PHILADELPHIA WATER DEPARTMENT
REBUTTAL STATEMENT NO. 2

BEFORE THE
PHILADELPHIA WATER, SEWER AND STORM WATER RATE BOARD

In the Matter of the Philadelphia Water Department's Proposed Change in Water, Wastewater and Stormwater Rates and Related Charges	Fiscal Years 2019-2021

Rebuttal Testimony

of

Valarie Allen, Ballard Spahr LLP,

Katherine Clupper, PFM, Peter Nissen, Acacia Financial, and

Melissa LaBuda and Steven Furtek,

Philadelphia Water Department

on behalf of

the Philadelphia Water Department

Topics Addressed:

Financial Planning & Metrics

Debt Service Coverage

Revenue & Revenue Requirements

Dated: May 4, 2018

REBUTTAL TESTIMONY OF VALARIE ALLEN, BALLARD SPAHR, KATHERINE CLUPPER, PFM, PETER NISSEN, ACACIA FINANCIAL, AND MELISSA LABUDA, PHILADELPHIA WATER DEPARTMENT

I. INTRODUCTION

Q1. PLEASE STATE YOUR NAMES AND POSITIONS FOR THE RECORD.

A1. Our names are Valarie Allen, Ballard Spahr LLP, Katherine Clupper, PFM, Peter Nissen, Acacia Financial, and Melissa LaBuda and Steven Furtek, Philadelphia Water Department. On behalf of the City of Philadelphia Water Department (Department), we proffer our collective rebuttal to Mr. Lafayette Morgan's testimony.

Q2. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY IN THIS PROCEEDING?

A2. Ms. LaBuda provided testimony in PWD Statement No. 2. Ms. Allen, Ms. Clupper and Mr. Nissen supported Ms. LaBuda in the development of her testimony. Mr. Furtek provided testimony in PWD Statement No. 3.

Resumes for Ms. Allen, Ms. Clupper, and Mr. Nissen are attached rebuttal Schedule R2-1.

Q3. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A3. In this rebuttal, we provide our response to some of the concerns and criticisms that Mr. Lafayette Morgan has expressed in his direct testimony on behalf of the Public Advocate. We specifically address the following areas of Mr. Morgan's testimony:

- Financial Planning & Financial Metrics
- Debt Service Coverage
- Revenue and Revenue Requirements

II. FINANCIAL PLANNING & FINANCIAL METRICS

Q4. DO YOU AGREE WITH MR. MORGAN'S RECOMMENDATION WITH RESPECT TO THE APPROPRIATE LEVEL OF CASH RESERVES FOR THE WATER AND WASTEWATER SYSTEMS?

A4. No, we disagree with Mr. Morgan. There are prudent financial reasons to maintain reserves of at least $150 million in the Rate Stabilization Fund. First, a municipal utility, like any business, needs a reserve of cash on hand in order to pay current obligations as they come due.

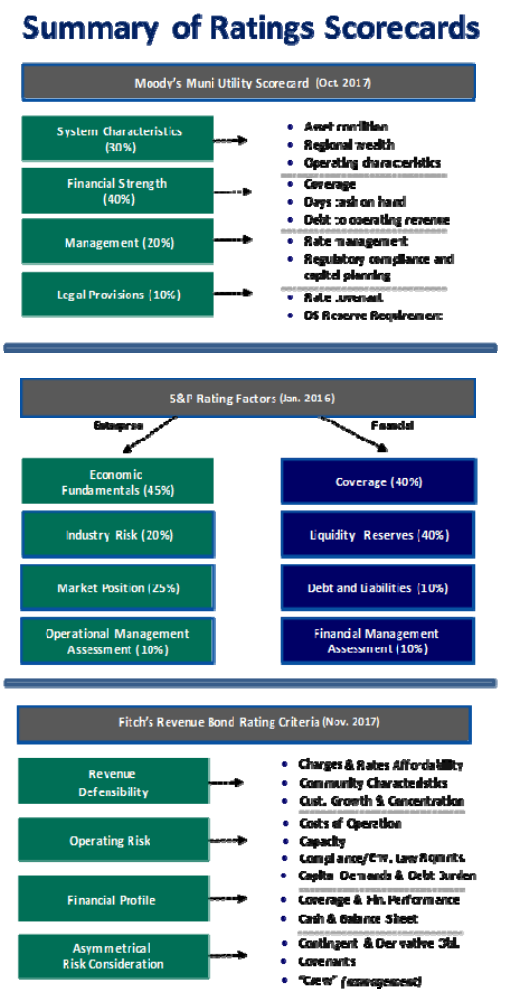
Municipal water and wastewater utilities incur costs to provide the service (labor, materials, supplies, services, etc.) in advance of bills being rendered and revenue collected for providing the service. The timing of the costs necessary to run the business precede the timing of the receipt of revenues to cover those

costs, which means a reserve of cash always must be available to handle basic day-to-day utility operations.

Second, utility revenue can fall short of expenditures, causing negative cash flow due to the inherent lag in the regulatory process of adjusting rates to match costs that have been impacted by inflation and other increases over time.

Q5. WHAT EVIDENCE CAN YOU PROVIDE THAT THE RATING AGENCIES FOCUS PARTICULAR ATTENTION ON THE AMOUNT OF CASH RESERVES MAINTAINED BY A MUNICIPAL UTILITY WHEN ASSIGNING A CREDIT RATING?

A5. As detailed in the testimony of Ms. LaBuda (PWD Statement No. 2), the rating agencies regularly publish sector reports and rating criteria in order to inform issuers and the investing public on their methodology and approach to rating municipal credits.



Both Moody's and S&P have published scorecards which identify certain rating factors as well as assigning weighting to these factors which serve to notch the scorecard. Fitch regularly provides national medians on a range of financial metrics on its utility credits in order to provide

transparency. An illustration of the rating agencies criteria is shown at right.

All three rating agencies view liquidity measures as a critical indicator of financial stability. This is discussed in pages 2-9 in the PFM Financial Advisors, LLC ("PFM") memo incorporated in the testimony of Melissa LaBuda.

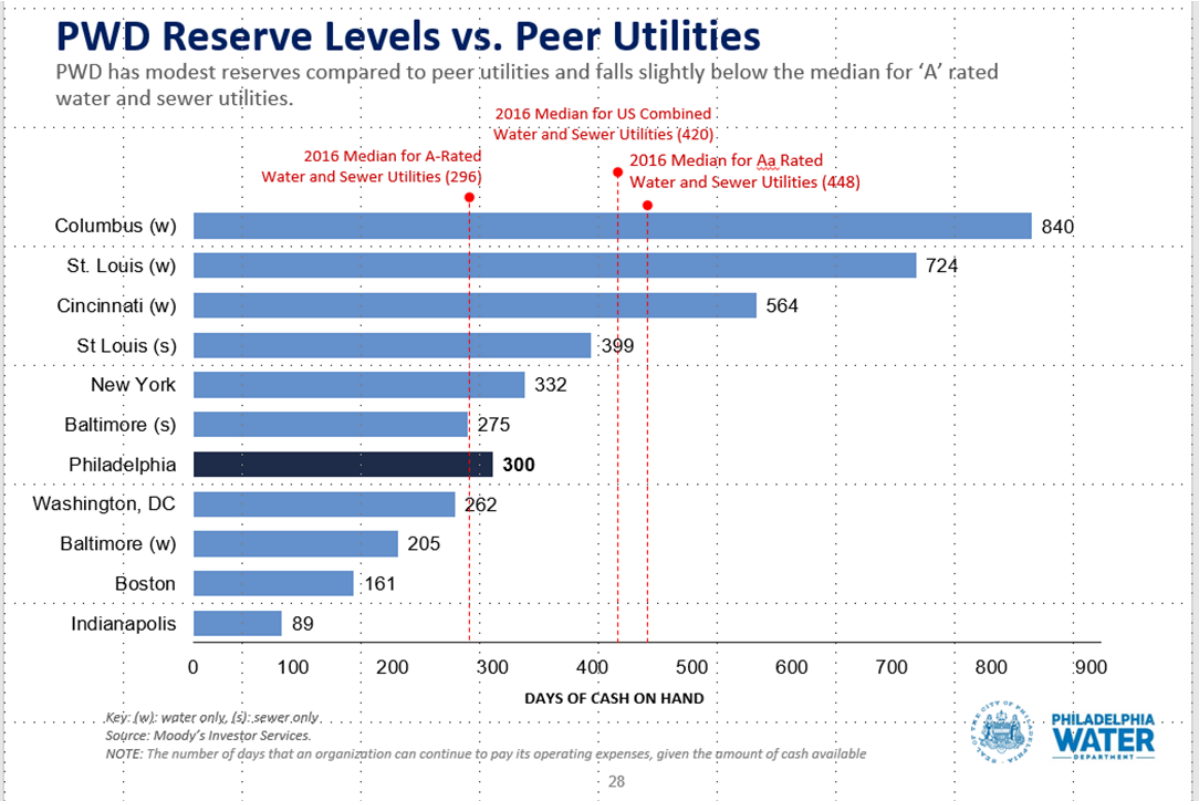
Additionally, in the rating reports specifically related to the Department, credit factors are discussed, including the amount of cash reserves and their importance. This is also discussed in both Ms. LaBuda's testimony as well as PFM's memorandum, Schedule ML-6. The Department's most current rating reports are also included in the submission.

Quotes related to the Department's recent credit report and liquidity:

- Moodys: "At year end 2016, total available cash in the Rate Stabilization Fund and Residual Funds amounted to $221 million…..equating to approximately 217 days cash on hand. When all available cash is considered, unrestricted reserves as a percent of O&M increase to 82%, in line with national peers in the A1 category."
- Standard & Poor's: "Unrestricted cash levels, including the RSF balance, at the end of each fiscal year also demonstrate stable financial performance, in our view. The combined unrestricted and RSF balances have typically represented 225-275 days operation (between about $225 million to $290 million)."

- Fitch : "Total available liquidity, which includes the RSF, PWD's residual fund and unrestricted cash and investments also showed modest improvement, increasing to a robust 265 days of cash on hand."

We do not agree with the Testimony of Lafayette K. Morgan stating that the $110 million is sufficient. This only represents 86.5 days of cash on hand, well below the required medians for an A rated credit on all accounts. Please see PWD Statement No 2. Direct testimony and schedules of Melissa LaBuda pdf page 64 of 158, "Peer Utility Review." The graph is also provided below.



Additionally, this level of cash reserves or liquidity severely impedes the Department's ability to mitigate any changes in revenue collections, unforeseen operating expenditures or disruptions in the ability to fund ongoing capital

needs. It would be irresponsible to leave a system with annual operating expenses of over $485 million and annual capital needs of over $300 million with cash reserves at such low levels. The proposed minimum of $165 million balance in the RSF and Residual fund would only represent approximately 244 days cash on hand for FY 2018. This is under the Moody's A median of 296 days cash on hand and should therefore only be considered as a minimum, not a limit which should not be exceeded.

Q6. WHY DO THE CREDIT RATING AGENCIES CONSIDER THE NUMBER OF DAYS CASH ON HAND TO BE SUCH A CRITICAL RATIO IN ASSESSING THE CREDIT QUALITY OF THE MUNICIPAL UTILITY?

A6. As previously mentioned, cash reserves are monitored by the credit agencies by calculating Days Cash on Hand, which are current unrestricted cash and investments, plus any cash reserves generally available to support the system, divided by operating expenditures, divided by 365. This is an indicator of a system's financial flexibility and ability to swiftly address unforeseen financial requirements. The number of days of cash on hand is a "key ratio" used by the rating agencies in assessing credit quality, meaning it is a highly important criteria in determining a credit rating for all three credit agencies. It is important to note that days of cash on hand is also consistent with references to terms such as "cash reserves" and "liquidity" that commonly appear in the Rating Agencies' ratings reports on individual municipal utilities.

Moody's Investors Service published a report dated April 5, 2018 entitled Median Water and Sewer Utilities that included data on maintenance of cash reserves. In this report, Moody's states that "strong liquidity provides operating flexibility and a cushion against contingencies while helping manage leverage."

In Fitch's published report dated November 30, 2017 entitled U.S. Water and Sewer Rating Criteria, Fitch states "A utility's cash and balance sheet serve as key indicators of an entity's credit rating. For the most part, relevant ratios are designed to measure a utilities available liquid resources to meet near-term liabilities, particularly in the event of unforeseen hardships or difficult operating conditions."

In S&P's published report dated January 19, 2016 entitled U.S. Public Finance Waterworks, Sanitary Sewer, and Drainage Utility Systems: Rating Methodology and Assumptions, S&P states (in addressing both management and liquidity) "Strong Management alone can lend itself to operational and fiscal continuity and can serve as a credit stabilizer. In addition, liquidity and reserves provide working capital, funding for unexpected operational problems and general budgetary flexibility. For example, if contingent liabilities become actual liabilities, both of these factors can together moderate or even relieve a utility from distress. Conversely, their absence creates a limiting factor and often leads to rapid credit deterioration."

Please see PWD rebuttal response attachment number 2 for copies of the reports.

Q7. ARE THERE OTHER SOURCES OF LIQUIDITY THAT THE DEPARTMENT CAN DRAW DOWN IN CASE OF EMERGENCY BESIDES THE RATE STABILIZATION FUND AND RESIDUAL FUND?

A7. No, there are no other sources of liquidity or cash reserves available to the Department other than the Rate Stabilization Fund ("RSF") and the Residual Fund. In addition to permitting the Department to access those Funds under certain conditions, the General Bond Ordinance permits the Department to temporarily "borrow" amounts from the RSF, Residual Fund and certain other funds and accounts held under the General Bond Ordinance in an emergency (i.e., the occurrence of a deficit in cash available to pay Operating Expenses or debt service when due and simultaneously meet the other current payment and deposit requirements of the General Bond Ordinance). However, all such borrowed amounts must be "paid" back within the fiscal year. This is important to understand and underscores the critical importance of ensuring that the Rate Stabilization Fund and Residual Fund are not underfunded. The risk simply outweighs the reward.

It should also be noted that the transfers between the Rate Stabilization Fund and the Revenue Fund occur annually, after the City completes its Annual Finance Report, which is typically produced on or about October 27th of each year for the fiscal year ending on the preceding June 30th. Therefore, liquidity needs required after the end of the Fiscal Year cannot be met immediately by RSF transfers.

Finally, regarding emergency capital expenditures, the only sources available are the Residual Fund and the Capital Account, and not the Rate Stabilization Fund. Therefore, in order to be prepared for emergency capital expenditures, there needs to be ongoing and consistent deposits to the Residual Fund and the Capital Account.

Q8. DO YOU AGREE WITH MR. MORGAN'S STATEMENT THAT THE DEPARTMENT SHOULD HOLD ITS RATE STABILIZATION FUND GOAL AT $110 MILLION?

A8. No, we do not agree with Mr. Morgan. The Department's Rate Stabilization Fund goal of $150 million is critical to the Department's overall financial strength, both in consideration of the Department's credit rating by all three rating agencies that rate the Department and for actual protection in the event of unforeseen emergency capital or operating requirements.

Moody's Investors Service's report, *Median Water and Sewer Utilities*, included data on maintenance of cash reserves. On the first page of this report, Moody's states that "strong liquidity is especially important for lower-rated entities, serving as a buffer against a limited ability to raise rates quickly to address unanticipated disruptions or capital needs." The report also states the median number of days cash on hand (of which the RSF represents a sizeable portion) for A-rated US water and sewer utilities is 296 days which is nearly identical to the Department's days cash on hand metric. Please see rebuttal Schedule R2-2. It is appropriate and important to use median reports as a benchmark for the

Water and Wastewater Systems because median reports provide transparency to market participants by giving clear understanding of the importance of liquidity and certain statistical ratios used in its review of water and sewer revenue bond credits.

Additionally, as noted in the Fitch rating report pertaining to the Department's most recent bond issuance (July 13, 2017) "Fitch expects PWD to sustain cash at levels generally consistent with the current 'A+' rating." In Moody's report pertaining to the Department's most recent bond issuance (July 13, 2017), under factors that could lead to a downgrade, Moody's notes "notable deterioration in cash and liquidity." Finally, S&P's report pertaining to the Department's most recent bond issuance (July 14, 2017), S&P notes as it relates to the 'Downgrade Scenario' that "If financial metrics deteriorate…we could lower the rating or revise the outlook to negative."

III. DEBT SERVICE COVERAGE

Q9. MR. MORGAN STATES THAT PRIOR RATE PROCEEDINGS WERE BASED UPON ATTAINING 1.20X COVERAGE. DO YOU AGREE?

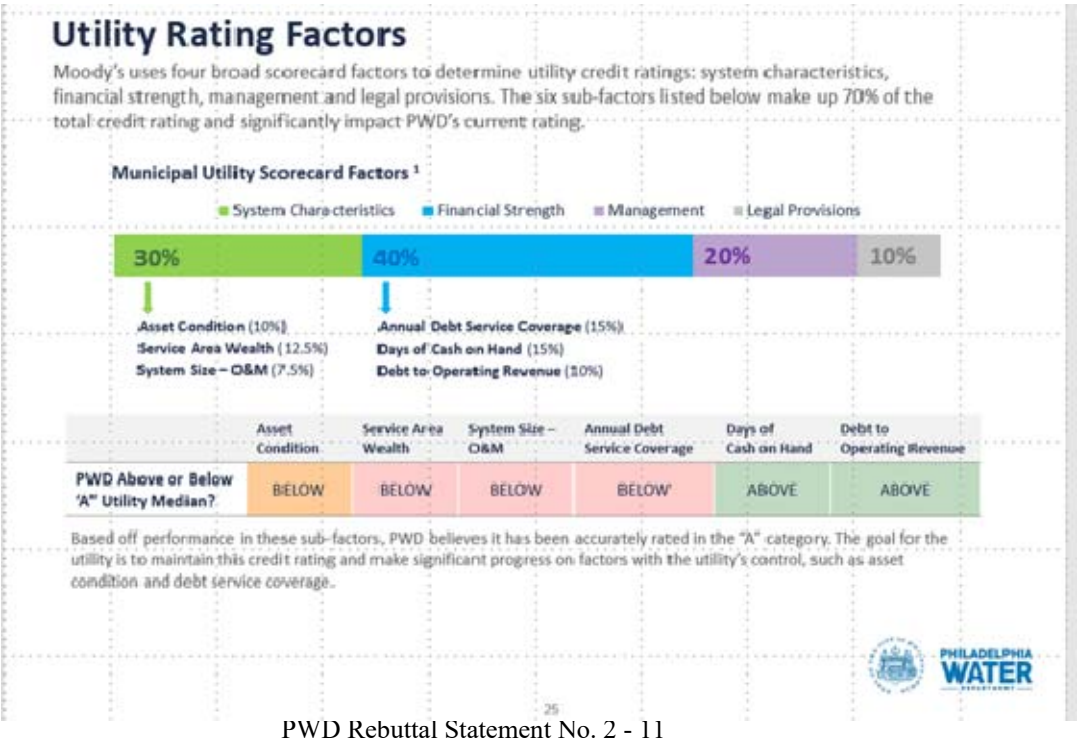
A9. No, we do not agree with Mr. Morgan. The 2016 Rate Proceeding detailed coverage greater than 1.20X. The Black & Veatch table C-1, titled Recommended Rate Board Adjustments – Final Analysis, detailed senior coverage of 1.25X and 1.26X. Please see rebuttal Schedule R2-3.

It is important to note that debt service coverage is simply cash flow which is used to support the system by funding certain actions such as capital projects. Any funds used for capital projects also allows the system to manage future leverage.

Q10. DO YOU AGREE WITH MR. MORGAN'S PROPOSED DEBT SERVICE COVERAGE RATIO? PLEASE EXPLAIN.

A10. No, we do not agree with Mr. Morgan.

One of the key risks that the Department faces should the Board agree with Mr. Morgan's recommendations is materially higher borrowing costs due to downward rating pressures from the lack of proper rate recovery and the lack of formulating sound financial metrics. As noted below, Financial Strength represents 40% of Moody's scorecard credit rating.



As detailed in the direct testimony and the PFM memorandum, Schedule ML-6, financially stable municipal utilities provide safe and reliable service at rates that recover all current costs, plus a margin more than current costs. This margin, also referred to as coverage or internally generated funds, is a municipal utility's only real alternative to issuing debt to fund capital program costs. It is important to note that the recent rating agency reports have emphasized the need for the Department to improve coverage.

As noted in the Fitch rating report pertaining to the Department's most recent bond issuance (July 13, 2017) "PWD generates narrow but consistent financial margins. While below Fitch's median for the rating category, PWD's consistency in setting rates annually to achieve 1.3x DSC and healthy liquidity levels support the 'A+' rating." In Moody's report pertaining to the Department's most recent bond issuance (July 13, 2017), Moody's states "The Department's commitment over the past decade to consistently increase rates has led to stable debt service coverage, though coverage is moderately more narrow than peers." Finally, in S&P's report pertaining to the Department's most recent bond issuance (July 14, 2017), S&P notes "A very strong financial risk profile primarily supported by a large available rate stabilization fund and debt service coverage that exceeds covenanted minimum levels."

Increasing the extent to which current revenues fund capital expenditures is mathematically necessary to improve debt service coverage to industry standards. From both an operational and a credit rating perspective it is essential

for the Department to sustain debt service coverage levels significantly above the minimum required levels.

IV. REVENUE & REVENUE REQUIREMENTS

Q11. DO YOU AGREE WITH MR. MORGAN CONTENTION THAT THE DEPARTMENT HAS CONSISTENTLY OUTPERFORMED SINCE 2012 THROUGH AND INCLUDING 2017. PLEASE EXPLAIN.

A11. The Department substantially revised projections as part of the 2016 proceeding whereby the Department's projections, where feasible, were aligned with the City's Five-Year Plan. This critical and dramatic shift resulted in very minor differences in its Fiscal Year 2017 results as compared to rate case projections.

Mr. Morgan's practice of referencing rate case results which predated Ms. LaBuda's tenor with the Department are not an appropriate benchmark as they were formulated under different leadership using different assumption methodology.

Q12. DO YOU AGREE WITH MR. MORGAN'S ASSERTION THAT THE DEPARTMENT'S BUDGET PROJECTIONS ARE CONSERVATIVE AND LIKELY TO RESULT IN OVER-STATED REVENUES AND UNDER-STATED EXPENSES FOR RATEMAKING PURPOSES? PLEASE EXPLAIN.

A12. No, we do not agree with Mr. Morgan. The Department does not use original budget to establish rates and charges. Rather the Department applies spend factors to reduce original budget amounts for rates and charges. This results in nearly 10% of the original budget not included in the calculation for rate making purposes.

Q13. DO YOU AGREE WITH MR. MORGAN'S ASSUMPTION THAT THE CAPITAL BUDGET SHOULD BE REDUCED TO ASSUME ONLY ACASH SPEND OF 76% VERSUS CURRENT PROJECTION OF 90%?

A13. No, we do not agree with Mr. Morgan.

As detailed in response to PA-IX-20, the Department looked at recent capital obligations by fiscal year along with expenditures. By the nature of the process, obligations precede expenditures. Expenditures lag behind obligations due to timing of the obligations during the fiscal year and the timing of the start of construction and the duration of the construction. Obligations therefore are a precursor to expenditures. As obligations increase, future expenditures will increase as the projects representing the obligations are constructed and paid for.

As shown in the table below, over the last 6 years, bidding of capital projects has been increasing as demonstrated by the increase in fiscal year obligations. As predicted, expenditures lag behind obligations. In FY 2017 the Department encountered an increase in expenditures to 82.12% of budget due to the increase in obligations in prior years demonstrating that the expenditures are catching up to the obligations.

	FY	Budget	Obligated	Obligations as % of Budget	Expenditure	Expenditures as % of Budget
	2013	$228,573,000	$171,497,831	75.03%	$142,016,000	62.13%
	2014	$235,153,000	$181,341,988	77.12%	$143,024,000	60.82%
	2015	$260,353,000	$235,833,991	90.58%	$175,618,460	67.45%
	2016	$284,041,000	$290,086,548	102.13%	$187,170,515	65.90%
	2017	$301,629,000	$333,689,547	110.63%	$247,692,583	82.12%
*	2018	$353,658,000	$388,436,942	109.83%		

Based on the large amount of obligations in fiscal years 2016, 2017, and 2018 it is appropriate to expect expenditures in fiscal years 2019, 2020, and 2021 will continue to rise above 82.12%, and may even surpass 90% of budget. Since the obligations over the past few years are considerably higher than historical obligations in the preceding years, historical performance is not a good indicator of future performance. Given that our obligations are increasing (which translates into future increases in spending), it would be inappropriate to lower the expenditure rate below the projected 90% of budget.

Q14. WHAT ARE THE RISKS TO RATE PAYERS AND THE DEPARTMENT, IF MR. MORGAN'S RECOMMENDATIONS ARE FOLLOWED AND THERE IS AN UNDER-ESTIMATION OF DEBT SERVICE COSTS?

A14. The risks associated with Mr. Morgan’s recommendations include the following:

General Bond Ordinance Implications

If due to such underestimation, the Department is unable to meet its debt service requirements at any time, the results could be any of (i) a draw on the debt reserve account if revenues are insufficient to fund payment of debt service when due, (ii) a covenant default if revenues are insufficient to produce the required 1.2x coverage, and (iii) a payment default if revenues and amounts in the debt reserve account are insufficient to pay debt service when due. The occurrence of any of these events are required to be disclosed immediately by the City to investors and the market under Rule 15c2-12 of the Municipal Securities Ratemaking Board and the City's Continuing Disclosure Agreements for its bond issues, and, therefore, would immediately impact the market's view of the City's creditworthiness. In each case, to varying degrees, this would have immediate and sustained impacts on the Department's credit ratings and cost of funds, as the Department would have to work – and the City would have to commit to raise and sustain rates – to restore the market's perception of the credit.

Additionally, with regard to (ii) and (iii) above, 25% of the Department's affected bondholders may appoint a trustee to litigate on behalf of all bondholders. In the case of (ii), bondholders have the right to litigate to enforce the rate covenant, adding substantial litigation expense that would have to be borne by ratepayers. Finally, in the case of (iii), a payment default would give the bondholders the right to accelerate all of the outstanding bonds of the Department, which would make all of the bonds immediately due and payable in full. This would be a catastrophic financial event for the Department and for ratepayers.

Q15. DOES THIS COMPLETE YOUR REBUTTAL TESTIMONY IN THIS MATTER?

A15. Yes, it does.

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Areas of Focus

Public Finance, Energy and Project Finance, Health Care, Education, Housing, Municipal Recovery, Securities and Capital Markets, Transactional Finance

Background & Experience

Valarie J. Allen advises issuers, underwriters, and borrowers in the structuring, issuance, offering, placement, remarketing, and restructuring of tax-exempt and taxable municipal securities and other debt instruments and derivatives.

Valarie serves as bond, borrower's, underwriter's, and disclosure counsel to clients across the United States. She represents investment banking firms, state housing agencies, electric-energy generation companies, educational and health care institutions, private and municipal utilities, school districts, and municipalities in virtually all areas of public finance.

Before joining Ballard Spahr, Valarie gained broad exposure to public finance matters while serving in numerous capacities in Massachusetts state government, including as budget analyst for the Massachusetts House Ways and Means Committee, Bond Finance Associate at the Massachusetts Development Finance Agency, and Director of the Airport Business Office at Logan International Airport, Massachusetts Port Authority.

Valarie serves on the firm's Hiring Committee.

Professional Highlights

Professional Activities

Board Member, Pennsylvania Association of Bond Lawyers (PABL)

National Association of Bond Lawyers (NABL)

Board Member, Ladies First in Public Finance

American Bar Association

Speaking Engagements

"What's Next: Continuing Disclosure & Tax Obligations after Bonds are Issued," panelist at the PHMC Conference, October 19, 2017

"New Issue Price Rules" presentation to PNC Bank, N.A. and PNC Capital Markets LLC, May 4, 2017

"Legal Authority for Issuance, Payment and Security – City of Philadelphia Water and Wastewater Revenue Bonds," presentation to managers and executive staff of the Philadelphia Water Department, May 2015

"Legal Authority for Issuance, Payment and Security – City of Philadelphia Water and Wastewater Revenue Bonds," presentation to managers and executive staff of the Philadelphia Water Department, May 2014

"Post-Issuance Compliance Issues and Procedures," presentation to the Financial Managers for the City of Philadelphia, July 16, 2012

Recognitions and Accomplishments

The Best Lawyers in America, public finance law, 2017-2018

Board Memberships

Economy League of Greater Philadelphia, 2010-2015

Please Touch Museum, Mayor's designee to Board

Project Forward Leap, 2010-2015

Education

University of Pennsylvania Law School (J.D., 2002)

University of Pennsylvania Law School (J.D. 2002)

Harvard College (A.B. 1992)

Admissions

Pennsylvania

Katherine Clupper

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Specialties
Financial Advisory
State & Local Governments,
Water & Sewer Utilities,
Higher Education & Non-Profits

Education
B.S.W.
Shippensburg University

MBA
Temple University

Professional Designations or Licenses
Municipal Advisor Representative (Series 50)

Started with PFM: 2003
Started in the Field: 1987

Katherine works with a range of governmental issuers in the Mid-Atlantic region. She also assists in the development of non-profit and higher education clients in Pennsylvania, Maryland, New Jersey and Delaware.

Katherine brings 30 years of experience working for investment banking firms, for financial advisory firms and as an issue manager in Philadelphia. She was the assistant to the director of finance for the City of Philadelphia where she worked for the city treasurer's office in debt management, acting as issue manager for approximately one billion dollars of securities. She has also worked for the Pennsylvania State Legislature. As an investment banker and a financial advisor for other firms, her responsibilities included business development in Pennsylvania, New Jersey, Delaware and Maryland, and working with a range of issuers providing financial advice in the area of debt management and capital financing. Katherine joined PFM in 2003.

She currently works with several large state and regional issuers such as the Pennsylvania Industrial Development Authority, City of Philadelphia Water Department, Pittsburgh Water and Sewer Authority, Commonwealth Financing Authority and the City of Baltimore Water/Wastewater. Additionally, she provides financial advisory services to a variety of non-profit and higher education organization such as Temple University, Drexel University and several smaller non-profits and secondary schools. Katherine has assisted her clients in successfully entering into the public markets, implementing best practices in managing their debt portfolio, analyzing and developing credit and long term asset/liability strategies. She has provided her clients with advice addressing transaction management, financial strategic planning, credit analysis and implementation of best practices.

Ms. Clupper has an MBA in finance from Temple University and currently serves on the board of directors of the Urban Affairs Coalition and the Committee of 70. She is also a member of the Forum of Executive Women.

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PROFESSIONAL HISTORY

Acacia Financial Group, Inc., SEC and MSRB Registered Municipal Advisory Firm, Mt. Laurel, New Jersey, Shareholder/Managing Director, 2006 – Present

Public Financial Management, Inc., Municipal Advisory Firm, Moorestown, New Jersey, Managing Director/Sen. Managing Consultant, 2000 – 2006

Whelan Financial Group, Inc., Municipal Advisory Firm, Moorestown, New Jersey, Vice President, 1994 – 2000

Stone & Webster Engineering Corporation, Cherry Hill, New Jersey, Senior Field Engineer, 1990 – 1994

PROFESSIONAL EXPERIENCE

- Lead financial advisor on billions of municipal issuances over 24-year career.
- Transaction experience includes: general obligation, lease revenue/subject to appropriation, toll roads, airports, solid waste, water and wastewater, higher education, health care, major economic development, not-for-profit (501(c)(3)), MSA tobacco secured, gaming industry, tax lien sales, PILOT bonds and multiple complex refundings.
- Major clients represented include: States of New Jersey, Ohio, New York, Massachusetts, Alaska, Cities of Philadelphia (City, PAID, PRA, PMA), New York, Los Angeles, Chicago, Philadelphia Water Department, New Jersey EDA, NJ Sports and Exposition Authority, NJ Building Authority, NJ Health Care Facilities Financing Authority, Casino Reinvestment Development Authority, South Jersey Transportation Authority, Delaware River Port Authority, Philadelphia School District, SEPTA, Alaska International Airport Systems and others.
- Primary responsibility for all quantitative analyses internally produced.
- Produced presentations to ratings agencies & bond insurers; negotiated with insurers, LOC banks; provided testimony before local and State level boards and committees. Provided reasonableness opinions on debt issuances and valuation opinion on the contribution of the NJ Lottery to the NJ Pension system (first ever).
- Issuance structures include: fixed rate, synthetic fixed rate, variable rate demand bonds, auction rate securities, private placement and LOC structures.
- Refunding structures completed include: current and advance fixed rate refundings, synthetic fixed rate refundings (with and without integration), forward refundings (with and without optionality), cross-over refundings, "cinderella" structures.
- Derivative and municipal reinvest experience including: SIFMA and % LIBOR swaps and swaptions, forward bond issuances (including optionality), forward security purchase agreements, collateralized repurchase agreements, float sales, SLGS and open markets escrow restructurings, and rate locks.
- MSRB Series 50 Examination passed.

EDUCATION

Bachelor of Science, Civil Engineering, Drexel University, Philadelphia, PA 1990

MOODY'S
INVESTORS SERVICE

SECTOR IN-DEPTH
5 April 2018

Rate this Research

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Water and sewer utilities - US

Medians - Solid financial metrics, ability to raise rates underpin stable sector

Municipal water and sewer utilities continue to demonstrate a stable to modestly positive financial performance, according our latest medians data. The steady performance is primarily driven by utility systems' willingness and ability to raise rates to support operations and debt service. However, declining asset condition across the sector indicates an underinvestment in infrastructure. These credit factors, which are key to our stable outlook for the sector, are set to continue. (Basis for medians can be found on page 5.)

» **Debt service coverage remains strong and stable at around 2x.** The median sectorwide coverage remained strong at 2.1x in 2016, indicating a healthy cushion to absorb unforeseen fluctuations in revenues or expenses. Stable coverage trends have roots in systems' autonomous rate-setting authority and an ability and willingness to adjust rates to meet operating and debt service needs.

» **Strong liquidity provides operating flexibility and a cushion against contingencies while helping manage leverage**. Higher-rated entities have historically maintained cash positions with healthy margins relative to operating expenditures due to well-developed capital plans supported by rate increases. Strong liquidity is especially important for lower-rated entities, serving as a buffer against a limited ability to raise rates quickly to address unanticipated disruptions or capital needs.

» **Leverage is manageable and declining, indicating capacity to finance future capital projects.** The downward trend in the median debt burden is driven by rate increases to support new debt issuances as well as an underinvestment in infrastructure. A low debt burden provides greater capacity to tackle capital needs. Highly leveraged systems exhibit elevated fixed costs, limiting operating flexibility.

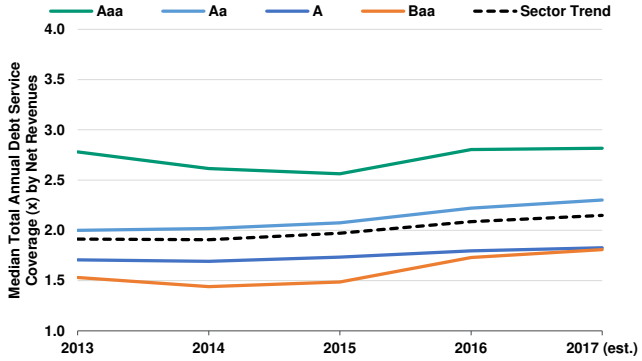
» **Larger systems benefit from increased operating flexibility provided by economies of scale.** Larger utilities generally have financial resources and a broad customer base, helping manage unexpected capital needs and customer losses. Smaller systems often have higher risks, such as customer concentration or limited treatment facilities.

» **Utilities in areas with healthy socioeconomic indicators benefit from greater rate-raising flexibility** Wealthier service areas have greater capacity to absorb rate increases, providing more flexibility to manage operations, debt service and capital needs.

» **Asset condition continues to decline, resulting from underinvestment in infrastructure.** Deferral of capital projects is driving a decline in the remaining useful life of assets sectorwide as depreciation outpaces investment in infrastructure.

Exhibit 1

Debt service coverage remains stable with trend set to continue



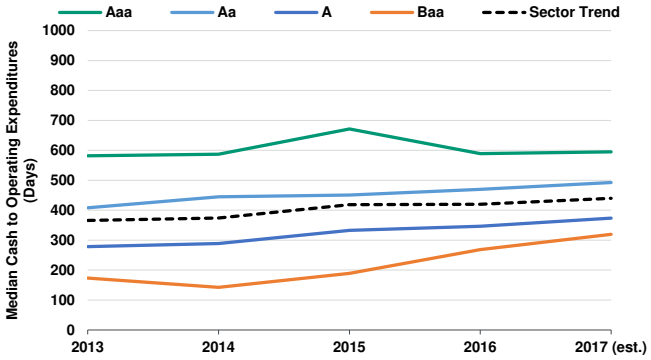
Debt service coverage: annual net revenues (including connection or impact fees) divided by annual debt service.
Source: Moody's Investors Service

Debt service coverage remains strong and stable

- Median debt service coverage across all rating categories remained stable or improved between 2013 and 2016, due to a willingness and ability to adjust rates. The sectorwide median of 2.1x in 2016 is strong and will likely remain so in 2017.
- The modest increase in coverage across all rating categories in 2016 reflects rate adjustments to meet growing operating expenses. Higher-rated utilities demonstrate greater coverage levels with the median for Aaa systems at 2.8x compared to 1.7x for the Baa category.
- For example, Broad River Water Authority, NC (A1) has implemented steady rate increases, allowing it to address capital needs using pay-go. A 2.5% rate increase in fiscal 2016 increased coverage to 1.8x from 1.3x the year before.

Exhibit 2

Continued healthy liquidity signals sound financial management



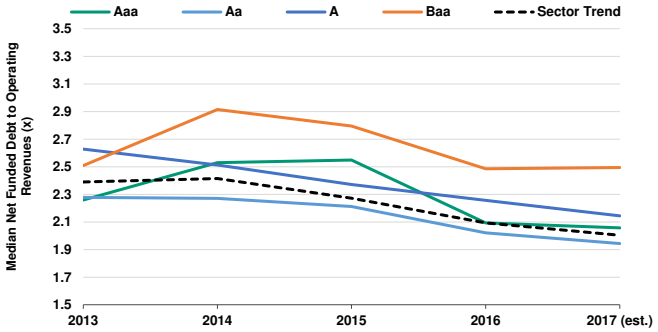
Liquidity: unrestricted cash and liquid investments multiplied by 365 and divided by operating and maintenance expenses (net of depreciation), expressed in days.
Source: Moody's Investors Service

Strong liquidity offers flexibility for contingencies, leverage

- Liquidity improved across most rating categories in fiscal 2016, giving systems the flexibility to address capital needs and maintain low leverage. Reserves help with rate stabilization, system shocks and capital needs.
- Average growth in liquidity has been in the low-to-mid single-digit range as growing cash levels outpace inflation. We expect this healthy trend to continue since utilities face manageable growth in core operating costs.
- Higher-rated entities continued to demonstrate a strong cash position in 2016, with Aaa- and Aa-rated utilities maintaining over one year's worth of liquidity relative to operating expenses.
- For example, Charleston (City of) SC Water & Sewer Enterprise (Aaa stable) had 1,131 unrestricted days cash on hand at fiscal year-end 2016, providing operating flexibility in the event of damage from hurricanes or flooding.

Exhibit 3

Higher-rated systems maintain lower leverage; Baa-rated credits face elevated leverage due to limited ability to increase rates



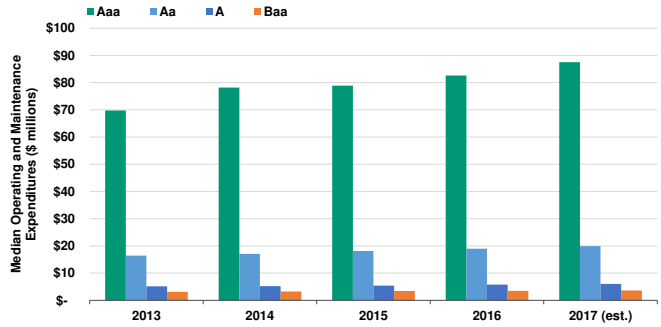
Debt to operating revenues: net long-term debt less debt service reserve funds divided by most recent year's operating revenues.
Source: Moody's Investors Service

Leverage is trending downward for most rating categories

- Declining leverage creates more capacity to finance capital projects in the face of aging infrastructure. This declining trend will likely continue, albeit at a slightly slower pace, as utilities launch capital projects.
- Median leverage across all rating categories was moderate at 2.1x operating revenues in 2016. Relatively low leverage provides the ability to issue additional debt to fund capital needs.
- Many Baa-rated systems face greater capital needs resulting from consent orders, leading to higher leverage. They are often challenged to implement timely rate increases given a lack of proactive management or lower resident wealth.

Exhibit 4

Higher-rated systems tend to be larger with an increased ability to manage expenditures and absorb unforeseen shocks



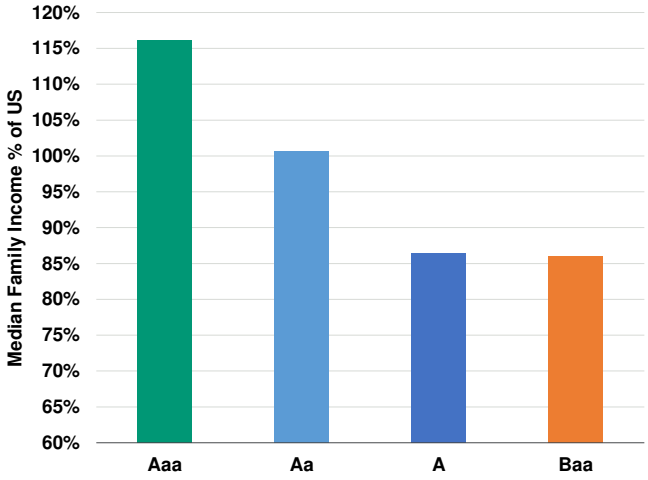
Operating expenses less depreciation.
Source: Moody's Investors Service

Larger systems benefit from increased flexibility provided by economies of scale

- Higher-rated utilities have larger budgets and more diverse customer bases and water sources, affording greater capacity to mitigate unexpected capital needs or operating shocks.
- Lower-rated entities exhibit more narrow fiscal resources limiting their ability to manage operating risks, such as customer concentration or a single supply of water or treatment plant.
- Operating expenditures have shown modest increases over the past several years largely due to service area growth, offset somewhat by more energy efficient upgrades to facilities and flat to declining water usage driven by increased conservation.
- Lower-rated systems (A and Baa) have maintained stable operating expenditures because they often serve stagnant, if not shrinking, areas.

Exhibit 5

Higher-rated systems tend to serve wealthier areas, allowing greater flexibility to raise rates



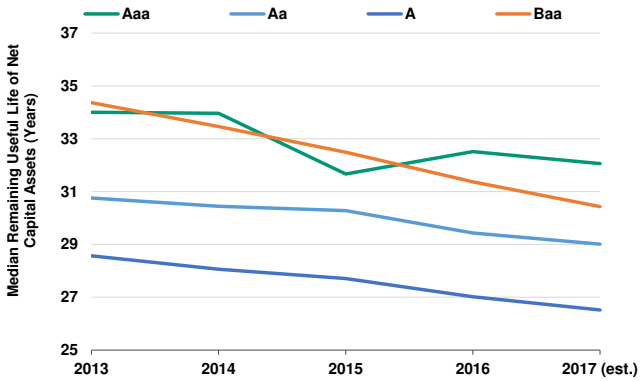
Median family income data is from the 2016 US Census American Community Survey.
Source: Moody's Investors Service

Utilities serving areas with stronger socioeconomic indicators have greater rate-raising flexibility

- Service charges are the primary revenue source for utilities, meaning ratepayers bear the costs of growing operating and capital expenditures. Highly rated systems tend to serve wealthier areas, providing greater capacity for customers to absorb rate increases.
- For example, Palo Alto (City of) CA Water Enterprise (Aa1) serves a very broad, wealthy, and economically dynamic service area, which provides a strong and reliable customer base with a 2016 median family income at 260.5% of the nation. This allows the city flexibility to implement required rate increases.
- Service areas with lower income levels limit a utility's practical ability to raise rates annually to keep pace with growing expenses and capital needs.

Exhibit 6

Declining asset condition indicative of underinvestment in infrastructure



Asset condition: net fixed assets divided by depreciation expense, expressed in years.
Source: Moody's Investors Service

Remaining useful life continues to decline as depreciation outpaces investment in infrastructure

- Continued deferral of maintenance increases the risk of operational issues such as sewer overflows or pipe bursts, which can lead to service disruptions and increased expenses to meet regulatory requirements.
- Despite the downward trend, the 2016 sector-wide median asset condition (or remaining useful life) of 29 years affords systems adequate time to implement capital plans before acute system failures.
- The median asset condition for the Baa category is higher than the Aa and A categories for multiple reasons, namely because lower-rated systems are often forced to reinvest at a faster pace due to consent orders.
- Remaining useful life medians are unlikely to change significantly over the next year due to multiyear capital planning.

Basis for medians

This medians report conforms to our US Municipal Utility Revenue Debt rating methodology published in October 2017. As such, the medians presented here are based on the key metrics outlined in the methodology and the associated scorecard. The appendix of this report provides additional metrics broken out by sector and rating category.

We use data from a variety of sources to calculate the medians, some of which have differing reporting schedules. Whenever possible, we calculated these medians using available data for fiscal year 2016. The median family income data was derived from the 2016 US Census American Community Survey.

Medians for some rating levels, namely Aaa- and Baa-rated issuers, are based on relatively small sample sizes. These medians may therefore be subject to substantial year-over-year variation.

Our ratings reflect our forward-looking opinion derived partly from forecasts of financial performance and qualitative factors, as opposed to strictly historical quantitative data. Our expectation of future performance, combined with the relative importance of certain metrics on individual local government ratings, account for the range of values that can be found within each rating category.

Key ratios

- Debt service coverage: annual net revenues (including connection or impact fees) divided by annual debt service.
- Liquidity: unrestricted cash and liquid investments multiplied by 365 and divided by operating and maintenance expenses (net of depreciation), expressed in days.
- Debt to operating revenues: net long-term debt less debt service reserve funds divided by most recent year's operating revenues.
- Asset condition: net fixed assets divided by depreciation expense, expressed in years.

Exhibit 7

Medians for all US water, sewer, stormwater and combined utilities

Selected Indicators	2013	2014	2015	2016
Moody's Median Senior Revenue Rating				Aa3
Median Family Income (% of US Median)	97%	96%	96%	96%
Asset Condition: (Remaining Useful Life)	30	30	29	29
Debt to Operating Revenues	2.4	2.4	2.3	2.1
Annual Debt Service Coverage	1.9	1.0	2.0	2.1
Days Cash on Hand	366	374	419	420
System Size: (O&M, $000)	10,585	10,954	11,146	11,933
Debt Service ($000)	3,846	4,013	3,975	3,981
Net Revenues ($000)	7,931	7,986	8,985	8,861
Net Funded Debt ($000)	41,843	40,964	40,819	41,621
Total Revenues ($000)	18,309	19,382	20,123	21,675

Exhibit 8

Medians for US water utilities

Selected Indicators	2013	2014	2015	2016
Moody's Median Senior Revenue Rating				Aa2
Median Family Income (% of US Median)	99%	100%	99%	100%
Asset Condition: (Remaining Useful Life)	32	32	32	31
Debt to Operating Revenues	2.1	2.2	2.2	2.0
Annual Debt Service Coverage	2.0	2.0	2.0	2.1
Days Cash on Hand	307	344	383	382
System Size: (O&M, $000)	6,876	6,963	7,251	8,349
Debt Service ($000)	2,471	2,755	2,795	2,835
Net Revenues ($000)	5,981	5,956	6,367	6,953
Net Funded Debt ($000)	25,544	26,026	28,732	28,434
Total Revenues ($000)	13,023	13,845	13,951	14,932

Exhibit 9

Medians for US sewer utilities

Selected Indicators	2013	2014	2015	2016
Moody's Median Senior Revenue Rating				Aa3
Median Family Income (% of US Median)	98%	98%	99%	99%
Asset Condition: (Remaining Useful Life)	31	30	30	30
Debt to Operating Revenues	2.9	2.7	2.7	2.5
Annual Debt Service Coverage	1.9	1.9	2.1	1.9
Days Cash on Hand	535	525	561	565
System Size: (O&M, $000)	9,151	9,048	9,312	10,048
Debt Service ($000)	4,200	4,300	3,740	3,813
Net Revenues ($000)	7,676	8,614	9,373	8,998
Net Funded Debt ($000)	40,485	37,937	37,022	40,881
Total Revenues ($000)	17,651	18,298	19,549	20,481

Exhibit 10

Medians for US water and sewer utilities

Selected Indicators	2013	2014	2015	2016
Moody's Median Senior Revenue Rating				Aa3
Median Family Income (% of US Median)	92%	91%	91%	91%
Asset Condition: (Remaining Useful Life)	29	28	27	27
Debt to Operating Revenues	2.4	2.4	2.3	2.1
Annual Debt Service Coverage	1.9	1.8	2.0	2.1
Days Cash on Hand	358	356	388	399
System Size: (O&M, $000)	14,009	14,627	16,047	15,859
Debt Service ($000)	4,954	5,025	5,175	5,160
Net Revenues ($000)	10,447	10,874	11,479	11,890
Net Funded Debt ($000)	55,104	55,161	51,311	50,840
Total Revenues ($000)	25,032	25,820	26,680	28,306

Exhibit 11

Medians for US stormwater utilities

Selected Indicators	2013	2014	2015	2016
Moody's Median Senior Revenue Rating				Aa2
Median Family Income (% of US Median)	94%	91%	90%	91%
Asset Condition: (Remaining Useful Life)	48	49	47	43
Debt to Operating Revenues	2.3	2.0	1.9	1.7
Annual Debt Service Coverage	2.2	1.9	1.8	2.8
Days Cash on Hand	618	552	733	700
System Size: (O&M, $000)	2,845	3,004	3,284	3,539
Debt Service ($000)	1,336	1,249	1,527	1,668
Net Revenues ($000)	2,767	3,536	3,852	4,041
Net Funded Debt ($000)	9,832	8,707	11,245	10,606
Total Revenues ($000)	6,812	7,475	7,351	8,892

Exhibit 12

Medians for Aaa-Rated US water and sewer utilities

Selected Indicators	2013	2014	2015	2016
Median Family Income (% of US Median)	125%	124%	124%	124%
Asset Condition: (Remaining Useful Life)	30	29	28	28
Debt to Operating Revenues	1.9	1.8	1.8	1.6
Annual Debt Service Coverage	2.9	3.5	3.4	3.0
Days Cash on Hand	625	674	700	779
System Size: (O&M, $000)	81,351	84,240	87,702	90,024
Debt Service ($000)	17,328	18,660	19,419	21,187
Net Revenues ($000)	74,786	70,650	71,920	75,469
Net Funded Debt ($000)	226,617	257,415	284,273	292,951
Total Revenues ($000)	148,618	149,803	146,159	150,265

Exhibit 13

Medians for Aa-Rated US water and sewer utilities

Selected Indicators	2013	2014	2015	2016
Median Family Income (% of US Median)	96%	95%	95%	95%
Asset Condition: (Remaining Useful Life)	29	28	28	28
Debt to Operating Revenues	2.3	2.3	2.2	2.0
Annual Debt Service Coverage	2.0	1.9	2.0	2.3
Days Cash on Hand	400	424	449	448
System Size: (O&M, $000)	19,075	20,484	21,123	22,335
Debt Service ($000)	7,674	7,775	7,712	7,831
Net Revenues ($000)	14,539	14,790	16,735	18,097
Net Funded Debt ($000)	81,323	76,097	74,742	72,648
Total Revenues ($000)	34,437	34,500	36,757	40,000

Exhibit 14

Medians for A-Rated US water and sewer utilities

Selected Indicators	2013	2014	2015	2016
Median Family Income (% of US Median)	83%	84%	84%	83%
Asset Condition: (Remaining Useful Life)	28	26	25	25
Debt to Operating Revenues	2.6	2.5	2.4	2.3
Annual Debt Service Coverage	1.7	1.7	1.7	1.8
Days Cash on Hand	242	248	289	296
System Size: (O&M, $000)	6,381	6,610	7,001	7,613
Debt Service ($000)	2,105	2,267	2,429	2,279
Net Revenues ($000)	4,096	4,038	4,462	4,477
Net Funded Debt ($000)	25,614	24,587	24,114	25,905
Total Revenues ($000)	10,916	11,626	11,745	11,995

Exhibit 15

Medians for Baa-Rated US water and sewer utilities

Selected Indicators	2013	2014	2015	2016
Median Family Income (% of US Median)	92%	94%	94%	97%
Asset Condition: (Remaining Useful Life)	27	23	25	23
Debt to Operating Revenues	2.6	3.5	2.7	2.4
Annual Debt Service Coverage	1.5	1.5	1.5	1.6
Days Cash on Hand	155	128	128	184
System Size: (O&M, $000)	3,105	3,234	3,763	3,335
Debt Service ($000)	614	779	663	850
Net Revenues ($000)	966	871	1,476	2,119
Net Funded Debt ($000)	8,711	10,902	10,555	10,234
Total Revenues ($000)	4,360	4,626	5,384	5,994

Moody's related publications

Methodology

» US Municipal Utility Revenue Debt, October 19, 2017

Outlook

» 2018 outlook stable as strong rate management and liquidity support sector, December 6, 2017

Sector-In-Depth

» Medians - Sound Financial Metrics Signal Continued Stability, March 16, 2017

To access any of these reports, click on the entry above. Note that these references are current as of the date of publication of this report and that more recent reports may be available. All research may not be available to all clients.

REPORT NUMBER 1114292

MOODY'S
INVESTORS SERVICE

FitchRatings

Public Finance

Water & Sewer / U.S.A.

U.S. Water and Sewer Rating Criteria

Sector-Specific Criteria

This report replaces "U.S. Water and Sewer Revenue Bond Rating Criteria," dated Nov. 30, 2016.

Related Criteria

Rating Criteria for Public Sector Revenue-Supported Debt (June 2017)

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Scope

This criteria report details Fitch Ratings' approach to rating new and existing debt issued by U.S. municipal water and sewer (sanitary and stormwater) utilities whose activities support essential public services and whose debt is intended to be repaid from the utility's own revenues or resources. Utility revenues and resources may be derived from various sources, including charges for services, public grants and tax support.

Ratings under these criteria are international scale ratings and are typically assigned to individual debt instruments and are therefore issue ratings. Fitch's issue ratings on water and sewer debt obligations are assessed on a stand-alone basis and are not explicitly connected to the rating of any parent municipality unless specific linkages are identified that would cause the rating to be limited by the parent municipality (for example, significant transfers from the utility to the parent municipality that impairs or severely weakens utility operations). Ratings under these criteria are applicable to all water and sewer utilities, although particular aspects of these criteria may have more or less applicability depending on the type of operations and related risks of a given utility.

Key Rating Drivers

Revenue Defensibility: Fitch's analysis addresses the ability of a utility to generate cash flow based on its legal framework and fundamental economics. Fitch will evaluate demand and pricing characteristics that influence revenue volatility and the tools available to the utility to respond to fluctuation in demand.

Operating Risks: Fitch's analysis considers the issuer's operating profile, including predictability and volatility of costs, life cycle/capital renewal risks, key resource cost risks and the ability to manage growth in costs over time.

Financial Profile: Fitch assesses the level of financial flexibility that an issuer can sustain as it encounters stresses expected to occur over the relevant forecast period. Metrics are used to evaluate the issuer's operating margins, liquidity profile and overall leverage in the context of the issuer's overall risk profile. This area of the analysis includes the majority of Fitch's key ratios. As a result, the financial profile of a utility is a primary determinant in the rating outcome.

Asymmetric Risk Factors: Risk factors such as debt structure, management and governance, legal and regulatory are also considered when assigning a rating. These risk factors are not scaled, and only weaker characteristics impact the rating.

Revenue Defensibility

Charges and Rate Affordability

In assessing revenue defensibility, Fitch assesses the rate approval process and general relationship with the utility's rate-making body. A major credit strength of municipal utilities is local control over rate setting, free from external oversight. Still, local authorities can be subject to other community interests or political pressures. A lengthy rate review process, which can hinder timely cost recovery, a demonstrated reluctance by rate-making officials to adjust charges in line with increasing costs, or an added layer of oversight from an external rate-regulatory body could negatively affect the rating. Similarly, the involvement of influential consumer councils in rate setting that can further limit financial flexibility can negatively affect the rating.

Most utilities bill customers based on a fixed amount (that is, a readiness-to-serve charge) and a volumetric rate relative to actual usage. Because systems with greater percentages of fixed charges have less volatility in their revenue streams than systems that rely extensively or completely on volumetric charges, utilities whose fixed-charge components generate a significant amount (30% or more) of their revenue streams are considered stronger.

Because the financial health of a utility depends on the receipt of revenues for services rendered, Fitch considers the development and maintenance of adequate billing and collection measures an imperative to investment-grade credit quality. Consequently, inadequate practices include failure to meter customers or to replace aging meters. Fitch also considers the existence of policies regarding the termination of service for unpaid accounts and a utility's practice of acting on those policies when necessary. In cases where accounts receivable (expressed as days of operating revenues) are significantly high in relation to a utility's billing cycle (for example, 2.0x or higher), this could negatively affect a rating.

Fitch also assesses affordability of residential charges, which generally comprises the bulk of utility revenues. Fitch generally considers rates for service higher than 1% of median household income (MHI) for an individual water, sewer and stormwater utility (based on 7,500 gallons of water usage and 6,000 gallons of sewer flows per month) to be financially burdensome. Fitch may also utilize the cost of service from other comparable utilities in the region, where available, in measuring relative affordability. The comparison helps to determine whether future growth may be hampered due to the lack of competitiveness, particularly in neighboring suburban communities that have similar economic and residential bases. The comparison is also useful in that anticipated rate increases may be projected forward to determine continued competitiveness. Finally, a regional comparison may act as a counterbalance to the 1% threshold where rates overall are above average but well within local affordability levels or, conversely, low to moderate overall but at or near 1% of MHI.

For wholesale providers, Fitch focuses on the relevant service contracts to understand the nature of the related obligations and to assess the terms. This includes an evaluation of the expiration and renewal terms of the contracts relative to the final maturity of a wholesaler's outstanding bonds. Debt maturities beyond the terms of the agreements generally are considered a negative rating factor given the uncertainty of sufficient revenue to meet debt service post-expiration. In these cases, Fitch will evaluate the likelihood of contract renewal, as well as the viability of the assets or enterprise to generate alternative revenue sufficient to meet debt service.

The credit quality of the purchasing utilities is also an important consideration when rating wholesale providers because the corresponding payments enable the wholesalers to meet their obligations on a full and timely basis. The ability and willingness of purchasers to make their required payments must therefore be considered. The degree to which a wholesaler's rating is influenced by the credit quality of any individual purchaser (or subset of purchasers) is determined by the specific terms of the contract and the nature of the obligation.

Contract obligations are typically characterized as take-and-pay or take-or-pay. Under take-and-pay contracts, a purchaser's payment obligation is not unconditional, but contingent upon the delivery of service and/or water supplies provided. Fitch expects wholesale utilities providing services through take-and-pay contracts will be required to set rates sufficient to meet debt service requirements. Rates must therefore be adjusted to account for nonpayment by a member system or changes in retailer demands. This provides an implicit or explicit unlimited step-up requirement for participating systems to mitigate operational risk. Consequently, ratings for wholesalers providing service under take-and-pay contracts are generally less sensitive to the credit quality of individual purchasers. Instead, the ratings broadly reflect the credit quality of the pool, or its largest purchasers, given the default protection provided by unlimited step-up provisions.

Take-or-pay contracts are often used to finance individual projects or particular systems. Under these contracts, purchasers usually are obligated to pay a fixed percentage of the project or system costs, including debt service, which corresponds to their allocated ownership interest or percentage of output. Payments by purchasers typically are subject to limited or no step-up provisions. Consequently, a wholesaler's ability to meet its obligations, including debt service, depends on each participant meeting its required payment, making the ratings more sensitive to individual purchaser credit quality. In these cases, the rating for a take-or-pay provider will generally reflect the credit quality of the weakest purchaser or purchasers after factoring the applicable step-up provision.

Where a step-up provision is insufficient to cover an individual purchaser's obligations if it were to default, the wholesaler's rating may be capped by the credit quality of that purchaser. For example, if a wholesaler's step-up is limited to 25%, then that wholesaler's ability to meet debt service obligations would be highly reliant on payments from any purchaser with an allocated share higher than 20%. Stepping up the required payments from the remaining systems responsible for less than 80% of the project costs by 25% would likely result in a shortfall in revenue.

If a wholesaler is highly reliant on more than one purchaser (that is, each purchaser has an allocated share of more than 20% in the case above), then the wholesaler's rating may be capped by the credit quality of the weakest of those purchasers. Although reserve funds could be used to avert an immediate default on the supplier's debt obligations, the long-term rating reflects the likelihood of payment through final maturity.

Fitch seeks to assess the credit quality of purchasing or member utilities using all available information, including public and private disclosure. In the absence of a Fitch public rating of a purchasing system, Fitch may assign its own credit opinion, consider ratings of the local government or other related enterprises, refer to ratings from other nationally recognized credit rating agencies, or rely on comparative peer metric reviews in determining credit quality.

Community Characteristics

The service area economy and customer base characteristics are part of the rating analysis since the essentiality of the enterprises' services provides localities with a de facto ability to tax

for their provisions. Quantitative factors related to the analysis of this particular area typically include employment/unemployment statistics, wealth levels in the form of median household income, poverty rates and an evaluation of major employers relative to the total employment base. The highest rated utilities typically reflect service areas with broad economies and broad and diverse customer bases, since they are less vulnerable to sectoral downturns and cyclical economic shifts.

Attributes: Revenue Defensibility

Stronger	• Residential charges for individual or combined water/sewer utilities less than or equal to 0.6% or 1.2% of MHI, respectively. • Approximately 30% or more of revenues recovered through fixed base charges. • Customer accounts stable or growing less than 1% annually. • Top 10 customers for retail utilities represent 5% or less of system revenues and no customer accounts for more than 2% of system revenues. • Unbilled/unaccounted for water of less than 10%. • Service territory MHI equal to 110% or more of the state and/or nation.
Midrange	• Residential charges for individual or combined water/sewer utilities of about 0.8% or 1.5% of MHI, respectively. • Approximately 15% of revenues recovered through fixed base charges. • Customer account growth of 1%–3% annually. • Top 10 customers for retail utilities represent approximately 10% of system revenues and no customer accounts for more than 5% of system revenues. • Unbilled/unaccounted for water of about 12%. • Service territory MHI equal to around 100% of the state and/or nation.
Weaker	• Residential charges for individual or combined water/sewer utilities in excess of 1.0% or 2.0% of MHI, respectively. • Little or no revenues recovered through fixed base charges. • Customer account growth in excess of 3% annually. • Top 10 customers for retail utilities represent over 20% of system revenues and/or individual customer concentration accounts for 10% or more of system revenues. • Unbilled/unaccounted for water exceeds 15%. • Service territory MHI equal to 85% or less of the state and/or nation.

Note: Stronger attributes are typically associated with issuers exhibiting 'AAA' credit quality; midrange, 'AA' credit quality; weaker, 'A' and below credit quality.

Customer Growth and Concentration

A central component of a utility's revenue profile, also affecting its operating profile, is the level of growth of a utility's residential, commercial, industrial and government customer bases, as well as the utility's customer concentration. In terms of growth, demonstrated steady increases of end-users are considered positive from a credit perspective, given projecting financial results and planning for needed improvements or expansions are generally easier in such stable environments. Conversely, high-growth and declining customer bases are more likely to affect a rating negatively, as they can pressure the financial and capital decisions of a utility. Fitch considers annual growth rates above 3% to be rapid, whereas rates of 1% and under are viewed as stable; annual growth rates between 1% and 3% are seen as moderate.

In a declining service base environment, customer concentration may ultimately lead to the loss of significant revenues with the departure of a single customer or downturn in a particular industry. This is considered a negative characteristic in the analysis. To this end, Fitch evaluates concentration levels in light of a service area's economic focus and sector concentration among the users. Volatility in the service base can be most severe when the largest customers, particularly industrial entities, exit a community or substantially downsize operations. In such a case, a utility not only would face pressures from the loss of revenues of such large users, but also may be constrained to increase rates because of elevated unemployment among its residential customers. In general, Fitch views revenue concentration within retail systems from the top 10 customers in excess of 20% as high. Fitch also considers concentration in excess of 5% from any individual customer as high.

Following on from the above assessment of revenue growth, a high-growth environment poses special challenges in terms of the timing and funding of capital improvements. As a community expands, water and wastewater infrastructure must often be built in advance of growth and/or additional water supplies or treatment capacity must be developed. Potential vulnerabilities include instances when growth does not occur as fast as anticipated. In such cases, user charges will likely be raised for existing customers to cover debt and operating costs. Not only can this provoke political and rate pressure for the utility, potentially resulting in strained financial margins, but it can also reduce the community's attractiveness to new residents and businesses, compounding the growth challenge. While these growth challenges pose credit concerns, management can offset potential risks through well-developed capital and financial plans and policies that identify the nature and timing of future capital and operational needs.

On the other end of the spectrum, Fitch considers the pressure associated with a declining customer base. Utilities with long-term planning practices in place may find savings through cost or personnel reduction and rely less on underused assets, when possible. The credit benefits of these management practices will be more pronounced when they are institutionally implemented on an ongoing basis, preparing for future challenges instead of responding to such demands in a reactive way.

Operating Risks

Costs of Operations

A utility's ability to generate adequate margin, while maintaining competitive rates and preserving affordability, is dependent in part on its ability to manage operating expenses, including costs for purchased services, such as power, water supply and treatment, as well as labor costs. Fitch considers a utility's operating cost burden in the context of its cost flexibility, focusing on a utility's ability to limit growth escalation. Fitch also considers the level of transfer out to the parent municipality as part of its analysis given the expectation these payments would continue to be made, even during periods of financial stress.

Capacity

Fitch considers treatment capacity available to service demands and contracted requirements as related capital expansion costs will likely be required once available capacity falls below 120% of demands. Fitch's criteria also consider a utility's comprehensive plans to maintain existing facilities and replace aging or obsolete assets. Consequently, Fitch views trends of deferred maintenance as a credit risk. Fitch evaluates a utility's annual depreciation in relation to its total historical depreciation of fixed assets to determine the age of plant. Fitch also compares a utility's annual capital expenditures in relation to depreciation for the year to gauge the amount of ongoing capital investment. Utilities with aging infrastructure or annual capital spending that regularly falls below the amount of annual depreciated assets may require substantial upgrades over time to maintain regulatory compliance. Another quantitative indicator is the amount of treated but unbilled water distributed. Water utilities regularly replacing aging pipelines should experience unbilled water rates at or below the 10%–12% typically seen within the industry.

The availability of adequate water supplies is critical for a utility to meet its customer demands. Credit quality is enhanced for utilities that demonstrate a sustainable long-term supply to meet current and expected future growth needs. Alternatively, negative credit implications arise for utilities whose resources may be insufficient to meet ongoing demands or allow for continued economic development.

Attributes: Operating Risks

Stronger	• Transfers to the parent municipality equal to less than 2% of operating revenues. • Treatment capacity in excess of 140% of demand or flows. • Annual renewal of 100% or more of depreciated assets. • Full compliance with regulatory requirements. • Existing and five-year projected debt per customer of $1,200 or less. • Existing and five-year projected debt per capita of $350 or less. • Total outstanding debt to net plant assets of 25% or less. • Debt funding of capital of 35% or less. • Amortization of principal equal to 90% or greater over the ensuing 20 years.
Midrange	• Transfers to the parent municipality of between 2%–5% of operating revenues. • Treatment capacity of about 130% of demand or flows. • Some deferred maintenance. • Limited noncompliance with regulatory requirements. • Existing and five-year projected debt per customer of approximately $1,800. • Existing and five-year projected debt per capita of about $500. • Total outstanding debt to net plant assets of 45%. • Debt funding of capital of about 45%. • Amortization of principal of approximately 80% over the ensuing 20 years.
Weaker	• Transfers to the parent municipality greater than 5% of operating revenues. • Treatment capacity falls below 120% of demand or flows. • Significant deferred maintenance. • Material noncompliance with regulatory requirements, resulting in significant capital expenses and/or fines. • Existing and five-year projected debt per customer of $2,100 or greater. • Existing and five-year projected debt per capita of approximately $600 or greater. • Total outstanding debt to net plant assets of 65% or more. • Debt funding of capital of about 55% or more. • Amortization of principal of about 70% or less over the ensuing 20 years.

Note: Stronger attributes are typically associated with issuers exhibiting 'AAA' credit quality; midrange, 'AA' credit quality; weaker, 'A' and below credit quality.

Compliance with Environmental Laws and Regulations

Mandates have been a dominant factor for sector credits since passage of the federal Clean Water Act in 1972 (as amended) and federal Safe Drinking Water Act in 1974 (as amended). Although regulatory requirements continue to pressure some enterprises, utilities can reduce credit risk by consistently attempting to predict and stay ahead of expected requirements at both the state and federal level given this typically provides more flexibility to utilities than acting while under the threat of orders and fines from regulatory bodies or the courts.

For utilities facing regulatory enforcement, Fitch evaluates in the rating process the events leading to enforcement, scope of the corrective plan, current stage of the corrective plan and projected timeline for completion. Fitch also focuses on the expected impact on ratepayers and management's commitment to meeting the set milestones and returning to compliance.

Capital Demands and Debt Burden

Utilities are capital intensive with debt service burdens that often surpass those of general governments as measured by the percentage of revenues. Because of the burden capital and debt activities can have on a utility's operating and financial profiles, resultant analysis directly affects an entity's credit rating. Debt ratios are an overarching consideration, with such ratios compared with those of other utilities to help gauge relative capital needs and debt burden.

In general, utilities limiting debt exposure by utilizing annual pay-as-you-go funding, including excess user charges and growth-related fees, for a significant portion of their capital programs are considered stronger than those relying predominantly on debt. Elevated debt issuance over the near term may not adversely affect credit quality, although, in its projections, Fitch

considers anticipated debt issuance in light of outstanding obligations, affordability levels and historical financial performance, as well as the need for financing such projects.

Key ratios used in evaluating an entity's debt burden include the measurement of outstanding debt on both a customer and per capita basis, as well as expected customer and per capita debt levels five years into the future; for wholesale systems, the measurement generally is limited to just debt per capita. Other ratios typically considered include the expected level of annual capital spending per customer through the capital improvement program (CIP) cycle, the percentage of debt funding relative to total CIP costs, and debt relative to equity and net plant assets. In addition, to gauge a utility's capacity for future debt issuances over the long term, Fitch evaluates the amortization rate of all debt payable from system revenues.

Financial Profile

Coverage and Financial Performance

Measuring an entity's revenues and expenditures relative to its debt, financial ratios serve as a primary indicator in a credit rating. These ratios are not only used to gauge current, historical and projected performance, but are also compared with those of other peer systems.

Attributes: Financial Profile

Stronger	• Total debt service coverage of approximately 2.5x or greater for retail systems and 1.5x or greater for wholesale utilities with take-and-pay contracts. • Coverage of all obligations of approximately 2.0x or greater for retail systems and 1.5x or greater for wholesale utilities with take-and-pay contracts. • Days cash and days of working capital equal to well over one year for retail systems and over 120 days for wholesale utilities with take-and-pay contracts. • Free cash relative to depreciation equal to 100% or greater. • Debt to FADS of around 4.0x or less for retail systems and of around 7.0x or less for wholesale utilities with take-and-pay contracts.
Midrange	• Total debt service coverage of approximately 2.0x for retail systems and approximately 1.3x for wholesale utilities with take-and-pay contracts. • Coverage of all obligations of approximately 1.5x for retail systems and approximately 1.3x for wholesale utilities with take-and-pay contracts. • Days cash and days of working capital of about one year for retail systems and around 75 days for wholesale utilities with take-and-pay contracts. • Free cash relative to depreciation equal to approximately 90%. • Debt to FADS of around 6.0x for retail systems and around 8.0x for wholesale utilities with take-and-pay contracts.
Weaker	• Total debt service coverage of approximately 1.5x or less for retail systems and less than 1.1x for wholesale utilities with take-and-pay contracts. • Coverage of all obligations of approximately 1.2x or less for retail systems and less than 1.1x for wholesale utilities with take-and-pay contracts. • Days cash and days of working capital of about one year for retail systems and less than 60 days for wholesale utilities with take-and-pay contracts. • Free cash relative to depreciation equal to approximately 90%. • Debt to FADS of around 8.0x greater for retail systems and greater than 10.0x for wholesale utilities with take-and-pay contracts.

FADS – Funds available for debt service. Note: Coverage of full obligations takes into account off-balance sheet obligations and transfers to the parent municipality. Stronger attributes are typically associated with issuers exhibiting 'AAA' credit quality; midrange, 'AA' credit quality; weaker, 'A' and below credit quality.

Fitch typically rates only the senior lien debt of an issuer, as subordinate debt is more commonly privately placed with a state revolving fund and not rated. However, Fitch reviews not only an entity's senior lien debt service coverage, but also coverage on all debt supported by the utility. This provides a more complete assessment of an entity's ability to pay all its obligations (that is, operating and debt) and generate adequate financial margins. Fitch takes into consideration all pledged revenues but also reviews coverage ratios without growth-sensitive revenues, such as connection fees, given their variability.

Systems meet their service requirements through a variety of arrangements. Most utilities own and operate their own water supply and treatment facilities and/or sewer treatment and disposal facilities, while others receive some or all required services through membership in municipal wholesalers. Fitch's analysis of utilities purchasing services includes an evaluation of the service provided and the related business risks in accordance with the criteria outlined in this report. Membership in a wholesale provider is generally viewed positively by Fitch, particularly for smaller systems, as wholesalers provide greater economies of scale and diversification of resources vis-à-vis asset ownership.

Financial metrics diverge widely with asset ownership and related borrowings. Utilities that have financed supply and system facilities on-balance sheet typically report lower debt service coverage and higher leverage metrics than systems that contract for water and/or sewer services. When rating water and sewer systems, Fitch factors contractual debt obligations in its analysis, particularly those issued by wholesalers or other third parties on behalf of its member systems and supported by service contracts. Financial metrics are adjusted for off-balance sheet obligations as appropriate to facilitate peer comparison. Fitch reviews all relevant service contracts to understand the nature of the related obligations and to assess the terms. Although a purchaser's payment obligation is not unconditional under a take-and-pay contract, as it is under a take-or-pay contract, Fitch does not generally distinguish between the obligations when evaluating a utility's financial metrics.

Fitch also evaluates internal cash flow scenario analyses that present both base case and rating case scenarios consistent with Fitch's "Rating Criteria for Public Sector Revenue-Supported Debt," dated June 2017. The base case serves as the agency's expected case in the current macroeconomic environment and also serves as the starting point of sensitivity analysis. The rating case will consist of a through-the-cycle scenario that incorporates a combination of revenue, cost or financial risk stresses that are formed, typically by reference to historical events, peer analysis, and Fitch's expectations for the future. These may incorporate a scenario of events to which the issuer is particularly vulnerable, such as loss of a key counterparty, supply risk, interest rate risk or refinance risk. The rating case will reveal levels and shifts in key operating, leverage and liquidity metrics contrasted to the base case that are consistent with a stable rating through that stress. As an additional sensitivity, analysts may also use the cash flows to test a break-even scenario that determines the maximum-level stress that can be applied to a variable without a default on a rated instrument. These stress scenarios are used solely to inform the evaluation of financial performance and are not used to predict future performance.

Other types of financial performance indicators evaluated by Fitch within its credit evaluation include growth in operating revenues and expenditures and the strength of the cash flows. Each of these ratios provides insight into the operations of the utility and serves to illuminate particular credit concerns. For example, growth in operating expenditures consistently outpacing that of operating revenues may signal that costs are not being adequately recovered in the rate structure. Also, cash flows consistently lower than the annual depreciation expense may signal that insufficient internal resources are being generated for renewal needs, which could lead to increased reliance on borrowable resources over time.

Wholesale providers exhibit financial metrics that in many cases are weaker than retail water/sewer systems for a given rating level, particularly those with take-or-pay projects where debt service coverage can be as low as 1.0x and cash balances held by the issuer may be limited. In general, Fitch believes the credit quality and strong contractual obligations of the member systems serve as mitigating factors to lower financial metrics of wholesalers.

For wholesalers with take-or-pay contracts, exceptionally strong project operating performance could potentially enhance the rating of a wholesaler above the level the purchaser evaluation would otherwise suggest, although such instances are rare. Conversely, poor operating characteristics would not necessarily result in a project rating lower than purchaser credit quality would suggest. Fitch's analysis assumes valid and binding take-or-pay obligations will be paid as required and any financial strain related to a poor-performing project would be separately reflected in the credit quality of the purchasers.

Fitch views long-term financial planning as a fundamental component for successful utility operations given long-range planning can clearly highlight future structural deficits necessitating revenue development, expenditure containment or both. Fitch believes stable utilities make such decisions in advance, as a result of financial forecasting, rather than on a reactive basis, under pressure and with increased political controversy.

Numerous factors can cause financial volatility, including variations in water supply, weather-related demand and economic cycles. Consequently, highly rated utilities set goals for appropriate financial margins, including debt service coverage levels, debt affordability and reserve funding (such as rate stabilization, repair and rehabilitation, and operating reserves), and consistently establish rates and budgets that comply with their goals. Utilities operating in areas especially prone to rainfall volatility that consider the effect of such variability on their revenues and establish financial cushions or rate structures to deal with potential weather events are considered stronger than those that do not consider such risks.

Cash and Balance Sheet Considerations

A utility's cash and balance sheet serve as key indicators of an entity's credit rating. For the most part, relevant ratios are designed to measure a utility's available liquid resources to meet near-term liabilities, particularly in the event of unforeseen hardships or difficult operating conditions. Because of the nature of these calculations, Fitch considers liquid resources to be current unrestricted assets, although credit may be given to noncurrent or restricted assets if they are available for general purposes at the discretion of the governing body (for example, a restricted operating reserve fund) and if Fitch is aware of such resources.

The key ratios Fitch uses in determining an entity's liquidity are days cash and days of working capital, which compare available resources with operating expenses. However, other measurements may also be used, including quick and current ratios, to gauge a utility's ability to meet near-term liabilities. Fitch also considers an entity's cash position relative to swap termination events to gauge the hardship such an event might pose to continued operating performance.

Asymmetric Risk Considerations

Contingent and Derivative Obligations

Fitch will evaluate the debt structure to identify liabilities from other sources, including derivatives identified in the audited and unaudited financial statements. Fitch believes it is imperative that management understand the implications of variable-rate and swap strategies prior to engaging in them, thoroughly evaluating the potential risks and benefits of such instruments within the utility's asset/liability plans. Utilities with a perceived high degree of exposure (for example, a significant proportion of variable-rate debt and/or swaps relative to all outstanding debt or a high exposure of credit facilities with a single institution) and/or a perceived lack of understanding and ability to manage such exposure will face tighter scrutiny than those with little or no variable-rate obligations or swap agreements outstanding. In

evaluating variable-rate and swap exposure Fitch evaluates lien payments of regular and termination payments, collateral posting requirements and cross-default provisions, and the ability to meet termination payments from unrestricted reserves.

Covenants

Fitch focuses on actual and likely future performance as opposed to minimum covenanted levels in debt instrument documentation. Consequently, risk factors in this area work asymmetrically, where only below-standard features are factored into the rating, while more credit-positive features are viewed as the norm with a neutral impact on the rating.

Fitch views standard bond covenants for retail utilities and most wholesale providers as those that limit parity bond issuance of either senior and/or subordinate lien obligations to instances when historical and/or projected revenues cover annual debt service (ADS) at least 1.1x and require 1.1x rate setting annually to cover both operations and debt service costs. Fitch also views 1.0x coverage of ADS from ongoing net revenues, excluding one-time sources such as connection fees, as standard for the additional bonds test and rate covenant. Additional covenants requiring debt service reserve funds and set-asides for operational, maintenance and other financial reserves are considered less standard but are positive credit features, as they heighten prospects for stable financial management.

In nearly all cases, Fitch will consider financial performance on a net revenue basis even if a gross revenue debt security pledge is present, as creditworthy systems must reliably cover operating expenditures from the same revenue streams used to pay debt service. However, most retail and wholesale utilities comfortably exceed their covenant coverage and liquidity requirements and should continue to do so. For them, the focus of a rating review should be actual and likely future performance, not minimum covenanted performance in a stress scenario.

Covenants will be an increasingly greater credit factor for lower rated credits and in cases of declining credit quality. Consequently, any loosening or modernization of such covenants may be expected to have a negative impact on the credit rating in these instances.

Attributes: Asymmetric Risk Considerations

Neutral to risk assessment	• Rate covenant of 1.10x or more of ADS by net revenues. • Additional bonds test of 1.10x or more of ADS by historical or projected net revenues. • General stability, effectiveness and experience of leadership. • Limited to no political pressure from governing body. • Transparency and communication between management and governing body. • In the case of wholesale systems, coordinated efforts among member utility systems and the governing body. • History of forecasts and resource management plans. • Documented policies and procedures.
Negative to risk assessment	• Rate covenant of less than 1.10x ADS by net revenues and/or less than 1.0x ADS from recurring net revenues. • Additional bonds test of less than 1.10x coverage of ADS by historical or projected net revenues and/or less than 1.0x ADS from historical or projected recurring net revenues. • Lack of experience, depth and/or stability in leadership at the utility. • Significant political pressure in the underlying municipality or in the members' service areas. • Significant discord within the governing body that may affect utility operations. • Failure to maintain open communications between the utility and the governing body, which may reveal itself in unexpected, significant rate increases. • Lack of forecasts and resource management plans. • Lack of policies and procedures.

Crew

Fitch's evaluation of management and management practices includes a review of organizational policies and practices. Because sound management practices are critical to a utility's operations and affect all aspects of Fitch's rating criteria, Fitch's assessment in this area has an asymmetric impact on a utility's credit rating, with standard to above-standard performance considered credit neutral and below-standard performance considered a credit negative. In general, utilities exhibiting management practices that promote operational stability (including actions that limit expenditure escalation by anticipating future regulatory and growth/supply demands), reliably implement rate increases to cover operational and capital costs, and ensure sufficient liquidity to cope with unexpected sales shortfalls or emergency needs are expected to be the norm. Numerous management practices that affect credit quality are discussed and highlighted throughout this report, in addition to being summarized in Appendix B.

Rating Sensitivities

U.S. water and sewer ratings are subject to positive or negative adjustment based on actual utility experience. Below is a non-exhaustive list of the primary sensitivities that can influence water and sewer ratings.

- Supply/Demand Performance: Changes in supply levels and resulting sales performance can affect a utility's ability to earn projected revenues and potentially reduce its ability to service the debt.
- Price Risk: Lower than expected rate action could reduce the expected cash flow generation, affecting coverage and leverage metrics and ultimately weighing negatively on a utility's rating.
- Costs: Operating and capital expenditures that deviate materially from projections may indicate greater than expected cost volatility, higher than expected funding needs or a failure to properly estimate or fully capture all relevant cost items.

Data Sources

Key assumptions underlying these criteria are developed by the analysis of data on water and sewer utilities and their vulnerability to credit risk. This includes the analysis of the key rating drivers and their performance over prolonged periods, analytical conclusions drawn from financial reports, public and private sector information, and analytical information received from issuers and other market participants. Assumptions are derived from experienced analytical judgment using such information.

Fitch's analysis and rating decisions are based on relevant information available. The sources are the issuer, the arranger, financial advisory consultants, third-party engineers or consultants, and the public domain. This includes publicly available information on the issuer, such as audited and unaudited (for example, interim) financial statements and regulatory filings. The rating process can incorporate information provided by other third-party sources. If this information is material to the rating, the specific rating action will disclose the relevant source.

Limitations

Ratings, including Rating Watches and Outlooks, assigned by Fitch are subject to the limitations specified in Fitch's Ratings Definitions and available at www.fitchratings.com.

Variations from Criteria

Fitch's criteria are designed to be used in conjunction with experienced analytical judgment exercised through a committee process. The combination of transparent criteria, analytical judgment applied on a transaction-by-transaction or issuer-by-issuer basis, and full disclosure via rating commentary strengthens Fitch's rating process while assisting market participants in understanding the analysis behind our ratings.

A rating committee may adjust the application of these criteria to reflect the risks of a specific transaction or entity. Such adjustments are called variations. All variations will be disclosed in the respective rating action commentaries, including their impact on the rating where appropriate.

A variation can be approved by a ratings committee where the risk, feature or other factor relevant to the assignment of a rating and the methodology applied to it are both included within the scope of the criteria, but where the analysis described in the criteria requires modification to address factors specific to the particular transaction or entity.

Appendix A: Key Ratios Used in the Rating Process

Ratio	Definition	Significance
Total Outstanding Long-Term Debt per Customer ($)	Total amount of utility long-term debt divided by the number of utility customers (for a combined utility, the aggregate number of water and sewer accounts is used)	Indicates the existing debt burden attributable to ratepayers (principal only)
Projected Debt per Customer Year Five ($)	Total projected outstanding system debt (existing debt less scheduled amortization plus planned issuances) divided by total outstanding projected customers five years from the date of the rating (for a combined utility, the aggregate number of water and sewer accounts is used and is inflated by anticipated growth)	Indicates the total debt burden to ratepayers five years from the date of the rating (principal only)
Total Outstanding Long-Term Debt per Capita ($)	Total amount of utility long-term debt divided by total population served by the utility	Indicates the existing debt burden of a utility attributable to each person served by the utility (principal only)
Projected Debt per Capita Year Five ($)	Total projected outstanding system debt (existing debt less scheduled amortization plus planned issuances) divided by total projected population served by the utility (population is inflated based on anticipated growth)	Indicates the total debt burden of a utility to each person served by the utility five years from the date of the rating (principal only)
Three-Year Historical Average Senior Lien Annual Debt Service (ADS) Coverage (x)	Most recent three-year historical average of annual revenues available for debt service divided by respective senior lien debt service for the year	Indicates the historical trend in senior lien ADS coverage
Senior Lien ADS Coverage (x)	Current-year revenues available for debt service divided by current-year senior lien debt service	Indicates the financial margin to meet current senior lien ADS with current revenues available for debt service
Minimum Projected Senior Lien ADS Coverage (x)	Minimum debt service coverage projected typically over the ensuing five-year period, based on revenues available for debt service in any given fiscal year, divided by the respective senior lien debt service amount for that fiscal year	Indicates the financial margin during the year in which future senior lien ADS coverage is projected to be the lowest
Three-Year Historical Average All-In ADS Coverage (x)	Most recent three-year historical average of annual revenues available for debt service divided by respective total debt service for the year	Indicates the historical trend in total ADS coverage
All-In ADS Coverage (x)	Current-year revenues available for debt service divided by current-year total debt service	Indicates the financial margin to meet current total ADS with current revenues available for debt service
Minimum Projected All-In ADS Coverage (x)	Minimum debt service coverage projected typically over the ensuing five-year period, based on revenues available for debt service in any given fiscal year, divided by the respective total debt service amount for that fiscal year	Indicates the financial margin during the year in which future total ADS coverage is projected to be the lowest
Days Cash on Hand	Current unrestricted cash and investments plus any restricted cash and investments (if available for general system purposes), divided by operating expenditures minus depreciation, divided by 365	Indicates financial flexibility to pay near-term obligations
Days of Working Capital	Current unrestricted assets plus any restricted cash and investments (if available for general system purposes) minus current liabilities payable from unrestricted assets, divided by operating expenditures minus depreciation, divided by 365	Indicates financial flexibility to pay near-term obligations
Free Cash as % of Depreciation	Current surplus revenues after payment of operating expenses, debt service and operating transfers out divided by current-year depreciation	Indicates annual financial capacity to maintain facilities at current level of service from existing cash flows

Appendix B: Water and Sewer Management Practices

Revenue Defensibility Related

- Willingness of governing board to adjust rates when necessary.
- Collection policies that regularly track the rate of timely payment receipts and enforce penalties against late payers or terminate service for nonpayment.
- Rate affordability guidelines that consider absolute levels of rates and their affordability relative to income levels.
- Limited operating exposure to growth-sensitive revenues, such as tap, connection or impact fees.

Operating Risks Related

- Limited exposure to financial operations of the general government, so that system revenues can be relied on for use to operate and improve the utility. For transfers to the general fund, policies that specifically limit their scope and growth are favorable.
- Prioritized capital improvement plans that cover at least five years and consider capacity, supply, regulatory, and replacement and renewal needs.
- Use of professional engineers, either within the utility or outside of it, to prepare objective reviews of system performance and needs on a regular basis and provide periodic revisions of construction cost estimates.
- Regular consultation with regional and local growth planners, community development officials and demographers to predict and, if possible, limit infrastructure needs related to population and business growth.
- Debt issuance policies, including types, terms and suitability under specific conditions, as well as the total amount of variable-rate debt deemed appropriate.

Financial Profile Related

- Long-term integrated financial forecasting that considers future demand, expected rate increases, regulations, and infrastructure renovation and renewal needs.
- Policies to ensure appropriate financial margins, including debt service coverage and operating liquidity levels.
- Regular financial reporting and monitoring systems that enable policymakers access to timely information on fiscal performance relative to the budget.
- Compliance with industry accounting practices and establishment of appropriate internal controls.

Asymmetric Risk Related

- Key management industry experience and active participation in organizations to keep pace with sector issues, regulatory mandates and technological advances.
- Development of comprehensive policies on the use of hedge agreements and their disclosure prior to entering into any such agreements. Utilities with variable-rate debt and swap agreements are expected to understand the implications and potential risks of such capital management strategies. In addition, these utilities should include management's rationale for the sizing of financial reserves and the adequacy of those reserves to cope with interest rate fluctuations and possible termination payments.

Scenario: Recommended Rate Board Adjustments - Final Analysis

TABLE C-1

COMBINED UTILITY: PROJECTED REVENUE AND REVENUE REQUIREMENTS (in thousands of dollars)

Line No.	Description			2017	2018
	OPERATING REVENUE				
1	Water Service - Existing Rates			256,068	255,008
2	Wastewater Service - Existing Rates			387,819	385,915
3	Total Service Revenue - Existing Rates			643,887	640,923
	Additional Service Revenue Required				
	Year	Percent Increase	Months Effective		
4	FY 2017	4.52%	12	29,124	28,989
5	FY 2018	4.52%	12		30,310
6	Total Additional Service Revenue Required			29,124	59,299
7	Total Water & Wastewater Service Revenue			673,011	700,222
	Other Income (a)				
8	Other Operating Revenue			22,347	6,200
9	Debt Reserve Fund Interest Income			0	0
10	Operating Fund Interest Income			316	279
11	Rate Stabilization Interest Income			581	476
12	Total Revenues			696,256	707,178
	OPERATING EXPENSES				
13	Water & Wastewater Operations			(280,214)	(290,433)
14	Direct Interdepartmental Charges			(171,962)	(177,547)
15	Total Operating Expenses			(452,176)	(467,980)
16	Transfer From/(To) Rate Stabilization Fund			15,600	42,700
17	**NET REVENUES AFTER OPERATIONS**			259,680	281,898
	DEBT SERVICE				
	Senior Debt Service				
	Revenue Bonds				
18	Outstanding Bonds			(181,580)	(182,769)
19	Pennvest Parity Bonds			(12,343)	(12,927)
20	Projected Future Bonds			(13,791)	(27,966)
21	Total Senior Debt Service			(207,715)	(223,661)
22	**TOTAL SENIOR DEBT SERVICE COVERAGE (L17/L21)**			1.25 x	1.26 x
23	Subordinate Debt Service			0	0
24	Total Debt Service on Bonds			(207,715)	(223,661)
25	**CAPITAL ACCOUNT DEPOSIT**			(21,745)	(22,289)
26	**TOTAL COVERAGE (L17/(L24+L25))**			1.13 x	1.14 x
	RESIDUAL FUND				
27	Beginning of Year Balance			15,255	15,129
28	Interest Income			55	55
	Plus:				
29	End of Year Revenue Fund Balance			30,220	35,948
30	Deposit for Transfer to City General Fund (b)			794	799
	Less:				
31	Transfer to Construction Fund			(30,400)	(35,900)
32	Transfer to City General Fund			(794)	(799)
33	Transfer to Debt Service Reserve Fund			0	0
34	End of Year Balance			15,129	15,232
	RATE STABILIZATION FUND				
35	Beginning of Year Balance			169,306	153,706
36	Deposit From/(To) Revenue Fund			(15,600)	(42,700)
37	End of Year Balance			153,706	111,006

(a) Includes other operating and nonoperating income, including interest income on funds and accounts transferable to the Revenue Fund. Includes projected contra revenue credits for Affordability Program Discounts in FY 2018.

(b) Transfer of interest earnings from the Bond Reserve Account to the Residual Fund as shown in Line 30 to satisfy the requirements for the transfer to the City General Fund shown on Line 32.

TABLE C-4

COMBINED UTILITY: COMPARISON OF TYPICAL BILL FOR RESIDENTIAL CUSTOMERS UNDER EXISTING AND PROPOSED RATES

(1)	(2)	(3)	(4)	(5)	(6)	(7)
		FY 2016	FY 2017		FY 2018	
Meter Size	Monthly Use	Existing Rates	Proposed Rates	% Proposed of Existing	Proposed Rates	% Proposed of FY 2017
Inches	Mcf	$	$	%	$	%
5/8	0.0	27.16	27.87	2.6	28.73	3.1
5/8	0.3	47.30	49.37	4.4	51.39	4.1
5/8	0.5	60.72	63.70	4.9	66.50	4.4
5/8	**0.6**	**67.43**	**70.87**	**5.1**	**74.05**	**4.5**
5/8	0.7	74.14	78.03	5.2	81.61	4.6
5/8	0.8	80.86	85.20	5.4	89.16	4.7
5/8	1.7	141.26	149.69	6.0	157.15	5.0
5/8	2.7	203.13	217.71	7.2	228.90	5.1
5/8	3.3	238.89	257.59	7.8	270.98	5.2

Mcf - Thousand cubic feet