



The Financial Impact of the COVID-19 Crisis on U.S. Drinking Water Utilities

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**American Water Works
Association**

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**ASSOCIATION OF
METROPOLITAN
WATER AGENCIES**

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Executive Summary

Drinking water utilities across the U.S. have experienced, and are anticipated to continue to experience, revenue and cost impacts associated with the COVID-19 crisis. This report was prepared for the American Water Works Association (“AWWA”) and the Association of Metropolitan Water Agencies (“AMWA”) to estimate the financial impacts of the crisis on drinking water utilities in the U.S.

The anticipated financial impacts were estimated by (1) obtaining recent and relevant data regarding observed or anticipated financial and operational water utility impacts, (2) monetizing the impacts, and (3) scaling up or aggregating the impacts to estimate the impacts on a national level.

The results of the assessment indicate that the aggregate financial impact of COVID-19 on drinking water utilities will likely be approximately \$13.9 billion, representing an overall 16.9 percent financial impact on the drinking water sector. These impacts are a result of drinking water utilities eliminating shut offs for non-payment, anticipated increased delinquencies as a result of high unemployment rates, reductions in non-residential water demands and associated revenues offset by increases in residential consumption, and lower customer growth. A summary of the financial impacts associated with these factors are provided in the table below.

Due to these financial impacts, drinking water utilities across the nation are anticipated to delay and reduce capital expenditures by as much as \$5 billion (annualized) to help manage cash flows due to the crisis. These capital expenditure reductions will have a cascade effect on economic activity in communities across the U.S. As a result, **communities will experience a reduction in economic activity by as much as \$32.7 billion** (annualized) in aggregate when considering economic multiplier effects. The reduction in capital expenditures is also anticipated to result in a loss of 75,000 to 90,000 private sector jobs.

Drinking water utilities may also experience additional future revenue losses estimated at approximately \$1.6 billion in aggregate as a result of deferrals of planned water rate increases, bringing **the total combined impact of the crisis on drinking water utilities to more than \$15 billion**. These deferrals will further exacerbate community economic impacts by further reducing capital spending and will put the water sector further behind in addressing its capital infrastructure needs.

The financial impact of the COVID-19 crisis on water and wastewater utilities combined is estimated to exceed \$27 billion.

Estimated Total Aggregate Financial Impact on Drinking Water Utilities

Description	2 Months	4 Months	6 Months	Annualized
Marginal Cost of Non-Shut Offs	\$0.10B	\$0.19B	\$0.29B	\$0.57B
Revenue Loss Due to Increased Delinquencies	\$0.82B	\$1.64B	\$2.46B	\$4.92B
Reduction in Commercial Revenues	\$1.23B	\$2.46B	\$3.69B	\$7.38B
Increase in Residential Revenues	(\$0.44B)	(\$0.88B)	(\$1.32B)	(\$2.64B)
Increase in Personnel Expenses	\$0.10B	\$0.21B	\$0.31B	\$0.63B
Reduction in System Development Charges	\$0.43B	\$0.87B	\$1.30B	\$2.60B
Reduction in Revenues from Lower Customer Growth	\$0.01B	\$0.05B	\$0.09B	\$0.41B
Total Aggregate Financial Impact	\$2.3B	\$4.5B	\$6.8B	\$13.9B

This assessment and report was funded by the Water Industry Technical Action Fund (“WITAF”) of AWWA. WITAF is managed by the Water Utility Council to support projects, studies, analyses, reports and presentations in support of AWWA’s legislative and regulatory agenda. WITAF is funded by a portion of organizational member’s dues.

1 Introduction

1.1. Background and Objectives

This report was prepared for the American Water Works Association (“AWWA”) and the Association of Metropolitan Water Agencies (“AMWA”) to assist in estimating the financial impact that the novel COVID-19 virus is anticipated to have on water utilities in the United States (“U.S.”). The intent of the report is to aid AWWA and AMWA in advocating for securing Federal funding for the drinking water sector to help deal with this crisis and to provide AWWA and AMWA membership with information regarding the aggregate financial impact of the COVID-19 crisis on the sector. This assessment and report was funded by the Water Industry Technical Action Fund (“WITAF”) of AWWA. The WITAF is managed by the Water Utility Council to support projects, studies, analyses, reports and presentations in support of AWWA’s legislative and regulatory agenda. WITAF is funded by a portion of organizational member’s dues.

1.2. Scope of Work

Drinking water utilities across the U.S. have experienced and are anticipated to experience revenue and cost impacts associated with the national, state, and local response to the COVID-19 crisis. The scope of this work consisted of estimating the aggregate financial impacts on drinking water utilities due to the following:

- 1. Changes in utility policies** to not shut off water service to customers with delinquent accounts and providing forgiveness of late penalty fees. This included preparing estimates of the anticipated rise in delinquencies due to the policy change, as well as due to anticipated rising unemployment rates.
- 2. Losses in revenue** from non-residential (i.e., commercial, industrial, and institutional) customers, net of residential revenue increases, as a result of national and state directives for the temporary shutdown of non-essential businesses and “stay at home” orders.
- 3. Operational actions taken**, or anticipated to be taken, by water utilities to ensure safe and reliable water service, such as sequestering water operators and other key staff.
- 4. Reducing, deferring or eliminating capital expenditures** to preserve cash and help maintain financial sustainability.
- 5. Reduction in system development charges and user charges from new growth** due to slowing of economic growth and development.

Due to the rapidly developing and changing crisis, the scope of work was initiated on April 1, 2020 and was completed on April 13, 2020.

The financial assessment summarized in this report was prepared based on relevant data and information available as of the date of this report. It does not incorporate any facts or information which may have come into existence after the date of the report, and such information could have a material effect on the findings and conclusions contained herein. As such, the estimates contained in this report are early estimates based on available data that may understate the financial impacts on drinking water utilities depending upon the length and severity of the crisis. The analyses focused on the national impacts to drinking water utilities in the U.S. and did not consider or involve developing specific state or city impacts, or a detailed estimate of the impacts to wastewater utilities.

1.3. Methodology

In general, the methodology used to estimate the financial impacts of the COVID-19 crisis on drinking water utilities consisted of (1) obtaining recent and relevant data regarding observed or anticipated financial and operational water utility impacts, (2) monetizing the impacts, and (3) scaling up or aggregating the impacts to estimate monthly and annualized national impacts. Specific methodologies used to identify and quantify the various financial impacts of COVID-19 on drinking water utilities are provided in Section 2.

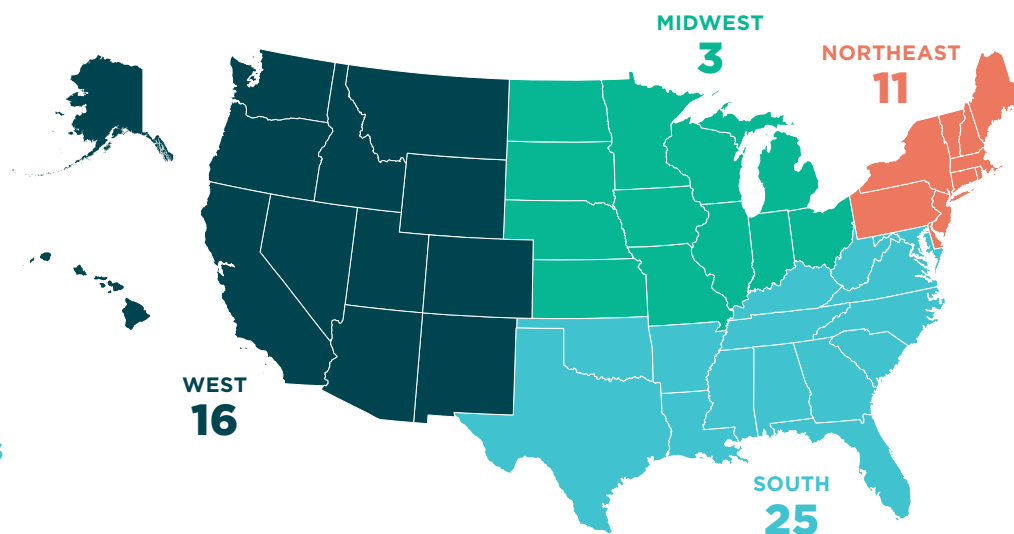


Figure 1-1.
Location of Utilities
Responding to Raftelis
Questionnaire

1.4. Data and Information Sources

Information that was used to complete the financial impact assessment was compiled from various AWWA and AMWA sector surveys, sector publications, responses from a questionnaire prepared and distributed to water utilities, and financial data and information from recent rate studies completed by Raftelis for various drinking water utility clients. Specific sector surveys and publications that were relied upon to complete the assessment, included the following:

- COVID-19 Survey Conducted by AWWA on March 25-30, 2020;
- 2019 Water and Wastewater Rate Survey. AWWA;
- Utility Benchmarking: Performance Management for Water and Wastewater. AWWA 2019;
- INSIGHT – Utility Financial Information Database. AMWA 2018;
- Dun & Bradstreet, First Research Industry profile for the Water Industry. 2018;
- Public Spending on Transportation and Water Infrastructure, 1956 to 2017. Congressional Budget Office, October 2018;
- U.S. Census Bureau, Population Survey (2019);
- U.S. Census Bureau, American Housing Survey Data (2017);
- U.S. Census Bureau, Historical Labor Force Unemployment Rate Statistics;
- U.S. Census Bureau, Building Permit Survey (2019);
- Residential End Uses of Water, Version 2 Executive Report, Water Research Foundation, April 2016;
- Back-of-the-Envelope Estimates of Next Quarter's Unemployment Rate. The Federal Reserve Bank of St. Louis, March 24, 2020;
- COVID-19: Economic Scenarios. Moody's Analytics. March 27, 2020;
- The Daily Shot: Consumers Cut Spending by About 50 Percent, Wall Street Journal, April 8, 2020;
- National Impact Fee Survey, Duncan Associates, 2019;
- Local Government Investment in Municipal Water and Sewer Infrastructure: Adding Value to the National Economy, Prepared for the U.S. Conference of Mayors by The Cadmus Group, Inc. August 14, 2008; and
- The Economic Benefits of Investing in Water Infrastructure, Bureau of Economic Analysis, 2018.

AWWA surveyed member utilities and other sector organizations between March 25 - 30, 2020 to gauge the impacts of COVID-19 and actions being taken to manage risk and plan for contingencies. AWWA received 615 responses to the survey, of which 532 responses were from unique utilities, and 81 were from non-utility survey participants. Results from this survey were used in this assessment, where noted.

Raftelis prepared a questionnaire focused on the financial and operational impacts of the COVID-19 crisis on drinking water utilities and distributed the questionnaire to more than 150 water utilities. The questionnaire was completed between April 6 – 8, 2020. A total of 102 responses to the survey were received, of which 55 responses were usable, complete, and represent responses from unique drinking water utilities. Responses from this questionnaire were used in this assessment, where noted. In addition, the full questionnaire and a summary of the responses are provided in Appendix A.

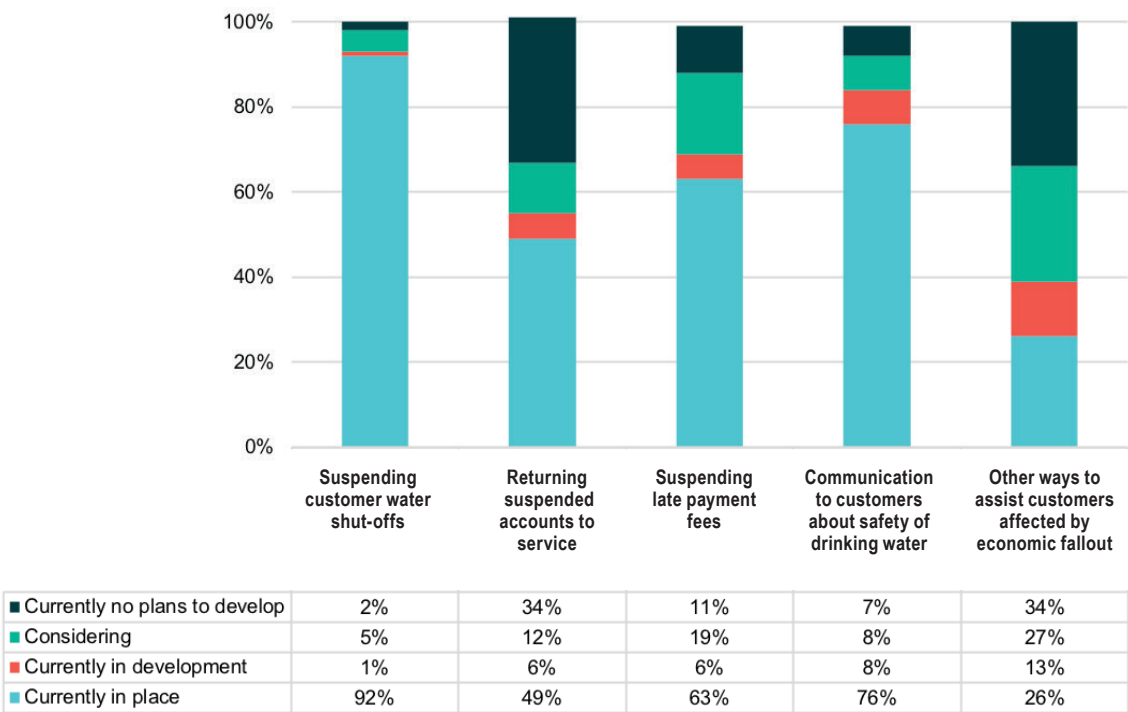
2 Analysis and Results

This section of the report provides a detailed description of the methodologies and analyses employed to quantify the financial impacts of the COVID-19 crisis on drinking water utilities and summarizes the results of the analyses.

2.1. Financial Losses Due to Changes in Customer Delinquency Policies

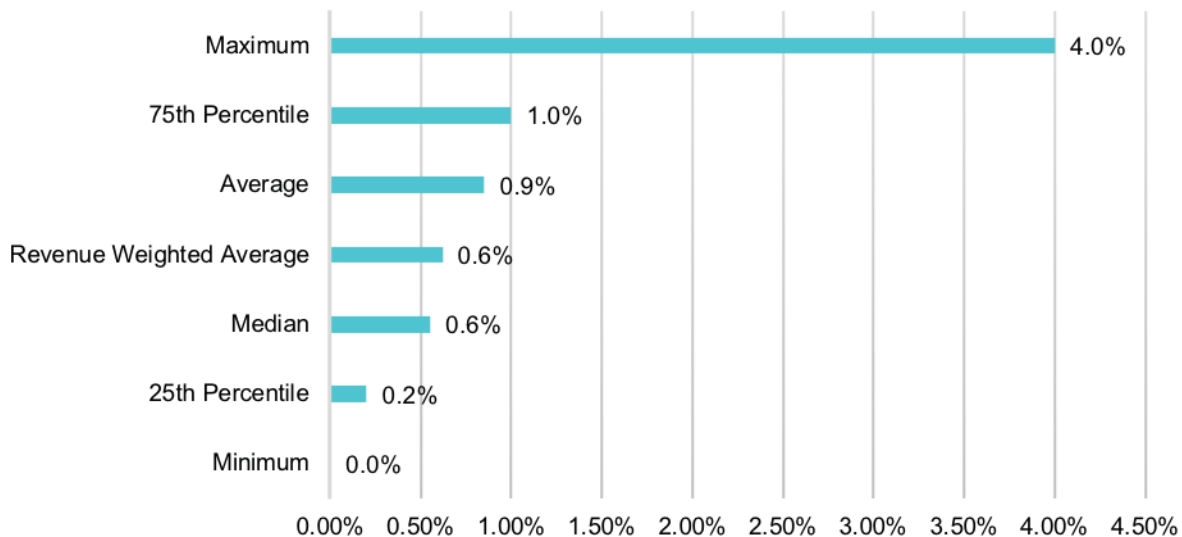
Many drinking water utilities have changed their shut-off and late bill payment fee policies for delinquent accounts in reaction to the crisis. According to the recent COVID-19 survey completed by AWWA in March 2020, approximately 98% of respondents indicated that policies are either in place to suspend customer water shut-offs, in development, or indicated that they are considering implementing such policies, as show in Figure 2-1.

Figure 2-1. Water Utility Changes to Delinquency Policies



Responses from the Raftelis COVID-19 impact questionnaire indicated that the median annual uncollectable percentage for drinking water utilities prior to the COVID-19 crisis was approximately 0.6 percent, as shown in Figure 2-2. In addition, survey respondents indicated the likelihood that delinquencies would increase significantly in the coming months.

Figure 2-2. Pre-Crisis Water Utility Uncollectible Rates (N=42)



Due to changes in water utility shut-off policies and rising unemployment rates, delinquencies and annual uncollectible percentages will likely increase significantly, resulting in incremental water utility revenue deferrals or losses. Some specific examples of delinquency policy changes that have been implemented are as follows:

Manchester Water Works (NH) is not charging late fees or performing shut-offs for not payment.

City of Tulsa (OK) is working on extending its payment arrangement plans without penalty. In some cases, it anticipates the need to write off the debt.

City of Chandler (AZ) is helping water customers financially burdened due to COVID-19 by suspending disconnections, not charging late fees, and extending payment plans.

WaterOne in Johnson County (KS) has eliminated late payment fees and anticipates a 53 percent reduction in late payment fees assuming that it foregoes changing these fees for six months.

2.1.1. Methodology

The steps used to estimate drinking water utility financial losses due to changes in delinquency policies are summarized as follows:

1. Estimate the marginal cost impact of non-shut offs of delinquent accounts:

- Identify typical delinquency rates and bad debt ratios using the AMWA INSIGHT survey, AWWA benchmarking study, and responses from the Raftelis water utility questionnaire.
- Estimate the typical marginal cost of water defined as variable costs (e.g. power, chemicals, etc.) as a percentage of the typical water utility total budget from sector survey results and Raftelis experience.
- Multiply marginal cost of water percentage by an estimate of the aggregate National water utility revenue and expenditure estimate.
- Estimate the monthly marginal cost impact by dividing the figure above by a factor of 12.

2. Estimate the deferred or lost revenue to drinking water utilities due to increased bill delinquencies:

- a. Use national unemployment statistics to estimate increases in delinquencies due to the crisis.
- b. Estimate additional delinquencies due to moral hazard / lack of consequences of customers not paying their utility bills. Estimated from sample of sector data from past events.
- c. Estimate incremental delinquency rate due to (a.) and (b.) above.
- d. Multiply the increased delinquency rate by the Aggregate National water utility revenue estimate.
- e. Estimate the monthly deferred revenue impact by dividing the figure above by a factor of 12.
- f. Estimate the portion of utilities that may implement a policy to relieve customers from having to pay their delinquent, unpaid bills from Raftelis questionnaire results.
- g. Estimate the potential monthly permanent revenue loss by multiplying the estimated value of delinquent water bills by the percentage of utilities implementing debt forgiveness policies.

3. Estimate lost revenue from the portion of utilities that may implement a policy to relieve customers from having to pay late bill fees.

- a. Estimate the typical amount of late bill fees collected by drinking water utilities as a percentage of total revenues from the AMWA INSIGHT survey.
- b. Multiply the late bill fee revenue percentage by the Aggregate National water utility revenue estimate.
- c. Estimate the proportion of drinking water utilities that have or plan to implement late bill fee forgiveness policies from the March 2020 AWWA survey.
- d. Multiply the proportion of drinking water utilities that have or plan to implement late bill fee forgiveness policies by the aggregate National late bill fee revenue estimate.

2.1.2. Analysis

The aggregate national level of annual revenues generated by drinking water utilities in the U.S. was estimated based on household and drinking water sector data as detailed in Table 2-1.

Table 2-1. Estimated Aggregate Annual Drinking Water Utility Revenues

Description	Reference	Parameter
a. Number of U.S. Households	¹	128.579M
b. U.S. Households on Private Wells	²	10.72%
c. U.S. Households on Public/Private Water Systems	1 - b	89.28%
d. U.S. Households on Public/Private Water Systems	a x c	114.8M
e. Median Monthly Residential Water Utility Bill	³	\$42.41
f. Estimated Annual Residential Water Utility Rate Revenue	d x e x 12	\$58.4B
g. Residential Share of Total Water Utility Rate Revenue	⁴	71%
h. Estimated Annual Water Sector Revenues in 2019	f / g	\$82.3B

¹ U.S. Census Bureau Population Survey (2019).

² U.S. Census Bureau, American Housing Survey Data (2017). Note that the estimated number of U.S. households on public or private water systems was calculated based on U.S. Census data and is slightly lower than an estimate calculated using the USEPA data on the population served by Community Water Systems of approximately 311 million. Dividing the USEPA population figure by an assumption of 2.5 people per household, results in an estimate of approximately 124 million households connected to community water systems. If estimate prepared using USEPA data was used, the financial impacts estimated in this report would be higher.

³ AWWA Water and Wastewater Rate Survey (2019).

⁴ AMWA Insight Survey (2018) indicating 51% of revenue is residential, 29% non-residential, and 20% wholesale/other. Adjusted residential and non-residential percentages to reflect that approximately 7.25% of non-residential is multifamily.

The estimated annual water sector revenues shown in Table 2-1 are used to calculate financial losses due to changes in customer delinquency policies and other financial impacts estimated herein.

The financial impact of delinquent account policy changes was then estimated by quantifying the financial impact of (1) drinking water utilities continuing to provide service to delinquent accounts, instead of enacting shut-offs, and (2) deferred or lost revenue associated with observed and anticipated higher delinquency rates during the COVID-19 crisis, as detailed in Tables 2-2 and 2-3. The temporary elimination of late payment fees was not estimated to have a significant impact on water utility revenues.

The estimate of deferred or lost revenue due to increased bill delinquencies was prepared based on the increase in unemployment rates and the potential for additional bill delinquencies due to the inability to pay and the lack of consequences for non-payment, as detailed in Table 2-2. This estimate includes consideration of the moral hazard (i.e., lack of consequences of customers not paying their utility bills) resulting in higher bill delinquencies.

Table 2-2. Estimated Deferred or Lost Revenue Due to Increased Bill Delinquencies

Description	Reference	Parameter
a. Delinquent Account Write-offs as % of Total Revenues	¹	0.6%
b. Pre COVID-19 Unemployment Rate	²	3.5%
c. Unemployment Rate During COVID-19 Crisis	³	12.0%
d. % Increase in Delinquencies Due to Higher Unemployment Rate	c / b	342.9%
e. % Increase in Delinquencies Due to Moral Hazard	⁴	320.0%
f. Adjusted Delinquencies as % of Total Revenues	a x d x e	6.6%
g. % Difference in Delinquencies	f - a	6.0%
h. Annual Aggregate Water Utility Revenues	⁵	\$82.3B
i. Annualized Incremental Delinquencies	g x h	\$4.9B
j. Monthly Incremental Delinquencies	i / 12	\$410M

¹ Results from Raftelis COVID-19 questionnaire.

² Labor Force Unemployment Rate Statistics from the U.S. Bureau of Labor Statistics for February 2020.

³ Blended unemployment rate estimate for the second quarter of 2020 from Federal Reserve Bank of St. Louis, Moody's Global Economic Forecast publication dated March 27, 2020, and various news articles on the estimated unemployment rate.

⁴ Data from observed increases in delinquencies from Seattle Public Utilities due to cessation of service shut-offs during new billing system conversion. Seattle observed an increase in delinquencies from 1.54% to 5.03% during this event. Factor adjusted based on AWWA March 2020 survey that indicated that approximately 98% of water utilities surveyed have suspended or are planning to suspend shut-offs in response to the COVID-19 crisis.

⁵ Calculation as provided in Table 2-1.

The elimination of shut-offs will result in an added cost to drinking water utilities as they continue to supply customers with delinquent bills with water service, rather than enacting shut-offs. An estimate of the incremental cost of continuing to supply these customers with water service is detailed in Table 2-3.

Table 2-3. Estimated Marginal Cost Impact of Non-Shut Offs of Delinquent Accounts

Description	Reference	Parameter
a. Operating Ratio (O&M expenses / operating revenue)	¹	58%
b. Variable Expenses as % of Total O&M expenses	²	20%
c. Marginal Cost	a x b	11.6%
d. Aggregate Annual Water Utility Revenue	³	\$82.3B
e. Aggregate Annual Marginal Cost	c x d	\$9.5B
f. Delinquent Account Uncollectable Rate % of Total Revenues	⁴	6%
g. Marginal Cost Impact of Non-Shut Offs - Annualized	e x f	\$0.6B
h. Marginal Cost Impact of Non-Shut Offs - Monthly	g / 12	\$47.6M

¹ AWWA Utility Benchmarking Survey (2019), Table 2-6A.

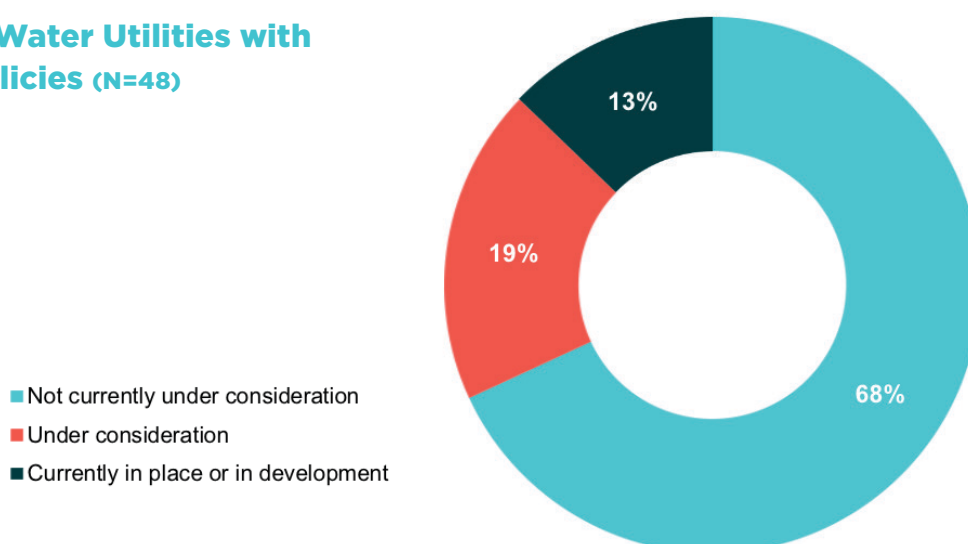
² AMWA INSIGHT Survey and Raftelis experience.

³ Calculation as provided in Table 2-1.

⁴ Calculated in Table 2-2.

Based on Raftelis questionnaire responses, 12 percent of respondents have already put in place policies for debt forgiveness, and 19 percent are considering implementing such a policy as shown in Figure 2-3. Therefore, a significant portion of the increase in bill delinquencies are anticipated to result in water utility write-offs and permanent losses in revenue.

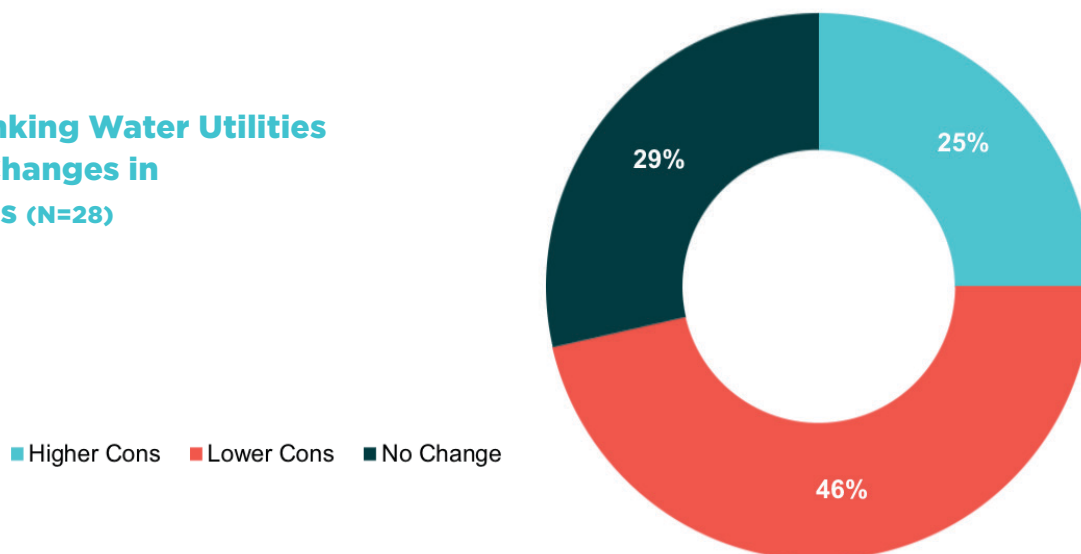
Figure 2-3. Drinking Water Utilities with Debt Forgiveness Policies (N=48)



2.2. Revenue Loss Due to Declines in Consumption

Approximately half of drinking water utilities responding to the Raftelis COVID-19 questionnaire indicated that they have already experienced reductions in water demands during the crisis that are a direct result of Federal, State, and local stay-at-home orders and reductions in commercial, industrial, and institutional activities, as shown in Figure 2-4.

Figure 2-4. Drinking Water Utilities Experiencing Changes in Water Demands (N=28)



Due to customer water metering frequencies (typically monthly, bi-monthly, or quarterly), there is a lag in observable changes in water consumption associated with the crisis, and for many utilities, it is too early to precisely estimate the impacts. However, it is anticipated that the vast majority of drinking water utilities across the U.S. will experience revenue loss due to water consumption declines. These reductions in demands are anticipated to result in losses in revenue from non-residential customers. Some specific utility examples of where consumption declines are occurring include:

A mid-sized utility in Pennsylvania experienced a 10 percent loss in water demands for the four-day average from March 1 – 4, 2020, as compared to the four-day average demands from a period in February prior to the crisis.

A large water utility in Virginia experienced a decline in demands between March 25 – 31, 2020 compared to the same time period in 2019 of approximately 6.7 percent.

A large water utility in Colorado has experienced reduction of more than 35 percent in water usage from non-residential customers, and approximately a 10 percent increase in residential water usage based on a small sample of customer meter data from the utility's AMI metering system.

Toho Water (FL) is anticipating experiencing a 52 percent reduction in commercial water usage and 12.5 percent reduction in reclaimed water sales over a six-month period, with a total annual revenue loss of approximately 9.2 percent.

Pittsburgh Water and Sewer Authority (PA) has experienced large college residential vacancies and commercial facilities shutdown that have resulted in reduction in total demands of approximately 12 percent.

South Central Connecticut Regional Water Authority (CT) has experienced a water production decline of approximately 6 percent. This utility serves primarily residential customers, but among their top 10 customers are universities and hospitals.

2.2.1. Methodology

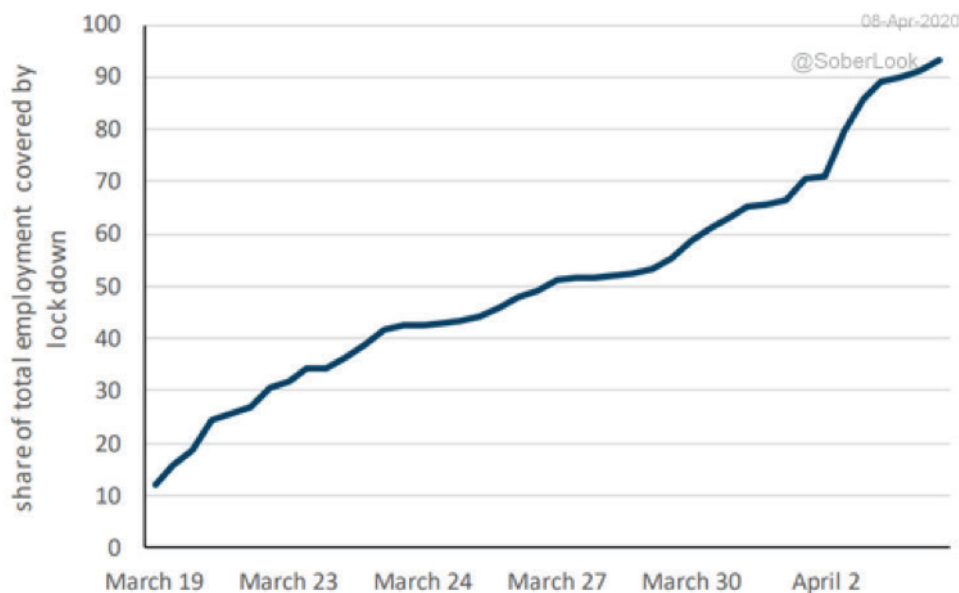
The potential loss in revenue due to anticipated declines in consumption was estimated as follows:

1. Identify the typical percentage of revenues generated by drinking water utilities from residential and non-residential customers based on the AMWA INSIGHT survey.
2. Estimate the reduction in non-residential water demands and revenues based on an aggregate sector analysis of affected stay-at-home orders and responses from the Raftelis COVID-19 questionnaire.
3. Estimate the typical water utility revenue reduction by multiplying the percentage of revenues associated with non-residential customers by the estimated reduction in non-residential water demands.
4. Multiply the estimate of the typical reduction in water utility revenues by the Aggregate National water utility revenue estimate.
5. Offset estimated losses on non-residential revenue with the estimated increase in revenue from residential water usage due to impacts of Federal and State stay-at-home orders.
6. Divide resulting revenue reduction number by 12 to convert to a monthly value.

2.2.2. Analysis

Recent U.S. labor market information indicates that stay-at-home orders and lockdowns during the COVID-19 crisis have impacted over 90 percent of the labor force¹, as shown in Figure 2-5.

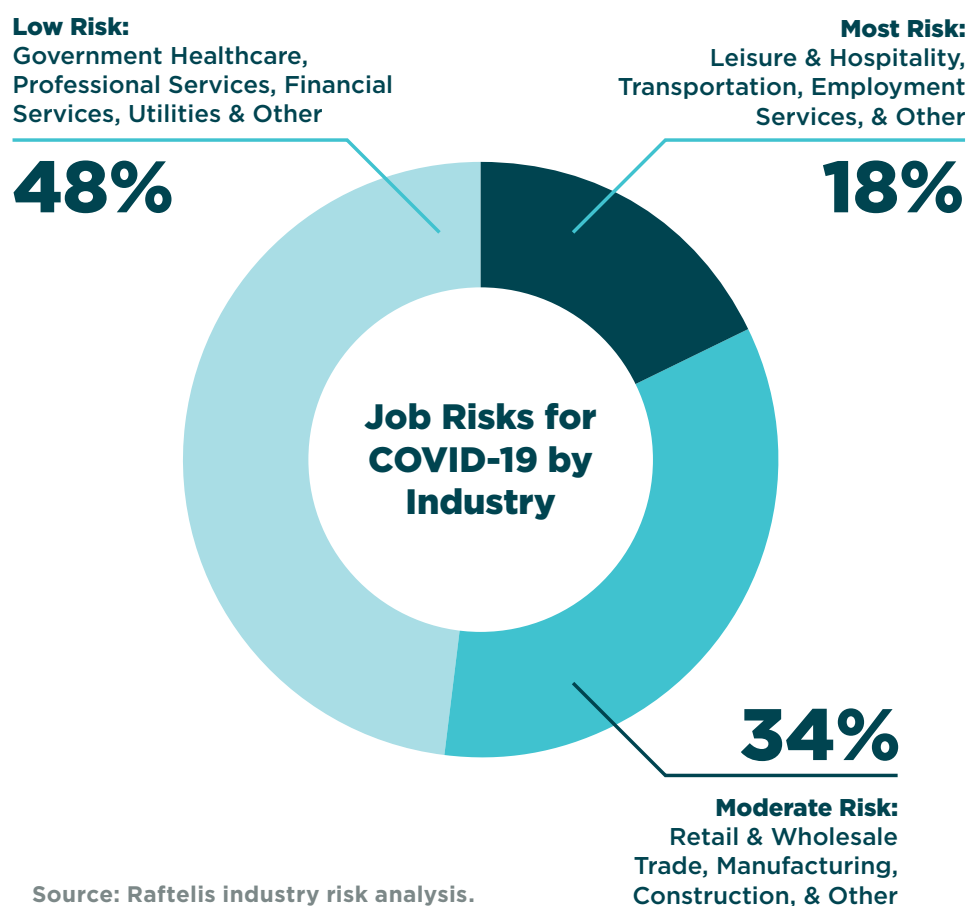
Figure 2-5. Cumulative Share of Labor Market Subject to State Lockdowns



¹) The Wall Street Journal, April 8, 2020.
<https://blogs.wsj.com/dailyshot/2020/04/08/the-daily-shot-consumers-cut-spending-by-about-50/>

Such stay-at-home orders have significantly impacted water demands from non-residential customers. A commercial sector risk assessment was completed to estimate the potential reduction of water demands and revenues from commercial and industrial businesses. Based on this analysis, it is anticipated that drinking water utilities will experience significant water demand reductions from industries in the leisure, hospitality, and transportation sectors, and moderate to significant reductions in water demands from other industries, such as retail and wholesale trade, manufacturing, and construction. The composition of these industries is summarized in Figure 2-6.

Figure 2-6. Industries Anticipated to Experience Significant Water Demand Reductions



Based on the industry risk analysis, it was estimated that there is the potential for nearly full reduction in water demands from high risk industries and partial reduction (we assumed 50% reduction) in water demands from moderate risk industries. These estimates were used to assess the potential revenue loss due to water demand declines during the COVID-19 crisis, as detailed in Table 2-4.

Table 2-4. Estimated Revenue Loss Due to Declines in Non-Residential Consumption

Description	Reference	Parameter
a. Typical Non-Residential Revenue as % of Total Revenue	¹	29.0%
b. Reduction in Non-Residential Water Demand	²	35.0%
c. Estimated Reduction in Revenue from Non-Residential	a x b	10.2%
d. Annual Aggregate Water Utility Revenue	³	\$82.3B
e. Annualized Reduction in Water Utility Revenues	c x d	\$8.4B
f. Marginal Cost Savings %	⁴	11.6%
g. Marginal Cost Savings \$	e x f	(\$1.0B)
h. Net Annualized Reduction in Water Utility Revenues	e - g	\$7.4B
i. Monthly Reduction in Water Utility Revenues	e / 12	\$615M

¹ AMWA INSIGHT Survey (2018).

² Estimated based on analysis of U.S. industry risk exposure to COVID-19 (<https://www.raftelis.com/insight/stress-testing-your-financial-plan/>) considering reduction in demands from high risk industries, including leisure & hospitality, transportation, and other, and moderate reduction in demand from moderate risk industries, such as retail & wholesale trade, manufacturing, and construction industries.

³ Calculation as provided in Table 2-1.

⁴ Calculation as provided in Table 2-3.

The estimated loss in non-residential revenues are anticipated to be somewhat offset by an increase in water demands and revenues from residential customers due to Federal and State stay-at-home orders and as indoor water use increases due to greater homeowner occupancy during normal working hours. The estimated increase in residential consumption and associated revenues as a result of the COVID-19 crisis are detailed in Table 2-5.

Table 2-5. Estimated Increase in Residential Consumption

Description	Reference	Parameter
a. Increase in Residential Indoor Water Use	¹	8.00%
b. Indoor Water Use as % of Total Water Use	²	60.00%
c. Increase in Residential Water Use Due to COVID19 Crisis	a x b	4.80%

¹ Estimated increase in indoor water use from a 33% increase in toilet use from an increase of eight hours at home (8 hrs / 24 hrs = 33.3%) times the percentage of toilet use as a % of total indoor water use of 24% from the publication: Residential End Uses of Water, Version 2 Executive Report, Water Research Foundation, April 2016.

² Residential End Uses of Water, Version 2 Executive Report, Water Research Foundation, April 2016.

Note that this estimate does not consider the potential that some residential customers may curtail water usage (e.g. outdoor water usage for irrigation) during the crisis to help lower their water bills.

Table 2-6. Estimated Revenue Increase Due to Increases in Residential Consumption

Description	Reference	Parameter
a. Residential Revenue as % of Total Revenue	¹	71.0%
b. Increase in Residential Water Demand	²	4.8%
c. Increase in Residential Water Revenue (%)	a x b	3.4%
d. Annual Aggregate Water Utility Revenue	³	\$82.3B
e. Annualized Increase in Water Utility Revenues	c x d	\$2.8B
f. Less: Adjustment for Increase in Residential Write-offs	⁴	6.0%
g. Net Annualized Increase in Water Utility Revenues	e x (1-f)	\$2.6B
h. Estimated Monthly Increase in Water Utility Revenues	e / 12	\$220M

¹ AMWA INSIGHT Survey (2018).

² Calculated in Table 2-5.

³ Calculation in Table 2-1.

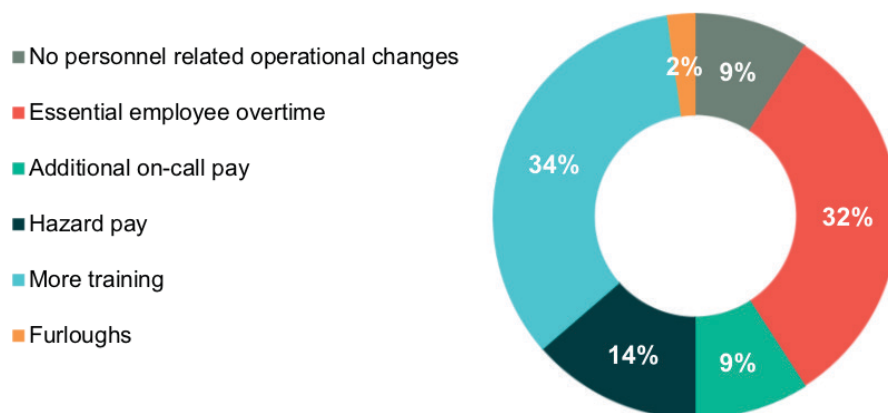
⁴ Calculation in Table 2-2.

The total estimated net decrease in water utility revenues is anticipated to be \$4.7 billion on an annualized basis considering the anticipated \$7.4 billion decrease in non-residential revenues and a \$2.7 billion increase in residential revenues.

2.3. Financial Impact of Water Utility Operational Policy Changes

Some drinking water utilities have implemented new operational policies in response to the COVID-19 crisis, such as new operating hours for essential water utility staff, sequestering operations staff, and providing increased compensation for essential employees. Based on the Raftelis COVID-19 questionnaire response, personnel-related changes included paying essential employees overtime, providing additional compensation to employees as “hazard pay,” incurring more employee on-call personnel expenses, and in some cases furloughing employees, as summarized in Figure 2-7.

Figure 2-7. Personnel Expense Changes (N=27)



For approximately the 40 percent of drinking water utilities responding that personnel expenses are anticipated to increase due to the crisis, the weighted average percent change in personnel expenses was approximately 6.5 percent. Specific examples from drinking water utilities responding to the questionnaire include the following:

A large utility in North Carolina is paying a 5% premium to essential workers.

El Paso Water Utilities Public Service Board (TX) is experiencing personnel impacts related to emergency administrative leave.

Great Lakes Water Authority (MI) indicated that it had increased the pay of all operation and maintenance personnel by \$1.00 per hour in response to the crisis.

Des Moines Water (IA) has sequestered treatment plant operating personnel enough for 12-hour shifts, and is paying each of these staff for 24 hours per day. The balance of personnel is being paid regular salaries, even though some will not be working.

La Puente Valley County Water District (CA) is implementing alternative work schedules in which a portion of staff is paid to be home at the ready.

2.3.1. Methodology

Estimation of the financial impacts of operational actions taken, or anticipated to be taken, by drinking water utilities that impact personnel expenses consisted of:

1. Obtain information from Raftelis questionnaire regarding % changes to personnel expenses due to crisis.
2. Obtain typical percentage of personnel expenses compared to total water utility expenditures from AWWA and AMWA survey data.
3. Multiply % change to personnel expenses by personnel expense estimate as % of total expense. Then multiply this resulting percentage by the national revenue estimate from the CBO source to aggregate to the national level.
4. Divide resulting national personnel expense impact by 12 to convert to a monthly value.

2.3.2. Analysis

An estimate of the personnel expense impact of changes to drinking water utility personnel policies was calculated as detailed in Table 2-7.

Table 2-7. Estimated Operation Policy Change Impacts on Personnel Expenses

Description	Reference	Parameter
a. Increase in Personnel Expenses Due to COVID-19 Crisis	¹	6.5%
b. Weighted Average Personnel Expense Increases	²	3.2%
c. Personnel Expenses as % of Total Budget	³	23.8%
d. Increase in Personnel Expense as % of Total Revenue	b x c	0.8%
e. Annual Aggregate Water Utility Revenue	⁴	\$82.3B
f. Aggregate Annual Increase in Personnel Expense	d x e	\$0.6B
g. Aggregate Monthly Increase in Personnel Expense	f / 12	\$52M

¹ Raftelis questionnaire response. Average increase in personnel expense for those respondents indicating increased expenses.

² Raftelis questionnaire response. Weighted responses by revenue, including those respondents indicating no expense increase.

³ Operating Ratio (58%) x Personnel Expense as % of operating & maintenance expense (41%). From 2019 AWWA Utility Benchmarking Survey, Table 2-6A and the 2019 AMWA INSIGHT Survey.

⁴ Calculated in Table 2-2.

Some utilities also responded to the Raftelis COVID-19 questionnaire that they anticipate experiencing increases in non-personnel related expenses due to the crisis, while others indicated potential decreases in non-personnel expenses due to the crisis. Reported increases in expenses consisted of equipment to enable employees to work from home (e.g. computers, monitors) and personal protective equipment. Reported decreases in expenses included items such as reduced travel and conference expenses, reductions in utilities and chemicals due to lower water production, reductions in material costs from reduction in non-essential work activities. Some specific examples of changes to non-personnel expenses are as follows:

Salt Lake City, Department of Public Utilities (UT) is anticipating additional chemical costs in order to have excess supplies in place if there are interruptions in vendor services, and additional personal protective equipment material and supply costs.

Portland Water District (ME) has incurred additional cost related to a remote workforce, including new personal computers, monitors, server, and software. In addition, it anticipates additional expenses in personal protective equipment.

Lehigh County Authority (PA) has experienced a significant investment in IT/technology expenses to support work-from-home arrangements, including rapid purchase and deployment of laptops and reimbursement for internet service and cell phone usage for employees working from home.

Manchester Water Works (NH) has reduced non-essential work activities which may reduce the purchase of certain materials and supplies.

Fort Pierce Utilities Authority (FL) has experienced increases in materials and supplies costs for disinfectants, towel wipes, respirators, thermometers, and masks. It also anticipates incurring additional expenses associated with sanitation of lobby areas and health monitoring when customer service offices open and employees return to utility offices after working from home.

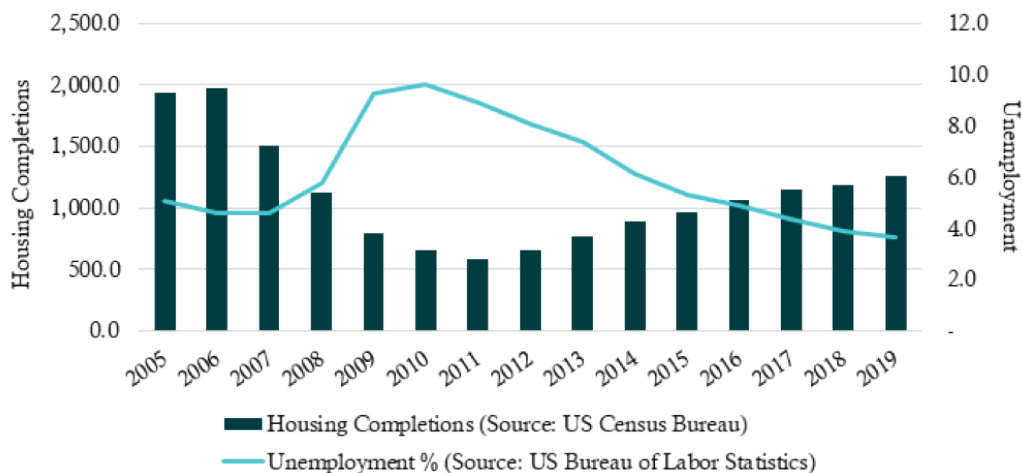
Dare County (NC) anticipates a decrease in chemical usage and utility costs.

Due to the variable responses from the Raftelis COVID-19 questionnaire, a definitive estimate of increased non-personnel expenses could not be made.

2.4. Financial Loss Due to Slower Customer Growth

The COVID-19 crisis is anticipated to slow the growth in new development and housing starts, which will further impact the revenues of drinking water utilities. Historical data on the correlation between the unemployment rate and housing development activity was gathered, reviewed, and analyzed. The analysis of this data indicated that a significant decrease in real estate development is likely to occur due to the COVID-19 crisis as a result of increased unemployment, as indicated in Figure 2-8.

Figure 2-8. Historical Trends in Housing Completions vs. Unemployment



Source: Labor force and unemployment statistics from the U.S. Census Bureau.

This anticipated slower growth in development will likely result in deferrals or losses associated with system development charges (“SDCs”) and user charge revenues from new customers. Some specific examples of drinking water utilities anticipating growth-related impacts are as follows:

Charlotte Water (NC) has revised its SDC projections to be flat or slightly lower in 2020 as compared to 2019. Prior to the crisis, Charlotte Water was anticipating an increase in SDCs from these fees due to development growth in the Charlotte region.

East Bay Municipal Utility District (CA) anticipates reductions in development activity and SDCs could be severe.

Tucson Water (AZ) expects approximately a 20 percent reduction in development activity and SDCs because prospective homebuyers might not be able to buy at this time.

Tualatin Valley Water District (OR) expects a 20 percent reduction in new connections and SDCs due to a reduction in growth and development.

2.4.1. Methodology

The deferrals or financial losses associated with anticipated lower development activity was estimated as follows:

1. Estimate the deferrals or losses from lower system development charges:

- Estimate pre-COVID-19 aggregate residential and non-residential SDCs from sector publications on system development and impact fees.
- Estimate the anticipated percent reduction in building permits during the COVID-19 crisis from U.S. Census Building Permit Survey data, information from the response to the Raftelis COVID-19 questionnaire responses and Raftelis estimates.
- Multiply the estimate of the percent reduction in building permits by the aggregate annual SDC estimate.
- Divide resulting reduction in SDCs by 12 to convert to a monthly value.

2. Estimate the net loss in anticipated water utility rate revenues due to slower customer growth

- Estimate the anticipated reduction in housing unit construction based on U.S. Census Building Permit Survey data, information from the response to the Raftelis questionnaire, and Raftelis estimates.
- Estimate the typical monthly water bill for residential customers based on the AWWA rate survey.
- Multiply the monthly reduction in housing unit construction by the typical monthly water bill for residential customers.
- Adjust the calculated revenue loss by an estimate of the reduction in water utility marginal cost of serving new customers.
- Calculate the cumulative net revenue loss if the COVID-19 crisis lasts 2-months, 4-months, or 6-months.

2.4.2. Analysis

The aggregate loss in system development charges was estimated as detailed in Table 2-8.

Table 2-8. Estimated Aggregate Loss of System Development Charges

Description	Reference	Parameter
a. Aggregate Residential System Development Charges (2019)	¹	\$2.4B
b. Residential as % of Total	²	69%
c. Aggregate Total System Development Charges (2019)	a / b	\$3.5B
d. Anticipated % Reduction in Building Permits During Crisis	³	75%
e. Annualized Reduction in System Development Charges	d x c	\$2.6B
f. Monthly Reduction in System Development Charges	e / 12	\$217M

¹ U.S. Census Bureau Building Permit Survey (2019) and National Impact Fee Survey, Duncan Associates, 2019.

² AWWA INSIGHT Survey (2018).

³ Raftelis estimate.

The loss of future rate revenue from anticipated declines in new customer connections was estimated as detailed in Table 2-9.

Table 2-9. Estimated Loss of Rate Revenue from Lower New Customer Growth

Description	Reference	Parameter
a. Anticipated % Reduction in Building Permits During Crisis	¹	75%
b. Monthly Lost Housing Unit Equivalents	²	85,647
c. Median Monthly Residential Water Bill	³	\$42.41
d. Monthly Reduction in Aggregate Residential Water Revenue	b x c	\$3.63M
e. Non-Residential Revenue as a % of Total Revenue	⁴	29%
f. Monthly Reduction in Aggregate Non-Residential Water Revenue	d x e/(1-e)	\$1.48M
g. Total Monthly Aggregate Reduction in Water Revenue	d + f	\$5.12M
h. Marginal Cost Factor	⁵	11.6%
i. Less Marginal Cost	g x h	\$0.59M
j. Net Monthly Aggregate Reduction in Water Revenue (Month 1)	g - i	\$4.52M
k. Annualized Aggregate Reduction in Water Revenue	calculation	\$0.4B

¹ Raftelis estimate.

² U.S. Census 2019 Building Permit Survey data multiplied by % reduction in building permits in (a.).

³ AWWA Water and Wastewater Rate Survey (2019).

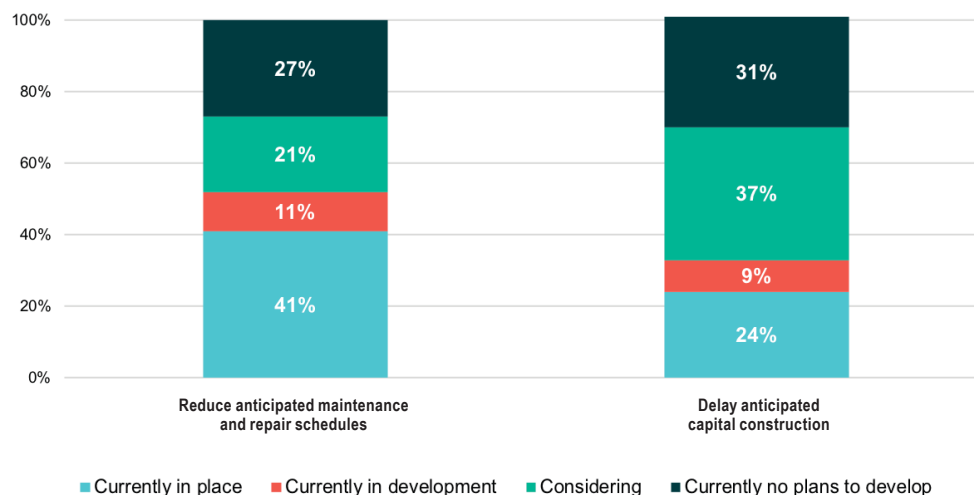
⁴ AMWA INSIGHT Survey (2018).

⁵ Calculated in Table 2-4.

2.5. Economic Impact of Reduced Capital Expenditures

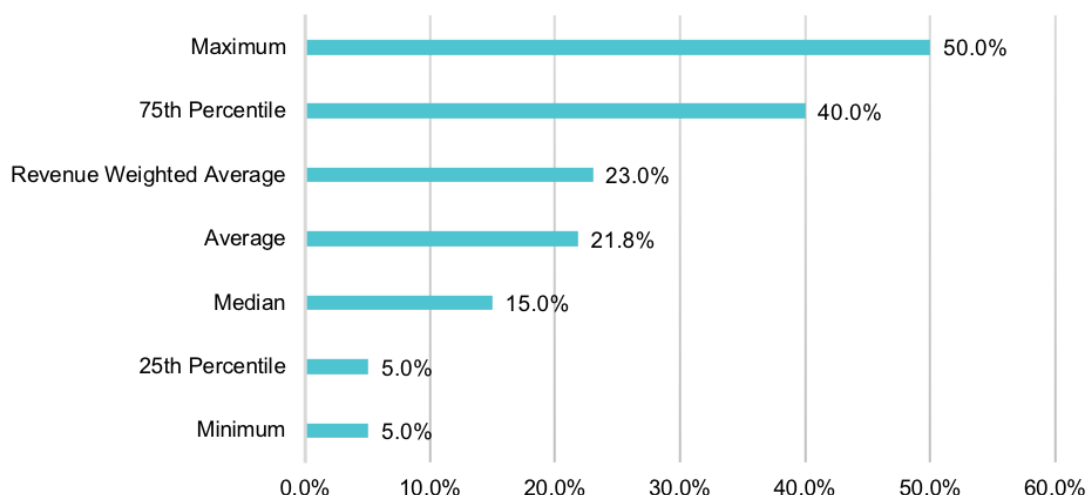
Some drinking water utilities are deferring a portion of their previously planned capital expenditures to manage cash flows during the COVID-19 crisis and to comply with required Federal or State temporary shutdown of non-essential businesses activities and “stay at home” orders. According to a recent COVID-19 survey completed by AWWA in March 2020, approximately 69 percent of water utility respondents were considering or anticipating delays in capital construction, as shown in Figure 2-9.

Figure 2-9. Drinking water utilities Indicating Delays in Capital Construction



Responses from the Raftelis COVID-19 impact questionnaire indicated that the anticipated range of capital expenditure changes for those drinking water utilities that expect declines in capital construction is between 5 percent and 50 percent, with a weighted average of approximately 23 percent, as shown in Figure 2-10.

Figure 2-10. Anticipated Annual Capital Expenditure Adjustments (N=11)



Some specific examples of anticipated levels of decline in capital construction from the responses to the questionnaire include the following:

Salt Lake City, Department of Public Utilities (UT) has reduced both cash funded and debt financed capital expenditures by 32 percent due to COVID-19.

Tucson Water (AZ) anticipates reducing both cash funded and debt financed capital expenditures by 50 percent.

Lehigh County Authority (PA) plans to reduce both cash funded and debt financed capital expenditures by 40 percent.

This capital expenditure deferral is anticipated to result in a loss in jobs and economic stimulus (e.g. GDP) in local economies across the country.

2.5.1. Methodology

An estimate of the economic impacts to local economies of a decrease in drinking water utility capital spending was prepared based on the following methodology:

1. Estimate the percentage of drinking water utilities that plan to defer or reduce capital expenditures from the March 2020 AWWA survey results and the responses from the Raftelis COVID-19 questionnaire.
2. For the portion of drinking water utilities that plan to defer or reduce capital expenditures, estimate the typical percent capital expenditure reduction from the results of the Raftelis COVID-19 questionnaire.
3. Multiply the percentage of utilities planning deferred or reduced capital expenditures by the percent reduction in planned capital expenditures to derive the overall percent reduction in capital expenditures.
4. Multiply the estimated percent reduction in capital expenditures by the estimated aggregate national level annual water utility capital expenditure amount.
5. Divide resulting revenue reduction number by 12 to convert to a monthly value.
6. Estimate lost economic stimulus on the local economy by multiplying the monthly national value of capital expense deferrals by the economic multipliers from published sources.

2.5.2. Analysis

The economic impact of delaying capital construction projects may help utilities preserve cash and postpone the need to secure additional financing during the crisis, but the delay in capital construction can have a significant impact on economic activity in the local community. A report prepared for the U.S. Conference of Mayors reported that for each dollar spent on water supply and sewer systems, there is an increase in private sector output (i.e. Gross Domestic Product) in the long-term of \$6.35.² In addition, this report cites the U.S. Department of Commerce's Bureau of Economic Analysis estimates that for each dollar of revenue of the water and sewer sector, there is an increase in revenue that occurs in private industry of \$2.62 in that year. Furthermore, a publication by the U.S. Bureau of Economic Analysis indicates that 15 to 18 jobs are created or sustained for each \$1 million of drinking water capital spending.³

Based on these economic multiplier effects, the economic impact that deferred capital construction expenditures are anticipated to have on local economies across the U.S. were estimated, as detailed in Table 2-10.

Table 2-10. Estimated Economic Impacts of Deferred Capital Construction Expenditures

Description	Reference	Parameter
a. Utilities Anticipating Reduction in Capital Spending	¹	70%
b. Anticipated Reductions in Capital Spending	²	23%
c. Aggregate Annual Water Utility Capital Expenditures	³	\$31B
d. Annualized Aggregate Reduction in Water Utility Capital Spending	a x b x c	\$5B
e. Monthly Aggregate Reduction in Water Utility Capital Spending	d / 12	\$416M
f. Capital Spending – GDP Economic Multiplier	⁴	\$6.55
g. Monthly Aggregate Loss in GDP from Reduced Capital Spending	f x e	\$2.7B
h. Annualized Aggregate Loss in GDP from Reduced Capital Spending	f x d	\$32.7B
i. Jobs Created Per \$1M in Water Capital Spending	⁵	15-18
j. Jobs Impact of Reduced Water Utility Capital Spending	d x h	75,000 – 90,000

¹ Raftelis questionnaire results.

² Ratelis questionnaire results.

³ Public Spending on Transportation and Water Infrastructure, 1956 to 2017. Congressional Budget Office. October 2018.

⁴ Local Government Investment in Municipal Water and Sewer Infrastructure: Adding Value to the National Economy, Prepared for the U.S. Conference of Mayors by The Cadmus Group, Inc. August 14, 2008.

⁵ The Economic Benefits of Investing in Water Infrastructure, Bureau of Economic Analysis, 2008.

As estimated in Table 2-10, it is anticipated that communities across the nation will experience a reduction in economic activity and jobs as a result of lower drinking water utility capital spending. The aggregate reduction in community economic activity is estimated to be as much as \$32.7 billion (annualized) when considering these public infrastructure multiplier effects. The reduction in water utility capital spending is also anticipated to result in a loss of between 75,000 to 90,000 private sector jobs. These economic impact estimates highlight the added “bang-for-the-buck” impact that drinking water utility capital spending has on the overall economy.

2) Local Government Investment in Municipal Water and Sewer Infrastructure: Adding Value to the National Economy, Prepared for the U.S. Conference of Mayors by The Cadmus Group, Inc. August 14, 2008.

3) The Economic Benefits of Investing in Water Infrastructure, Bureau of Economic Analysis, 2008.

2.6. Other Impacts and Considerations

The COVID-19 crisis is anticipated to have other financial impacts that have not been quantified in the analysis above. Based on the responses from the Raftelis COVID-19 questionnaire, these other impacts may also include:

- Reductions or deferrals of drinking water utility rate increase that were previously planned;
- Financial impacts associated with directives by City or County government management for across the board spending reductions by all units of government, including water departments, which could impact the level of service of drinking water utilities impacted by such directives;
- Financial impacts associated with directives by City or County management for enterprise funds, including water enterprise funds, to transfer a portion of available cash balances to the General Fund, leaving some drinking water utilities more vulnerable to cash flow issues as the crisis drags on;
- Delays in securing financing for capital improvements as a result of bond market volatility and uncertainty, thereby increasing the magnitude of delays in capital spending.

Some specific examples of these other impacts are provided below:

The City of Springfield (MA) originally planned to have a 7% water rate increase but is now considering a 17% increase due to anticipated revenue losses from consumption declines. The utility is concerned about having such a large increase at this time.

The Austin City Council (TX) has cut residential water and sewer rates by 10 percent in reaction to the COVID-19 crisis.

The City of Tacoma (WA), which has a six-year rate plan, was asked to review the plan to determine the impact of reducing it.

South Central Connecticut Regional Water Authority (CT) is conducting budget and projection revisions and has decided to defer a planned rate application.

For one utility in the Midwest, its City Council enacted an inter-fund loan from the water and power utilities to the General Fund to help address General Fund budget shortfalls. This included authorizing a \$15 million transfer from the water utility to the General Fund, representing essentially all of the utility's capital improvement project funds and excess reserves, leaving only a 45- to 60-day operating cash reserve.

One utility in the West (anonymous), with a fiscal year of July 1 – June 30, was in process of adopting its FY 2021 budget prior to the economic disruption related to COVID-19. It is now proposing a revised and reduced budget.

Dayton Water (OH) received a general government request for reduction in expenditures, except essential purchases or COVID-19-related purchases.

It is anticipated that many drinking water utilities may defer or reduce planned water rate increases as a result of the COVID-19 crisis because of political pressure, even though they have or will experience negative financial impacts associated with the crisis. Therefore, an estimate of the potential lost future revenue associated with reduction or deferral of water rate increases was prepared as detailed in Table 2-11.

Table 2-11. Estimated Revenue Loss from Reduction and Deferral of Water Rate Increases

Description	Reference	Parameter
a. Aggregate Annual Water Utility Revenue	¹	\$82.3B
b. Historical Average Annual Water Rate Increase	²	4%
c. Annual Increase in Aggregate Water Utility Revenue	a x b	\$3.3B
d. % Reduction in Annual Rate Increases due to COVID-19	³	50%
e. Annualized Lost Revenue from Water Rate Increase Deferrals	c x d	\$1.6B

¹ Calculated in Table 2-1.

² Water and Wastewater Maintenance Index, Bureau of Labor Statistics.

³ Raftelis estimate.

The analysis indicates the potential for drinking water utilities to experience additional aggregate revenue loss of approximately \$1.6 billion. Much of the need to raise water rates in the U.S. is to obtain funds to ensure adequate water supplies, continue to meet drinking water regulations, and address aging infrastructure.⁴ As a result of additional deferment of water rate increases and associated reductions in capital expenditures, the COVID-19 crisis will put the water sector further behind in addressing its capital infrastructure needs.

2.7. Estimated Total Aggregate Financial Impact on U.S. Drinking Water Utilities

The aggregate total direct financial impacts on drinking water utilities if the crisis lasts two months, four months, or six months are shown in Table 2-12. However, these monthly estimates do not consider the lingering impacts that are likely to be experienced after the crisis subsides, such as continued negative financial impacts from a potential extended economic recession. Therefore, the estimated aggregate annualized financial impact on drinking water utilities of \$13.9B may be a better estimate of the total potential direct financial impact.

Table 2-12. Estimated Total Aggregate Financial Impact

Description	2 Months	4 Months	6 Months	Annualized
Marginal Cost of Non-Shut Offs	\$0.10B	\$0.19B	\$0.29B	\$0.57B
Revenue Loss Due to Increased Delinquencies	\$0.82B	\$1.64B	\$2.46B	\$4.92B
Reduction in Commercial Revenues	\$1.23B	\$2.46B	\$3.69B	\$7.38B
Increase in Residential Revenues	(\$0.44B)	(\$0.88B)	(\$1.32B)	(\$2.64B)
Increase in Personnel Expenses	\$0.10B	\$0.21B	\$0.31B	\$0.63B
Reduction in System Development Charges	\$0.43B	\$0.87B	\$1.30B	\$2.60B
Reduction in Revenues from Reduced Customer Growth	\$0.01B	\$0.05B	\$0.09B	\$0.41B
Aggregate Financial Impact¹	\$2.3B	\$4.5B	\$6.8B	\$13.9B

¹ Note \$13.9B compared to drinking water sector size of \$82.3B equals an overall estimated financial impact of 16.9%.

Raising water rates on customers to offset these impacts is likely not an option for many drinking water utilities due to political considerations and because increasing water rates at a time crisis may result in even higher revenue losses due to increased delinquencies. Moreover, responses from the Raftelis COVID-19 questionnaire indicate that many drinking water utilities may be deferring or decreasing planned water rate increases, rather than raising water rates to offset these losses. The analysis results indicate the potential for drinking water utilities to experience additional aggregate future revenue loss of approximately \$1.6 billion as a result of these future deferment of water rate increases. Therefore, the combined potential impact, including the impact on current and future revenues, is anticipated to be as much as \$15.5 billion.

2.8. Wastewater Sector Potential Impacts

While this report focused on estimating the financial impacts to drinking water utilities, similar impacts are likely to be experienced by wastewater utilities across the U.S. Assuming aggregate annual wastewater sector revenues of approximately \$63 billion, the wastewater sector financial impact may be in the range of \$12 billion (16.9% impact x \$63B). If deferrals of wastewater rate increases occur similar in frequency as those anticipated for drinking water utilities, the combined impact may be as high as \$11 billion. A preliminary estimate prepared by the National Association of Clean Water Agencies indicates the impact may be in the \$12.5 billion range. Therefore, the combined water and wastewater sector impact of COVID-19 is estimated to be more than \$27 billion.

4) 2019 State of the Water Industry Report, AWWA.

3 Conclusions

The following are the primary results and conclusions from the financial impact analysis:

1. Customer delinquencies

Water utilities are expected to experience at least a 6.0 percent increase in customers delinquent in paying their water bills as a result of the COVID-19 crisis and policy changes eliminating water service shut-offs, which may result in an annualized shortfall of \$4.9 billion for drinking water utilities. As water utilities continue to provide water to customers with bill delinquencies, rather than enacting shut-offs, they will incur an estimated \$0.6 billion of additional costs.

2. Revenue shortfall

Drinking water utilities across the nation are expected to experience an estimated revenue shortfall of \$7.4 billion (annualized) due to declines in commercial, industrial, and institutional water consumption due to the COVID-19 crisis. This revenue shortfall may be offset by an increase in residential user charge revenue of approximately \$2.6 billion due to “stay-at-home” orders.

3. Reduced system development charges

The COVID-19 crisis is anticipated to slow the growth in new development and housing starts, which will further impact the financial losses of drinking water utilities. Slowing of new customer growth will reduced system development charges of drinking water utilities by an estimated \$2.6 billion (annualized). Declines in new customer growth may also result in additional reductions in planned water rate revenues of \$0.4 billion (annualized) as new customer accounts are slower to be added to service territories of drinking water utilities, causing utilities to carry the already built excess capacity of drinking water systems longer.

4. Increased personnel expenses

Operational policies implemented by drinking water utilities to ensure essential staff remain healthy and available to help provide essential water service to the U.S. population are anticipated to increase personnel expenses of drinking water utilities by an estimated \$0.6 billion, with the potential for additional costs associated with other non-personnel related materials, supplies, and equipment.

5. Aggregate current financial impact

The combined aggregate financial impact of COVID-19 on drinking water utilities from the current financial impacts quantified above is estimated to be approximately \$13.9 billion representing an overall 16.9 percent impact on drinking water sector revenues.

6. Delayed and reduced capital expenditures

Due to these financial impacts, drinking water utilities across the nation are anticipated to delay and reduce capital expenditures by as much as \$5 billion (annualized) to help manage cash flow due to the COVID-19 crisis. These capital expenditure reductions will have a multiplier effect on economic activity in communities across the U.S. As a result, communities will experience a reduction in economic activity by as much as \$32.7 billion (annualized) in aggregate when considering these public infrastructure multiplier effects. This reduction in water utility capital expenditures is also anticipated to result in a loss of 75,000 to 90,000 private sector jobs.

7. Deferred water rate increases

Drinking water utilities may also experience future revenue losses estimated at approximately \$1.6 billion in aggregate as a result of deferrals of planned water rate increases, bringing the total combined impact of the COVID-19 crisis to more than \$15 billion. These deferrals may further exacerbate community economic impacts by further reducing drinking water utility capital spending, and will put the water sector further behind in addressing its capital infrastructure needs.

8. Combined financial impact

The combined current and future financial impact of the COVID-19 crisis on water and wastewater utilities is estimated to exceed \$27 billion.

Appendix COVID-19 Questionnaire Results

1. Please state the name of your organization.					
<i>n</i>	Northeast	Midwest	West	South	
55	11	3	16	25	
See open ended tables for list of organizations willing to self identify.					
2. Please enter your name and title.					
Names are not reported to maintain respondent privacy.					
Titles are not reported to maintain respondent privacy but generally included Utility Directors and Chief Financial Officers.					
3. What are your drinking water utility's total annual revenues from the following sources for the most recent full fiscal year (Residential rate revenue, Non-residential rate revenue, Other rate revenue (e.g. bulk or wholesale), System development fees (i.e. capacity fees), Other miscellaneous revenue)? Note: Reported summary statistics use revenue totals across sources and were used to calculate revenue weighted averages for select questions.					
<i>n</i>	Min	Max	Average	Median	
51	\$2,274,000	\$1,524,000,000	\$137,439,975	\$60,067,052	
4. If your drinking water utility has experienced changes in daily water demand from typical levels since the Covid-19 crisis started having impacts in your area (around early or mid-March 2020 for most geographies), please provide information on how such demands have changed:					
Typical normal daily water demand (MGD)					
<i>n</i>	Min	Max	Average	Median	
36	1.45	548.00	66.52	41.45	
% reporting Covid-19 crisis demand impact					
<i>n</i>	No change	Higher Demand	Lower Demand	Average % change	
28	29%	25%	46%	-0.7%	
5. If you have experienced changes in water demand since the Covid-19 crisis started, please describe the nature of the change you have observed:					
See open ended tables.					
6. Have you or do you anticipate instituting a policy of debt forgiveness of delinquent KII amounts for customers in response to the Covid-19 crisis? Please select one.					
<i>n</i>	Currently in place or in development	Under consideration	Not currently under consideration		
47	13%	19%	68%		
7. If currently in place, in development, or under consideration, please describe any criteria you are considering for offering customer debt forgiveness for debt accumulated during the Covid-19 crisis:					
See open ended tables.					
8. What is your annual uncollectible, or write-off, percentage of total revenue in a typical year?					
<i>n</i>	Min	Max	Average	Median	Revenue Weighted Average
42	0%	4%	0.85%	0.55%	0.62%

9. Do you anticipate implementing any of the following personnel-related operational changes as a result of the Covid-19 crisis? Please select all that apply. Note: Reported as % selecting each option.

<i>n</i>	27
Does not apply / no personnel related operational changes	9%
Essential employee overtime	32%
Additional on-call pay	9%
Hazard pay	14%
More training	34%
Furloughs	2%
Other	See open ended tables.

10. Please provide an estimate of the total percent change in monthly personnel expenses resulting from your operational changes during the crisis:

<i>n</i>	Min	Max	Average	Revenue Weighted Average	Revenue Weighted Average (among non-zero, <i>n</i> =10)
25	0%	+25%	+2.6%	+3.2%	+6.5%

11. Do you anticipate changes to any of the following non-personnel related operating line items as a result of the Covid-19 crisis? Please select all that apply.

<i>n</i>	36
Does not apply / no non-personnel related operational changes	10%
Professional / contract services	28%
Chemicals	9%
Materials & supplies	32%
Fuel	14%
Utilities	7%
Other, please describe	See open ended tables.

12. Please provide an estimate of the total percent change in monthly non-personnel expenses resulting from your operational changes during the crisis:

<i>n</i>	Min	Max	Average	Revenue Weighted Average	Revenue Weighted Average (among non-zero, <i>n</i> =7)
7	-10%	+5%	-3%	-2.2%	-2.2%

13. If you wish to elaborate on these non-personnel related operational expense changes you may describe them further here:

See open ended tables.

14. Is your drinking water utility part of a larger municipal government (i.e. City or County Government)? Please select yes or no.

<i>n</i>	Yes	No
54	57%	43%

15. Have you experienced across-the-board directives by the general government to limit water utility spending on non-essential activities? Please select yes or no.

<i>n</i>	Yes	No
30	40%	60%

16. Please provide the potential percentage reduction in expenses as part of these directives by the general government to limit spending on non-essential activities.

<i>n</i>	Min	Max	Average	Median
8	0%	75%	10.62%	0%

17. If you wish to elaborate on these reductions in spending as part of these directives you may describe them further here:

See open ended tables.

18. Has your general government requested the transfer of cash reserves from the drinking water utility enterprise fund to the general fund in response to the crisis?

<i>n</i>	Yes	No
28	4%	96%

19. Please provide the amount of cash reserves requested to be transferred to the general fund from your drinking water utility enterprise fund in response to the crisis.

<i>n</i>	0
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20. Have or do you plan to adjust, delay, or defer any of the following capital spending due to the COVID-19 crisis? (% responding to each)

<i>n</i>	47
Cash funded capital expenditures	23%
Debt financed capital expenditures	0%
Both cash funded and debt financed capital expenditures	34%
None / no plan to adjust, delay, or defer spending on capital projects	43%

21. Please provide the percentage of your annual capital expenditures you have already or anticipate adjusting, delaying or deferring due to the Covid-19 crisis.

<i>n</i>	Min	Max	Median	Average	Revenue Weighted Average
11	5%	50%	15%	22%	23%

22. Have you experienced, or do you anticipate experiencing reductions in system development fees (i.e. capacity fees) due to reduced development activity associated with the Covid-19 crisis? (% responding to each)

<i>n</i>	43
Yes	44%
No	33%
Not applicable / we don't charge SDFs	23%

23. Please provide the percentage reduction in annual system development fee revenues you anticipate due to reduced development activity associated with the Covid-19 crisis.

<i>n</i>	Min	Max	Median	Average	Revenue Weighted Average
9	-8%	-50%	-20%	-23%	-19%

24. Do you anticipate experiencing reductions in the growth in new customers connecting to your drinking water system? (% responding to each)

<i>n</i>	42
Yes	50%
No	50%
If yes, please elaborate	See open ended tables.

25. Are there any other details or financial impacts to your utility resulting from COVID-19 that have not been covered within this survey? If yes, please share.

See open ended tables.

26. Would you be willing to allow us to attribute the data you provided with your utility's name in our report?

<i>n</i>	51
Yes	63%
No	37%

1. Please state the name of your organization.

Region	State	Organization	
Midwest	OH	Dayton Water Department	
Midwest		Anonymous Midwestern Utility	
Midwest		Anonymous Midwestern Utility	
Northeast	CT	South Central Connecticut Regional Water Authority	
Northeast	ME	Portland Water District	
Northeast	NH	Manchester Water Works	
Northeast	NY	Suffolk County Water Authority	
Northeast	RI	Newport, RI Dept of Utilities	
Northeast	RI	Providence Water Supply Board	
Northeast	PA	Pittsburgh Water And Sewer Authority	
Northeast	PA	Lehigh County Authority	
Northeast		Anonymous Northeastern Utility	
Northeast		Anonymous Northeastern Utility	
Northeast		Anonymous Northeastern Utility	
South	AL	The Water Works Board of the City of Birmingham	
South	AR	Central Arkansas Water	
South	FL	City of Lakeland	
South	FL	Martin County Utilities	
South	FL	Charlotte County Board of County Commissioners	
South	FL	Fort Pierce Utilities Authority	
South	GA	Gwinnett County Water Resources	
South	NC	Charlotte Water	
South	NC	Dare County, NC	
South	NC	Raleigh Water	
South	OK	City of Tulsa	
South	TX	City of Round Rock, Texas	
South	TX	El Paso Water Utilities Public Service Board	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
South		Anonymous Southern Utility	
West	AZ	City of Chandler	
West	AZ	City of Tucson - Tucson Water	
West	CA	City of San Diego Public Utilities	
West	CA	East Bay Municipal Utility District	
West	CA	La Puente Valley County Water District	
West	CA	Metropolitan Water District of Southern California	
West	CO	Centennial Water and Sanitation District	
West	CO	City of Greeley, Colorado	

1. Please state the name of your organization. (continued)

Region	State	Organization	
West	OR	Tualatin Valley Water District	
West	UT	Salt Lake City Department of Public Utilities	
West		Anonymous Western Utility	
West		Anonymous Western Utility	
West		Anonymous Western Utility	
West		Anonymous Western Utility	
West		Anonymous Western Utility	
West		Anonymous Western Utility	

5. If you have experienced changes in water demand since the Covid-19 crisis started, please describe the nature of the change you have observed:

South Central Connecticut Regional Water Authority	We are seeing a decline in production. We are largely residential and have not seen an increase. Our top ten customers are primarily universities and hospitals.
City of Round Rock, Texas	Not enough data to distinguish change in usage yet.
Martin County Utilities	MCU has decreased pressures to relieve stress on surficial wells. This water is blended with deeper brackish water (wells) and treated through RO membranes. We are at the peak of Florida's dry season and are experiencing very dry conditions. This coupled with increased residential water demands drove demands well over 12 MGD (highest demand on record was 14 MGD April 2018). Decrease in non-residential demand is masked.
City of Chandler	Chandler has been tracking higher for water use in 2020 when compared to 2019 with the biggest factor being Intel. Governor Ducey, announced shelter in place in March and we took a dip. However our large industrial demands and outdoor water use are ramping up. Bottom line is we have not seen a reduction in water use.
Gwinnett County Water Resources	Overall demand has increased March 1 through March 19. We do not have the data for consumption after that point yet. We are continuing to monitor consumption data closely as April bills go out (March consumption).
Salt Lake City Department of Public Utilities	We are unable to determine the specific impacts at this time. Consumption for March 2020 compared to March 2019 is higher in both categories. April will provide better insights to usage patterns.
Charlotte County Board of County Commissioners	Our county is very seasonal so we see many changes in demand around this time normally. We have seen an increase in demand, slightly less than normal, but we are not easily able to determine if it relates to COVID.

5. If you have experienced changes in water demand since the Covid-19 crisis started, please describe the nature of the change you have observed: (continued)

Charlotte Water	We have noticed that our residential consumption has increased by .05 Ccf and our commercial consumption has decreased by almost the same amount.
Tualatin Valley Water District	Anomalies in weather are making it difficult to attribute demand reductions to COVID-19. We our deliveries appear to be on par with past years. And our bimonthly billing cycles have not allowed a more detailed analyses. But we're worried.
Dare County NC	We do not know because of increasing seasonality.
City of San Diego Public Utilities	Too soon to tell, but i imagine we are seeing a spike in residential use and probably a larger dip in non-residential use, because of lack of tourists in hotels and theme parks, etc.
Pittsburgh Water And Sewer Authority	Large college residential vacancies and commercial facilities shutdown has reduced demand somewhat.
Manchester Water Works	Decreased non-residential demand.
Suffolk County Water Authority	Very slight (3%) increase in demand; this is mostly on the East end of Long Island. Right now, our assessment is that this is a result of Manhattan residents fleeing the city for their summer residences. We appear to be a month ahead of schedule for where our demand normally sits.
City of Tulsa	We won't see the numbers for consumption for March until tomorrow, which I can forward to you by customer classification. Water demand numbers provided above are for pumpage. For the last two years, we are actually seeing our consumption numbers decrease, while our pumpage numbers are increasing due to the amount of flushing we need to perform on dead-end lines to keep disinfectant residuals up in a chloraminated system.
The Water Works Board of the City of Birmingham	Overall, potable water production is up 2% for year-to-date 2020 over the similar period in 2019. That's a little surprising given how much rainfall we had in January/February and the assumed curtailment of commercial restaurant usage.
Lehigh County Authority	Too early to tell. Impact appears to be minimal. Industrial usage is maintained due to high percentage of food / beverage manufacturing on our system.

7. If currently in place, in development, or under consideration, please describe any criteria you are considering for offering customer debt forgiveness for debt accumulated during the Covid-19 crisis:

City of Lakeland	There has been discussions about deferring payments or allowing customers to make pre-set payments until caught up but at this time debt forgiveness has not been discussed.
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7. If currently in place, in development, or under consideration, please describe any criteria you are considering for offering customer debt forgiveness for debt accumulated during the Covid-19 crisis: (continued)	
Gwinnett County Water Resources	We are considering removing late fees for bills accumulated during the crisis.
Tualatin Valley Water District	Still in development. We're very concerned about the ability to assess needs since we don't have access to data for means testing.
Dare County NC	Governor's executive order
City of San Diego Public Utilities	Too early to know.
Portland Water District	Waiving late fees on delinquent accounts
Pittsburgh Water And Sewer Authority	Similar to the requirements for debt forgiveness for low income residents. \$300 per year if efforts to pay are made.
Manchester Water Works	We are not charging late fees or doing shut offs for non-payment during this time.
Suffolk County Water Authority	SCWA is considering eliminating the late charges during the COVID crisis.
City of Tulsa	Only under consideration now. We are working on extending our payment arrangement plans. Knowing it will take time for recovery of jobs, income, other bills, credit cards, etc., we would rather have the money that is owed to us, but extend the payment arrangement plans (without penalty). In some cases though, we anticipate we will just need to write off the debt.
City of Tucson - Tucson Water	Mayor and Council Policy Direction
Centennial Water and Sanitation District	We have suspended disconnects and working with customers on payment plans. We are developing options for reducing or finding other funding sources to assist customers in need.
Dayton Water Department	Currently only delay of payment, wave late fees, no shut offs, could evolve.
Lehigh County Authority	Low-income or unemployed customers are our primary concern. We may consider either extending due dates for a longer period to pay prior to assessing penalties / terminations once the pandemic has ended.

9. Do you anticipate implementing any of the following personnel-related operational changes as a result of the Covid-19 crisis? Please select all that apply. Note: Reported as % selecting each option.

South Central Connecticut Regional Water Authority	We are currently paying all employees and paying overtime, if incurred. We are also considering options to reduce expenses.
City of Lakeland	Non-essential employees paid Administration leave.
East Bay Municipal Utility District	Two week rotation with pay for field and operating staff as a precaution against sudden widespread infection of field and operating staff
Metropolitan Water District of Southern California	Non-essential employees teleworking.
Charlotte County Board of County Commissioners	Operational schedule changes only - employees working from home
Charlotte Water	Altered work schedules
Tualatin Valley Water District	Not at this time. But we're monitoring things carefully and may implement furloughs if revenues are too far below plan.
Fort Pierce Utilities Authority	Admin time for those unable to telework from home
EL PASO WATER UTILITIES PUBLIC SERVICE BOARD	Emergency Administrative Leave, new Federal COVID-19 Laws
Pittsburgh Water And Sewer Authority	employee make 2 teams with furloughs every other week
Manchester Water Works	only essential employees working, all others are home with pay
La Puente Valley County Water District	Alternative schedules in which a portion of the staff is paid to be home at the ready.
City of Tulsa	Reduction in temporary employment services
City of Tucson - Tucson Water	Hiring Freeze, Suspended all temp personnel, layoffs
Dayton Water Department	Essential employees report, non-essential on paid leave.
Raleigh Water	paying critical employees 5% premium
Lehigh County Authority	Extensive work-from home for administrative staff

11. Do you anticipate changes to any of the following non-personnel related operating line items as a result of the Covid-19 crisis? Please select all that apply.

East Bay Municipal Utility District	some field work not getting done, so might have some small non labor cost savings
Tualatin Valley Water District	Reduction in training that requires travel.
Fort Pierce Utilities Authority	Sanitization, PPE, Safety/Health Monitoring
Dare County NC	Chemicals & Utilities will decrease
Central Arkansas Water	travel
City of Tucson - Tucson Water	essential only purchases for water operations
Lehigh County Authority	Technology purchases to support work from home.

13. If you wish to elaborate on these non-personnel related operational expense changes you may describe them further here:

South Central Connecticut Regional Water Authority	We are revising our budget for our upcoming fiscal year due to COVID-19 as well as year current year projection.
Gwinnett County Water Resources	Additional laptops, VPN licenses, computer monitors.

13. If you wish to elaborate on these non-personnel related operational expense changes you may describe them further here: (continued)

Salt Lake City Department of Public Utilities	We anticipate additional chemical costs to have supplies in place if there are interruptions on vendor services. Additional materials and supply costs are anticipated to properly protect our employees during this time.
Tualatin Valley Water District	Most are related to reduction in training and the elimination of travel for training events. Training is limited to those individual and activities that are required to maintain certifications.
Fort Pierce Utilities Authority	Disinfectants, Towel wipes, Respirators, Thermometers, Masks, etc. H2O2 Air purifiers, and the ultimate sanitization of the lobby area before we reopen to serve customers.
Portland Water District	Items related to remote working - pc, monitors, new server and software, PPE some programs not being done so savings may result - hydrant inspection/painting, etc.
Pittsburgh Water And Sewer Authority	Masks, daily medical screening testing of staff and vendors entering WTP and Operations yards.
Manchester Water Works	We are not performing any non-essential work, therefore the materials we would have purchased to do these jobs will not be bought. In addition, we don't have crews driving around the City because they are not working so we will likely save on fuel costs as well.
La Puente Valley County Water District	Difficult to accurately factor at this time.
City of Tucson - Tucson Water	Applies to discretionary spending
The Water Works Board of the City of Birmingham	Janitorial Services-including sanitizing the facilities. Material-Purchasing PPE material
Dayton Water Department	Mostly related to fuel and petroleum based products. Ethanol production is in crisis with severe demand reduction requiring refineries to support a much reduced volume.
Lehigh County Authority	Some increase in fuel due to allowing all staff to travel home in utility vehicles. Many construction projects are on hold, so we're not sure of the impact to those contracts. Significant investment in IT / technology to support work-from-home arrangements including rapid purchase and deployment of laptops and reimbursement (if needed) for internet service and cell phone service for employees working from home.

17. If you wish to elaborate on these reductions in spending as part of these directives you may describe them further here:

City of Round Rock, Texas	City of Round Rock is doing only targeted department and program reductions at this time. No water utility reductions related to COVID at this time.
City of Chandler	General non-essential operating contracts
Gwinnett County Water Resources	None have been given at this time.
Salt Lake City Department of Public Utilities	We were not asked to curtail non-essential spending but have revised our FY21 budget request.
Manchester Water Works	No specific directives on spending as we are an enterprise fund, but we have been directed by the Mayor to only have essential employees working on essential tasks.
City of Tulsa	The water utility has plenty of unencumbered cash-funded capital to that could be used via budget amendment for any shortfall in revenues not covered by expense savings. Employees are being asked to watch expenses, but not to the point that it would impact any service delivery.
Dayton Water Department	Essential purchases only or COVID-19 related

24. Do you anticipate experiencing reductions in the growth in new customers connecting to your drinking water system? (% responding to each)

East Bay Municipal Utility District	Unknown but could be severe
Tualatin Valley Water District	New connections (and SDCs) are still above plan. But we're anticipating a reduction in growth and development.
Pittsburgh Water And Sewer Authority	Development activities are reduced
City of Tulsa	Commercial customers - small businesses; residential is still expected to increase slightly.
City of Tucson - Tucson Water	Prospective homebuyers might not be able to buy at this time. Anticipated recovery might take quite some time.
The Water Works Board of the City of Birmingham	Customers are less inclined to move during these uncertain times.
Lehigh County Authority	Short-term reductions due to work stoppage for private construction. Not sure about long-term impact!

25. Are there any other details or financial impacts to your utility resulting from COVID-19 that have not been covered within this survey? If yes, please share.

South Central Connecticut Regional Water Authority	As part of our budget and projection revisions, we are deferring a planned rate application.
City of Chandler	Helping water customers financially burdened due to COVID-19 by suspending disconnections, not charging late fees, and extending payment plans.
Tualatin Valley Water District	We are working hard to anticipate the impacts of the potential economic slowdown on our customers. We're in the middle of a major infrastructure investment and see the potential to help our local economy recover by maintaining investment in infrastructure post-COVID-19 pandemic. Essentially we're in the shovel-ready business right now and have capital plans that can be executed as soon as funding is available.
Portland Water District	Investment Interest income expected to be lower. Delay in installation of summer seasonal accounts will reduce review
Suffolk County Water Authority	SCWA is in a unique situation as we are currently going through a bond offering, which has been delayed. We anticipate that this deal will conclude, but it has been an abnormal process due to the crisis and resulting market conditions.
City of Tulsa	Are you planning on changing future rate increases due to COVID-19? Yes. Water remains at 0% for FY21 (July 2020 - June 2021). Sewer is changing from a 7% increase in additional revenue required to a 3%.