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Water and Wastewater Annual Price Escalation Rates for Selected Cities across the United States

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FEMP
Federal Energy Management Program

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Abbreviations and Acronyms

AWWA	American Water Works Association
BLS	Bureau of Labor Statistics
CPI	Consumer Price Index
DOE	U.S. Department of Energy
EIA	Energy Information Administration
FEMP	Federal Energy Management Program
kGal	1000 gallons
LCCA	life-cycle cost analysis
PNNL	Pacific Northwest National Laboratory

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Preface

Annual water and wastewater price escalation rates are needed for U.S. Department of Energy's Federal Energy Management Program (FEMP) to make informed decisions using life-cycle cost analyses (LCCA) on water efficiency projects. However, determining appropriate water and wastewater price escalation rates can be difficult, and regional data on the topic is often unavailable. For these reasons, Pacific Northwest National Laboratory (PNNL) conducted this study for FEMP to identify trends in annual water and wastewater price escalation rates across the U.S.

To develop a sample set of water and wastewater annual price escalation rates throughout the U.S., PNNL used the American Water Works Association water and wastewater rate surveys to gather historical rate data for water and wastewater utilities in the United States. This data was compiled and assessed to produce a single dataset of time series rate data for more than 60 water utilities and 40 wastewater utilities located throughout the U.S. (see Figure E.1). An annual price escalation rate was calculated for each utility based on the reported rates for the past 8 years, and statistical trends in the annual price escalation rates are provided by the seven regions identified in Figure E.1.

Figure E.1. Map of the United States Showing the Water and Wastewater Utilities in this Study

This report also provides guidance on how to develop localized water and wastewater price escalation rates for use in LCCA models. Although the preferred source for a forecast of annual water and wastewater price escalation rates is the local water or wastewater utility, suggestions are provided to develop alternative estimates when this local data is not available, which include relying on selected regional historical annual price escalation rates in this study.

1 Introduction

Pacific Northwest National Laboratory (PNNL) conducted this study for the U.S. Department of Energy's (DOE) Federal Energy Management Program to identify trends in annual water and wastewater price escalation rates across the United States. Determining appropriate forecasts of water and wastewater price escalation rates is necessary for life-cycle cost analysis (LCCA) of water projects; there is currently no publicly available comprehensive projection of price escalation rates for water and wastewater in the United States. While DOE's Energy Information Administration (EIA) forecasts future changes in energy prices, no governmental organization projects future changes in water and wastewater prices. Energy prices are significantly driven by commodity prices, whereas infrastructure projects often drive large variances in price escalations across water and wastewater service providers. The purpose of this analysis is to develop a sample set of water and wastewater annual price escalation rates from utilities throughout the U.S. to facilitate the appropriate integration of such factors in LCCAs of water efficiency projects.

2 Analysis Method

PNNL used the American Water Works Association (AWWA) water and wastewater rate surveys to gather historical rate data for water and wastewater utilities in the United States. This data was compiled and assessed to produce a single dataset of time series rate data for more than 60 water utilities and 40 wastewater utilities located throughout the United States. An annual price escalation rate was calculated for each utility based on the reported rates for the past 8 years.

2.1 Data Source

The AWWA is a nonprofit water-industry-focused association dedicated to providing information and solutions related to effective water management. The AWWA water and wastewater rate surveys collect information on the water and wastewater rates and associated fees and charges from communities across North America, inclusive of the United States, Canada, and Puerto Rico. Each survey breaks down the utilities surveyed by location, demand, and revenue received over the previous 2 years for both water services and wastewater services. Water services include collection and management of source water treatment to potable water standards, and distribution. Wastewater services include collection and treatment to permit requirements for discharge. To carry out this analysis, the results of the 2008, 2010, 2012, 2015, and 2016 AWWA water and wastewater rate surveys (AWWA and RFC 2008, 2010, 2012, 2015, 2016)[1] were compiled and examined.

Although participation in the survey is voluntary, in its most recent (2016) survey, AWWA collected water data from more than 260 water utilities and more than 180 wastewater utilities in 42 states. Using the AWWA survey results conducted and published over multiple years provided consistency to how the data was presented, and resulted in more time series results to include in this study than what was available in previous analyses (Giever 2010). Nevertheless, there are limitations to the AWWA data used in this study. Not all utilities that were asked to participate in the survey submitted data, and the set of utilities that provides data from one survey to the next often changes; thus, consistent sets of time series data are not available for many utilities. There are also inconsistencies related to the measurement units reported and manner in which a "rate" is defined from year to year. For example, a particular utility might include flat fees as part of a volume rate in one survey, but not include these fees in another survey. To address these issues, all data was reviewed for consistency. When abnormal data patterns were found, the data was either corrected with utility-specific sources or discarded from the sample set.

2.2 Water and Wastewater Data Compilation

The AWWA water and wastewater surveys from 2008, 2010, 2012, 2015, and 2016 were reviewed to find the water and wastewater rate trends for commercial and industrial customers. Utilities that responded to at least four AWWA surveys were identified to see how their rates changed over time. Location and utility information was imported into Microsoft Excel for further rate analysis. The AWWA datasets from 2008, 2010, and 2012 included a unique identifier for most utilities that allowed for a consistent mapping of the utilities from one survey year to the next. AWWA survey datasets from 2015 and 2016 did not include a unique identifier, so the mapping was done based on utility name and location. Utility name data was standardized to eliminate any inconsistencies between survey years.

Once the utilities with multiple survey responses were identified, their water and wastewater price data was converted to rates and standardized. The AWWA surveys bin customers based on water consumption, shown in Table 1, and have non-seasonal and peak price information for base charge, volume charge, and total monthly bill. Price data was converted to a marginal water and wastewater rate, presented in dollars per 1000 gallons ($/kGal) by dividing the utility-provided price by the midpoint consumption of each consumption

[1] The 2016 AWWA water and wastewater rate survey is available at https://www.awwa.org/resources-tools/water-and-wastewater-utility-management/water-wastewater-rates.aspx. To access earlier versions of the water and wastewater rate surveys, please contact AWWA.

bin in gallons. The resulting water and wastewater rates were converted to 2016$ using the Bureau of Economic Analysis implicit price deflators.[2]

Table 1. AWWA 2016 Water and Wastewater Survey Customer Class Bins

Customer Class	Water Meter Size	Consumption	
		Cubic Feet	Gallons
Residential	5/8 inch	0	0
Residential	5/8 inch	500	3,740
Residential	5/8 inch	1,000	7,480
Residential	5/8 inch	1,500	11,220
Residential	5/8 inch	3,000	22,440
Non-Residential/ Commercial	5/8 inch	3,000	22,440
Commercial/ Light Industrial	2 inch	50,000	374,000
Industrial	4 inch	1,000,000	7,480,000
Industrial	8 inch	1,500,000	11,220,000

Based on the data compilation and consistency checks conducted on the AWWA water and wastewater rate surveys, there were 68 water utilities and 43 wastewater utilities that had submitted at least 4 years of data. Some utilities did not submit data in the 2016 survey, but submitted data from 2008 to 2015. These utilities and their full raw data are provided in Appendix A.

2.3 Price Escalation Rate Derivation

To capture the true marginal cost of water and wastewater services over time, the analysis focused on volume-based charges. An effort was made to avoid fixed fees as part of the rate. It was determined that the 8-inch water meter size industrial consumer class reflected an appropriate commercial volumetric rate in most cases. This is because this class of consumer typically pays a relatively smaller portion of maintenance and infrastructure fees compared to the total volume of water and wastewater that they consume. This, in effect, dampens out the flat fixed fees and approximates more closely the marginal cost of water and wastewater. The rates per kGal in 2016$[3] are provided in Figure 1 and Figure 2 for 61 water utilities (Figure 1) and 39 wastewater utilities (Figure 2), ordered from lowest to highest rates per kGal. There is a large variation in rates across these utilities, likely due to infrastructure investment requirements. For example, the wastewater rate for Seattle is notably higher than for other cities analyzed in this study (see Figure 2), likely driven by Seattle's required investments to address sewage infrastructure and overflow into the Puget Sound (Thompson 2014).

[2] Bureau of Economic Analysis implicit price inflators can be found at: https://bea.gov/faq/index.cfm?faq_id=513.
[3] In cases where 2016 data was not available, 2015 data was used.

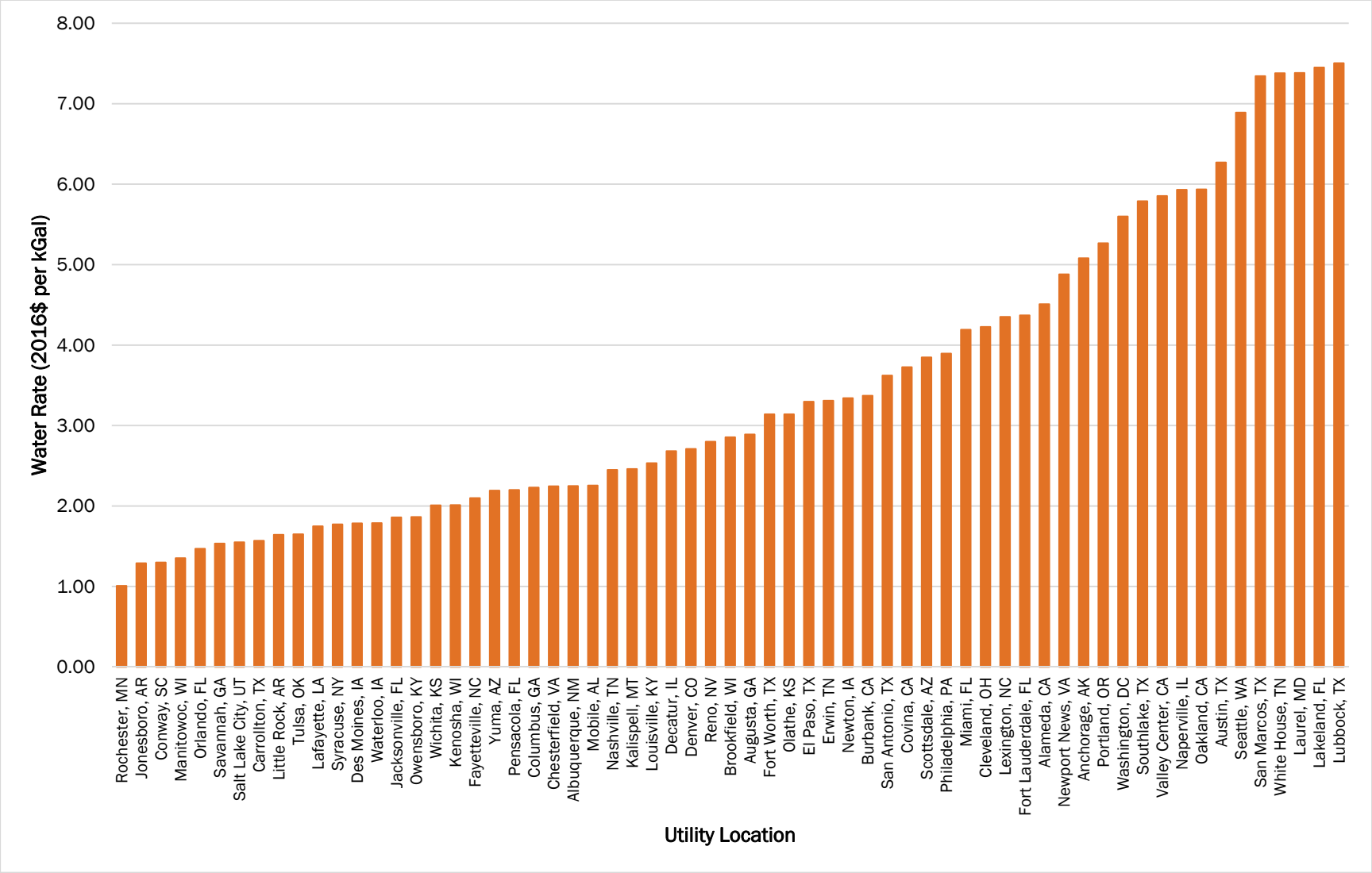

Figure 1. Water Rates for Water Utilities Included in this Study (2016$)

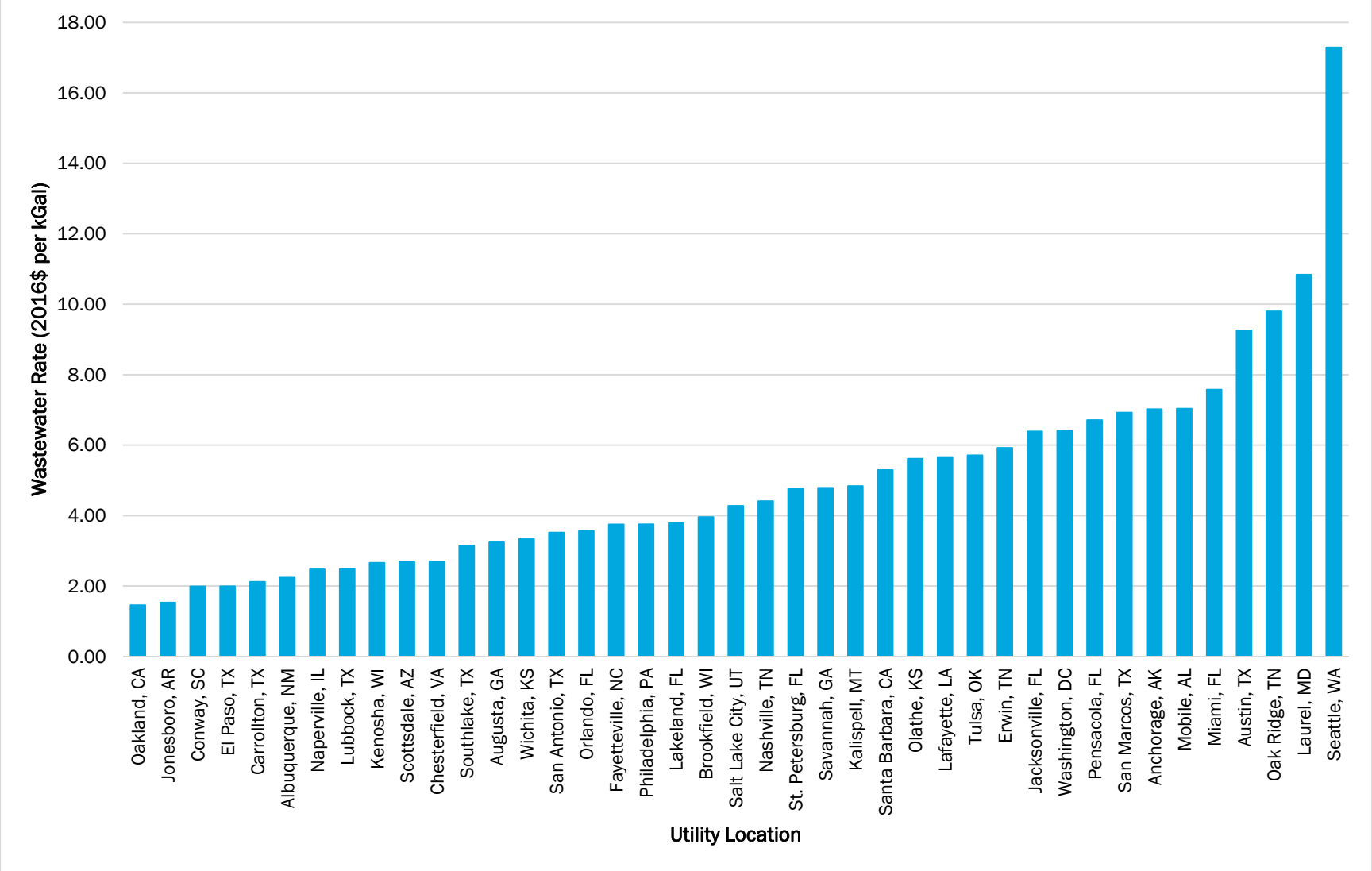

Figure 2. Wastewater Rates for Wastewater Utilities Included in this Study (2016$)

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Figure 3 and Figure 4 provide the minimum and maximum rates, the average (mean) rates per kGal, and the standard deviation around the mean for three separate years: 2008, 2012, and 2016.

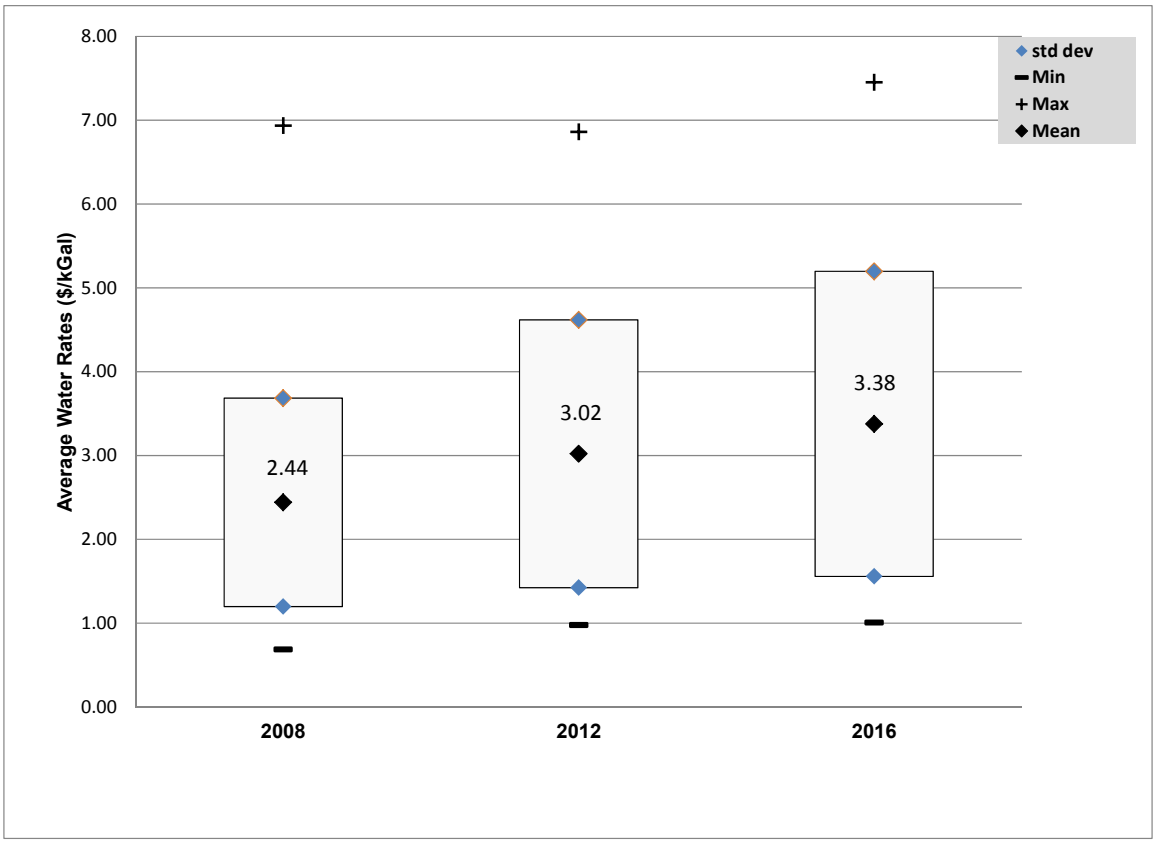

Figure 3. Survey Sample Average Water Rates over Time

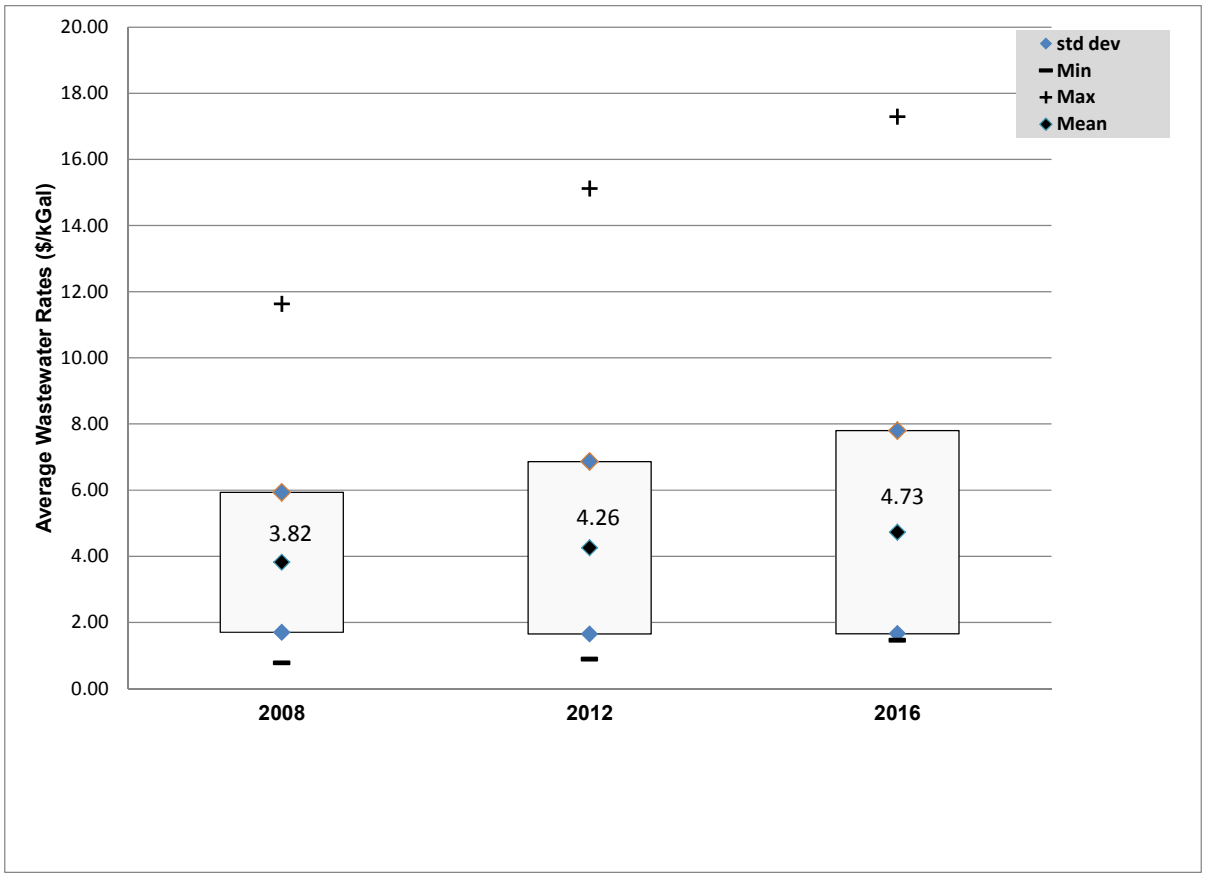

Figure 4. Survey Sample Average Wastewater Rates over Time

Figure 3 and Figure 4, over the 8-year timespan between 2008 and 2016, the average water rates across all utilities in the sample increased by nearly 40% while the average wastewater rates increased by 24%.

Annual Price Escalation Determination

The overall objective of this study was to estimate the annual price escalation rate for water and wastewater by examining these historical trends. The annual price escalation rates during this same period were calculated for these utilities based on a methodology that is used to calculate inflation rates. A price escalation rate identifies how much the water or wastewater price has changed annually between 2 specific years.[4] The annual price average escalation rates were calculated using the following formula:

$$Annual\ Average\ Price\ Escalation\ Rate = \left(\frac{Final\ Year\ Rate}{First\ Year\ Rate}\right)^{\frac{1}{(Final\ Year - First\ Year)}} - 1$$

[4] In this study, water and wastewater annual average escalation rates were calculated for several spans of time for comparison purposes: from 2008 to 2016, 2010 to 2016, and 2012 to 2016. It was determined that the 2008 to 2016 period provided the most robust and representative annual escalation rates; thus, these rates are reported for all sampled utilities in Table 2 and Table 3.

The results of applying the price escalation rate to the utility water and wastewater data is presented in Section 3 of this report. Figure 5 shows a map of the cities of each utility for which an annual price escalation rate is calculated. This map also shows U.S. regions that were used in the study to examine water rates regionally. Table 2 and Table 3 provide the annual price escalation rates for each utility examined, organized by region of the country.

Figure 5. Map of the United States Showing the Water and Wastewater Utilities in This Study

3 Analysis Results

This section presents the average annual price escalation rate application analysis for both water and wastewater rates for each utility included in this analysis. It also includes summary statistics on regional rate trends, based on the sample of utilities examined.

3.1 Annual Water Price Escalation Rate Results

The calculated average annual price escalation rates for water utilities (based on historical rates from 2008 to 2016) are shown in Table 2 for each utility in the sample survey, organized by census region. Figure 6 shows the location of each water utility for which an annual price escalation rate is calculated.

Table 2. Annual Price Escalation Rates for Water Utilities in the United States

State	City	Water Utility	Annual Price Escalation Rate
		West-Pacific	
AK	Anchorage	Anchorage Water and Wastewater Utility	2.45%
CA	Alameda	Alameda County Water District	2.91%
CA	Burbank	Burbank Water and Power	3.40%
CA	Covina	Suburban Water Systems	7.31%
CA	Oakland	East Bay Municipal Utility District	6.06%
CA	Valley Center	Valley Center Municipal Water District	5.90%
OR	Portland	Portland Water Bureau	6.82%
WA	Seattle	Seattle Public Utilities	7.26%
		West-Mountain	
AZ	Scottsdale	City of Scottsdale	0.00%
AZ	Yuma	City of Yuma	0.42%
CO	Denver	Denver Water	2.00%
MT	Kalispell	City of Kalispell	-1.46%
NM	Albuquerque	Albuquerque Bernalillo County Water Utility Authority	0.78%
NV	Reno	Truckee Meadows Water Authority	0.14%
UT	Salt Lake City	Salt Lake City Corp Public Utilities	2.47%
		Midwest-West North Central	
IA	Des Moines	Des Moines Water Works	4.53%
IA	Newton	Newton Water Works	9.87%
IA	Waterloo	Waterloo Water Works	8.33%
KS	Olathe	City of Olathe	2.64%

State	City	Water Utility	Annual Price Escalation Rate
KS	Wichita	City of Wichita	5.20%
MN	Rochester	Rochester Public Utilities	-0.35%
		Midwest-East North Central	
IL	Decatur	City of Decatur	7.04%
IL	Naperville	City of Naperville Department of Public Utilities	15.25%
OH	Cleveland	Cleveland Division of Water	3.11%
WI	Brookfield	City of Brookfield	7.35%
WI	Kenosha	Kenosha Water Utility	2.34%
WI	Manitowoc	Manitowoc Public Utilities	1.03%
		Northeast	
NY	Syracuse	Onondaga County Water Authority	10.62%
PA	Philadelphia	Philadelphia Water Department	6.66%
		South-South East	
AL	Mobile	Mobile Area Water and Sewer	3.60%
DC	Washington, DC	District of Columbia Water and Sewer Authority	7.20%
FL	Fort Lauderdale	City of Fort Lauderdale	5.69%
FL	Jacksonville	JEA	7.06%
FL	Lakeland	City of Lakeland Water Utilities	3.49%
FL	Miami	Miami Dade Water and Sewer Department	6.58%
FL	Orlando	Orange County Utilities	0.39%
FL	Pensacola	Emerald Coast Utilities Authority	2.90%
GA	Augusta	Augusta Utilities	0.71%
GA	Columbus	Columbus Water Works	3.83%
GA	Savannah	City of Savannah	3.12%
KY	Louisville	Louisville Water Company	1.61%
KY	Owensboro	Owensboro Municipal Utilities	5.72%
MD	Laurel	Washington Suburban Sanitary Commission	6.95%
NC	Fayetteville	Fayetteville Public Works Commission	1.13%
NC	Lexington	Davidson Water Inc.	3.33%
SC	Conway	Grand Strand Water and Sewer Authority	0.09%

State	City	Water Utility	Annual Price Escalation Rate
TN	Erwin	Erwin Utilities	16.65%
TN	Nashville	Metro Water Services	0.66%
TN	White House	White House Utility District	4.15%
VA	Chesterfield	Chesterfield County Department of Utilities	2.38%
VA	Newport News	Newport News Waterworks	1.35%
		South-West South Central	
AR	Jonesboro	City Water and Light	8.15%
AR	Little Rock	Central Arkansas Water	1.28%
LA	Lafayette	Lafayette Utilities System	2.30%
OK	Tulsa	Tulsa Metropolitan Utility Authority	0.88%
TX	Austin	Austin Water Utility	6.09%
TX	Carrollton	City of Carrollton	-0.62%
TX	El Paso	El Paso Water	0.51%
TX	Fort Worth	Fort Worth Water Department	2.64%
TX	Lubbock	City of Lubbock	13.58%
TX	San Antonio	San Antonio Water System	2.10%
TX	San Marcos	City of San Marcos	0.72%
TX	Southlake	City of Southlake	3.25%

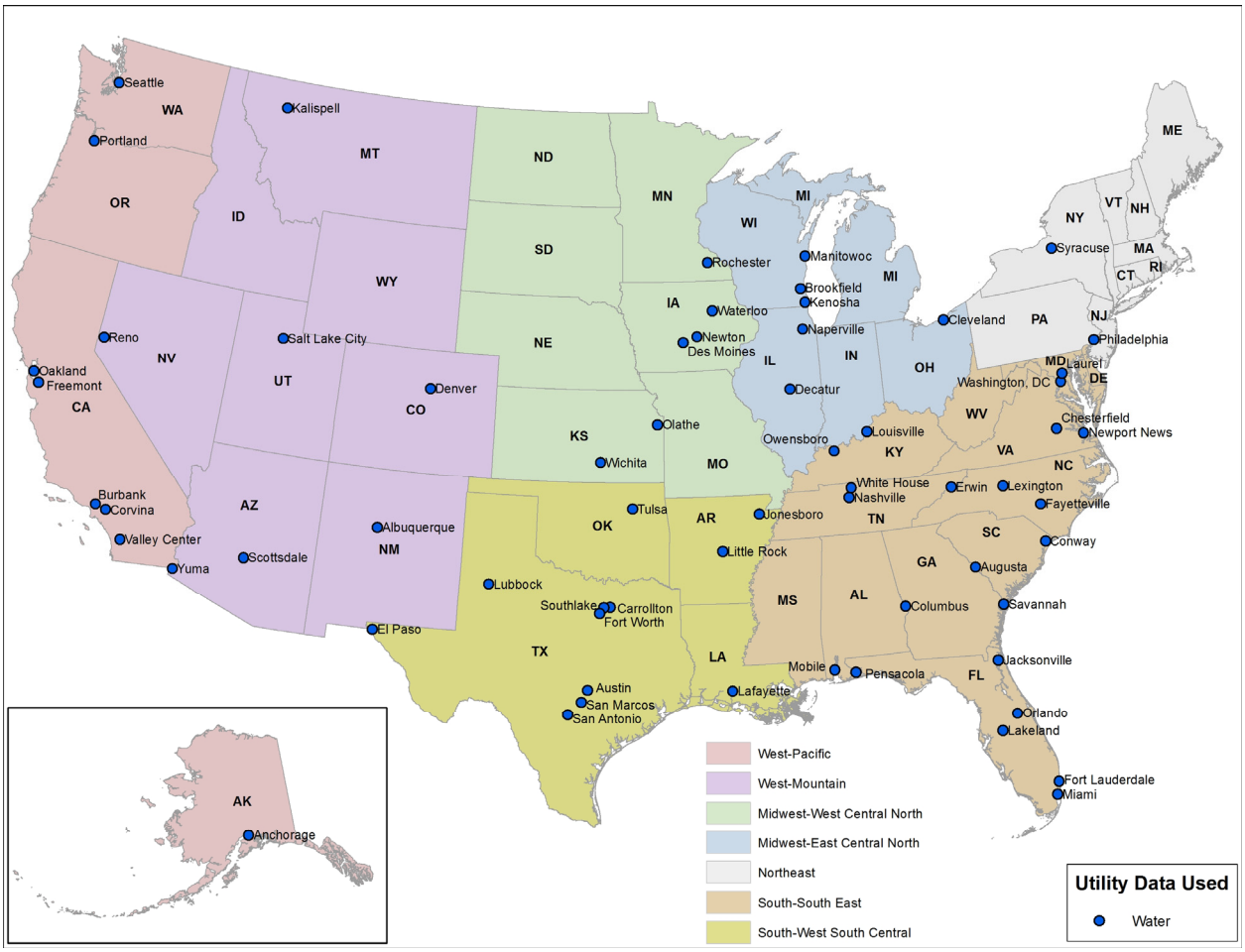

Figure 6. Map of the United States Showing the Water Utilities in This Study

Across the entire survey sample examined in this report, the average annual price escalation rate for water is 4.1% based on reported rates from 2008 through 2016. The highest price escalation rates were reported from Erwin, Tennessee (16.65%), and Naperville, Illinois (15.25%), while de-escalation in rates was reported for Kalispell, Montana (-1.46%), Carrollton, Texas (-0.62%), and Rochester, Minnesota (-0.35%). Figure 7 and Figure 8 provide summary statistics by region for water price escalation rates and commercial water rates for the utilities in the survey sample.

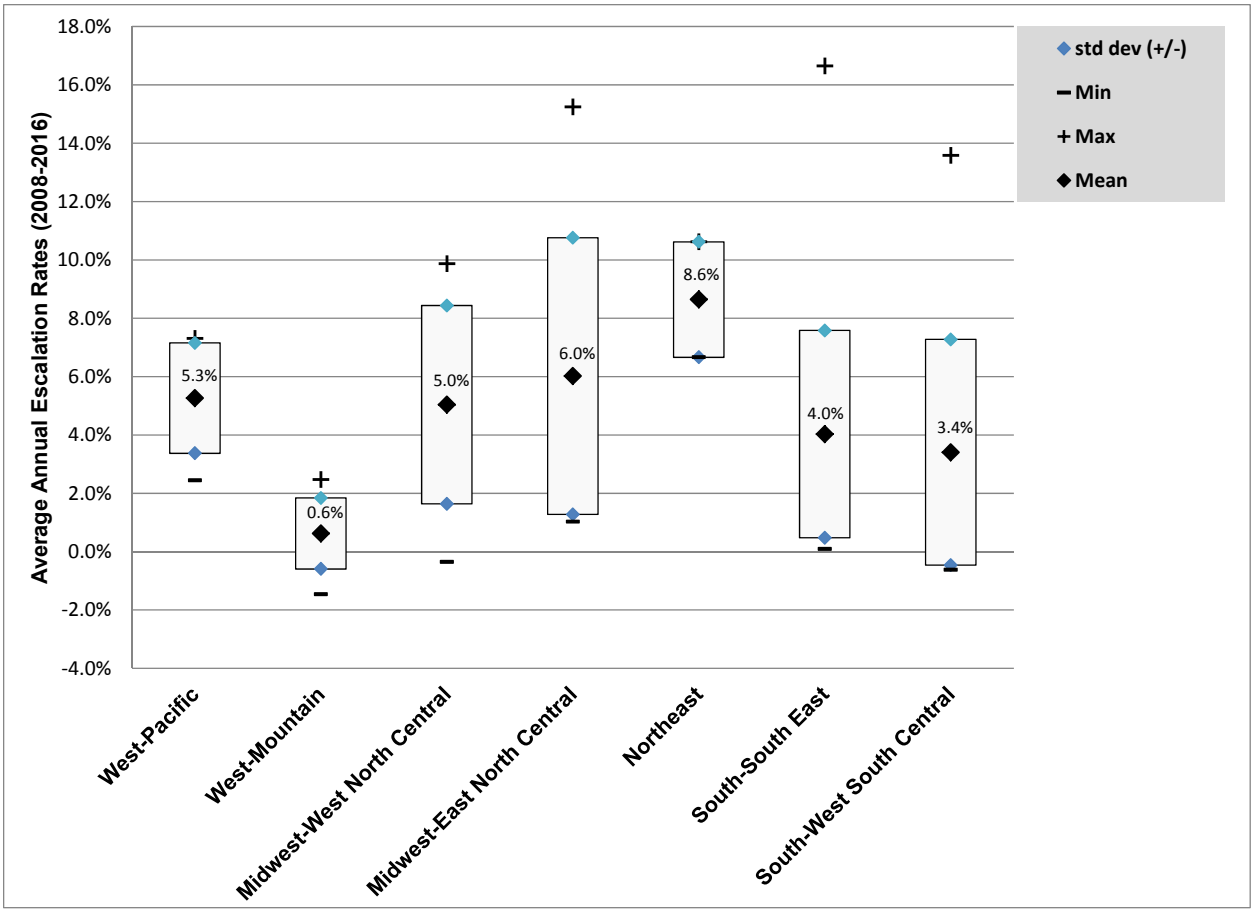

Figure 7. Average Annual Water Price Escalation Rates by Region (2008-2016)

Some regional trends are observed; however, it is important to note that regional sampling is variable and limited. For example, the Northeast region is represented by only two utilities. Based on the utilities observed, it would appear that the Midwest and Northeast have some of the lowest average water rates (see Figure 8)[5]; however, Figure 7 would suggest that these same regions have had some of the highest annual price escalation rates in recent years. Conversely, although the West-Pacific states have the highest average regional water rates (see Figure 8), the annual price escalation rate, at 5.3% (see Figure 7), is only slightly higher the entire sample average of 4.1%. There is a wide range and variability in both water volume rates and historical price escalation rates across the southern utilities observed in this study, with an average escalation of about 3.5% across the entire southern region. The study's scope did not include an investigation into why such a large variation exists, but these variations are often driven by local infrastructure investments by the given utility (Walton 2017).

[5] Since some water utilities included in this analysis did not complete the 2016 AWWA survey, the 2015 data for all water utilities was used for Figure 8.

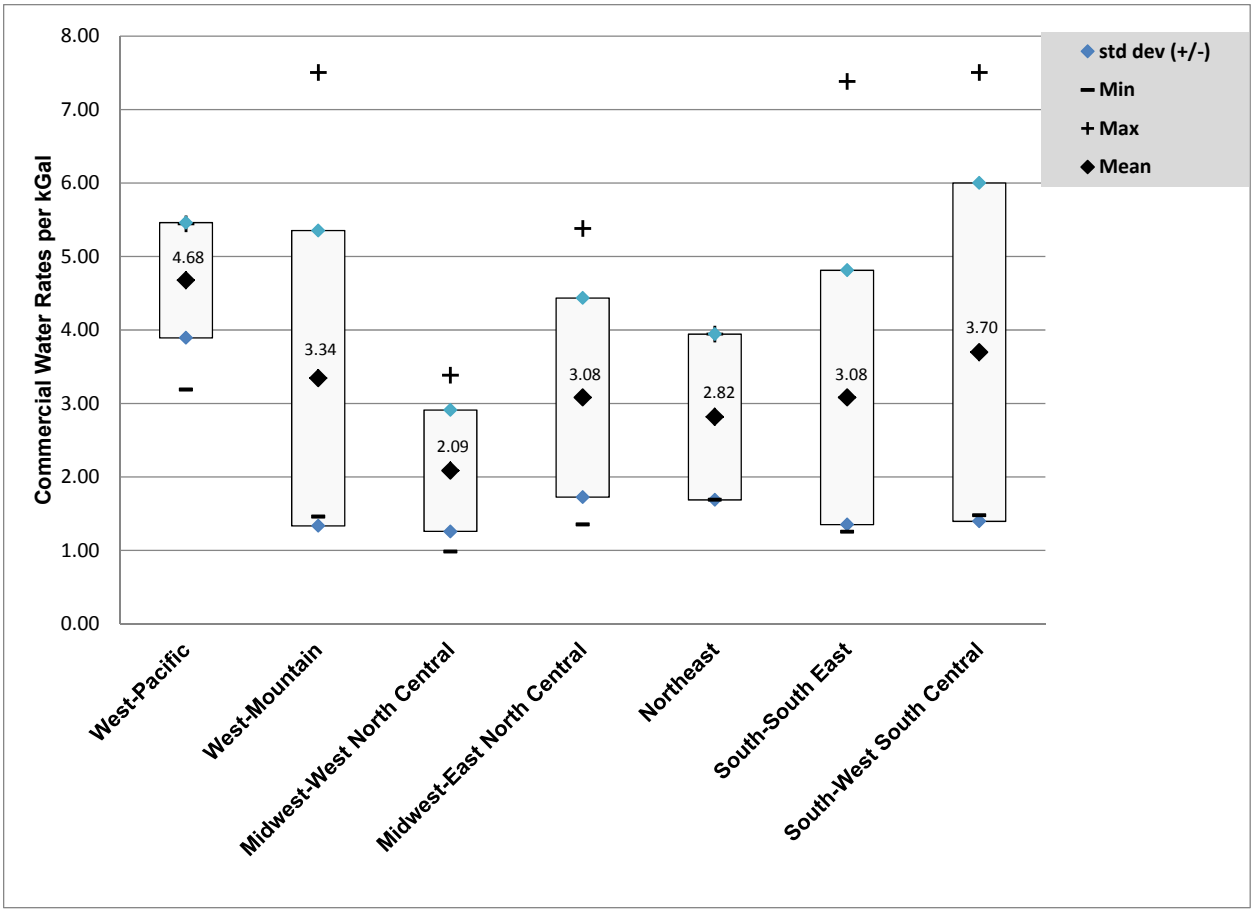

Figure 8. Average Commercial Water Rates by Region (2015)

3.2 Annual Wastewater Price Escalation Rate Results

The calculated average annual price escalation rates for wastewater utilities (based on historical rates from 2008 to 2016) are shown in Table 3 for each utility in the survey sample, organized by census region. Figure 9 shows the location of each wastewater utility for which an annual price escalation rate is calculated.

Table 3. Annual Price Escalation Rates for Wastewater Utilities in the United States

State	City	Wastewater Utility	Annual Price Escalation Rate
		West–Pacific	
AK	Anchorage	Anchorage Water and Wastewater Utility	3.86%
CA	Oakland	East Bay Municipal Utility District	8.33%
CA	Santa Barbara	City of Santa Barbara	3.12%
WA	Seattle	Seattle Public Utilities	5.08%
		West-Mountain	
AZ	Scottsdale	City of Scottsdale	-2.09%
MT	Kalispell	City of Kalispell	0.41%
NM	Albuquerque	Albuquerque Bernalillo County Water Utility Authority	0.09%

State	City	Wastewater Utility	Annual Price Escalation Rate
UT	Salt Lake City	Salt Lake City Corp Public Utilities	3.71%
		Midwest-West North Central	
KS	Olathe	City of Olathe	5.44%
KS	Wichita	City of Wichita	5.19%
		Midwest-East North Central	
IL	Naperville	City of Naperville Department of Public Utilities	3.83%
WI	Brookfield	City of Brookfield	1.14%
WI	Kenosha	Kenosha Water Utility	-0.66%
		Northeast	
PA	Philadelphia	Philadelphia Water Department	4.40%
		South-South East	
AL	Mobile	Mobile Area Water and Sewer	4.95%
DC	Washington, DC	District of Columbia Water and Sewer Authority	4.09%
FL	Jacksonville	JEA	2.29%
FL	Lakeland	City of Lakeland Water Utilities	3.52%
FL	Miami	Miami Dade Water and Sewer Department	3.85%
FL	Orlando	Orange County Utilities	0.04%
FL	Pensacola	Emerald Coast Utilities Authority	2.89%
FL	St. Petersburg	City of St. Petersburg	2.24%
GA	Augusta	Augusta Utilities	1.07%
GA	Savannah	City of Savannah	4.07%
MD	Laurel	Washington Suburban Sanitary Commission	5.58%
NC	Fayetteville	Fayetteville Public Works Commission	0.62%
SC	Conway	Grand Strand Water and Sewer Authority	0.16%
TN	Erwin	Erwin Utilities	9.99%
TN	Nashville	Metro Water Services	1.83%
TN	Oak Ridge	City of Oak Ridge	2.73%
VA	Chesterfield	Chesterfield County Department of Utilities	4.05%
		South-West South Central	
AR	Jonesboro	City Water and Light	8.30%

State	City	Wastewater Utility	Annual Price Escalation Rate
LA	Lafayette	Lafayette Utilities System	3.67%
OK	Tulsa	Tulsa Metropolitan Utility Authority	7.59%
TX	Austin	Austin Water Utility	3.39%
TX	Carrollton	City of Carrollton	-0.40%
TX	El Paso	El Paso Water	0.55%
TX	Lubbock	City of Lubbock	2.74%
TX	San Antonio	San Antonio Water System	6.10%
TX	San Marcos	City of San Marcos	-0.56%
TX	Southlake	City of Southlake	-0.83%

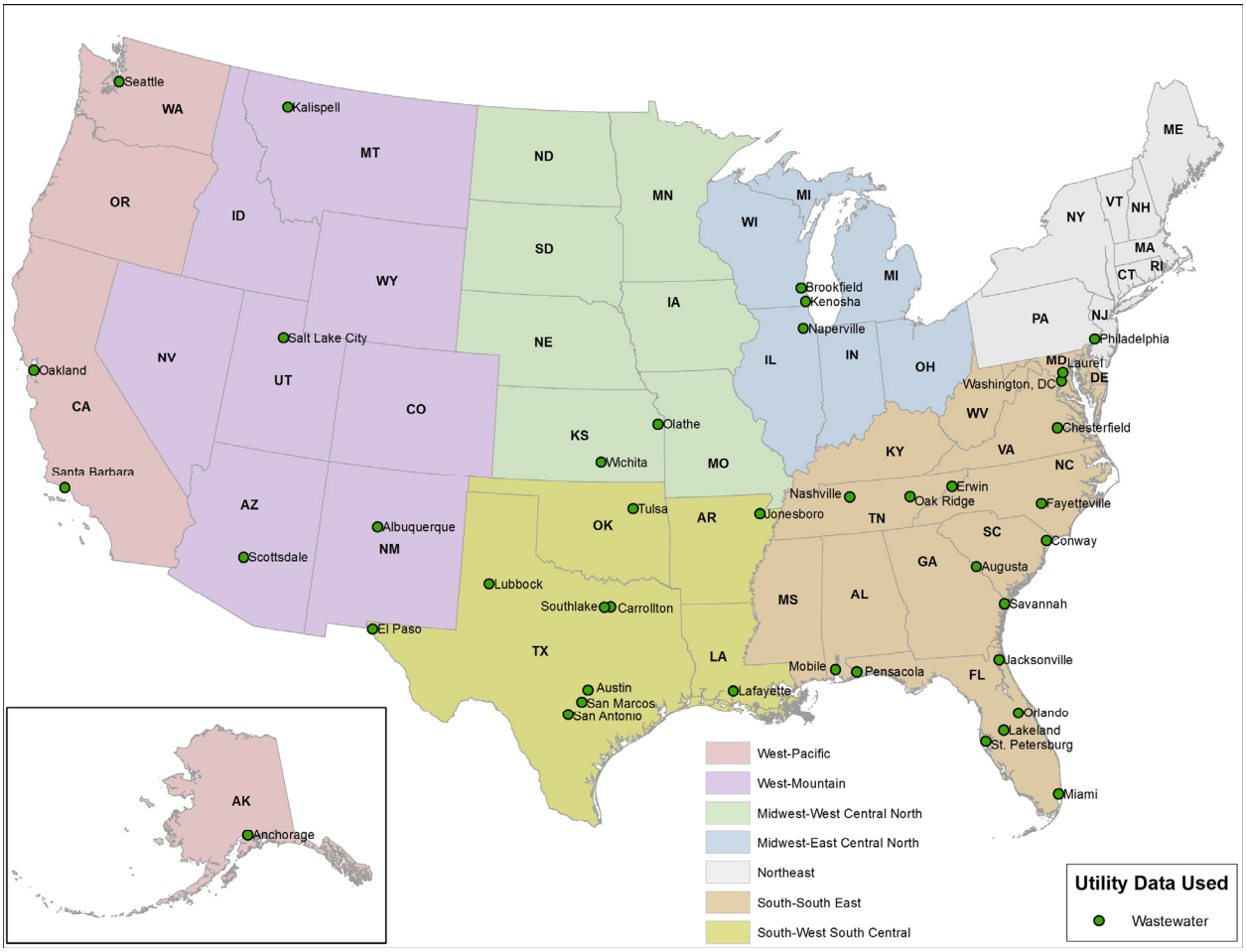

Figure 9. Map of the United States Showing the Wastewater Utilities in This Study

Across the entire survey sample examined in this report, the average annual price escalation rate for wastewater is 3.3% based on reported rates from 2008 through 2016. As with the water rates, the highest

wastewater price escalation rates were reported for Erwin Utilities of Tennessee (9.99%), while de-escalation in rates were reported for five utilities, three of which are located in Texas (see Carrollton, Southlake, and San Marcos in Table 3). Figure 10 and Figure 11 provide summary statistics by region for wastewater price escalation rates and commercial wastewater rates for the utilities in the survey sample. Since 2008, the region that has experienced the highest annual price escalation rates in wastewater is the Midwest–West Central North region; however, this region was only represented by two utilities. In general, the price escalation rates for wastewater do not vary across the utilities and regions as much as water rates. The West-Mountain states have had the greatest variability around the mean average annual price escalation rate of 2.8%. The West - Pacific region has the highest average marginal rates for wastewater (see Figure 11)[6] and also has one of the highest price escalation rates (see Figure 10) based on historical rates from 2008 through 2016.

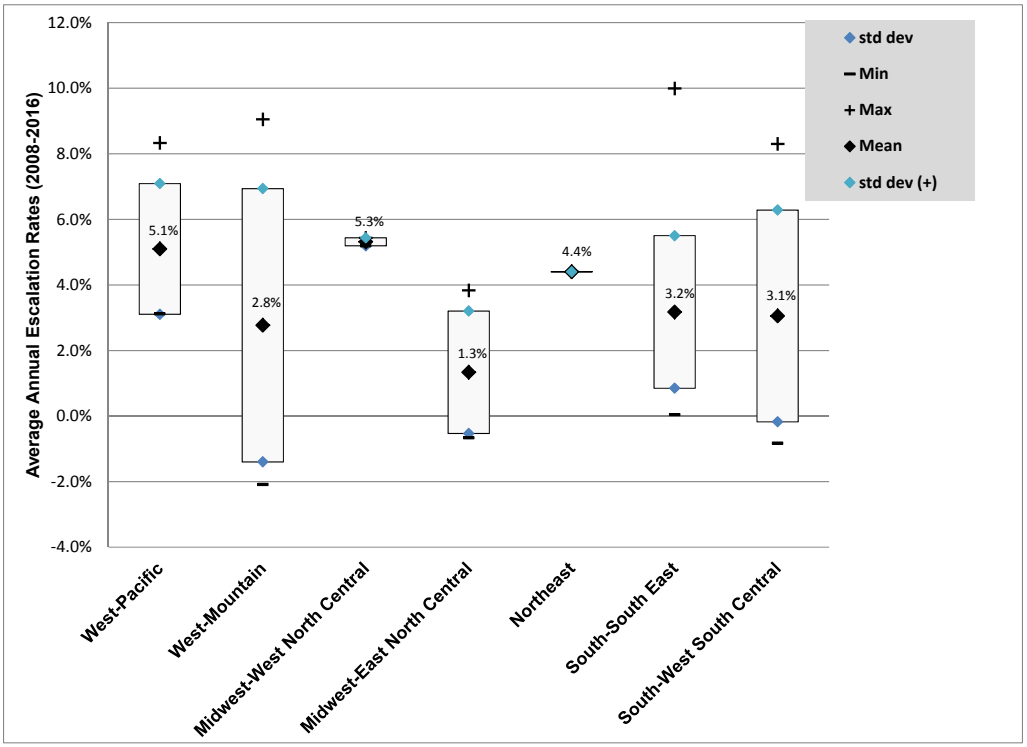

Figure 10. Average Annual Wastewater Price Escalation Rates by Region (2008-2016)

[6] Since some wastewater utilities included in this analysis did not complete the 2016 AWWA survey, the 2015 data for all wastewater utilities was used for Figure 11.

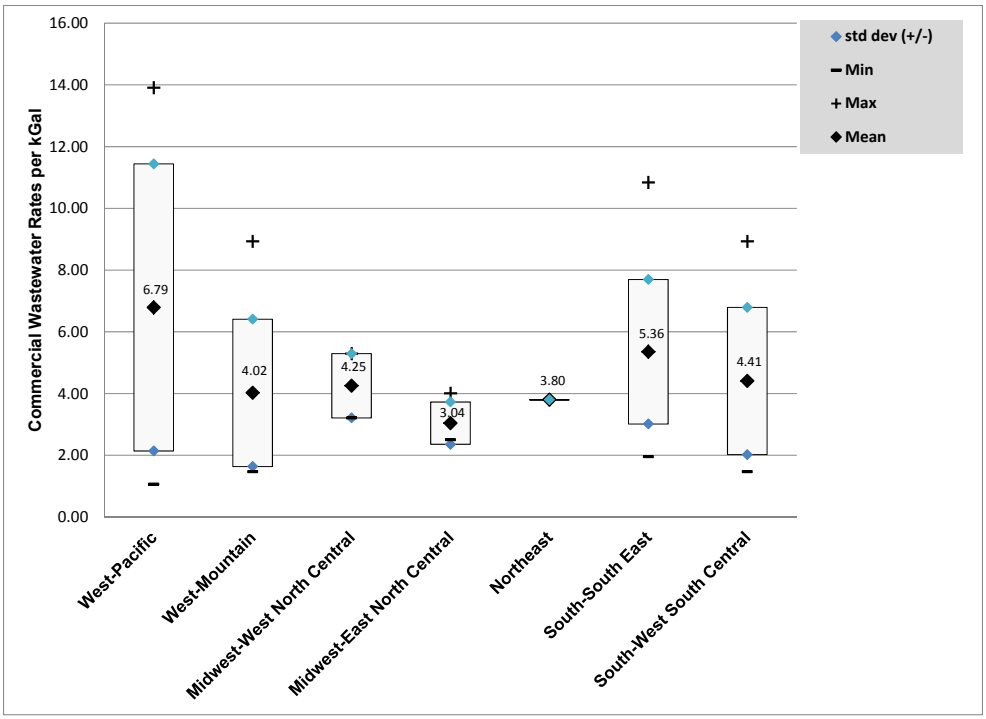

Figure 11. Average Commercial Wastewater Rates by Region (2015)

4 Annual Water and Wastewater Price Escalation Rates for Use in Life-Cycle Cost Analysis

Annual water and wastewater price escalation rates are needed in LCCAs to estimate the overall cost savings of water efficiency projects. However, determining appropriate forecasts of water and wastewater price escalation rates can be more difficult than ascertaining comparable rates for various forms of energy. While the EIA forecasts future changes in energy prices, no governmental organization projects future changes in water and sewer prices. Energy prices are also significantly driven by commodity prices, whereas infrastructure projects often drive large variances in price escalations across water and sewer service providers.

The preferred source for a forecast of annual water and wastewater price escalation rates is the local water or wastewater utility. The serving utility can be contacted to determine if there are any forecasts of future water and wastewater rate changes, whether published or via a written statement or other documentation from the utility. If possible, obtain year-specific price escalation rates, rather than a multi-year average, for use in the LCCA. The Building Life Cycle Cost program,[7] for example, allows entry of such year-specific rates.

Absent a forecast from the serving water or wastewater utility, the next recommended method for forecasting water and wastewater prices is to look to past local rate changes as a general prediction of future rate changes. To determine historical annual rates of change, collect at least 5 years of past billing statements or rate data from the local utility and use the equation presented in Section 2.3 of this document to calculate an average annual price escalation rate. Other important guidelines for this option include the following:

- When directly calculating the average annual price escalation rates, make sure to use *marginal* rates (typically \$/kGal or \$/100 ft^3) rather than *average* rates. Do not simply take a bill total and divide it by total usage to obtain an average rate. Rather, obtain the volumetric charge for water (and wastewater, as relevant), which should be stated on the bill or provided by the serving utility in their rate schedule. In some cases, the average and marginal rates can differ tremendously, and water efficiency projects avoid costs at the marginal rates.
- If monthly rates differ within a calendar year, choose the historical rates from the same month of each year. For example, choose the rates from January or December of each year.
- Finally, calculate water and wastewater price escalation rates separately.

If past billing data is not available and the local utility cannot provide price escalation rates, the results of this study may be used to approximate rates of price escalation. When relying on price escalation rates from this analysis, the analyst may use differing criteria to select appropriate rates, depending on the type of project and region in which the water efficiency project is located. For example, in some cases it might be appropriate to find utilities in a similar region and/or perhaps of a similar size. In other cases, the analyst might consider the base volumetric water rate when selecting a representative price escalation rate. Statistics on these characteristics are provided in Sections 3.1 and 3.2 of this report to assist with this selection process.

While the historical price escalation rates presented in this report could help inform a regional LCCA study, it is important to note the limitations and caveats of this dataset:

- *Limited Sample:* The sample size is limited, and the data does not reflect a balanced geographic distribution, nor does it represent some of the more populous cities throughout the U.S. In some cases, a region is represented by only one or two utilities.

[7] Information about the Building Life Cycle Cost program can be found at https://energy.gov/eere/femp/building-life-cycle-cost-programs.

- *Rate Definition Variability and Time Series Consistency:* Although an effort was made to compile clean datasets for a sample of utilities across the U.S., as discussed in Section 2.1 of this report, the AWWA survey is voluntary and often is completed by different utilities, people, and/or departments from year to year. Thus, consistency issues can arise related to the manner in which "a rate" is defined from one survey to the next. Utility rate structures and customer classifications may also change over time, which also poses consistency issues in the time-series data.

Historical Data, Utility Specificity: In general, historical water and wastewater price escalation rates can help provide useful forecasts of future price escalation rates; however, history is never a perfect predictor of the future. All data observed in this analysis is historical data and may or may not be an appropriate indication of future rates, depending on the circumstances for a given utility. Appropriate price escalation rates may be very specific to a utility, given that infrastructure projects may be primary drivers of costs for water and wastewater utilities, but may return to lower rates once infrastructure projects are completed. If utility- or region-specific options for price escalation rates are not viable, another option to consider is to use historical, national-level Consumer Price Index (CPI) data maintained by the Bureau of Labor Statistics (BLS)[8] to serve as a basis for an estimate of future price increases. Included as a component of the overall CPI is "water and sewerage maintenance." For the most recent 20 years of data (1996-2016), the national average annual price increase for water and sewerage maintenance has been 4.71%, for example.[9] As a point of comparison, economy-wide inflation, as measured by the BLS CPI-U All Items index, has run 2.15% over the same period.

[8] Bureau of Labor Statistics, Consumer Price Index: https://www.bls.gov/cpi/home.htm.
[9] While water and sewerage maintenance price increases have often been higher than 4.71% in recent years, utilizing a relatively long period (e.g., 20 years) helps to dampen year-to-year swings in prices, and provides a long-term average. See *Trends in Consumer Prices (CPI) for Utilities through 2015* (Beecher 2016) from Michigan State University's Institute of Public Utilities, for more information on and numerous charts conveying historical trends.

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Appendix A: Water and Wastewater Utility Rates

This appendix contains the data associated with the utilities that contributed to at least four American Water Works Association water and wastewater rate surveys. Table A.1 shows the water rates in 2016$ for the volume charge of the large industrial consumers with an 8-inch water meter. Table A.2 shows the wastewater rates in 2016$ for the volume charge of the large industrial consumers with an 8-inch wastewater meter.

Table A.1. Water Utility Volume Charge in 2016$ per kGal for Large Industrial Consumers

Utility (Location)		Volume Charge in 2016$ per kGal for 8" Water Meter				
Water Utility	State	2008	2010	2012	2015	2016
Anchorage Water and Wastewater Utility	AK	4.19	4.50	4.68	5.14	5.08
Mobile Area Water and Sewer	AL	1.70	1.89	1.88	2.18	2.26
City Water and Light	AR	0.69	0.88	1.01	1.53	1.29
Central Arkansas Water	AR	1.49	1.62	1.63	1.67	1.64
City of Yuma	AZ	2.12	2.27	2.18	2.09	2.19
City of Scottsdale	AZ	3.85	4.36	4.19	3.75	3.85
Burbank Water and Power	CA	2.58	3.00	2.89	3.19	3.37
Suburban Water Systems	CA	2.12	2.36	3.14	3.69	3.73
Alameda County Water District	CA	3.58	4.05	4.46	4.60	4.51
Valley Center Municipal Water District	CA	3.70	4.34	5.23	5.44	5.85
East Bay Municipal Utility District	CA	3.71	4.00	4.40	5.36	5.94
Denver Water	CO	2.31	1.63	1.88	1.86	2.71
District of Columbia Water and Sewer Authority	DC	3.21	3.69	4.59	5.25	5.60
Orange County Utilities	FL	1.43	1.49	1.47	1.45	1.47
JEA	FL	1.08	1.55	1.96	1.88	1.86
Miami Dade Water and Sewer Department	FL	4.48	4.90	6.47	5.00	7.45
City of Fort Lauderdale	FL	2.81	3.63	3.91	4.19	4.37
Emerald Coast Utilities Authority	FL	1.81	1.96	2.17	2.21	-
City of Lakeland Water Utilities	FL	1.67	1.75	1.83	2.18	2.20
Columbus Water Works	GA	1.65	1.47	1.81	1.98	2.23
City of Savannah	GA	1.20	1.35	1.40	1.45	1.54
Augusta Utilities	GA	2.75	2.86	2.84	2.89	-
Des Moines Water Works	IA	1.25	1.39	1.66	1.70	1.79
Waterloo Water Works	IA	0.94	1.30	1.39	1.56	1.79
Newton Water Works	IA	1.57	1.55	2.46	3.38	3.34
City of Naperville Department of Public Utilities	IL	1.91	2.76	3.47	5.38	5.93
City of Decatur	IL	1.67	1.88	2.08	2.68	-
City of Wichita	KS	1.34	1.35	1.61	1.93	2.01
City of Olathe	KS	2.55	2.68	2.75	2.95	3.14
Owensboro Municipal Utilities	KY	1.19	1.47	1.62	1.80	1.86
Louisville Water Company	KY	2.23	2.44	2.43	2.47	2.53
Lafayette Utilities System	LA	1.46	1.43	1.85	1.77	1.75
Washington Suburban Sanitary Commission	MD	4.61	5.59	6.86	7.38	-
Rochester Public Utilities	MN	1.04	1.02	0.98	0.98	1.01
City of Kalispell	MT	2.73	2.67	2.57	2.46	-
Fayetteville Public Works Commission	NC	1.92	2.03	2.05	2.11	2.10
Davidson Water Inc.	NC	3.35	3.98	4.00	4.41	4.35
Albuquerque Bernalillo County Water Utility Authority	NM	2.11	2.07	2.20	2.20	2.25
Truckee Meadows Water Authority	NV	2.77	3.08	2.97	2.84	2.80
Onondaga County Water Authority	NY	0.79	1.53	1.72	1.69	1.77
Cleveland Division of Water	OH	3.41	3.96	3.90	4.23	-
Tulsa Metropolitan Utility Authority	OK	1.54	1.13	1.79	1.48	1.65
Portland Water Bureau	OR	3.11	3.59	4.37	4.66	5.27

Utility (Location)		Volume Charge in 2016$ per kGal for 8" Water Meter				
Water Utility	State	2008	2010	2012	2015	2016
Philadelphia Water Department	PA	2.32	2.97	3.48	3.94	3.89
Grand Strand Water and Sewer Authority	SC	1.29	1.27	1.27	1.26	1.30
Erwin Utilities	TN	0.97	1.43	1.93	2.76	3.31
Metro Water Services	TN	2.34	2.41	2.56	2.45	-
White House Utility District	TN	5.33	6.08	6.84	6.97	7.38
Austin Water Utility	TX	3.91	4.33	4.97	6.25	6.27
City of Carrollton	TX	1.65	1.67	1.61	1.59	1.57
Fort Worth Water Department	TX	2.55	2.65	2.96	2.91	3.14
El Paso Water	TX	3.17	3.10	4.66	-	3.30
San Antonio Water System	TX	3.07	1.90	3.34	3.43	3.62
City of Southlake	TX	4.48	4.64	4.90	5.48	5.79
City of San Marcos	TX	6.94	6.79	6.74	7.08	7.34
City of Lubbock	TX	3.08	6.52	6.27	7.50	-
Salt Lake City Corp Public Utilities	UT	1.28	1.29	1.32	1.46	1.55
Chesterfield County Department of Utilities	VA	1.86	1.82	1.87	2.15	2.25
Newport News Waterworks	VA	4.38	4.47	4.70	4.94	4.88
Seattle Public Utilities	WA	3.93	5.15	5.72	5.34	6.89
Kenosha Water Utility	WI	1.67	1.74	1.69	1.98	2.01
City of Brookfield	WI	1.74	1.70	2.82	2.86	-
Manitowoc Public Utilities	WI	1.26	1.20	1.30	1.35	-

Table A.2. Wastewater Utility Volume Charge in 2016$ per kGal for Large Industrial Consumers

Utility (Location)		Volume Charge in 2016$ per kGal for 8" Wastewater Meter				
Wastewater Utility	State	2008	2010	2012	2015	2016
Anchorage Water and Wastewater Utility	AK	5.19	5.55	4.51	7.11	7.02
Mobile Area Water and Sewer	AL	4.78	5.89	5.84	6.78	7.04
City Water and Light	AR	0.81	1.07	1.17	1.47	1.53
City of Scottsdale	AZ	3.20	2.92	2.81	2.83	2.70
City of Santa Barbara	CA	4.14	4.22	4.83	5.08	5.29
East Bay Municipal Utility District	CA	0.77	0.87	0.88	1.07	1.46
District of Columbia Water and Sewer Authority	DC	4.85	5.31	5.61	6.42	-
City of St. Petersburg	FL	4.00	4.12	4.36	4.66	4.77
Emerald Coast Utilities Authority	FL	5.50	5.93	6.60	6.71	-
JEA	FL	5.33	5.82	6.46	6.47	6.39
Miami Dade Water and Sewer Department	FL	5.60	6.17	6.59	6.30	7.58
Orange County Utilities	FL	3.56	3.60	3.57	3.51	3.57
City of Lakeland Water Utilities	FL	2.87	3.26	3.25	3.66	3.79
Augusta Utilities	GA	3.01	3.13	3.10	3.24	-
City of Savannah	GA	3.48	4.22	2.08	4.50	4.79
City of Naperville Department of Public Utilities	IL	1.83	1.80	2.48	2.50	2.47
City of Olathe	KS	3.68	3.97	4.43	5.29	5.61
City of Wichita	KS	2.22	2.29	2.86	3.21	3.33
Lafayette Utilities System	LA	4.24	4.16	5.99	5.73	5.66
Washington Suburban Sanitary Commission	MD	7.41	8.27	8.79	10.84	-
City of Kalispell	MT	4.70	4.61	4.44	4.84	-
Fayetteville Public Works Commission	NC	3.57	3.83	3.71	3.59	3.75
Albuquerque Bernalillo County Water Utility Authority	NM	1.12	1.15	1.72	1.58	2.24
Tulsa Metropolitan Utility Authority	OK	3.42	3.92	4.52	5.71	-
Philadelphia Water Department	PA	2.66	3.02	3.13	3.80	3.75

Utility (Location)		Volume Charge in 2016$ per kGal for 8" Wastewater Meter				
Wastewater Utility	State	2008	2010	2012	2015	2016
Grand Strand Water and Sewer Authority	SC	1.96	1.93	1.96	1.95	1.99
City of Oak Ridge	TN	7.90	7.70	7.75	9.92	9.80
Erwin Utilities	TN	2.76	2.98	3.79	5.45	5.92
Metro Water Services	TN	3.89	4.15	4.61	4.41	-
Austin Water Utility	TX	7.09	7.31	8.27	8.93	9.26
City of Carrollton	TX	2.19	2.22	2.14	2.15	2.12
City of Lubbock	TX	2.05	2.26	2.17	2.48	-
City of San Marcos	TX	7.24	7.10	7.00	6.94	6.92
City of Southlake	TX	3.37	3.30	3.18	3.04	3.15
El Paso Water	TX	1.91	1.68	1.67	-	1.99
San Antonio Water System	TX	2.19	2.26	2.77	3.20	3.52
Salt Lake City Corp Public Utilities	UT	3.20	1.94	1.95	4.01	4.28
Chesterfield County Department of Utilities	VA	1.97	2.13	2.12	2.63	2.70
Seattle Public Utilities	WA	11.63	13.21	15.12	13.91	17.29
City of Brookfield	WI	3.70	3.63	3.81	4.01	3.96
Kenosha Water Utility	WI	2.81	2.84	2.73	2.61	2.66

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