San Antonio Water System

Water and Wastewater Facilities Land Use Assumptions Plan, Capital Improvements Plan, and Maximum Impact Fees Study

# Land Use Assumptions Technical Memorandum

November 2018

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# Glossary

| | |
|---|---|
| ADF | Average daily flow |
| Carollo | I, Inc. |
| CCN | Certificate of Convenience and Necessity |
| CIP | Capital Improvements Program |
| EDU | Equivalent Dwelling Unit. For SAWS, one (1) Water EDU is proposed as 290 gal/day and one (1) Wastewater EDU is proposed as 200 gal/day. |
| GPCD | Gallon per capita per day |
| GPD | Gallons per day |
| I/I | Inflow and infiltration. For SAWS, the infiltration and inflow is assumed to be 600 gpd and is used to determine the wastewater system's peak wet weather flow. |
| Impact Fee | A charge or assessment imposed upon new development in order to generate revenue for funding and recovering the costs of capital improvements or facility expansions required to serve that development. |
| LUAP | Land Use Assumptions Plan |
| MG | Million gallons |
| PWWF | Peak wet weather flow. For SAWS, the PWWF is 650 gal/EDU. |
| SAWS | San Antonio Water System |
| Service Area | The area within the corporate boundaries or extraterritorial jurisdiction, as determined under Chapter 42, of the political subdivision to be served by the capital improvements or facilities expansions specified in the capital improvements plan, except roadway facilities and storm water, drainage, and flood control facilities. (TLGC §395) |
| TLGC | Texas Local Government Code |
| WMP | Water Management Plan |
| WRC | Water Recycling Center |

# Section 1 Introduction

The San Antonio Water System (SAWS) provides water and wastewater service to large portions of Bexar County and has authority to provide service to parts of two adjacent counties. SAWS retained Carollo Engineers (Carollo) to review and update the existing Land Use Assumptions Plan (LUAP) to determine what portions require updates for the ten-year period of 2019 through 2028 in order to assess its impact fees. Impact fees provide utilities with a mechanism for funding or recouping costs associated with capital improvements or facility expansions of water and/or wastewater systems necessitated and attributable to new development.

From Chapter 395 of the Texas Local Government Code (TLGC §395), utilities adopt a LUAP and Capital Improvements Plan (CIP) before assessing or collecting impact fees to fund capital improvements required to serve new development. The LUAP incorporates the best information available to project future land use and demand for service areas within which a municipality intends to supply utility services.

Identification of potential changes to improve the impact fee equity requires an evaluation of existing service areas. SAWS has a total of five impact fee components. For the Water System, the components evaluated are Water Supply, System Development, and Flow. For the Wastewater System, the components are Wastewater Treatment and Collection. Because land use assumptions are based on a ten-year period, these assumptions may be general and do not require detailed projections for specific tracts of land.

This technical memorandum summarizes the projected growth in number of equivalent dwelling units (EDU) for each component by service area for the impact fee study period 2019 through 2028. An EDU is a standardized measure of demand for an average single family household unit. These projections help determine where capacity will be required to serve new development and what portion of planned CIP will be eligible for inclusion in subsequent impact fee calculations.

# Section 2 Methodology

The land use assumption focuses on the existing and projected SAWS data for service area populations and EDUs. Projected land use assumptions are based on existing land use data from the 2017 SAWS Water Management Plan (WMP), historical operations data, and hydraulic analysis of the water and wastewater systems. The following sections describe the methodologies to evaluate land use, population, and EDUs.

## 2.1 Existing Land Use

SAWS service areas remain consistent, but, based on the 2017 WMP, some land use by acreage has changed. The service area land use distribution is provided in Table 1.

Table 1 Existing Service Area Land Use Distribution

| | Water | | Wastewater | |
|---|---|---|---|---|
| Land Use | Acres | Percentage | Acres | Percentage |
| Commercial | 92,859 | 18% | 90,731 | 19% |
| Industrial | 5,796 | 1% | 5,354 | 1% |
| Residential | 163,944 | 32% | 149,000 | 32% |
| Undevelopable | 53,372 | 10% | 47,384 | 10% |
| Vacant | 197,877 | 39% | 174,714 | 37% |
| **Total** | **513,848** | | **467,182** | |

The land use includes undevelopable land such as parks, lakes, cemeteries, roads, landfills, easements, and floodplains. Land that is identified as vacant is the largest usage share and does not fall into other categories. Vacant land could be developed into any of the other categories.

## 2.2 Population Projections

The SAWS process for projecting population coordinates information from state and local agencies with data from private sector master plans. The water system population projections for these land use assumptions are based upon the 2017 WMP. The wastewater population data is adjusted based on the hydraulic model. The modeling data inputs include existing land uses, household sizes and birthrates, employment numbers and types, future roads and developable land. The model projects future population and households based on common transportation and land use relationships determined by the inputs.

Figure 1 and Table 2 summarize the existing and projected population change for the Water service areas.

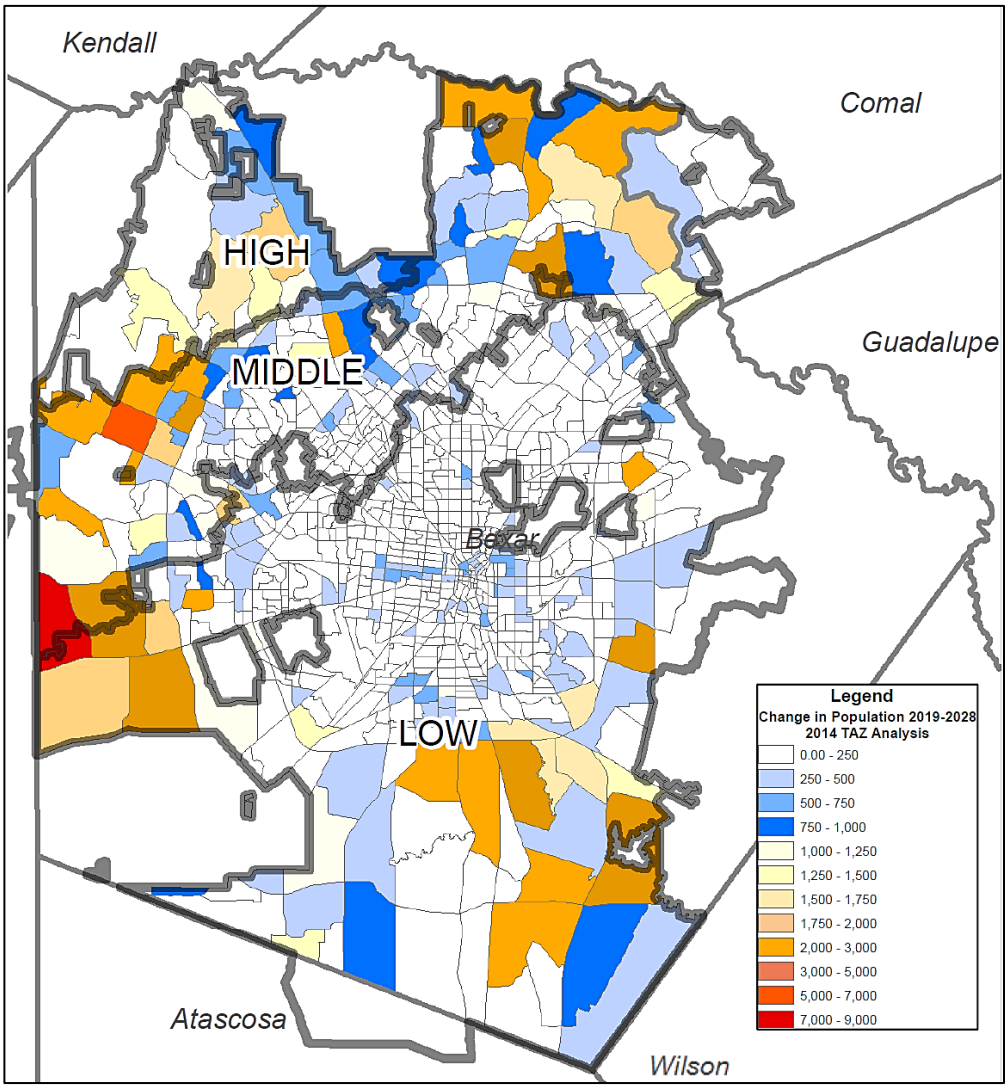


Figure 1 Water Service Area Population Change for 2019 through 2028

Table 2 Water Service Area Population Years 2018 and 2028

| Service Area | Year 2018 | | Year 2028 | |
|---|---|---|---|---|
| | Population (1) | Percentage | Population (1) | Percentage |
| Low Elevation | 1,167,848 | 63% | 1,355,336 | 62% |
| Middle Elevation | 626,725 | 34% | 761,709 | 35% |
| High Elevation | 56,774 | 3% | 73,134 | 3% |
| **Total** | **1,851,347** | | **2,190,179** | |

Notes:
(1) Service area populations are as of December 31 of the year.

Figure 2 and Table 3 summarize the existing and projected population change for the Wastewater service areas.

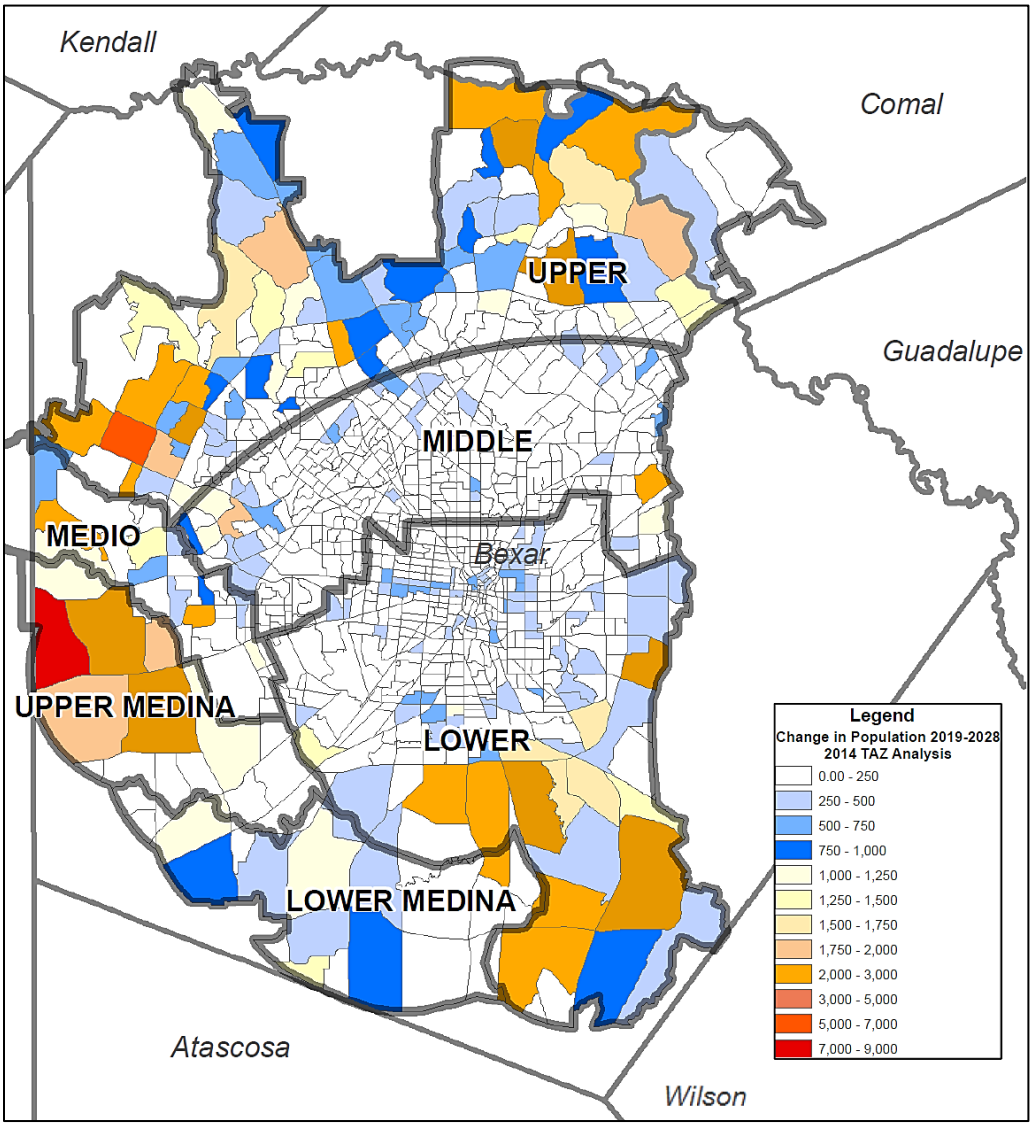


Figure 2 Wastewater Service Area Population Change for 2019 through 2028

Table 3 Wastewater Service Area Population Years 2018 and 2028

| Service Area | Year 2018 | | Year 2028 | |
|---|---|---|---|---|
| | Population (1) | Percentage | Population (1) | Percentage |
| Medio Creek | 128,601 | 7% | 167,581 | 8% |
| | | | | |
| Leon Creek/Dos Rios | | | | |
| Upper Medina | 47,632 | 3% | 77,616 | 4% |
| Lower Medina | 17,944 | 1% | 29,278 | 1% |
| Upper Collection | 450,173 | 24% | 551,404 | 25% |
| Middle Collection | 626,973 | 34% | 682,919 | 31% |
| Lower Collection | 580,025 | 31% | 681,380 | 31% |
| **Total** | **1,851,348** | | **2,190,178** | |

Notes:
(1) Service area populations are as of December 31 of the year.

# Section 3 EDU Definition

## 3.1 EDU Calculations and Factors

Demand is projected by converting population to EDUs. For the LUAP, an EDU is the common measure since it is the standardized expression of water demand for an average household unit. A single family residence using a 5/8-inch meter has one (1) EDU demand on the water system. Commercial and industrial users have larger meters, higher demand, and higher numbers of EDUs. For the water system, the calculation to determine one (1) EDU is the annual usage in million gallons (MG) divided by the product of total annual EDUs for all days in the year.

This EDU calculation is illustrated by the following formula:

$$1\ EDU = (\ Total\ Annual\ Flow\ ) \div (\ Total\ Annual\ EDUs\ x\ 365\ days\ )$$

For example, for the water system, the 2017 EDU calculation yields:

$$1\ EDU\ =\ (\ 78{,}443\ MG\ ) \div (\ 760{,}081\ EDUs\ x\ 365\ days) \ =\ 283\ gpd$$

However, for this study, one (1) water EDU is proposed to equal 290 gallons per day (gpd). This proposed EDU of 290 gpd is based on the average usage per EDU for the past five-year period from 2013 through 2017. The SAWS water system experiences a variability of EDU growth per year, but the five-year period best encompasses the decreasing demand trend that started in 2008. Over the past decade, there was a peak in usage in 2011, but the overall trend is decreasing due to conservation efforts.

Figure 3 illustrates the change in actual EDUs and compares it to the EDU projections from the previous LUAPs completed in 2006, 2011, and 2014.

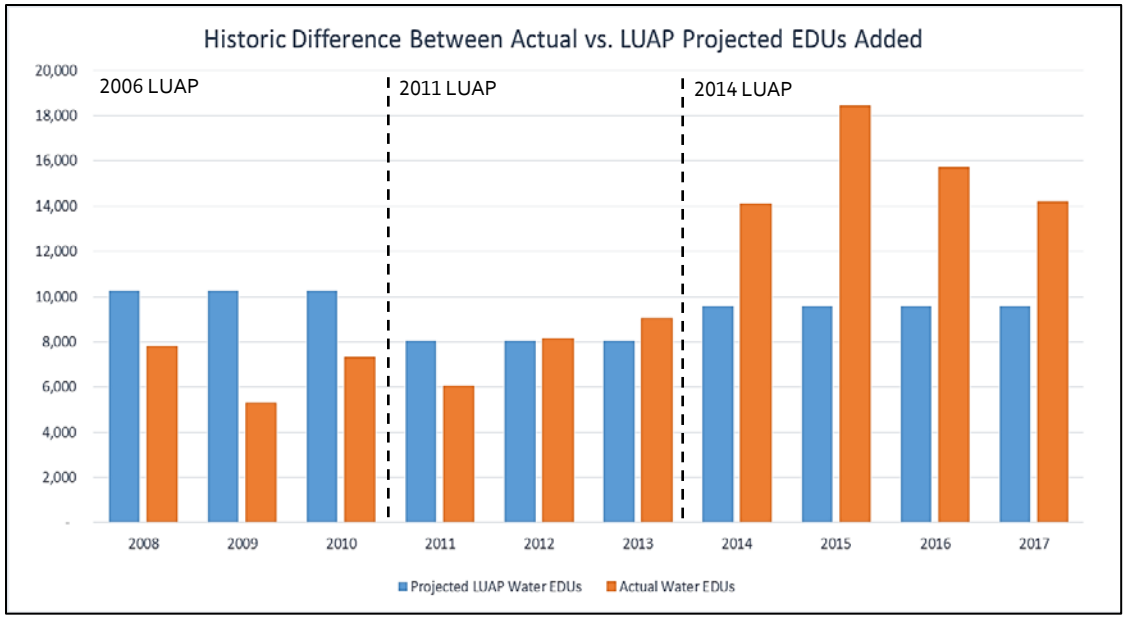


Figure 3 Actual vs. Projected EDUs Added from 2008 through 2017

For projections within the 2006 and 2011 LUAPs, the average EDU growth was a static increase of approximately 10,300 and 8,000 EDUs per year, respectively. However, for the 2014 LUAP, a more dynamic approach was implemented in the form of a population to EDU ratio. The population to EDU ratio is useful to represent population as demand, currently and in the future. The 2014 LUAP applied a 2.40 population to EDU ratio to project the number of water EDUs and 2.39 to project wastewater EDUs. EDUs were adjusted to remove customers of the San Antonio River Authority and Leon Springs utilities, as well as those customers with septic tanks.

The following formula is used to calculate the Population to EDU ratio:

$$\begin{matrix} Population\ to \\ EDU\ Ratio \end{matrix} = \left( \begin{matrix} Actual\ Service\ Area\ Population \\ Five\ Year\ Average \end{matrix} \right) \div \left( \begin{matrix} Actual\ EDUs \\ Five\ Year\ Average \end{matrix} \right)$$

Similarly for this LUAP, future EDU projections are calculated with the population to EDU ratio based on the preceding five-year period between 2013 and 2017. However, the ratio is calculated separately for the water and wastewater systems, and the EDUs are calculated using the 2017 WMP data. For the ten-year period beyond 2018, the population to EDU ratio is projected to be 2.39 for the water system and 2.57 for the wastewater system as illustrated by the following calculations:

$$\begin{matrix} Water\ Population \\ to\ EDU\ Ratio \end{matrix} = (\ 1{,}745{,}801\ customers\ ) \div (\ 729{,}144\ \ EDUs\ ) = 2.39$$

$$\begin{matrix} Wastewater\ Population \\ to\ EDU\ Ratio \end{matrix} = (\ 1{,}745{,}801\ customers\ ) \div (\ 679{,}740\ EDUs\ ) = 2.57$$

The future EDU projection is the future population projection multiplied by the EDU to Population factor. The annual EDU calculations for the water and wastewater systems are shown in Table 4.

Table 4 Projected Water and Wastewater EDUs Added Annually

| Year | Water EDUs Added at 2.39 Ratio | Cumulative Water EDUs | Wastewater EDUs Added at 2.57 Ratio | Cumulative Wastewater EDUs |
|---|---|---|---|---|
| 2018 | 13,486 | 774,623 | 17,082 | 720,369 |
| 2019 | 14,209 | 788,832 | 13,214 | 733,583 |
| 2020 | 14,210 | 803,042 | 13,215 | 746,798 |
| 2021 | 14,169 | 817,211 | 13,176 | 759,974 |
| 2022 | 14,169 | 831,380 | 13,177 | 773,151 |
| 2023 | 14,169 | 845,549 | 13,176 | 786,327 |
| 2024 | 14,168 | 859,717 | 13,177 | 799,504 |
| 2025 | 14,169 | 873,886 | 13,176 | 812,680 |
| 2026 | 14,169 | 888,055 | 13,176 | 825,856 |
| 2027 | 14,169 | 902,224 | 13,177 | 839,033 |
| 2028 | 14,169 | 916,393 | 13,176 | 852,209 |

## 3.2 Wastewater EDUs

A wastewater EDU equivalent of 200 gpd is proposed in this study. The wastewater EDU calculation is similar to the water calculation, however there is an additional step due to the difference in water customer usage and wastewater customer demand. To determine one (1) EDU for the wastewater system, the wastewater treatment plant (WWTP) flow is divided into the wastewater EDUs for each day of the year.

The following formula illustrates how to calculate a wastewater EDU:

$$1\ EDU = \left(\begin{array}{c} Annual\ WWTP\ Flow \\ Five\ Year\ Average \end{array}\right) \div \left(\begin{array}{c} Annual\ EDUs \\ Five\ Year\ Average \end{array}\ x\ 365\ days\right)$$

$$1\ EDU = (\ 48,331\ MG\ ) \div (\ 660{,}198\ EDUs\ x\ 365\ days) = 200\ gpd$$

For SAWS, the 200 gpd wastewater EDU recommendation represents the average daily flow (ADF). For peak wet weather flow (PWWF), that flow is multiplied by the 2.5 peaking factor then infiltration and inflow (I/I) is added. For SAWS, the I/I is assumed to be 600 gpd per acre. At 4 EDUs per acre (150 gpd per EDU), the total PWWF is 650 gpd per EDU. Further details of this PWWF calculation are in the Demand Criterion section of the CIP Chapter.

A wastewater EDU can be based on flow and/or loadings of the system. Many utilities are experiencing conservation that is causing excess hydraulic capacity, but limited loadings capacity. As a result, some utilities are evaluating if an EDU based on hydraulic or loadings capacity—or a combination of both— is most equitable. However, Carollo does not recommend modifying the wastewater EDU to include loadings capacity because SAWS already requires pretreatment for high-strength customer.

# Section 4 Service Areas

According to the TLGC Chapter 395, service areas are the zones within the corporate boundaries or extraterritorial jurisdiction (as determined under Chapter 42) of the political subdivision to be served by the capital improvements or facilities expansions specified in the CIP, except roadway

facilities and storm water, drainage, and flood control facilities. State of Texas authority is provided by Certificate of Convenience and Necessity (CCN) and some service is provided by contract outside of the CCN. SAWS service areas remain consistent for this study's land use assumptions.

## 4.1 Water Service Areas

The three impact fee components evaluated for the water system are Water Supply, System Development, and Flow. Water Supply facilities are the infrastructure associated with providing new water sources to the system. The proposed Water Supply impact fee service area is the infrastructure associated with providing new water sources to the system. System Development facilities are the infrastructure associated with pumping, storing, and transmitting water to the distribution system. Flow facilities make up the distribution system. The population and EDU projections for the water impact fee service areas are summarized in Table 5.

Table 5 Water Service Areas Populations and EDU Projections

| Component | Service Area | Population (1) | | EDUs | | |
|---|---|---|---|---|---|---|
| | | 2018 | 2028 | 2018 | 2028 | Change |
| **Total Water Supply / Flow** | All | **1,851,348** | **2,190,178** | **774,623** | **916,393** | **141,770** |
| System Development | Low Elevation | 1,167,848 | 1,355,336 | 488,639 | 567,086 | 78,447 |
| | Middle Elevation | 626,725 | 761,709 | 262,229 | 318,707 | 56,478 |
| | High Elevation | 56,774 | 73,134 | 23,755 | 30,600 | 6,845 |
| **Total System Development** | | **1,851,348** | **2,190,178** | **774,623** | **916,393** | **141,770** |

Notes:
(1) Service area populations are as of December 31 of the year.

The general water service area for SAWS is illustrated by Figure 4. The water system map shows the City of San Antonio (COSA) extraterritorial jurisdiction and the areas of Bexar County served by other purveyors.

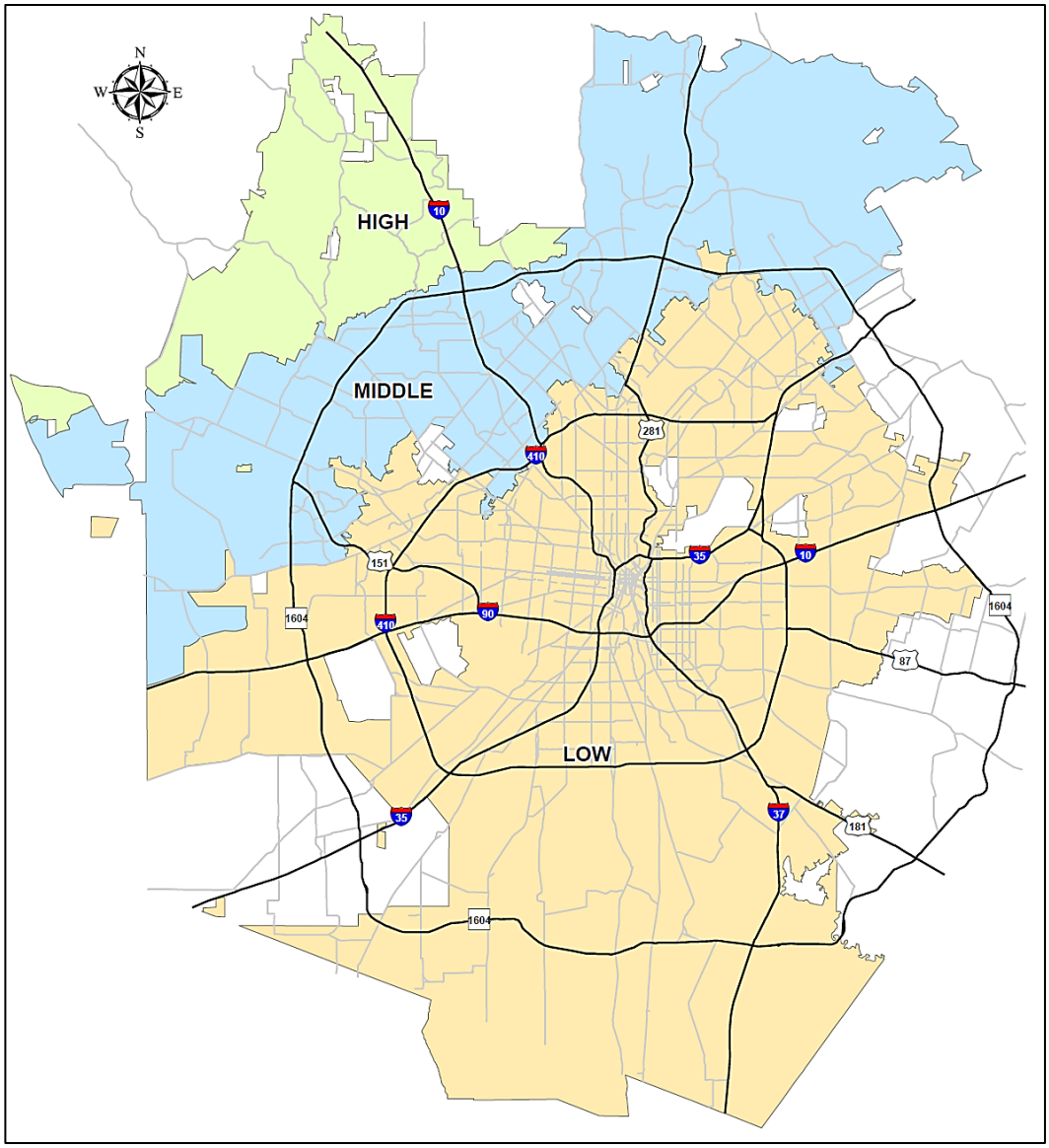


Figure 4 Water Service Area from 2019 through 2028

## 4.2 Wastewater Service Areas

The impact fee components evaluated for the wastewater system are Treatment and Collection. The Collection impact fee service areas reflect the boundaries of the sewersheds served by the WRCs but also designate areas that have higher costs mainly due to distance to the WRC. The Collection impact fee service areas include the proposed Upper and Lower Medina service areas, which are related to the Southwest Bexar Sewer Pipeline (SBSP). The Upper Medina service area includes land currently served by Medio Creek WRC. The population and EDU projections for the water and wastewater impact fee service areas are summarized in Table 6.

Table 6 Wastewater Service Areas Populations and EDU Projections

| Component | Service Area | Population (1) | | EDUs | | |
|---|---|---|---|---|---|---|
| | | 2018 | 2028 | 2018 | 2028 | Change |
| Treatment | Medio Creek | 128,601 | 167,581 | 50,039 | 65,207 | 15,168 |
| | Leon Creek / Dos Rios | 1,722,747 | 2,022,597 | 670,330 | 787,002 | 116,672 |
| **Total Treatment** | | **1,851,348** | **2,190,178** | **720,369** | **852,209** | **131,840** |
| Collection | Medio Creek | 128,601 | 167,581 | 50,039 | 65,207 | 15,168 |
| | Upper Medina | 47,632 | 77,616 | 18,534 | 30,201 | 11,667 |
| | Lower Medina | 17,944 | 29,278 | 6,982 | 11,392 | 4,410 |
| | Upper Collection | 450,173 | 551,404 | 175,165 | 214,554 | 39,389 |
| | Middle Collection | 626,973 | 682,919 | 243,958 | 265,727 | 21,769 |
| | Lower Collection | 580,025 | 681,380 | 225,691 | 265,128 | 39,437 |
| **Total Collection** | | **1,851,348** | **2,190,178** | **720,369** | **852,209** | **131,840** |

Notes:
(1) Service area populations are as of December 31 of the year.

The general wastewater service area is illustrated by Figure 5. The wastewater system map shows the shows the COSA extraterritorial jurisdiction and the watersheds that flow into the water recycling centers (WRC) operated by SAWS.

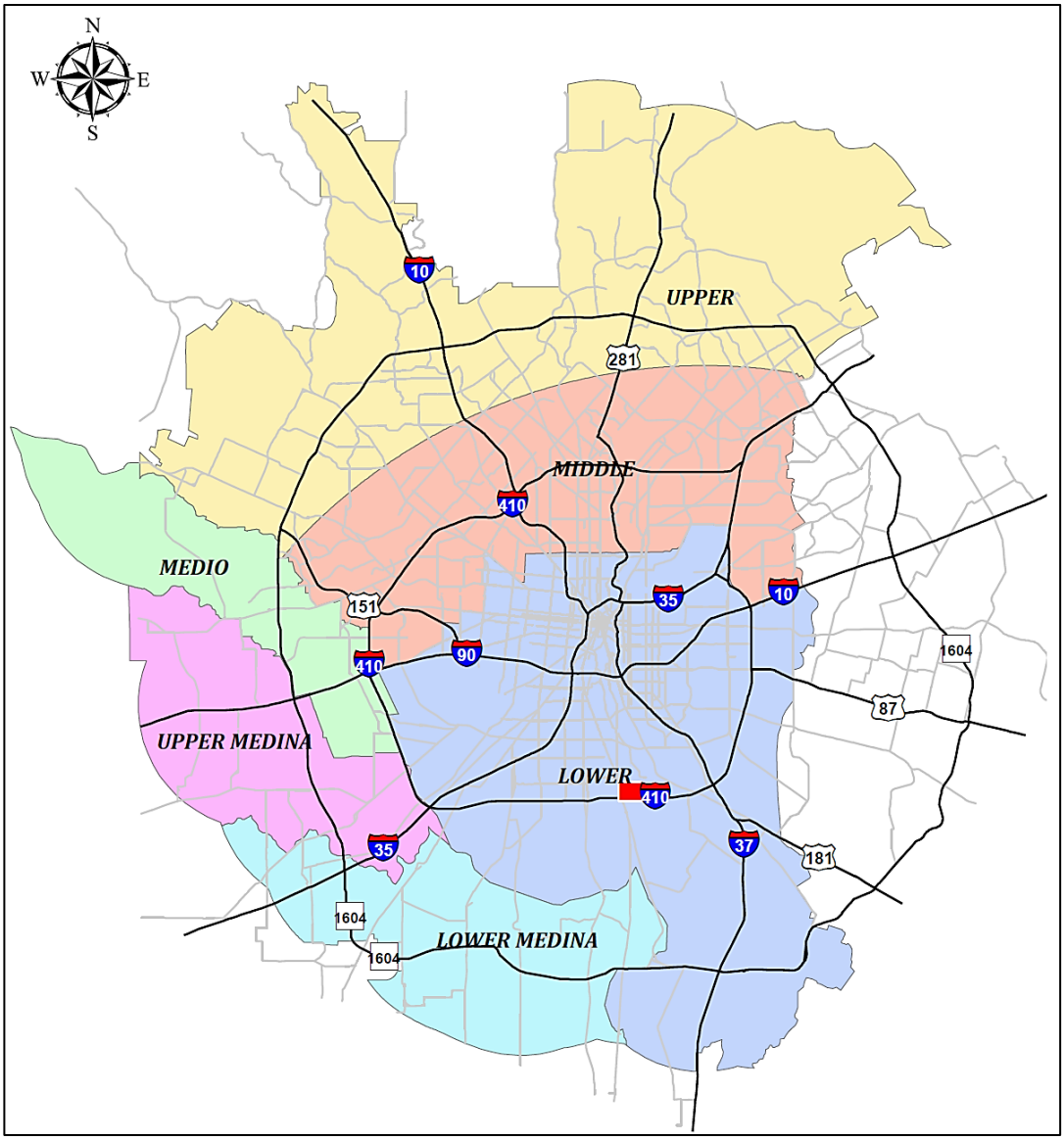


Figure 5 Wastewater Service Area from 2019 through 2028