing Capacity	Basis
Annual Well Production [a]	ac-ft/yr	92.8	122.47	Annual Water Requirement
Well Capacity	gpm	106	125	Peak Day
Storage Capacity [b]	gal	80,933	84,000	Mass Balance
Booster Pump Capacity	gpm	510	600	Peak Hour
Hydropneumatic Tank	gal	4,140	6,000	TCEQ Requirement

[a] Existing Well Production Capacity based on Central Texas Groundwater Conservation District's max allowable annual production for Wells 1 & 2 of 81.65 ac-ft/yr. Max annual production for Well 3 assumed to be equal, giving a total max annual production of 40.825 ac-ft/yr per well or 122.47 ac-ft/yr for the 3 existing wells.

[b] Minimum volume needed calculated (Peak Hour flow rate - Well Capacity) x Irrigation Duration. Actual volume needed dependent on irrigation usage patterns.

WP-4
RIO ANCHO WATER SYSTEM
WATER NEEDS

TYPICAL LOT CHARACTERISTICS

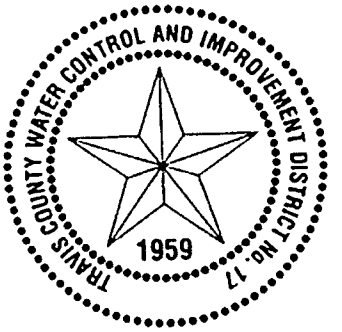
Lot	Section	Lot Size (ac)	Lot Size (sf)	Impervious Cover (sf)	Septic Drainfield (sf)	Irrigatable Land (Ac)	Irrigatable Land (sf)
12	1	0.84	36,590.4	7,315.0	2,500.0	0.61	26,775.4
32	1	0.75	32,670.0	6,351.0	2,500.0	0.55	23,819.0
54	1	0.90	39,204.0	5,207.0	2,500.0	0.72	31,497.0
70	1	0.75	32,670.0	6,361.5	2,500.0	0.55	23,808.5
4	2	0.78	33,976.8	6,606.0	2,500.0	0.57	24,870.8
67	2	0.97	42,253.2	6,121.0	2,500.0	0.77	33,632.2
77	2	0.92	40,075.2	6,670.0	2,500.0	0.71	30,905.2
85	2	0.91	39,639.6	6,451.0	2,500.0	0.70	30,688.6
Average		**0.85**	37,134.9	6,385.3	2,500.0	**0.65**	**28,249.6**

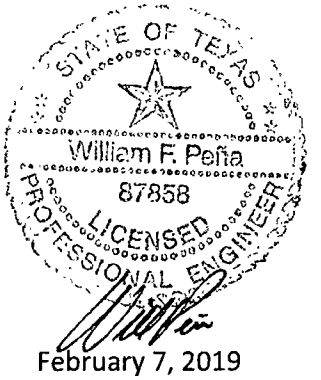
Notes:

1. Lot Sizes taken from Burnet County Appraisal District (BCAD)
2. Irrigatable Land calculated by subtracting the impervious cover and drainfield areas from the total lot size.
3. Impervious cover includes areas covered with concrete or other non-pervious material, and for this calculation includes the home, driveway and sidewalks. Home sizes taken from BCAD. Driveways and sidewalk areas calculated from Google aerial photo.
4. Septic Drainfield size estimated assuming a 250 gal/day system with an application rate of 0.1 gal/day per square foot.

WATER CAPITAL RECOVERY FEE STUDY
2018 UPDATE

TRAVIS COUNTY WCID NO. 17





February 7, 2019

Prepared by:

Green Civil Design
GCD
Engineering & Consulting
TX Registered Engineering Firm F-17563
11130 Jollyville Road, Suite 101
Austin, TX, 78759
(512) 640-6590

Attachment
WP-5

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ATTACHMENTS

Table 4.1
Historic Water Use

Year	Year End No. of LUEs	Average LUEs	No. of LUEs Added	Raw Water Pumped (Ac-ft)	Raw Water Pumped (K gal)	Raw Water Pumped (gpd/LUE)	Peak Day Production (gpd)	Peak Day Production (gpd/LUE)
1998	3,751	3,259	985	1,610.0	524,619	441.1	3,891,000	1,194.1
1999	4,287	4,019	536	2,075.3	676,244	461.0	3,583,000	891.5
2000	4,780	4,534	493	2,303.2	750,512	453.6	4,416,000	974.1
2001	5,115	4,948	335	2,496.5	813,493	450.5	4,478,000	905.1
2002	5,618	5,367	503	2,930.5	954,912	487.5	5,354,000	997.7
2003	6,181	5,900	563	3,262.2	1,063,000	493.7	6,390,000	1,083.1
2004	7,031	6,606	850	3,566.1	1,162,000	481.9	6,690,000	1,012.7
2005	8,513	7,772	1,482	4,114.7	1,340,768	472.6	6,760,000	869.8
2006	9,589	9,051	1,076	5,380.3	1,753,175	530.7	9,322,000	1,029.9
2007	10,749	10,169	1,160	4,576.1	1,491,127	401.7	7,230,000	711.0
2008	11,615	11,182	866	6,193.5	2,018,161	494.5	11,080,000	990.9
2009	12,455	12,035	840	6,428.2	2,094,626	476.8	11,639,000	967.1
2010	13,136	12,796	681	6,040.0	1,968,139	421.4	10,750,000	840.1
2011	13,879	13,508	743	7,953.0	2,591,495	525.6	15,300,000	1,132.7
2012	14,678	14,279	799	7,444.9	2,425,930	465.5	13,565,000	950.0
2013	15,534	15,106	856	6,571.6	2,141,357	388.4	10,567,000	699.5
2014	16,097	15,816	563	6,126.9	1,996,451	345.8	10,227,000	646.6
2015	16,685	15,749	588	5,784.0	1,884,720	327.9	12,575,000	798.5
2016	17,384	17,084	699	7,184.3	2,341,008	375.4	14,000,000	819.5
2017	17,588	17,691	204	7,534.3	2,455,056	380.2	12,420,000	702.1
2018*		18,086					13,340,000	737.6
		Average:	**741**			**443.8**		**910.8**
		Minimum:	**204**			**327.9**		**646.6**
		Maximum:	**1,482**			**530.7**		**1,194.1**
Previous 10 Years:								
		Average (2008-2017):	**684**			**420.2**		**854.7**
		Minimum (2008-2017):	**204**			**327.9**		**646.6**
		Maximum (2008-2017):	**866**			**525.6**		**1,132.7**
Previous 5 Years:								
		Average (2013-2017):	**582**			**363.5**		**733.2**
		Minimum (2013-2017):	**204**			**327.9**		**646.6**
		Maximum (2013-2017):	**856**			**388.4**		**819.5**
*2018 Data through October								

Water Use of Texas Water Utilities

2020 Biennial Report

Attachment
WP-6

87th Texas Legislative Session

Texas Water Development Board

Water Use of Texas Water Utilities

Fourth Biennial Report to the Texas Legislature

Peter Lake, Chairman

Kathleen Jackson, Member

Brooke Paup, Member

Jeff Walker, Executive Administrator

January 1, 2021

Texas Water
Development Board

Table of Contents

1. Executive Summary

In 2011, the 82nd Texas Legislature enacted Senate Bill 181, which revised the Texas Water Code §16.403 and §16.404 and directed the Texas Water Development Board (TWDB) and the Texas Commission on Environmental Quality (TCEQ) to develop a uniform method for calculating water use and a related reporting program for municipalities and water utilities with more than 3,300 connections. The measure also required submission of a legislative report regarding statewide water usage by water utilities. In response to that legislation, the TWDB and TCEQ, in conjunction with the Water Conservation Advisory Council, developed *Guidance and Methodology for Reporting on Water Conservation and Water Use* for water utilities and the public (www.twdb.texas.gov/conservation/doc/SB181Guidance.pdf). The guidance document sets out the necessary methods for calculating uniform water use data. Water utilities should use the methods prescribed in the guidance document when they respond to the TWDB's Water Use Survey, an annual survey that requests and collects water use data for the calendar year.

From the Water Use Survey 2019 reporting year, 394 public water systems in the state served more than 3,300 customer connections and provided water use data. Significant findings include the following:

- Nearly two-thirds of these 394 public water systems were municipality-owned, although authorities/districts, water supply corporations, and investor-owned utilities were also represented.
- About 82 percent of the systems reported water use by the various customer sectors in 2019 compared to 67 percent in 2012. The fact that some water systems did not report by various customer sectors was mostly because they did not report single-family and multifamily sectors separately for residential water use.
- On average, more than half of metered municipal water was delivered to single-family and multifamily residential customers.
- In general, as systems became larger, the relative percentage of their metered water delivered to residential sectors (single and multifamily) decreased and deliveries to non-residential sectors increased. For the smaller systems, residential sectors averaged 71 percent of total deliveries compared to 48 percent for metropolitan systems.

This report finds that the pattern and volume of system water usage can vary significantly between utilities, but there also appear to be commonalities. As was the trend in past reports, more utilities are making progress in being able to categorize the sectors where they deliver water. With this knowledge, water utilities are better able to select the most appropriate

conservation strategies, measure their implementation, identify areas of further potential water savings, and plan for long-term needs.

2. Introduction

As documented in regional and state water plans, planning for the state's water supply is essential to avoid negative economic impacts and ensure the health and safety of Texas residents. Of all the identified strategies to ensure future water supply, conservation is often the least expensive. For Texas water utilities to develop effective programs to save water, they must have a comprehensive understanding of how that water is used. This requires measuring water use and interpreting the meaning of those metrics. That necessary understanding is the basis of Texas Water Code §16.403 and §16.404 and this biennial report (see Appendix A for a description of Texas Water Code §16.403 and §16.404).

Purpose of Report

As required by Texas Water Code §16.403(e), this report provides the most recent data relating to statewide water use in residential, industrial, agricultural, commercial, and institutional sectors. The most recent data for municipalities and utilities with more than 3,300 connections is also reported. This data is collected through the TWDB's annual Water Use Survey and used for the development of water use estimates (www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/index.asp).

Sector-based reporting, the means to report how much water was used by various customer sectors, can be highly beneficial to water providers by providing more specific information regarding customers and their usage. When system water use data is limited to the total volume of water diverted and the population served, total gallons per capita per day is the default metric often used to evaluate performance. This can be misleading, however, because of highly variable water use profiles. It is important to keep in mind that the more detailed the information obtained per water use sector, the greater the understanding of how water is being used and where opportunities for conservation exist.

Detailed information about amounts of water delivered to the different customer sectors can be used by a system for internal evaluation purposes and as a planning tool in evaluating its own conservation programs and system needs. In addition, such detailed information allows the system to develop better targets and goals to include in conservation plans. Similarly, state planning efforts can benefit from higher resolution, sector-based water data that improves

understanding of water use and conservation opportunities for various types of water use throughout the state.

Ability for Water Utilities to Report

It is very important for water utilities to maintain and collect data relating to water use, population, and conservation plan implementation because that information is critical in planning for long-term needs. Over time, utilities can monitor trends in residential, industrial, commercial, institutional, and agricultural use to discover any long-term reduction brought about by the implementation of various programs.

The classification of customer accounts and the reporting of such information take time for the system to prepare. The Texas Legislature and water professionals recognize that many utilities' customer accounting and billing systems may not be able to categorize their customers and their water use. Because of the possible difficulties in reporting water use by the specified categories, Texas Water Code §16.404 specifies that the TCEQ may not adopt a rule requiring an entity to report data that is more detailed than a system's existing billing system is able to produce directly. The TCEQ, however, may require that billing systems purchased after September 1, 2011, be capable of reporting such detailed information.

Data Challenges

The overall entity response rate in the 2019 TWDB Water Use Survey was 70 percent;[1] however, some utilities respond one year but not the next.[2] Because the TWDB uses self-reported data from the surveys to prepare this report, analyzing changes over time becomes problematic when utilities do not consistently report their annual water use.

Sector-based water use reporting could be difficult and burdensome for smaller water utilities due to limited resources; therefore, this report uses the connection threshold of 3,300, representing a population of roughly more than 10,000 persons. From the 2019 Water Use Survey, 394 water utilities served more than 3,300 customer connections. About 82 percent of water utilities serving more than 3,300 customer connections reported water use by the various customer sectors compared to 67 percent in 2012. The primary reason utilities did not report by

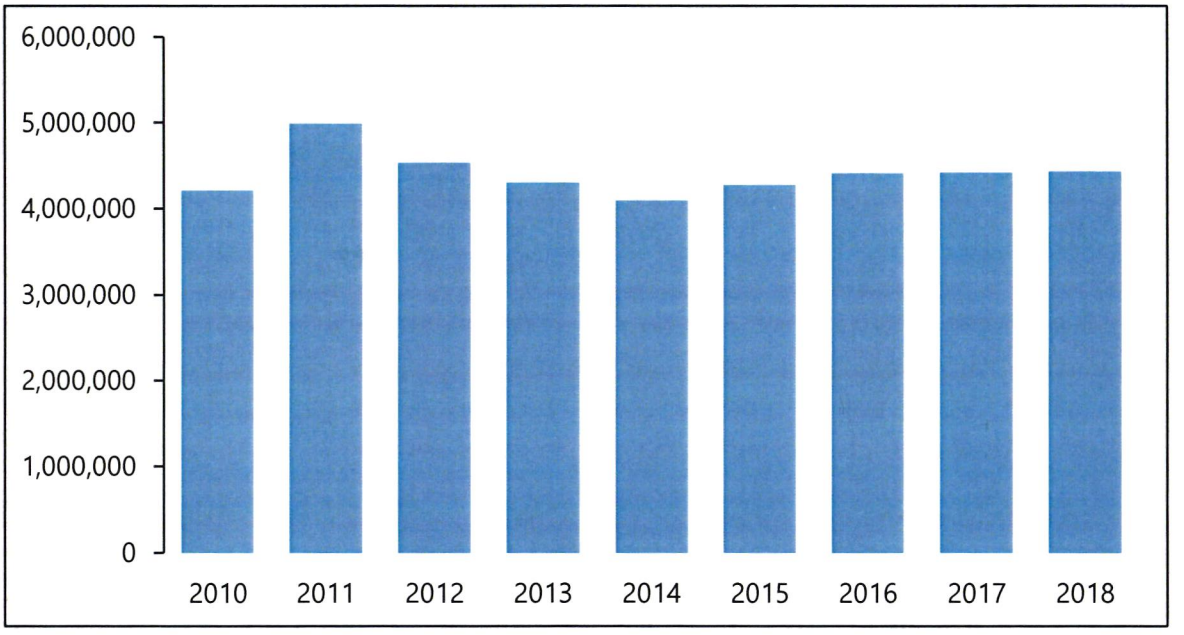
[1] Volumetrically, the response rate represents roughly 97 percent of the estimated statewide water use.
[2] Systems that do not submit their annual Water Use Survey are not eligible for TWDB funding or water right permits from the TCEQ.

customer sectors was because single-family and multifamily sectors were not separated for residential water use reporting.

3. Estimated Statewide Municipal Water Use

Water use can vary significantly from year to year depending on weather. For that reason, it is beneficial to look at long-term trends. In 1999, reporting total water use data through the Water Use Survey became mandatory for water utilities, greatly increasing the reliability of water use data around the state. Statewide, the municipal water use "all time" peak was during the drought in 2011 (Figure 1).[3] Thereafter, statewide municipal water use declined to 2014 as the drought receded but then increased slightly in recent years.

Figure 1 – Annual statewide municipal water use (acre-feet)



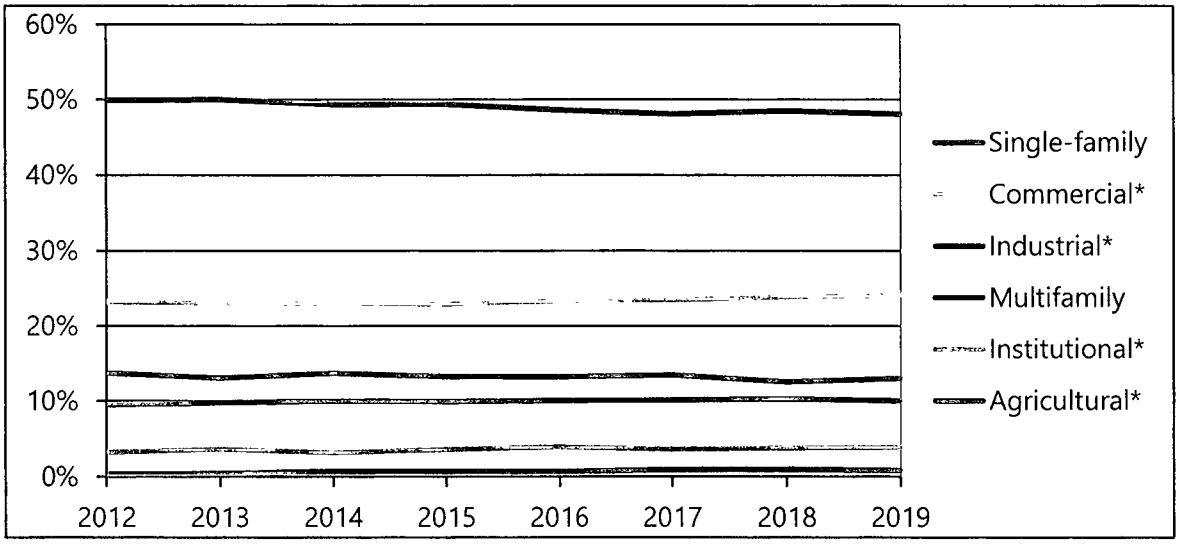
[3] Municipal water use does not include water volumes sold to large manufacturing, mining, or steam-electric power facilities.

4. Sector-Based Water Use

Categorizing water use into six sectors first became standardized in the 2012 reporting year (see Appendix B for definitions of each sector). About 82 percent of water utilities serving more than 3,300 customer connections reported water use by customer sectors annually in the 2012 through 2019 Water Use Surveys. This is up from 67 percent in 2012. Some changes in volume below may be a result of reclassification of water use, for instance, from industrial to commercial between 2017 and 2019 in Figure 2.

From 2012 to 2019, the state's population grew by more than 2.9 million people, an increase of 11.3 percent.[4] Despite this growth, single-family and multifamily sector-based water uses have held steady since 2016.

Figure 2 – Historical share of annual water use by customer sector



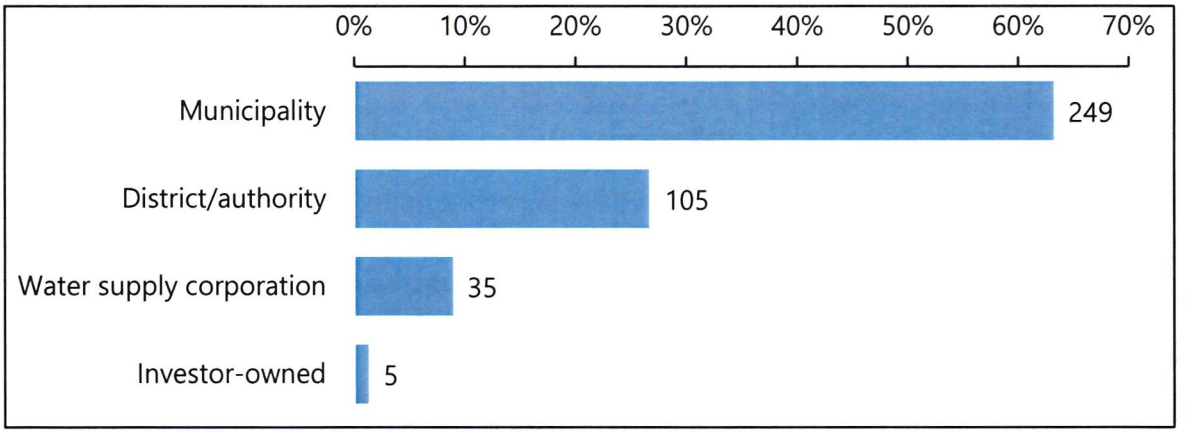
* Water for these categories represents water supplied by utilities and does not include statewide use.

In 2019, the TWDB sent annual water use surveys to more than 4,600 public water systems. Each water system, whether a municipality-owned system, a district, a water supply corporation, or an investor-owned utility, may own one or more of the surveyed public water systems. Three hundred ninety-four utilities met the criteria of serving more than 3,300 connections in the 2019

[4] U.S. Census Bureau population estimates: www.census.gov/programs-surveys/popest/data/tables.html

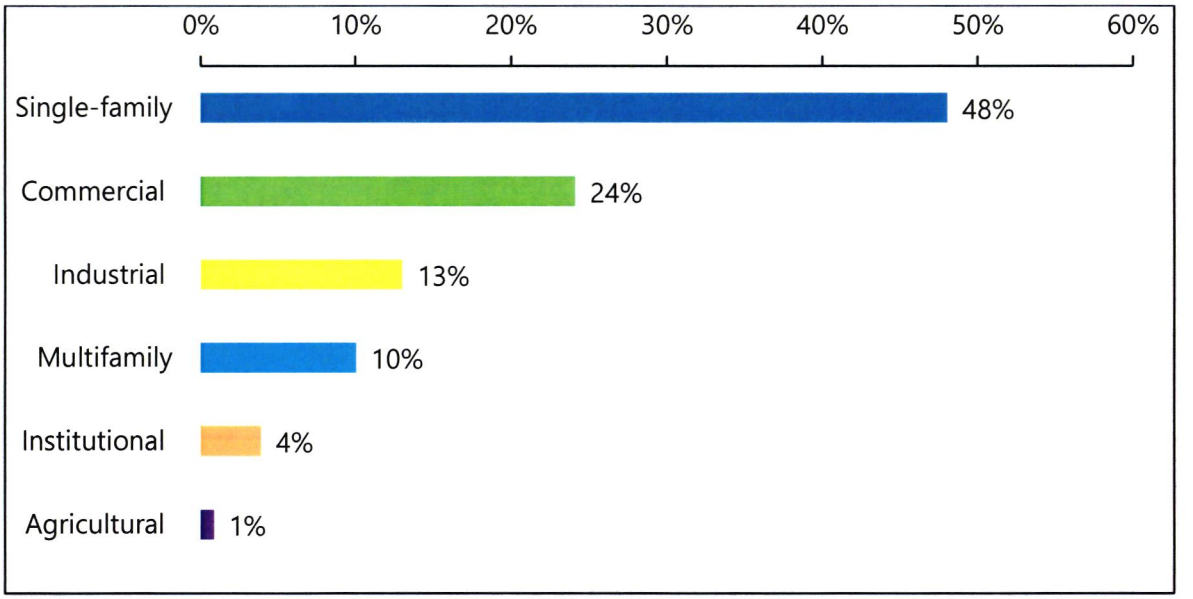
reporting year (Appendix C). More than 60 percent of these utilities were municipality owned, although all types of ownership were represented by at least one system (Figure 3).

Figure 3 – Water systems by ownership type



Of the 394 public water systems that met the criteria of serving more than 3,300 connections in 2019, about 82 percent of these systems reported water use by the various customer sectors. Of those reporting by sector, well over half of the metered water volume was delivered to residential customers consisting of single-family (48 percent) and multifamily (10 percent) customers (Figure 4).

Figure 4 – Sector-based water use, 2019



Note: Sectors are shown as a percentage of total metered water by volume.

Water Use by System Size

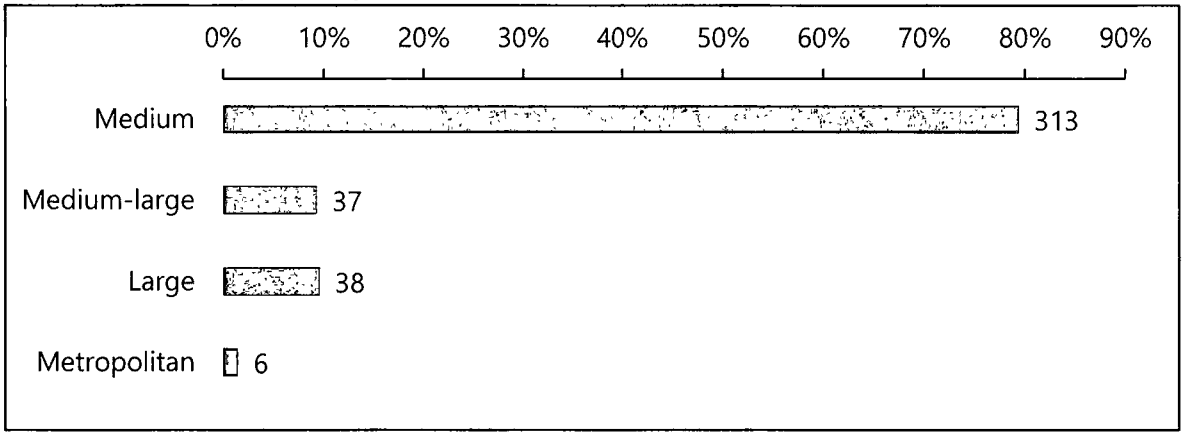
Each system serves a different customer base; however, it is instructive to categorize water systems by general size to examine if there are common characteristics. Table 1 represents the four general size categories based on the total connections reported in the TCEQ's Safe Drinking Water Information System.

Table 1 – System size categories based on total connections

Size categories	Total connections	General population
Medium	3,300–16,667	10,000–50,000
Medium-large	16,668–33,333	50,001–100,000
Large	33,334–166,666	100,001–500,000
Metropolitan	>166,666	>500,000

The criterion of 3,300 connections was set forth in Texas Water Code §16.403. The medium category distinguishes systems from the small-system designation of utilities with fewer than 3,300 connections used by the U.S. Environmental Protection Agency's Drinking Water Infrastructure Needs Survey and Assessment. The additional break points for the size categories were selected for this report based upon population thresholds for various local government development powers, such as extra-territorial jurisdiction buffer size and eligibility for federal Community Development Block Grants. Most water utilities fall into the medium category (Figure 5).

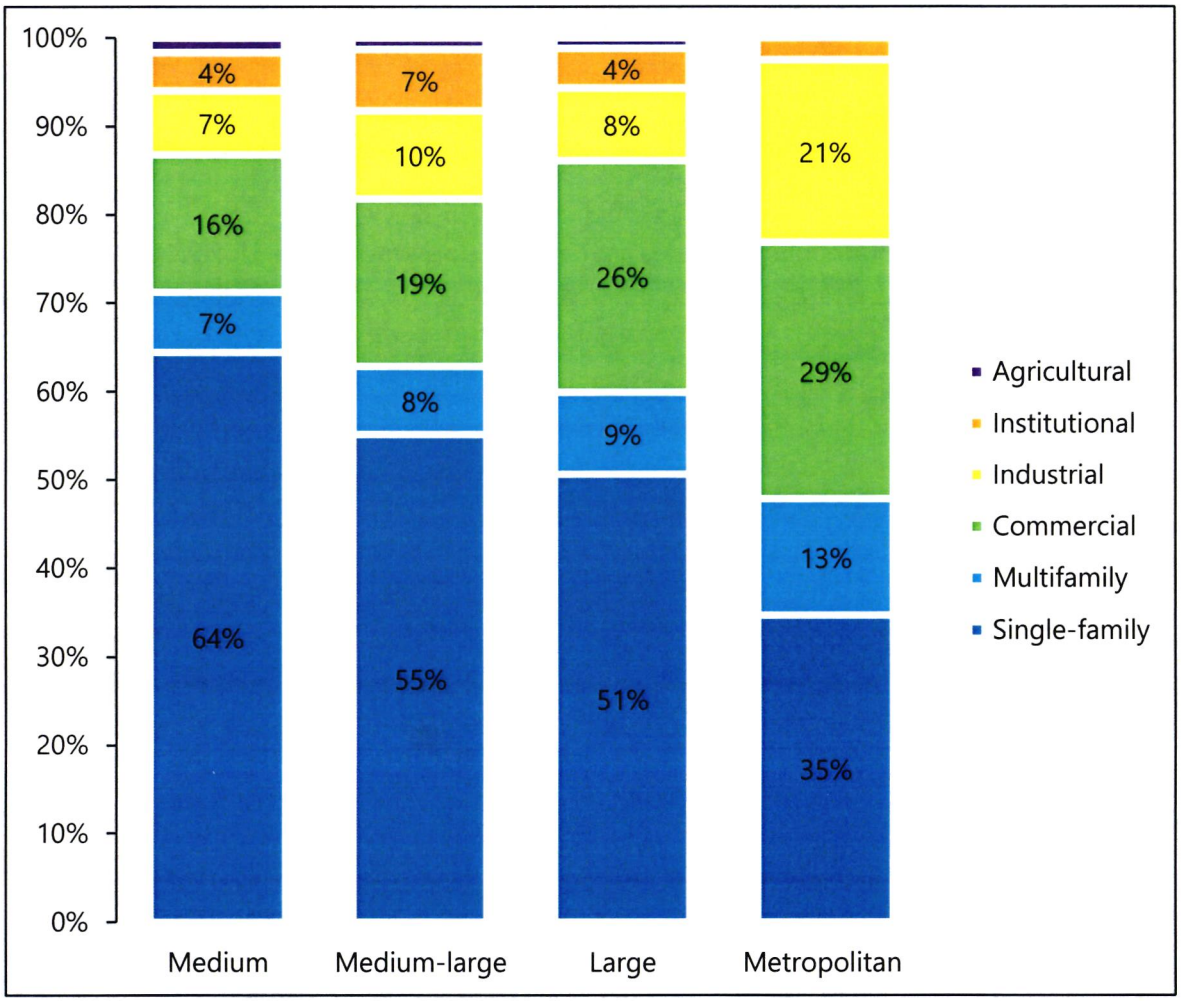
Figure 5 – Water systems by size, 2019



It is generally the case that smaller systems will have a greater percentage of their water used for single-family residences (Figure 6). As a community and its water system grow, more multifamily, institutional, commercial, and industrial customers tend to be established. Furthermore, agricultural water use tends to decrease as a system becomes larger and more urbanized.

The customer base of utilities is unique to the water demands of their location, other utilities in the surrounding area, and available water sources. For example, the industrial sector of metropolitan utilities is heavily weighted by the City of Houston's provision of 43 percent industrial use.

Figure 6 – Sector-based water use by size, 2019



Note: Unlabeled sectors represent less than 4 percent.

5. Daily Water Use

Comparing gallons of per capita daily water use is often difficult and unproductive due to variations in assumptions and calculations. Texas Water Code §16.403 directed the TWDB and TCEQ to develop a uniform methodology of calculating the total and residential water use in gallons per capita daily. The average total gallons per capita daily generally increases with the size of the system since larger systems tend to have more institutional, commercial, and industrial customers. In other words, more water is used, but not necessarily by residents themselves.

Regarding per capita water use (Table 2), 2018 values are used because the system service area population estimates are based on the U.S. Census block group data and utility service area boundaries. Also, the 2019 Census data was not available at the time of this report.

The average residential (single-family and multifamily) water use in gallons per capita daily, often referred to as GPCD, typically decreases as the size category of the utility increases. However, in Table 2, the residential GPCD held steady for the medium to large categories and, as expected, dropped for metropolitan systems. Water loss of approximately 20 GPCD appears to be relatively consistent, regardless of size category of the utility. Total water use in GPCD is the highest among large systems.

Because some systems respond to the survey one year but not the next or they do not consistently report their annual water use by sector, analyzing trends over time can be problematic and misleading. Therefore, it is important for individual systems to carefully track their own changes over time.

Table 2 – Average per-capita daily water use by system size, 2018 (gallons)

	Medium	Medium-large	Large	Metropolitan	All analyzed
Residential	82	82	82	68	82
Water loss	20	21	19	23	20
Total water use	137	134	142	125	137

When water use by sector is available, the resulting average per-connection daily water use better characterizes the system and its customers. When daily water use per connection is calculated, the water use variation between different customer sectors becomes apparent (Table 3). The higher per-connection water usage for multifamily connections is possibly an indication of the difficulty utilities face in determining the number of apartment units/connections versus a single master meter serving an entire apartment complex. Instructions in the Water Use Survey specify the intent to collect the number of housing *units* rather than a count of the master connections for each apartment complex.

Table 3 – Average per-connection daily water use by sector and utility size, 2019 (gallons)

	Medium	Medium-large	Large	Metropolitan	All analyzed utilities
Single-family residential	228	240	229	198	220
Multifamily residential	229	168	197	554	296
Commercial	744	946	1,355	1,636	1,259
Industrial	10,294	28,640	32,729	180,925[5]	41,996
Institutional	1,647	1,811	2,242	1,457	1,770
Agricultural	936	698	585	0	724
Total water use	296	331	342	457	364

[5] The industrial sector of metropolitan utilities is heavily influenced by the City of Houston's industrial water use.

6. TWDB Online Data-Collection Efforts

Consolidated Reporting

In 2013, the 83rd Texas Legislature appropriated funds for the TWDB to consolidate online reporting for the Water Use Survey, Water Loss Audit, and the Conservation Plan Annual Report.[6] As noted earlier, Water Use Survey data from public water systems provided the information analyzed in this report. The integration of the data collection between the survey, audit, and Conservation Plan Annual Report provides a unique opportunity to view how utilities use, lose, and conserve their water.

In 2016, the Water Use Survey and the Water Loss Audit were integrated so that all common information entered in the survey automatically populates in the audit's online form. A subsequent phase of the project, which became operational in January 2018, created an online reporting tool for the Conservation Plan Annual Report. Like the Survey-Audit integration, any common data entered into the first two forms is populated in the Conservation Plan Annual Report. The consolidation and implementation of the innovative online tool save utility staff time and improve the quality of the data collected.

Public Water System Boundary Viewer

The TWDB administers a statewide public water system service boundary mapping application, the "Texas Water Service Boundary Viewer." This online application strives to provide the best current data available on the service areas for all community public water systems within Texas. In conjunction with the annual Water Use Survey, water system participants are able to update their boundaries or verify that the boundaries on file correctly display their service area. In January 2020, the application became available to the public to view the water service boundaries and related reports, including historical water use and TCEQ public water system information. This innovative tool has improved the quality and usefulness of information already being collected in the Water Use Survey.

[6] 83rd Texas Legislature, General Appropriations Act, p. VI-61, paragraph 24.

7. Conclusion

Texas water systems, at the provider level, continue to improve their ability to understand their individual customer base and the volume of water delivered to customers. For providers that do not track water use by customer sectors because of limited billing systems, updated systems could enable them to better identify their customer types. This could make it easier for them to compare their own water use over time and discover any long-term reductions brought about by the implementation of targeted water conservation efforts. It would also help them plan better for long-term needs.

8. Appendix A – General Description of Texas Water Code §16.403 and §16.404

In 2011, the 82nd Texas Legislature passed Senate Bill 181 to address the calculation and reporting of water usage by municipalities and water utilities for state water planning and other purposes. Through amendments to Chapter 16 of the Texas Water Code, this legislation established a consistent method for reporting water use data and improving conservation reporting procedures.

Texas Water Code §16.053(e) requires that regional water plans include information on projected water use and conservation in the regional water planning area, as well as the implementation of projects and water conservation strategies necessary to meet the state's water demands based on these projections. Evaluating implementation of such conservation strategies is dependent upon utilities measuring their water use in a consistent manner over time.

Senate Bill 181 added §16.403 and §16.404 to the Texas Water Code. Section 16.403, Water Use Reporting, required the TWDB and TCEQ, in consultation with the Water Conservation Advisory Council (WCAC), to develop a uniform, consistent methodology for calculating water use and a guidance document for reporting on water conservation. Municipalities and water utilities with more than 3,300 connections are required to use these methodologies in their efforts to develop water conservation plans and prepare annual reports and five-year implementation reports. Section 16.404, Rules and Standards, directs the TWDB and TCEQ to require an entity to report the most detailed level of water use data that the entity can produce.

Texas Water Code §16.404 required that by January 1, 2015, and on that date of each subsequent odd-numbered year, the TWDB shall submit to the legislature a report regarding the statewide water usage by water utilities in the residential, industrial, agricultural, commercial, and institutional sectors, as well as the data collection and reporting program developed.

Development of the Data Collection and Reporting Program

The Senate Bill 181 Committee composed of staff from the TWDB and TCEQ, as well as interested members of the WCAC, developed the reporting methodology. The committee met periodically in late 2011 and early 2012 to discuss rules, definitions, calculations, guidance documents, and other requirements pertaining to implementation of the bill. The Senate Bill 181 Committee developed documents and posted them in December 2012 on the TWDB's website

for public review. The documents resulted in the *Guidance and Methodology for Reporting on Water Conservation and Water Use.* Much of the following information can be found in the guidance document available on the TWDB's website.

Water Use Calculation Methodology

Texas Water Code §16.403 states that "a sector-based water use metric, adjusted for variables in water use by municipalities and water utilities, is necessary to provide an accurate comparison of water use and water conservation among municipalities and water utilities." The TWDB and TCEQ, in consultation with the WCAC, developed a uniform, consistent methodology and guidance for calculating water use and conservation that a municipality or water utility can use when developing water conservation plans and preparing reports required under this code. At a minimum, this sector-based methodology and guidance are required by Texas Water Code §16.403(b) to include

- a method of calculating total water use by a municipality or water utility, including water billed and nonrevenue water used, and a method of calculating water use for each sector of water users served by a municipality or water utility;
- a method of calculating total water use by a municipality or water utility in gallons per capita per day;
- a method of classifying water users within sectors;
- a method of calculating water use in the residential sector that includes both single-family and multi-family residences, in gallons per capita per day;
- a method of calculating water use in the industrial, agricultural, commercial, and institutional sectors that is not dependent on a municipality's population or the number of customers served by a water utility; and
- guidelines on the use of service populations by a municipality or water utility in developing a per-capita-based method of calculation, including guidance on the use of permanent and temporary populations in making calculations.

The results of the collaboration between the TWDB, TCEQ, and WCAC in developing the methodology and guidance can be found in *Guidance and Methodology for Reporting on Water Conservation and Water Use.*

9. Appendix B – Sector Descriptions

Total Water Use and Residential Water Use

The legislature directed the TWDB and TCEQ, in consultation with the Water Conservation Advisory Council (WCAC), to develop "a uniform, consistent methodology and guidance for calculating water use," including total water use in gallons per capita daily and residential (single family and multifamily) in gallons per capita daily (Texas Water Code §16.403[b]). The previously mentioned Senate Bill 181 Committee developed this methodology and guidance, and a full description of the gallons per capita daily figures can be found in *Guidance and Methodology for Reporting on Water Conservation and Water Use.*[7]

Total Water Use

"Total gallons per capita per day takes into account all water use sectors that a system may have including residential, industrial, commercial, institutional, and agricultural. This metric then divides the total volume of water taken into the system by a population number, even though not all of the water use may be population-dependent." (Guidance, p. 29)

Residential Water Use

"Residential gallons per capita per day — the total gallons sold for residential use by a public water supplier divided by the residential population served and then divided by the number of days in the year." (Texas Administrative Code Chapter 288.1) (Guidance, p. 33)

Single-family Residential

Single-family residential use is defined as the use of water that is delivered to single residences, which applies to indoor and outdoor uses. Single-family residential use is a classification of housing in which a single detached dwelling is a freestanding residential building. However, duplexes are also included in the single-family residential sector due to the similarity in water use and the common practice of allowing duplexes within single-family residential zoning areas.

Multifamily Residential

Multifamily residential use is a classification of housing in which multiple separate housing units for residents are contained within one building or several buildings within one complex. Water

[7] www.twdb.texas.gov/conservation/doc/SB181Guidance.pdf (Hereafter referred to as Guidance)

use and the number of units (connections) are often difficult for utilities to report, as the apartment complex may be categorized as commercial and the complex may have a single meter.

Institutional

Institutional use is defined as the use of water by an establishment dedicated to public service, such as a school, university, church, hospital, nursing home, prison, or government facility. All facilities dedicated to public service are considered institutional regardless of ownership. (Guidance, p. 15)

Commercial

Commercial use is defined as the use of water by a place of business, such as a hotel, restaurant, or office building. This does not include multifamily residences or agricultural, industrial, or institutional users. (Guidance, p. 14)

Industrial

Industrial use is defined as the use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, and the development of power by means other than hydroelectric (agricultural use is excluded). (Guidance, p. 14)

Agricultural

Agricultural use is defined as any water use involving agriculture, including irrigation. Agriculture is defined to include the following activities:

- Cultivating the soil to produce crops for human food, animal feed, or seed planting, or for production of fibers
- Practicing floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or non-soil media by a nursery grower
- Raising, feeding, or keeping animals for breeding purposes or for production of food or fiber, leather, pelts, or other tangible products having a commercial value
- Raising or keeping equine animals
- Managing wildlife
- Planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure (Guidance, p. 14)

10. Appendix C – Water Systems by Size with 3,300 or More Connections

(FWSD=Fresh Water Supply District, MUD=Municipal Utility District, MWS=Municipal Water System, SUD=Special Utility District, WCID=Water Control and Improvement District, WSC=Water Supply Corporation, WSD=Water Supply District)

MEDIUM

ACTON MUD
AGUA SUD
ATASCOSA RURAL WSC
BACLIFF MUD
BENBROOK WATER AUTHORITY
BENTON CITY WSC
BETHESDA WSC
BI COUNTY WSC 1
BOLIVAR PENINSULA SUD
BOLIVAR WSC
BORGER MWS
BRIDGESTONE MUD
BROOKESMITH SUD
BRUSHY CREEK MUD
CADDO BASIN SUD
CANYON MWS
CASH SUD
CIMARRON MUD
CITY OF ALAMO
CITY OF ALICE
CITY OF ALVIN
CITY OF ANDREWS
CITY OF ANGLETON
CITY OF ANNA
CITY OF ARANSAS PASS
CITY OF ATHENS
CITY OF AZLE
CITY OF BALCH SPRINGS
CITY OF BASTROP
CITY OF BAY CITY
CITY OF BEDFORD
CITY OF BEEVILLE
CITY OF BELLAIRE
CITY OF BELLMEAD
CITY OF BELTON
CITY OF BIG SPRING
CITY OF BOERNE
CITY OF BONHAM
CITY OF BRENHAM
CITY OF BRIDGE CITY
CITY OF BROWNFIELD
CITY OF BROWNWOOD
CITY OF BUDA
CITY OF BURKBURNETT
CITY OF BURLESON
CITY OF CARTHAGE
CITY OF CEDAR HILL
CITY OF CELINA
CITY OF CIBOLO
CITY OF CLEBURNE
CITY OF CLEVELAND
CITY OF CLUTE
CITY OF COLLEYVILLE
CITY OF CONVERSE
CITY OF COPPELL
CITY OF COPPERAS COVE
CITY OF CORINTH
CITY OF CORSICANA
CITY OF CROWLEY
CITY OF DEER PARK
CITY OF DENISON
CITY OF DONNA
CITY OF DUMAS
CITY OF DUNCANVILLE
CITY OF EL CAMPO
CITY OF ELGIN
CITY OF ENNIS
CITY OF FATE
CITY OF FOREST HILL
CITY OF FORNEY
CITY OF FORT STOCKTON
CITY OF FREDERICKSBURG
CITY OF FREEPORT
CITY OF FRIENDSWOOD
CITY OF FULSHEAR
CITY OF GAINESVILLE
CITY OF GALENA PARK
CITY OF GATESVILLE
CITY OF GLENN HEIGHTS
CITY OF GRAHAM
CITY OF GRANBURY
CITY OF GREENVILLE
CITY OF GROVES
CITY OF HALTOM CITY
CITY OF HARKER HEIGHTS
CITY OF HEATH
CITY OF HENDERSON
CITY OF HEWITT
CITY OF HIDALGO
CITY OF HIGHLAND VILLAGE
CITY OF HORSESHOE BAY
CITY OF HUMBLE
CITY OF HUTTO
CITY OF INGLESIDE
CITY OF JACKSONVILLE
CITY OF JASPER
CITY OF JERSEY VILLAGE
CITY OF KATY
CITY OF KELLER
CITY OF KENNEDALE
CITY OF KERMIT
CITY OF KERRVILLE
CITY OF KILGORE
CITY OF KINGSVILLE
CITY OF KYLE
CITY OF LA MARQUE
CITY OF LA PORTE
CITY OF LAGO VISTA
CITY OF LAKE JACKSON
CITY OF LAMESA
CITY OF LAMPASAS
CITY OF LANCASTER
CITY OF LEVELLAND
CITY OF LOCKHART
CITY OF MABANK
CITY OF MANOR
CITY OF MARSHALL
CITY OF MELISSA
CITY OF MERCEDES
CITY OF MIDLOTHIAN
CITY OF MINERAL WELLS
CITY OF MOUNT PLEASANT
CITY OF MURPHY

MEDIUM (continued)

CITY OF NAVASOTA
CITY OF NEDERLAND
CITY OF ORANGE
CITY OF PALESTINE
CITY OF PAMPA
CITY OF PARIS
CITY OF PECOS
CITY OF PFLUGERVILLE
CITY OF PLEASANTON
CITY OF PORT LAVACA
CITY OF PORT NECHES
CITY OF PORTLAND
CITY OF PRINCETON
CITY OF RICHLAND HILLS
CITY OF RICHMOND
CITY OF RIO GRANDE CITY
CITY OF ROBINSON
CITY OF ROCKPORT
CITY OF ROCKWALL
CITY OF ROMA
CITY OF ROSENBERG
CITY OF ROYSE CITY
CITY OF SACHSE
CITY OF SAGINAW
CITY OF SAN BENITO
CITY OF SAN JUAN
CITY OF SCHERTZ
CITY OF SEABROOK
CITY OF SEAGOVILLE
CITY OF SEGUIN
CITY OF SELMA
CITY OF SILSBEE
CITY OF SNYDER
CITY OF SOUTH HOUSTON
CITY OF SOUTHLAKE
CITY OF STEPHENVILLE
CITY OF SUGAR LAND - GREATWOOD
CITY OF SUGAR LAND - NEW TERRITORY
CITY OF SULPHUR SPRINGS
CITY OF SWEETWATER
CITY OF TAYLOR
CITY OF TERRELL
CITY OF TEXAS CITY
CITY OF TOMBALL
CITY OF UNIVERSAL CITY
CITY OF UNIVERSITY PARK
CITY OF UVALDE
CITY OF VERNON
CITY OF WATAUGA
CITY OF WEATHERFORD
CITY OF WEBSTER
CITY OF WESLACO
CITY OF WEST UNIVERSITY PLACE
CITY OF WHITE SETTLEMENT
CITY OF WOODWAY
CITY OF WYLIE
CLEAR BROOK CITY MUD
CLWSC CANYON LAKE SHORES
CNP UTILITY DISTRICT
CONSOLIDATED WSC 287 SOUTH
COUNTY LINE SUD
CRYSTAL CLEAR SUD
CYPRESS HILL MUD 1
CYPRESS SPRINGS SUD
DALHART MWS
DEL RIO UTILITIES COMMISSION
DENTON COUNTY FWSD 1
DENTON COUNTY FWSD 7 LANTANA
EAST CEDAR CREEK FWSD
BROOKSHIRE
EAST CENTRAL SUD
EAST FORK SUD
EAST RIO HONDO WSC
ECTOR COUNTY UTILITY DISTRICT
FORT BEND COUNTY MUD 128
FORT BEND COUNTY MUD 142
FORT BEND COUNTY MUD 23
FORT BEND COUNTY MUD 25
FORT BEND COUNTY MUD 30
FORT BEND COUNTY MUD 58
FORT BEND COUNTY WCID 2
GALVESTON COUNTY WCID 1
G-M WSC
GOFORTH SUD
GREEN VALLEY SUD
HARRIS COUNTY FWSD 51
HARRIS COUNTY FWSD 61
HARRIS COUNTY MUD 1
HARRIS COUNTY MUD 102
HARRIS COUNTY MUD 105
HARRIS COUNTY MUD 120
HARRIS COUNTY MUD 157
HARRIS COUNTY MUD 165
HARRIS COUNTY MUD 167
HARRIS COUNTY MUD 168
HARRIS COUNTY MUD 200
HARRIS COUNTY MUD 24
HARRIS COUNTY MUD 26
HARRIS COUNTY MUD 285
HARRIS COUNTY MUD 368
HARRIS COUNTY MUD 419
HARRIS COUNTY MUD 53
HARRIS COUNTY MUD 55
HARRIS COUNTY MUD 71
HARRIS COUNTY MUD 81
HARRIS COUNTY MUD 82
HARRIS COUNTY UTILITY DISTRICT 6
HARRIS COUNTY WCID 109
HARRIS COUNTY WCID 21
HARRIS COUNTY WCID 36
HARRIS COUNTY WCID 96
HARRIS MONTGOMERY CO MUD 386
HEREFORD MWS
HORIZON REGIONAL MUD
HUDSON WSC
JONAH WATER SUD
KEMPNER WSC
KINGSLAND WSC
LAGUNA MADRE WATER DISTRICT
LAKE CITIES MUA
LAKEWAY MUD
LAMAR COUNTY WSD
LANGHAM CREEK UTILITY DISTRICT
LEE COUNTY WSC
LINDALE RURAL WSC
LUMBERTON MUD
MACEDONIA EYLAU MUD 1
MANVILLE WSC
CITY OF LANCASTER
CITY OF LEVELLAND
CITY OF LOCKHART
CITY OF MABANK
CITY OF MANOR
CITY OF MARSHALL
CITY OF MELISSA

MEDIUM (continued)

CITY OF MERCEDES
CITY OF MIDLOTHIAN
CITY OF MINERAL WELLS
CITY OF MOUNT PLEASANT
CITY OF MURPHY
CITY OF NAVASOTA
CITY OF NEDERLAND
CITY OF ORANGE
CITY OF PALESTINE
CITY OF PAMPA
CITY OF PARIS
CITY OF PECOS
CITY OF PFLUGERVILLE
CITY OF PLEASANTON
CITY OF PORT LAVACA
CITY OF PORT NECHES
CITY OF PORTLAND
CITY OF PRINCETON
CITY OF RICHLAND HILLS
CITY OF RICHMOND
CITY OF RIO GRANDE CITY
CITY OF ROBINSON
CITY OF ROCKPORT
CITY OF ROCKWALL
CITY OF ROMA
CITY OF ROSENBERG
CITY OF ROYSE CITY
CITY OF SACHSE
CITY OF SAGINAW
CITY OF SAN BENITO
CITY OF SAN JUAN
CITY OF SCHERTZ
CITY OF SEABROOK
CITY OF SEAGOVILLE
CITY OF SEGUIN
CITY OF SELMA
CITY OF SILSBEE
CITY OF SNYDER
CITY OF SOUTH HOUSTON
CITY OF SOUTHLAKE
CITY OF STEPHENVILLE
CITY OF SUGAR LAND - GREATWOOD
CITY OF SUGAR LAND - NEW TERRITORY
CITY OF SULPHUR SPRINGS
CITY OF SWEETWATER
CITY OF TAYLOR
CITY OF TERRELL
CITY OF TEXAS CITY
CITY OF TOMBALL
CITY OF UNIVERSAL CITY
CITY OF UNIVERSITY PARK
CITY OF UVALDE
CITY OF VERNON
CITY OF WATAUGA
CITY OF WEATHERFORD
CITY OF WEBSTER
CITY OF WESLACO
CITY OF WEST UNIVERSITY PLACE
CITY OF WHITE SETTLEMENT
CITY OF WOODWAY
CITY OF WYLIE
CLEAR BROOK CITY MUD
CLWSC CANYON LAKE SHORES
CNP UTILITY DISTRICT
CONSOLIDATED WSC 287 SOUTH
COUNTY LINE SUD
CRYSTAL CLEAR SUD
CYPRESS HILL MUD 1
CYPRESS SPRINGS SUD
DALHART MWS
DEL RIO UTILITIES COMMISSION
DENTON COUNTY FWSD 1
DENTON COUNTY FWSD 7
LANTANA
EAST CEDAR CREEK FWSD
BROOKSHIRE
EAST CENTRAL SUD
EAST FORK SUD
EAST RIO HONDO WSC
ECTOR COUNTY UTILITY DISTRICT
FORT BEND COUNTY MUD 128
FORT BEND COUNTY MUD 142
FORT BEND COUNTY MUD 23
FORT BEND COUNTY MUD 25
FORT BEND COUNTY MUD 30
FORT BEND COUNTY MUD 58
FORT BEND COUNTY WCID 2
GALVESTON COUNTY WCID 1
G-M WSC
GOFORTH SUD
GREEN VALLEY SUD
HARRIS COUNTY FWSD 51
HARRIS COUNTY FWSD 61
HARRIS COUNTY MUD 1
HARRIS COUNTY MUD 102
HARRIS COUNTY MUD 105
HARRIS COUNTY MUD 120
HARRIS COUNTY MUD 157
HARRIS COUNTY MUD 165
HARRIS COUNTY MUD 167
HARRIS COUNTY MUD 168
HARRIS COUNTY MUD 200
HARRIS COUNTY MUD 24
HARRIS COUNTY MUD 26
HARRIS COUNTY MUD 285
HARRIS COUNTY MUD 368
HARRIS COUNTY MUD 419
HARRIS COUNTY MUD 53
HARRIS COUNTY MUD 55
HARRIS COUNTY MUD 71
HARRIS COUNTY MUD 81
HARRIS COUNTY MUD 82
HARRIS COUNTY UTILITY DISTRICT 6
HARRIS COUNTY WCID 109
HARRIS COUNTY WCID 21
HARRIS COUNTY WCID 36
HARRIS COUNTY WCID 96
HARRIS MONTGOMERY CO MUD 386
HEREFORD MWS
HORIZON REGIONAL MUD
HUDSON WSC
JONAH WATER SUD
KEMPNER WSC
KINGSLAND WSC
LAGUNA MADRE WATER DISTRICT
LAKE CITIES MUA
LAKEWAY MUD
LAMAR COUNTY WATER SUPPLY DIST
LANGHAM CREEK UTILITY DISTRICT
LEE COUNTY WSC
LINDALE RURAL WSC
LUMBERTON MUD
MACEDONIA EYLAU MUD 1
MANVILLE WSC
MAURICEVILLE MUD
MEMORIAL VILLAGES WATER AUTHORITY
MILITARY HWY WSC LAS RUSIAS
MILITARY HWY WSC PROGRESO
MISSION BEND MUD 2

MEDIUM (continued)

MONTGOMERY COUNTY MUD 46
MONTGOMERY COUNTY MUD 47
MONTGOMERY COUNTY MUD 60
MONTGOMERY COUNTY MUD 67
MONTGOMERY COUNTY MUD 7
MONTGOMERY COUNTY MUD 8
MONTGOMERY COUNTY MUD 9
MONTGOMERY TRACE WATER SYSTEM
MOUNTAIN PEAK SUD
MUSTANG SUD
NEW CANEY MUD
NEWPORT MUD
NORTH AUSTIN MUD 1
NORTHTOWN MUD
NORTHWEST HARRIS COUNTY MUD 5
NORTHWEST PARK MUD
NUECES COUNTY WCID 3
NUECES COUNTY WCID 4
ORANGE COUNTY WCID 1
PASEO DEL ESTE MUD 1
PECAN GROVE MUD
PERRYTON MWS
PLAINVIEW MWS
PONDEROSA FOREST UTILITY DISTRICT
PORTER SUD
QUAIL VALLEY UTILITY DISTRICT
RAYFORD ROAD MUD
REMINGTON MUD 1
ROCKETT SUD
S S WSC
SARDIS LONE ELM WSC
SAWS CASTLE HILLS
SAWS TEXAS RESEARCH PARK
SJWTX TRIPLE PEAK PLANT
SOUTHWEST MILAM WSC
SOUTHERN MONTGOMERY CO MUD
SPRING CREEK UTILITY DISTRICT
SPRINGS HILL WSC
TALTY SUD
THE WOODLANDS MUD 1
TIMBER LANE UTILITY DISTRICT
TOWN OF ADDISON
TOWN OF FAIRVIEW
TOWN OF HIGHLAND PARK
TOWN OF LITTLE ELM
TOWN OF PROSPER
TRAVIS COUNTY WCID 17
TRI SUD
WELLBORN SUD
WELLS BRANCH MUD 1
WEST CEDAR CREEK MUD
WEST JEFFERSON COUNTY MWD
WEST TRAVIS COUNTY PUBLIC UTILITY
WICKSON CREEK SUD
WINDERMERE COMMUNITY
ZAPATA COUNTY WATERWORKS

Water Use of Texas Water Utilities, January 1, 2021

MEDIUM-LARGE
AQUA WSC
CITY OF BRYAN
CITY OF CEDAR PARK
CITY OF CONROE
CITY OF DESOTO
CITY OF EAGLE PASS
CITY OF EDINBURG
CITY OF EULESS
CITY OF FARMERS BRANCH
CITY OF GALVESTON
CITY OF GRAPEVINE
CITY OF HUNTSVILLE
CITY OF HURST
CITY OF LEANDER
CITY OF LONGVIEW
CITY OF LUFKIN
CITY OF MANSFIELD
CITY OF MISSION
CITY OF NACOGDOCHES
CITY OF NORTH RICHLAND HILLS
CITY OF PHARR
CITY OF PORT ARTHUR
CITY OF ROWLETT
CITY OF SAN MARCOS
CITY OF SHERMAN
CITY OF SUGAR LAND
CITY OF THE COLONY
CITY OF VICTORIA
CITY OF WAXAHACHIE
CLEAR LAKE CITY WA
HARLINGEN WATER WORKS SYSTEM
JOHNSON COUNTY SUD
SAWS NORTHEAST
SHARYLAND WSC
SOUTHERN UTILITIES
TEXARKANA WATER UTILITIES
TOWN OF FLOWER MOUND

LARGE
AMARILLO MWS
BROWNSVILLE PUBLIC UTILITIES
CITY OF ABILENE
CITY OF ALLEN
CITY OF ARLINGTON
CITY OF BAYTOWN
CITY OF BEAUMONT
CITY OF CARROLLTON
CITY OF COLLEGE STATION
CITY OF CORPUS CHRISTI
CITY OF DENTON
CITY OF FRISCO
CITY OF GARLAND
CITY OF GEORGETOWN
CITY OF GRAND PRAIRIE
CITY OF IRVING
CITY OF KILLEEN
CITY OF LAREDO
CITY OF LEAGUE CITY
CITY OF LEWISVILLE
CITY OF MCKINNEY
CITY OF MESQUITE
CITY OF MIDLAND
CITY OF ODESSA
CITY OF PASADENA
CITY OF PEARLAND
CITY OF PLANO
CITY OF RICHARDSON
CITY OF ROUND ROCK
CITY OF SAN ANGELO
CITY OF TEMPLE
CITY OF TYLER
CITY OF WACO
CITY OF WICHITA FALLS
LUBBOCK PUBLIC WATER SYSTEM
MCALLEN PUBLIC UTILITY
NEW BRAUNFELS UTILITIES
NORTH ALAMO WSC

METROPOLITAN
CITY OF AUSTIN
CITY OF DALLAS
CITY OF FORT WORTH
CITY OF HOUSTON
EL PASO WATER UTILITIES
SAN ANTONIO WATER SYSTEM