STATE OF ALASKA

THE REGULATORY COMMISSION OF ALASKA

Before Commissioners: Stephen A. McAlpine, Chair
Rebecca Pauli
Robert M. Pickett
Norman Rokeberg
Janis W. Wilson

In the Matter of the Tariff Revision Designated as TA xxx-122, filed by MUNICIPALITY OF ANCHORAGE d/b/a ANCHORAGE WATER AND WATEWATER UTILITY, for its Water Utility, for Interim and Permanent Rate Relief	TAxxx-122
In the Matter of the Tariff Revision Designated as TA xxx-126, filed by MUNICIPALITY OF ANCHORAGE d/b/a ANCHORAGE WATER AND WATEWATER UTILITY, for its Wastewater Utility, for Interim and Permanent Rate Relief	TAxxx-126

PRE-FILED DIRECT TESTIMONY OF DR. BENTE VILLADSEN

November 22, 2017

Table of Contents

Page

I. INTRODUCTION AND SUMMARY

Q1. Please state your name, occupation and business address.

A. My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is One Beacon Street Suite 2600, Boston, MA 02108.

Q2. Please summarize your professional qualifications.

A. I have more than 17 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance and accounting issues. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California, Illinois, New Mexico, Oregon as well as before the Bonneville Power Administration, the Surface Transportation Board, the Alberta Utilities Commission, and the Ontario Energy Board. I have provided white papers on cost of capital to the British Columbia Utilities Commission, the Canadian Transportation Agency as well as to European and Australian regulators on cost of capital. Recently, I co-authored a book on "Risk and Return for Regulated Industries."[1]

I have testified or filed testimony, expert reports or affidavits on regulatory accounting issues before the Regulatory Commission of Alaska,[2] Federal Energy Regulatory Commission (FERC), the Michigan Public Service Commission, the Texas Public Utility Commission as well as in international and U.S. arbitrations and regularly provide advice to utilities on regulatory matters as well as risk management. I have previously testified on cost of capital before the Regulatory Commission of Alaska (Commission or RCA). I

[1] Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, "*Risk and Return for Regulated Industries*," Academic Press, May 2017 (Villadsen et al. 2017).

[2] U-17-083.

hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Exhibit BV-01 contains more information on my professional qualifications as well as a list of my prior testimonies.

Q3. Please summarize your testimony.

A. Anchorage Water and Wastewater Utility (AWWU) has asked me to determine the cost of equity and fair rates of return on equity for Anchorage Water Utility (AWU) and Wastewater Utility (ASU) in connection with AWU's and ASU's request for an increase in rates. Because both the water utility and the wastewater utility are seeking to change rates, I discuss both utilities and recommend a capital structure and return on equity for each utility. At year-end 2016, AWU had 62% debt (38% equity) and ASU had 67% debt (33% equity) on their books, while the average water utility had about 48% debt on its balance sheet. AWU is expected to increase its equity percentage to above 40% by year-end and remain above that level in most years going forward. For that reason, I believe it is reasonable to use AWU's actual capital structure for ratemaking purposes.[3] However, ASU is not expected to reach 40% equity in the near term and for that reason I recommend that ASU's return on equity be determined using a hypothetical capital structure. Relying on a hypothetical capital structure for ASU makes a comparison between ASU and the sample more useful. Specifically, I recommend that the average book capital structure of the water utilities I consider in my comparable sample be used to benchmark the capital structure used to regulate ASU.

[3] AWWU has petitioned to lift the dividend restriction on AWU in U-17-095, which also is a result of its significantly improved financial condition. The expected equity percentage in AWU's and ASU's capital structure is depicted in Exhibit BV-04.

I selected a sample of water utilities that are subject to regulation and reviewed the average and median capital structure as of Q2 2017 and over the most recent five year period. The average and median equity percentage as of Q2 2017 was 52.2% and 51.0%, respectively. The five-year average and median equity percentage was 51.5% and 50.8%, respectively.[4] I therefore recommend the same equity percentage as in ASU's most recent rate application, TA158-126. At that time, ASU applied to use 52% equity for regulatory purposes. Because 52% equity remains consistent with the average experienced for water utilities, I recommend using a hypothetical capital structure with 52% equity in this case, which will allow ASU on a stand-alone basis to have metrics that are comparable to those of other utilities.

AWU's actual capital structure of approximately 40% equity is within the range of equity percentages that, for example, Moody's sees as consistent with a Baa (or BBB in Standard & Poor's terminology) bond rating. However, the equity thickness is below the average or median equity percentage among U.S. regulated water utilities and consequently, AWU has higher financial risk due to its higher leverage. As a result, it would be justifiable to grant AWU a higher return on equity than what is required at 52% equity. I therefore calculate the return on equity that is consistent with a capital structure containing 40% equity although I understand that AWU is asking for a return on equity of only 10.5%, which is the figure I recommend at 52% equity.

I calculated the cost of equity for the sample companies using standard models and methods such as the Capital Asset Pricing Models (CAPM), Discounted Cash Flow (DCF) models and a risk premium model. Having estimated the cost of equity for the sample, I then considered specific risks of ASU and AWU to derive a range of cost of

[4] Exhibit BV-04.

equity estimates for ASU and AWU. I concluded that a range of reasonable return on equity (ROE) estimates for a generic water and wastewater utility with 52% equity is as indicated below.[5] Because publicly traded water companies engage in regulated activities in both the water and wastewater industry, I consider the group comparable to both ASU and AWU. I recommend an ROE for ASU and AWU below:[6]

Return on Equity at 52% Equity

	Reasonable Range for Proxy Group
CAPM-Based Methods	10% - 11%
DCF-Based Methods	8¾% - 11¾%
Risk Premium	10% - 10¼%
Recommended ROE at 52% Equity	**10½%**

Return on Equity at 40% Equity

	Reasonable Range for Proxy Group
CAPM-Based Methods	11% - 13½%
DCF-Based Methods	10½% - 14¼%
Risk Premium	~12%
Midpoint ROE at 40% Equity	**12½%**

[5] I select my water and wastewater utility sample from Value Line's Water Utility group, which included companies in the water and wastewater industry. All sample companies engage in both water and wastewater activities.

[6] These ranges exclude outliers and are rounded relative to the actual estimates.

Based on my estimates' results, a reasonable return for wastewater utilities is in the range of 9¾% to 11% when the equity percentage is 52%.[7] While the midpoint of the range above is about 10¼%, I consider ASU to be of higher risk than the average sample company, so that it should be placed in the upper half of the range due to its smaller size and high level of Contributions in Aid of Construction (CIAC). I therefore recommend an ROE of 10.50%. Further, the Commission has in the past assigned primary weight to the single-stage DCF, which results in an ROE of 11.8%, and lesser weight to the CAPM, which results in ROE estimates of 9.9% to 10.9%. A 60% weighting of the single-stage DCF would result in an ROE higher than 10.5%.[8] Therefore, my recommendation is consistent with the Commission's relative weighting of the DCF and CAPM in Order 10. I discuss the details of my analysis of ASU and AWU specific factors later in my testimony.

As for AWU, at 40% equity its financial risk is higher than that of the sample companies and therefore it would be reasonable to have the ROE reflect the higher leverage. At 40% equity the sample companies' midpoint estimated cost of equity is a little over 12%, so I would normally recommend that AWU be allowed an ROE of about 12.5% on 40% equity and find that AWU's request for an ROE of 10.5% on its actual capital structure is conservative and well within what is reasonable.

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[7] The reasonable range eliminates the highest and lowest estimate.

[8] Assigning a weight of 60% to the single-stage DCF estimate of 11.7%, and 40% weight to the lowest CAPM estimates of 9.9%, results in an ROE of 11%. *See* Regulatory Commission of Alaska (RCA) Order No. 10 in dockets U-08-157 and U-08-158 ("Order 10") dated March 1, 2010, at p. 44. This estimate assigns no weight to the risk premium result.

II. APPROACH TO ESTIMATING THE COST OF CAPITAL

A. PRELIMINARY COMMENTS

Q4. What are the guiding principles for determining a just and reasonable rate of return on utility investments?

A. Fortunately, there has been a lot of guidance provided on this topic over the years. Perhaps the seminal guidance was provided by the U.S. Supreme Court in the Hope and Bluefield cases, which found that:[9]

1. The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[10]

2. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and

3. The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[11]

Q5. Please describe how you conducted your cost of equity analysis.

A. I selected a sample of regulated water utilities that are comparable to AWU and ASU, estimated the return that investors required to provide capital for those utilities and reviewed the return on equity authorized in other jurisdictions. I also reviewed the

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[9] *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia*, 262 U.S. 679 (1923) (Bluefield), and *Federal Power Com'n v. Hope Natural Gas Co.*, 320 U.S. 591 (1944) (Hope).

[10] *Hope*.

[11] *Bluefield*.

specific risks for ASU and AWU including business, financial, and regulatory risk. I discuss the Water Utility Sample in detail later on in my testimony.

In order to provide additional support for my recommendation, I undertake several analyses. Specifically, I use the CAPM, DCF and Risk Premium analyses; all of which are widely used in the utility and ratemaking setting. The wisdom of employing multiple methodologies has been acknowledged by the Commission in prior decisions.[12]

To arrive at my final ROE recommendation, I considered (i) the ranges of my calculated cost of equity numbers, (ii) the current economic outlook, (iii) the financial risk differences between ASU, AWU and the sample, (iv) the business risks of ASU and AWU relative to that of the benchmark samples, and (v) the regulatory environment in which ASU and AWU operates. The analyses or assessments I undertook to arrive at my final ROE recommendation is discussed below. Based upon my analyses of the factors noted above, I determined that a reasonable ROE for ASU is 10.50% if regulated using a hypothetical capital structure including 52% equity. For AWU, I would recommend an ROE of 12.25% if AWU's actual capital structure including approximately 40% equity is used (equivalent to a 10.25-10.50% ROE if a hypothetical capital structure including 52% equity were used).

1. Cost of Capital and Risk

Q6. How is the "cost of capital" defined?

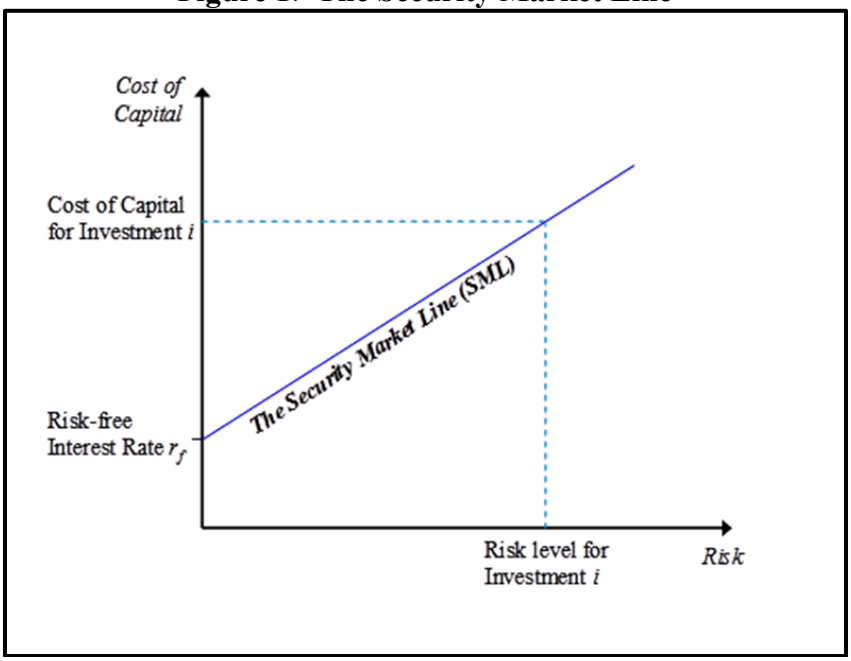
A. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. The cost of capital is a type of opportunity

[12] Order 10 at 33, lines 7-9.

cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 1 below. The higher the risk, the higher the cost of capital required.

Figure 1: **The Security Market Line**



Q7. Why is the cost of capital relevant in utility rate regulation?

A. The "cost of capital" for rate regulation purposes is the return that utility investors expect to earn on investments of comparable risk[13] and is one of the relevant factors set forth in the Hope and Bluefield cases.

Q8. What does this mean from an economic perspective?

A. From an economic perspective, rate levels that give investors a fair opportunity to earn the cost of capital are the lowest levels that compensate investors for the risks they bear. A utility's ability to attract capital and maintain its financial integrity requires that the combined equity return and equity ratio be such that not only is the expected return commensurate with that of other enterprises, but it also meets the expectations of credit market participants.

More important for customers, however, are the broader economic consequences of providing an inadequate return to the company's investors. In the short run, deviations from the expected rate of return on the rate base from the cost of capital may seemingly create a "zero-sum game"—investors gain if customers are overcharged, and customers gain if investors are shortchanged. In the longer term, inadequate returns are likely to cost customers—and society generally—far more than may be saved in the short run. Inadequate returns lead to inadequate investment, whether for maintenance or for new plant and equipment. Without access to investor capital, the company may be forced to forgo opportunities to decrease its costs through timely maintenance, upgrading, and expanding of its systems and facilities. Indeed, the cost to consumers of an undercapitalized industry can be far greater than any short-run gains from shortfalls in the

[13] See Stewart C. Myers, "The Application of Finance Theory to Public Utility Rate Cases," *The Bell Journal of Economics & Management Science* 3:58-97 (1972).

cost of capital. This is especially true in capital-intensive industries (such as the water, electric and gas utility industry), which feature systems that take time to decay. Such long-lived infrastructure assets cannot be repaired or replaced overnight, because of the time necessary to plan and construct the facilities. Thus, it is in customers' interest not only to make sure the expected return of the investors does not exceed the cost of capital, but also that the expected return does not fall short of the cost of capital. Details on infrastructure assets and needed investments are discussed in the pre-filed direct testimony of Brett Jokela, Stephen Nuss and David Persinger.

2. The Impact of Risk on the Cost of Capital

Q9. Please summarize how you factored in risk when determining the cost of capital.

A. I analyzed the difference in leverage among the sample utilities and the regulatory capital structure of ASU and AWU. To determine where in the estimated range ASU and AWU ROE's reasonably fall, I compared the business risk of ASU and AWU to that of the sample utilities and also considered recent capital market developments.

Q10. Why is capital structure important for the determination of the cost of equity?

A. Owners of a company with more debt face more equity risk and therefore the return on equity needs to be greater.[14] This is irrespective of the ownership structure. In liquidation, debt holders are paid prior to owners, therefore debt increases risk for the residual claimants / owners. There are several manners in which the impact of financial risk can be taken into account in an analysis of cost of equity. One way is to determine the after-tax weighted-average cost of capital for the entities and let that figure be

[14] Robert S. Hamada, "Portfolio Analysis, Market Equilibrium and Corporate Finance," *The Journal of Finance* 24: 13-31 (March 1969).

constant between the estimate obtained for the sample and the entity to which it is applied. This assumes that the after-tax weighted-average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.[15] A second approach was developed by Professor Hamada, who unlevered the beta estimates in the CAPM to obtain a so-called all-equity or assets beta and then re-levered the beta to determine the beta associated with the target regulatory capital structure. This requires an estimate of the systematic risk associated with debt (i.e., the debt beta), which is usually quite small. In Exhibit BV-02, I set forth additional technical details related to methods to account for financial risk when estimating the cost of capital.

Q11. Why is a hypothetical capital structure merited for ASU?

A. ASU's actual capital structure included 67% debt for 2016 and is expected to include 65% and 64% debt for 2017 and 2018, respectively.[16] This is higher than that of any of the comparable companies. Because the cost of equity depends on the capital structure as discussed above, it is therefore necessary that ASU either be allowed a "normalized" hypothetical capital structure for ratemaking purposes or an unusually high ROE to ensure ASU has an opportunity to earn a reasonable return on equity and the ability to maintain a revenue bond coverage that allows ASU to pay interest and principal on a timely schedule.[17] It is not uncommon in situations where the capital structure of the

[15] See also the discussion in Jonathan Berk & Peter DeMarzo, "*Corporate Finance*," 3rd Edition, 2014, p. 490.

[16] *See* Pre-Filed Direct Testimony of Karen M. Bell ("Bell Testimony"), Exhibit KMB-06.

[17] Looking at ASU's Long Range Financial Plan for years 2017-2031, which assumes an ROE of 10.5% on 52% equity, the resulting coverage ratios (EBIT interest Coverage and FFO interest coverage) are within Moody's guidelines for an investment grade of 1.50 to 2.50 for

regulated utility deviates from that of the industry to allow the use of a hypothetical capital structure for ratemaking purposes. The Commission has in the past acknowledged that a hypothetical capital structure may have merit if the book capital structure is unreasonable or exposes the utility to excessive risk.[18] In the current case, ASU's book capital structure is outside of the range of what, for example, Moody's considers reasonable for an A rating.[19] As explained in the pre-filed direct testimony of Steven Kantor, Fitch in its September 2017 rating review of ASU's bonds noted that ASU's debt level is above average – in fact, Fitch calls the debt burden significant and a weakness "potentially reducing future debt capacity that may be needed to address potential regulatory capital requirements."[20]

Q12. Would your ROE recommendation change if ASU's actual capital structure were to be used for ratemaking purposes?

A. Yes. It is a common first step for cost of capital experts to rely on a sample of comparable companies to estimate the cost of equity for companies with comparable business risks. However, this is only the first step in determining the cost of equity for a

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the revenue bond service coverage. *See* Pre-Filed Direct Testimony of Karen M. Bell, Exhibit KMB-06; *See also* U-17-095, AWWU's Petition to Remove the Restriction on AWU Paying Dividends, Exhibit D, Attachment BV-04.

[18] For example, RCA Order No. 22 in dockets U-13-184/U-15-096/U-15-097 re Anchorage Municipal Light and Power (April 3, 2015) at p. 51 notes that the Commission "use[s] a hypothetical capital structure when (1) the actual capital structure is inefficient or unreasonable, (2) the level of debt subjects the utility to excessive risks, or (3) the utility is part of a holding company system in which the utility's book capitalization and capital costs are not a true reflection of the system's capital costs with respect to the utility."

[19] Moody's Investors Service, "Regulated Water Utilities," December 22, 2015, pp. 14-17.

[20] Fitch Ratings, "Fitch Affirms Anchorage, AK's Sewer Revs at 'AA'; Outlook Stable," September 2017.

specific company, because any one company may face larger business, financial, or regulatory risks than the sample. Step two is therefore an assessment of the risk associated with the target entity – ASU. Therefore if ASU has less equity than the sample, an ROE adjustment needs to be made for the added risk in ASU's capital structure, so that using ASU's actual capital structure, which included approximately 67% debt, would require an ROE increase of more than 350 basis points. It is important to keep in mind that the cost to customers is the allowed dollar return on equity plus the cost of debt, if we ignore taxes, and the example below illustrates this. The cost to customers would be the same for (A) a hypothetical capital structure of 52% equity with an ROE of 10.5%, or (B) an actual capital structure of 33% equity with an ROE of 13.85%. Scenario A is simply more in line with what is commonly allowed.

Example illustrating Customer Cost Associated with Cost of Capital

	Scenario A	Scenario B
Equity Percentage	52%	33%
Rate Base	$1,000	$1,000
Allowed ROE	10.50%	14.24%
Cost of Debt	4.00%	4.00%
Cost to Customers	$73.8	$73.8

Note: The rate base and cost of debt were chosen for illustrative purposes and does not reflect ASU's current rate base or cost of debt.

Because the cost of equity (and debt) depends on what capital structure is used, and the use of ASU's actual capital structure not only exposes ASU to an excessive amount of financial risk but also is inefficient in that it makes it difficult to compare ASU to other utilities. I therefore recommend a hypothetical capital structure be used.

Q13. What about AWU's actual capital structure?

A. AWU's actual capital structure has a substantially lower equity percentage than the equity percentage used to derive the cost of equity estimate for the sample. Therefore a higher cost of equity award would be warranted using standard financial theory. However, its actual capital structure has more equity than that of ASU, so therefore the difference between a hypothetical and actual capital structure ROE is lower. Specifically, as shown below, a ROE of 10.5% on 52% equity is equivalent to an ROE of about 12.45% on 40% equity.

Example illustrating Customer Cost Associated with Cost of Capital

	Scenario A	Scenario C
Equity Percentage	52%	40%
Rate Base	$1,000	$1,000
Allowed ROE	10.50%	12.45%
Cost of Debt	4.00%	4.00%
Cost to Customers	$73.8	$73.8

Q14. Are there any ASU and AWU-specific risk factors?

A. Yes. First, the book value of total assets was approximately $454 million for ASU and $603 million for AWU at year-end 2016.[21] In comparison, the average and median of total asset for the sample at year-end 2016 exceeds $3.8 billion and $1.4 billion, respectively.[22] Similarly, looking at the book equity among the sample companies the

[21] *See* Pre-Filed Direct Testimony of Erik Johnson ("Johnson Testimony"), Exhibits ELJ-02 and ELJ-03 at page 17.

[22] See Exhibit BV-04, p. 1 for details.

average and median was $1.2 billion and $458 million at year-end 2016, whereas ASU and AWU had only $86 million and 140 million, respectively.[23] Thus, ASU and AWU are both smaller than the average / median sample company and even their combined size is smaller than the average / median water utility.

Second, neither ASU nor AWU have achieved the allowed return on equity since AWU did so in the single year of 2014. This is shown in Figure 2 and Figure 3 below.

Figure 2: ASU Earned Return

		Year				
		2016	2015	2014	2013	2012
ASU Earned Return on Equity	[a]	5.4%	7.1%	10.0%	10.5%	9.5%
Alllowed Return on Equity	[b]	11.01%	11.01%	11.01%	11.10%	11.60%

Sources/Notes:
[a] Johnson Testimony Exhibit ELJ-03 at page 60.
[b]: TA134-126 Letter Order L1100636, TA143-126 Letter Order L1200756, and U-13-202(9), which stipulated the last adjudicated ROR from U-08-158(10).

Figure 3: AWU Earned Return

		Year				
		2016	2015	2014	2013	2012
AWU Earned Return on Equity	[a]	6.8%	8.8%	11.3%	10.5%	7.9%
Alllowed Return on Equity	[b]	11.01%	11.01%	11.01%	11.10%	11.60%

Sources/Notes:
[a] Johnson Testimony Exhibit ELJ-02 at page 62.
[b] TA137-122 Letter Order L1100636, TA144-122 L1200756, and U-13-201(9), which stipulated the last adjudicated ROR from U-08-157(10).

This indicates that there has been an asymmetry between over- and under-earning. For example, ASU and AWU could not expect to earn their allowed ROEs on average. Over

[23] *See* Exhibit BV-04, p. 1; *See* also Johnson Testimony Exhibits ELJ-02 and ELJ-03 at page 19.

the past five years, ASU has under-earned on average by approximately 260 basis points, while AWU has under-earned by an average of over 200 basis points. Thus, if the allowed ROE is set at the utility's expected cost of capital, the utility cannot necessarily expect to earn it. Because the investment in fixed assets needs to be used and useful before the utility can recover capital cost, a utility that engages in capital expenditures necessarily faces a lag in the recovery of capital costs. This is the case for ASU and AWU. I understand that the Commission has adopted regulations that may help offset some regulatory lag pertaining to certain types of infrastructure investments.[24] While PRISM allows the earlier recovery of certain horizontal asset investment, capital spending related to treatment plants is not covered by PRISM.

Third, ASU and AWU have a very large portion of their assets financed by CIAC.[25] The presence of a large CIAC has two effects. As ASU and AWU do not earn a return on these funds, it has larger than usual operating risks; in essence, the utility is responsible for fixed costs over and above what it earns a return on. Therefore, the exposure to asset-related risks is larger than what is reflected in the rate making process. Further, as the CIAC funded assets are being replaced by utility funded assets, the utilities face financing risks. The effect is slightly larger for ASU than for AWU but both utilities exhibit a ratio of CIAC to Net Property, Plant and Equipment (PPE) or to long-term debt that is much higher than that of any sample company. For example, the CIAC to PPE ratio of both utilities is three times that of the average sample company and none of the sample

[24] 3 AAC 52 Amendment: Article 9. Plant Replacement and Improvement Surcharge Mechanism (PRISM), June 29, 2014

[25] *See* Johnson Testimony at Exhibit ELJ-04.

companies are close to having a CIAC to PPE or CIAC to long-term debt ratio comparable to that of ASU or AWU. Figure 4 below summarizes the results.

Fourth, assuming ASU will be allowed a hypothetical capital structure of 52% equity, it nonetheless carries more financial risk than what is inherent in the CAPM and DCF cost of equity estimates. Because the CAPM and DCF models use data from capital markets to estimate the return on equity that investors require, the data entered into the calculation are market data – e.g., the total return to investors (changes in stock prices plus dividends) relative to the investment made. The investment is the dollar value of equity and debt, so the market value of equity and debt is what matters, when measuring the capital structure inherent in the CAPM and DCF based estimates of the cost of equity. Over the last five years, the average utility in my water sample has had approximately 64% equity in their capital structure, when measured at market value.[26]

Q15. Please summarize the impact of a large CIAC amount on ASU's and AWU's risk.

A. Figure 4 summarizes the CIAC among the sample companies as well as for ASU and AWU.

[26] I measure both equity and debt at market value. See, Exhibit BV-03 at Table No. BV-Water-4.

Figure 4: CIAC Relative to Net Plant and Debt

Company		CIAC	Carrying Value of LT Debt	% CIAC of LT Debt	Net PPE	% CIAC of Net PPE
[1]		[2]	[3]	[4]	[5]	[6]
American States Water Co	[a]	121	326	37%	1,151	10%
American Water Works Co Inc	[b]	1,218	5,749	21%	14,992	8%
Aqua America Inc	[c]	542	1,911	28%	5,002	11%
California Water Service Group	[d]	181	558	32%	1,859	10%
Connecticut Water Service Inc	[e]	95	202	47%	601	16%
Middlesex Water Co	[f]	75	135	56%	518	15%
SJW Corp	[g]	152	433	35%	1,146	13%
York Water Co	[h]	37	85	43%	271	14%
Average	[i]	303	1,175	38%	3,193	12%
Median	[j]	136	379	36%	1,149	12%
ASU	[k]	173	175	99%	392	44%
AWU	[l]	212	227	93%	527	40%

Sources/Notes:
[a]-[h]: Company 2016 Annual Reports and 10-Ks.
[k], [l]: Exhibits ELJ-02 page 66 and ELJ-03 page 64.

As can be seen from Figure 4 above, both ASU and AWU have substantially more CIAC than the sample companies. For example, the average CIAC to long-term debt is an average of 38% among the sample companies but close to 100% for ASU and AWU. Similarly, as a fraction of net PPE, ASU and AWU's CIAC are at 44% and 40%, respectively, while the sample's average and median are only 12%.

Because CIAC has been used to finance long-lived assets that are operated by ASU or AWU, but ASU or AWU earn no return on those assets, the magnitude of the CIAC impacts the financial performance. The presence of fixed assets increases operating leverage, because these assets still need maintenance etc., but the revenue associated with the contributed assets does not include a return. Hence, the level of fixed costs to revenue is larger than what it would have been without so much CIAC and therefore operating leverage is increased. Operating leverage (like financial leverage) exposes the utility to risk.

Q16. Please discuss the impact of ASU and AWU being small in size.

A. Looking to the Duff & Phelps company rankings by total assets, ASU falls in their group 23 while AWU falls in group 22, where groups are ranked from largest to smallest. The average sample company falls in group 13 and the median is in group 19.[27] Empirically, investors have required a higher premium to invest in smaller companies than in larger ones. For example, Duff & Phelps data indicates that companies in group 22 on average merit a risk premium of 10.85% while companies in group 19 merits a risk premium of 10.02%, so that the additional premium for AWU would be 0.83% over the median of the sample. As ASU is in group 23, which according to Duff & Phelps merits a risk premium of 11.20%, ASU's premium over the median sample company would be 1.18%.[28] While the estimated premia are different if size is measured by equity, sales, or net income, the directional effect is similar. ASU and AWU's smaller size merits a premium over that of the average or median sample company. As some of the companies relied upon to assess the sample's cost of equity are also of smaller size, the full adjustment would not be warranted, but there is strong indications that ASU and AWU should be placed in the upper half of the estimation results.

Q17. What are some examples of the strong indications that ASU and AWU should be placed in the upper half of the estimation results?

A. For example, ASU's and AWU's operations are concentrated in Anchorage and the surrounding area, which due to its location creates some unique challenges in, for example, construction due to weather. Further, while ASU's and AWU's service territory is concentrated in one area of one state, larger water and wastewater companies

[27] Duff & Phelps 2017 SBBI Valuation Handbook, Appendix 4 Exhibit A-5 (Exhibit BV-05)..

[28] *Ibid.* The analysis uses the smoothed average risk premium.

such as American Water Works and Aqua America operate in multiple states. Thus, the sample is much more geographically diverse than is ASU and AWU.

Q18. What about ASU and AWU having a higher bond rating than the comparable companies?

A. First, I note that the sample utilities on average have a bond rating of about A. Thus, ASU, AWU and the sample companies all have a bond rating well above the investment grade level. This is important because neither AA, A, nor BBB rated companies have much default risk.[29] Second, bond ratings are measures of default risk. Thus, the bond rating is the risk of default to the bonded debt only, not all debt. For example, it does not apply to the State of Alaska loan debt or any general debt of the utility to its vendors. The bonded debt is akin to secured versus unsecured debt and gets paid before the non-bonded debt, having a claim to the revenue ahead of any subordinated or other unsecured debt. Neither does it apply to equity holders, who are last in line. The risk profile as an equity holder looks much different than it does to a bonded debt holder and the bond rating says little about how the risks look from the bottom of the payment waterfall. A better measure of the risk of a company's equity is its beta measure, not its bond rating.

For these reasons, there is no argument that the bond rating of ASU and AWU makes its **equity** any more or less risky than the sample companies.

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[29] According to Standard & Poor, "2016 Annual Global Corporate Default Study and Rating Transitions," April 13, 2017, p 10 the default rate for AA and A rated corporate entities has been zero from 2010 onward while BBB rated entities saw a single year (2011) with a default rate of 0.07%, which is miniscule.

III. IMPACT OF THE ECONOMY AND MARKETS ON THE COST OF EQUITY

A. INTEREST RATES

Q19. How do interest rates affect the cost of equity?

A. Interest rates and the developments in interest rates are important for the determination of the cost of equity for several reasons. First, current or forecasted interest rates are inputs to some commonly used cost of equity estimation methods such as the Capital Asset Pricing Model and the Risk Premium Model. Second, the developments in interest rates impact parameters or the interpretation of parameters that are often used in cost of equity estimation models. Economists often work with yields, which measures the return an investor realized on a bond – for example, the current yield is the annual interest divided by the current price of the bond. The yield on a bond generally increases if the bond has a longer time to maturity and/or if it has higher default risk, but investor perception also matters. If the difference between the yield on, for example, utility bonds and government bonds increases, it could be because (i) the risk characteristics of one of the bonds has changed or (ii) investors require a higher premium to hold non-government bonds.

Q20. What are the relevant developments regarding interest rates?

A. Recent interest rates and especially government bond yields have been low. However, the spread between utility bond yields and government bond yields of the same maturity remains higher than before the financial crisis although this spread has been reduced in the last couple of years.

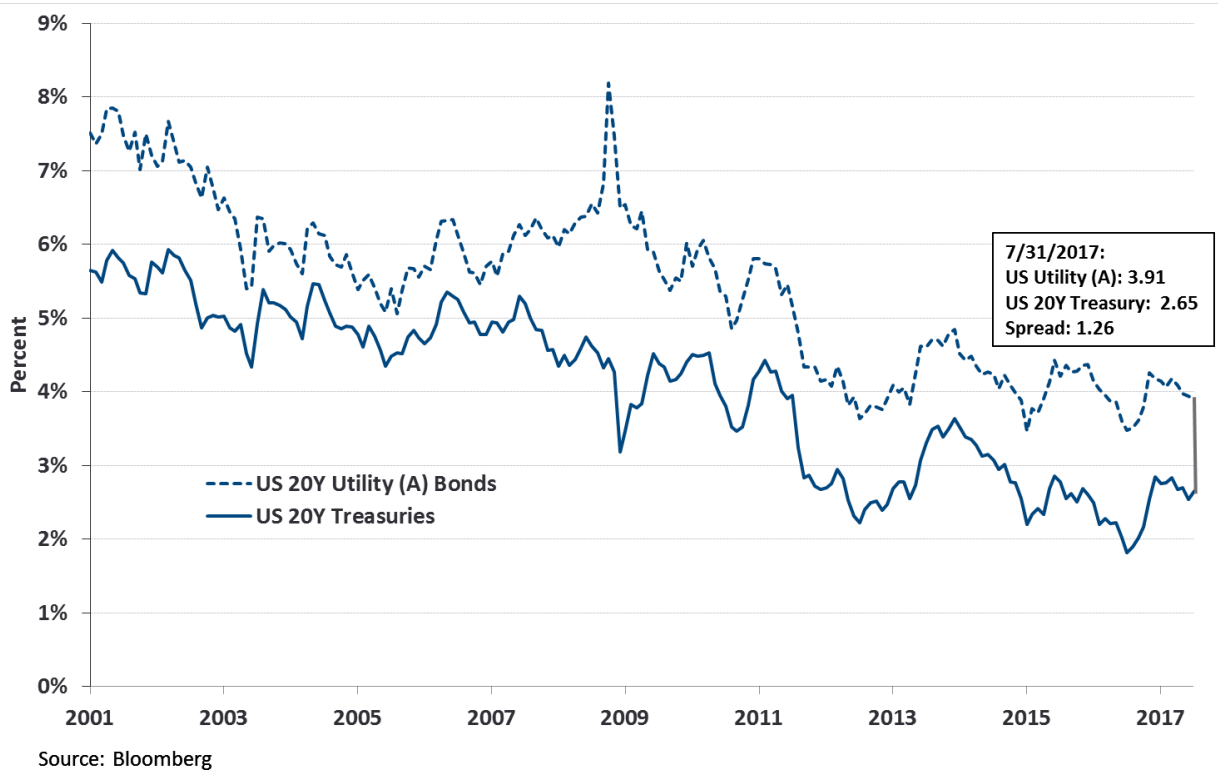
Figure 5 below shows the development in A rated utility and Government bond yields from 2001 to today.[30] It is evident that the yield spread (the difference between the yield on A rated utility bonds and government bonds) is higher than its historical level, but lower than during ASU's most recent filing (TA158-126).

Figure 6 shows the spread between A rated utility bonds and government bond yields along with the average spread prior to the financial crisis. Again, it is evident that the spread is greater than its historical average. Thus, a review of both BBB rated and A rated bonds illustrates that the spread between the utility bond yield and government bond yields is elevated.[31]

[30] For clarity "BBB rated" refer to bonds in the range of BBB- through BBB+ and "A rated" reference bonds in the range of A- through A+. The majority of water utilities are in the A range rating.

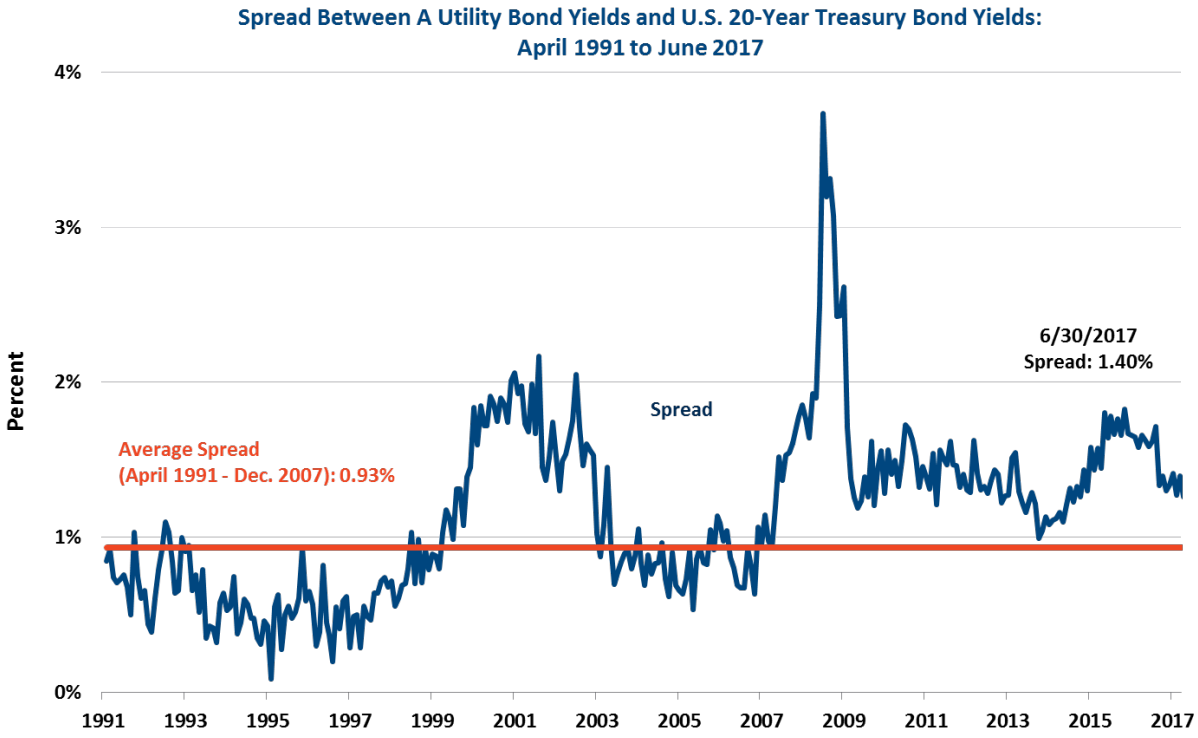
[31] I acknowledge that the elevation in spread has declined since June, 2017, but remains elevated. As the spread has declined the government bond yield and the forecasted bond yield has increased, so that the impact would be a slight increase.

Figure 5: A Utility and Government Bond Yields



Source: Bloomberg

Figure 6: Spread between A Rated Utility and 20-Year Government Bond Yield



Source: Bloomberg.

Q21. How does the current spread between utility and government bond yields compare to the historical spread?

A. As shown in Figure 5 and Figure 6 above, the spread between A rated utility bond yields and government bond yields is higher than its historical average. As of August, 2017 the BBB spread stood at 166%, which is approximately 40 basis points higher than prior to the 2008-09 financial crisis. At the same time the A rated utility bond spread was 1.26% for an increase of about 30 basis points over the pre-crisis level. (*See Exhibit BV-02 for details*).

Q22. How are interest rates expected to trend going forward?

A. Blue Chip Economic Indicators expects that the yield on 10-year Treasury Notes will increase by about 60 basis points by 2018 and the publication forecasts additional increases for 2019 and beyond.[32] Consensus Forecast similarly expects the 10-year yield to increase 60 basis points by mid-2018.[33] These expectations are consistent with the current downward pressure on Government bond yields, which has largely been caused by the Federal Reserve's large balance sheet.[34]

Q23. How do these developments impact the cost of equity analysis?

A. There are several ways in which the current interest rate environment affects the cost of equity analysis. First and most directly, the CAPM utilizes as one of its inputs a measure of the risk-free rate (see Figure 1). I used the yield on a 20-year US government bond as a proxy for the risk-free rate.[35] The CAPM estimated the cost of equity as the risk-free or government bond rate plus a premium. Therefore, if the risk-free rate increases (decreases) by 1%, then the cost of equity increases (decreases), as estimated by the CAPM, by 1%. As a result, to the extent that the government bond rate is driven by monetary policy rather than market factors, so is the CAPM estimate. Importantly, if the government bond rate is downward (upward) biased, then the CAPM estimate will be downward (upward) biased. When that is the case, it is necessary to normalize the relied upon government bond rate, so that the resulting CAPM estimate reflects a non-biased government bond rate. I consider this effect in my CAPM analysis.

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[32] Blue Chip Economic Indicators, March 2017 and July 2017.

[33] Consensus Forecasts, August 7, 2017.

[34] See, for example, https://www.newyorkfed.org/newsevents/speeches/2017/pot171106.

[35] The main reason I rely on the 20-year bond yield is that the MRP as derived by Ibbotson is measured over bonds with a maturity of about 20 years. To avoid having to consider the impact of a maturity premium, I use the 20-year government bond.

Second and as a further indication of a potential bias, if the spread between the yield on utility (or corporate) bonds and government bonds (the "yield spread") widens, it indicates that the premium investors require for holding securities other than government bonds has increased. Thus, there is evidence that the market equity risk premium has increased. A higher than normal yield spread is one indication of the higher risk premiums currently prevailing in capital markets. Investors consider a risk-return tradeoff (like the one displayed in Figure 1 above) and select investments based upon the desired level of risk. Higher yield spreads reflect the fact that the return on corporate debt is higher relative to government bond yields than is normally the case, even for regulated utilities. Because equity is more risky than debt, this means that the spread between the cost of equity and government bond yields must also be higher; i.e., the premium required to hold equity (the Market Risk Premium or MRP) rather than government bonds has increased. If this fact is not recognized, then the traditional cost of capital estimation models will underestimate the cost of capital prevailing in the capital markets. My analyses recognize this effect and therefore reflect the cost of equity capital more accurately.

Third, in times of economic uncertainty (such as the present) investors seek to reduce their exposure to market risk. This precipitates a so-called "flight to safety," wherein demand for low-risk government bonds rises at the expense of demand for stocks. If yields on bonds are extraordinarily low, however, any investor seeking a higher expected return must choose alternative investments such as stocks, real estate, gold or collectibles. Of course, all of these investments are riskier than government bonds, and investors demand a risk premium (perhaps an especially high one in times of economic uncertainty) for investing in them. But short of accepting meager returns, investors

simply have few alternatives to returning to the stock market. Utility stocks may have experienced the "flight to safety" phenomenon to a larger degree than other stock because they traditionally have paid a substantial portion of their earnings as dividends. Therefore, investors who have sought income from their investments and found government bonds too unattractive may have accepted a higher risk and invested in utility stock with the goal of receiving periodic dividend payments. Importantly, if utility stock prices increase, the dividend yield declines and cost of equity estimates from the Discounted Cash Flow (DCF) model will, everything else equal, be lower. I discuss the potential impact in Section III.B below.

One possible explanation of the current elevated level of the yield spread is that current and near-term expected levels of government bond yields are artificially depressed due to monetary policy.[36] The large holding of mortgage backed securities and treasury bonds by the Federal Reserve is expected to last for several years and only gradually unwind.[37] As a result, U.S. government bond yields are expected to increase substantially over the next several years.[38]

Q24. What are the implications of elevated yield spreads to the cost of equity?

[36] As of Q2 2017, the Federal Reserve held approximately $1.8 trillion of mortgage-backed securities, whereas the magnitude was less than $0.5 trillion in mid-2009. Sources: Bloomberg, "The Fed Eases Off," September 16, 2015, Federal Reserve Balance Sheet August 2017.

[37] https://www.washingtonpost.com/news/wonk/wp/2017/09/20/in-sign-of-u-s-economys-strength-fed-to-start-reducing-4-5-trillion-balance-sheet/?utm_term=.1fa068334254

[38] If investors' believe the yield on government bonds will soon elevate, they may demand higher yields on corporate debt relative to the prevailing government bond yields, thus widening the yield spread.

A. The increase in the yield spread indicates that (i) the current long-term government bond yields are depressed relative to their normal levels and / or (ii) investors are demanding a premium higher than the historical premium to hold securities that are not risk free. The latter is an indication that the market equity risk premium may be elevated relative to its historical level. Regardless of the interpretation, the consequence is that if cost of equity is estimated using the current risk-free rate and a market equity risk premium based on historical data, then it will be downward biased. Hence, it is necessary to "normalize" the risk-free rate **or** take into account the current (rather than historical) market equity risk premium.[39]

B. MARKET VOLATILITY AND OTHER MARKET PHENOMENA

Q25. Why is market volatility important?

A. Academic research has found that investors expect a higher risk premium during more volatile periods. The higher the risk premium, the higher the required return on equity. Therefore uncertainty in the market leads investors to demand a higher return for equity investments.

[39] I note that if a combination interpretation is used, it becomes important to make sure that the overall (total) "normalization" takes into account the elevated yield spread once and only once. I therefore consider two scenarios in my CAPM analysis. In Scenario I, the risk-free rate is increased by the abnormal increase in the yield-spread to take into account the elevated yield spread. This scenario is consistent with the interpretation that the current government bond yield is artificially downward suppressed. In Scenario II, the MRP is increased by an amount that is consistent with the interpretation that the increase in the yield spread is due to an increase in the premium investors require to hold assets other than those that are risk-free. Importantly, I use the historical MRP in Scenario I and the 2017 forecast risk-free rate in Scenario II, so that no scenario includes both a normalization of the risk-free rate and an increase in the MRP.

One implication of this finding is that the MRP tends to increase when market volatility is high, even when investors' level of risk aversion remains unchanged.

Q26. What do you mean by the term "risk aversion"?

A. Risk aversion is the recognition that investors dislike risk, which means that for any given level of risk, investors must expect to earn an appropriate return to be induced to invest. An increase in risk aversion means that investors now require a higher return for that same level of risk.

Q27. Has the MRP increased since the 2008-09 financial crisis?

A. Yes. A recently updated analysis by Duarte and Rosa of the Federal Reserve of New York aggregates the results of many models of the required MRP in the U.S. and tracks them over time. This analysis finds a very high MRP in recent years.

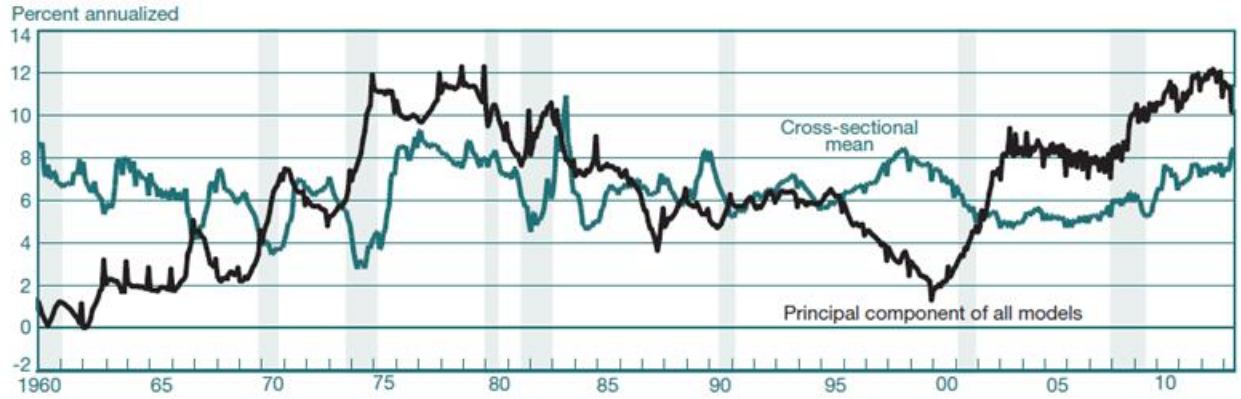
The analysis estimates the MRP that results from a range of models each year from 1960 through the present.[40] The analysis then reports the average as well as the first principal component of results.[41] The analysis then finds that the models used to determine the risk premium are converging to provide more comparable estimates and that the average annual estimate of the MRP was at an all-time high in 2013. These estimates are reasonably consistent with those obtained from Bloomberg and the consistent elevation

[40] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Review of Models," *Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

[41] Duarte & Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the most variability among the 20 models over time.

of the MRP over the historical figure indicates that the elevated level is persistent. Figure 7 below shows Duarte and Rosa's summary results.

Figure 7
Duarte and Rosa's Chart 3
One-Year Ahead MERP and Cross-Sectional Mean of Models



Q28. Are there other features of financial markets that are currently unusual?

A. Yes. The current level of many companies', including water utilities', Price-to-Earnings (P/E) ratio is higher than what has been experienced historically. Empirically, the P/E ratio increases when interest rates decline. This effect is shown in Figure 8 below using water utilities' quarterly P/E ratios from 1990 to Q2 2017.

Figure 8: Relationship Between Average Price / Earnings Ratio and 20-Year Treasury Bond Yield

Q29. Please explain the relationship between the P/E ratio and the 20-year government bond yield of interest in your analysis.

A. The dividend yield, which is calculated as Dividends divided by Price (D/P), is closely related to the P/E ratio as dividends are paid out of earnings. If the P/E ratio is very high (low), then the Earnings-to-Price ratio is low (high) and so is the dividend yield (D/P).

The average water utility pays approximately 60% of its earnings as dividends, so if the P/E ratio increases from, for example, 20 to 22 (10%), then the Earnings / Price ratio declines by about 0.45% (from 5% to 4.55%) and the dividend yield declines by 0.27% (60% × 0.45%). Therefore, if the 20-year government bond yield is artificially depressed and expected to increase, then the dividend yield is also artificially depressed and expected to increase. As a result, the results from the standard dividend discount models are likely to underestimate the cost of equity that will prevail going forward.

Q30. What do you conclude from this information?

A. The increase in the spread between the yield on utility and government bonds indicates that the premium investors require to hold assets that are not risk-free is higher than its historical level. Likewise, the recent trends in preferred equity yields confirm that the premium on assets other than government bonds has increased. Similarly, the forecasted MRP is high relative to its historical average. These factors point to a relatively high degree of investor risk aversion and the premium that investors require to hold assets that are not risk-free is elevated. Similarly, the very low risk-free rate is likely to have led to higher P/E ratios due to the flight to quality discussed above and consequently lower than "normal" dividend yields.

C. IMPACT ON ROE ESTIMATION

Q31. Please summarize how the economic developments discussed above have affected the return on equity and debt that investors require.

A. Utilities rely on investors in capital markets to provide funding to support their capital expenditure program and efficient business operations. Investors consider the risk return tradeoff in choosing how to allocate their capital among different investment

opportunities. It is therefore important to consider how investors view the current economic conditions; including the plausible development in the risk-free rate and the current MRP.

These investors have been dramatically affected by the credit crisis and ongoing market volatility, so there are reasons to believe that their risk aversion remains elevated relative to pre-crisis periods.

Likewise, the effects of the Federal Reserve's monetary policy have artificially lowered the risk-free rate. As a result, yield spreads on utility debt, including top-rated instruments, have remained elevated. The evidence presented above demonstrates that the equity risk premium is higher today than it was prior to the crisis for all non-risk-free investments. This is true even for investments of lower-than-average risk, such as the equity of regulated utilities.

Q32. Does your analysis consider the current economic conditions?

A. Yes. In implementing the CAPM and risk premium models, I considered two scenarios that consider the increased yield spread as being (i) a downward bias in the risk-free rate **or** (ii) an elevation of the MRP. Specifically, I relied on two sets of inputs for the CAPM: I consider the elevated spread between utility and government bond yields and either (i) normalize the risk-free rate to reflect the current downward bias of the yields and combine that with the historical MRP or (ii) rely on Blue Chip's 2018 government bond yield forecast for the risk-free rate and combine that with a MRP that reflects the strong evidence that risk premiums are elevated relative to their long-term historical

average.[42] Similarly, I considered the impact on the dividend yield from the discussion above, which indicates that dividend yields will increase with increasing interest rates and hence will be higher going forward than they are today. This is especially true in a version of the discounted cash flow model that relies on current dividend yields and long-term GDP growth rates.

IV. ANALYZING THE COST OF EQUITY

A. APPROACH

Q33. Please outline your approach for determining the cost of equity for ASU and AWU.

A. As described above in Section II.A, the standard for establishing a fair rate of return on equity requires that a regulated utility be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for ASU and AWU focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by ASU and AWU. Because the models I rely upon most heavily require market data, my consideration of comparable companies is restricted to those that have publicly traded stock.

To this end, I have selected a sample of publicly-traded companies that primarily provide regulated water and wastewater services.

For this sample, I derive estimates of the representative cost of equity according to standard financial models including two versions of the CAPM and two versions of the

[42] If the yield spread were to return to the level before the financial crisis, it would, everything else equal, be appropriate to consider the forecasted risk-free rate for the period during which rates will be in effect along with the historical average MRP.

DCF model. I further review summary analysis of allowed ROEs for water utilities. The latter analysis is conducted using allowed returns on equity and associated allowed equity ratios rather than market data; the results of these analyses are used as a test on the reasonableness of my market-based results.[43]

As the cost of equity for the CAPM and DCF based models are derived from market data that reflect the capital that investors hold in the sample companies, I consider the impact of any difference between the financial risk inherent in the cost of equity estimates and the capital structure to which it is assigned using several methods to avoid any one method biasing the results.

B. SAMPLE SELECTION

Q34. How do you identify sample companies?

A. AWWU is a regulated water and wastewater utility, so I start with the universe of publicly traded utilities classified as water utilities in Value Line. I require that the companies have an investment grade credit rating, no recent dividend cuts, and generally have data available for estimation.[44]

Q35. What are the characteristics of the Water Utility sample?

A. The water utility sample comprises water utilities whose primary source of revenues and majority of assets are subject to regulation. The final sample consists of the water utilities

[43] I note that I only have data on the allowed ROE for water utilities back to 2004, whereas I have data back to 1990 for electric and gas utilities. Due to the more limited data availability I am more cautious in interpreting the water risk premium results.

[44] Commonly, I also eliminate companies with merger and acquisition activity as well as smaller entities with limited trading activity. However, there are only a limited number of companies available for analysis, so I do not use these criteria.

listed in Figure 9 below. These companies own regulated water and wastewater utility subsidiaries in many states. Therefore, the sample is broadly representative of the regulated water and wastewater industry from a business risk perspective.

Figure 9 reports the sample companies' annual revenues for the most recent four quarters as of Q2, 2017 and also reports the market capitalization, credit rating, beta and growth rate. I note that compared to the sample companies included in Order 10, American Water Works has been added because it now has data available for analysis. At the time the data that led to Order 10 was obtained, American Water had just started trading and therefore had very limited market data available for analysis.[45]

The sample consists of companies that Value Line classifies as water utilities except (i) Consolidated Water, which is a developer and operator of desalination plants rather than a utility, (ii) Global Water Resources, which does not have sufficient data available for analysis, and (iii) Artesian Water, which was excluded due to its concentrated ownership.

[45] I note that Pennichuck was acquired by the City of Nashua in 2011 and therefore is no longer part of Value Line's group of Water Utilities.

Figure 9: Characteristics of Water Utility Sample

Company	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2017 Q2 (USD million)	Betas	S&P Credit Rating (2016)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]
American States Water Co	$443	R	$1,779	0.80	A+	6.18%
American Water Works Co Inc	$3,332	R	$14,362	0.65	A	7.76%
Aqua America Inc	$815	R	$5,981	0.70	A-	6.55%
California Water Services Group	$628	R	$1,760	0.80	A+	7.13%
Connecticut Water Service Inc	$101	R	$674	0.65	A	4.76%
Middlesex Water Co	$133	R	$652	0.80	A	8.12%
SJW Corp	$363	R	$1,048	0.75	BBB+	5.74%
The York Water Co	$48	R	$474	0.80	A-	7.97%
Average	$733		$3,341	0.74		6.78%
ASU	***$52***	***R***				
AWU	***$61***	***R***				

R: More than 80% of assets are regulated

Sources: 2016 Audited Financial Statements contained in the Pre-filed Direct Testimony of Erik Johnson, Exhibit ELJ-02 at 19 for AWU and Exhibit ELJ-03 at 19 for ASU. Other data from Bloomberg.

Q36. How does the water utility sample compare to AWU and ASU?

A. The sample consists of eight (8) companies with operations concentrated in the regulated water and wastewater industry. The sample companies are on average much larger than ASU, AWU (or AWWU).

ASU and AWU currently have a slightly higher bond rating than the average sample company, however (1) ASU, AWU, and the sample companies are all highly rated and the differences are small, and (2) bond rating measures bond default risk rather than the cost of equity. Therefore, the impact of a slightly higher bond rating is simply that ASU and AWU have slightly lower bond default risk than the average sample company,[46]

[46] See footnote 29 above.

which may be reflected in lower interest rates, which benefits customers. It does not, however, affect the cost of equity.

Finally, while the sample companies are investor-owned and publicly traded companies, AWWU is a municipally-owned entity that does not have publicly traded stock.[47]

Q37. Are there any differences in the regulatory environment in which the comparable companies and ASU and AWU operate?

A. While all jurisdictions to a degree are unique, I note that while Anchorage is more urbanized and faces less extreme weather than much of Alaska, the state of Alaska is unique in that it is much more thinly populated, faces difficulties engaging in construction for a substantial part of the year and thus makes some main and pipe replacements challenging. Alaska, unlike many states in the West, does not face water supply difficulties.

As for the specific risks that face ASU or AWU, I noted above the very high level of CIAC and a higher than average debt level in both companies (albeit higher for ASU than AWU).

I also note that ASU's wastewater treatment facilities are expected to meet current treatment standards and there is the potential for additional standards to be imposed because at least one of ASU's wastewater treatment facilities currently operates under an administrative extension of a permit that has expired. ASU's largest wastewater treatment plant, Asplund, is permitted under a provision of the Clean Water Act, Section 301(h). Operation of the plant as a primary treatment facility is dependent on

[47] As a result of being a municipally-owned entity, AWWU follows GAAP and GASB while the sample companies follow GAAP; additionally AWWU has access to low interest loans from the State of Alaska, which are reflected in rates through lower cost of debt.

continuation of the ability to operate under the Section 301(h) permit modification. If the modification is not renewed, secondary or possibly tertiary treatment of the wastewater may be required and will require significant upgrades to the Asplund treatment facility. This is further discussed in the pre-filed direct testimony of Mr. David Persinger.

C. THE CAPM BASED COST OF EQUITY ESTIMATES

Q38. Please briefly explain the CAPM.

A. In the CAPM, the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security Market Line (see Figure 1 in Section II), in which the required expected return on an asset is proportional to that asset's relative risk as measured by that asset's so-called "beta".

More precisely, the CAPM states that the cost of capital for an investment, S (e.g., a particular common stock), is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \qquad (1)$$

where $\boldsymbol{r_S}$ is the cost of capital for investment S;

$\boldsymbol{r_f}$ is the risk-free interest rate;

$\boldsymbol{\beta_S}$ is the beta risk measure for the investment S; and

$\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is a "risk-positioning model" that relies on the empirical fact that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment whose returns do not vary relative to market returns should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 1). Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the Market Risk Premium: the risk premium on a value-weighted portfolio of all investments, which by definition has average risk.

1. Inputs to the CAPM

Q39. What inputs does your implementation of the CAPM require?

A. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the market equity risk premium (MRP), as well as a measurement of the stock's beta. There are many methodological choices and sources of data that inform the selection of these inputs. I discuss these issues, along with the finance theory underlying the CAPM, in Exhibit BV-02 to this written testimony. I performed multiple CAPM calculations corresponding to distinct "scenarios" reflecting different values of the inputs. This allowed me to derive a range of reasonable estimates for the cost of equity capital implied by each of my samples.

Q40. What values did you use for the risk-free rate of interest?

A. I used the yield on a 20-year Government Bond as the risk-free asset for purposes of my analysis. Recognizing the fact that the cost of capital set in this proceeding will be in effect through at least 2018 and perhaps longer, I rely on a forecast of what Government bond yields will be one year out. Specifically, Blue Chip predicts that the yield on a 10-

year Government Bond will be 3.0% by Q4, 2018.[48] I adjust this value upward by 50 basis points to reflect the historical maturity premium for the 20-year over the 10-year Government Bond.[49] This gives me a lower bound on the risk-free rate of 3.5%.

I also considered a scenario in which the appropriate risk-free rate of interest is 3.8%, which adds a portion of the increase in yield spread to the risk-free rate to take the downward pressure on the government bond yield into account. An alternative is to increase the MRP to reflect the widening of the yield spread.[50] The baseline Government bond yield of 3.5% reflects that Government bond yields are expected to increase going forward.

Q41. What values did you use for the market equity risk premium (MRP)?

A. Like the cost of capital itself, the market equity risk premium is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can *expect* to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable, and must be inferred or forecasted based on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds over some long historical period. *Duff and Phelps* performs such a

[48] Blue Chip Economic Indicators, Consensus Forecasts, July 2017. The October 2017 forecast the 10-year government bond yield at 3.4% for 2019.

[49] This maturity premium is estimated by comparing the average excess yield on 20-year versus 10-year Government Bonds over the period 1990 - 2016, using data from Bloomberg.

[50] As of August 8, 2017, the spread between A rated utility and government bond yields was elevated by 33 basis points relative to the historical norm of which I apply 30 to normalize the risk-free rate.

calculation of the MRP. The average market risk premium from 1926 to the present (March 2017) is 6.94%.[51] I used 6.9% as the value of the MRP in one of my CAPM scenarios.

However, investors may require a higher or lower risk premium, reflecting the investment alternatives and aggregate level of risk aversion at any given time. As explained in Section III, there is evidence that investors' level of risk aversion remains elevated relative to the time before the global financial crisis and ensuing recession that commenced in 2008. In recognition of this evidence, together with forward-looking measurements of the expected market equity risk premium that are higher than the long-term historical average, I also performed CAPM calculations using a MRP of 7.9% for the market equity risk premium. This figure is used in combination with the forecasted risk-free rate (without any accounting for the higher than usual yield spread) and is a reflection of a higher than usual market risk premium as shown in Figure 7 above.[52]

Q42. What is the basis for stating that the current MRP is higher than its historical average?

A. Academic articles that were written in the late 1990s or early 2000s often found that the U.S. MRP at the time was lower than its historical average based on various forward-looking models, such as market-wide versions of the DCF model. A recent article by Duarte and Rosa of the Federal Reserve of New York summarizes many of these models

[51] See *Duff and Phelps 2017 Valuation Handbook*, p. 3-33.

[52] Bloomberg currently forecast the U.S. MRP at 7.2% over a 10-year Government bond. At the same time the elevation in yield spread is about 0.3% relative to the pre-crisis period, so at a bond beta of .25, the elevation would indicate and increase in the historical MRP of about 1.20% for an MRP of about 8.1% (calculated as 0.30% / 0.25).

and also estimates the MRP from the models each year from 1960 through the present.[53] The authors find that the models are converging to provide more consensus around the estimate and that the average annual estimate of the MRP is consistent with the academic literature and with forward-looking estimates such as Bloomberg's. Their analysis shows that the U.S. MRP was lower than its long-term historical average in the early 2000s, but is currently at an all-time high. Chart 3 from Duarte & Rosa 2015 was re-produced in Figure 7, which shows the average estimated MRP (over 30-day T-bills) for 20 models.

To my knowledge these studies have not been updated but are consistent with investors' required risk premium being higher than before the financial crisis. I also note that the approximately 30 basis points elevation in the yield spread indicates an elevated MRP.[54] However, as the yield spread and forecasted MRP has declined, my ultimate recommendation for the CAPM models will be fully supported by the lower, historical MRP of 6.9%.[55]

Q43. What betas did you use for the companies in your sample?

A. I used Value Line betas, which are estimated using five years of weekly data, which is consistent with approach taken in Order 10.[56]

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[53] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Consensus of Models," *Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

[54] See Exhibit BV-02 for details.

[55] Following the evidence in standard finance textbooks, I rely on the arithmetic average for the historic market risk premium. See, for example, Brealey, Myers and Allen, "Principles of Corporate Finance," 11th Edition, 2014 pp. 162-163 and Ross, Westerfield and Jaffe, "Corporate Finance," 10th Edition, 2013 pp. 322-323. Reliance on an arithmetic historic average is also consistent with Order 10.

[56] Order 10 at 40.

2. The Empirical CAPM

Q44. Did you use any other CAPM-based model?

A. Yes. Empirical research has shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted.[57] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employed makes use of these empirical findings. It estimated the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

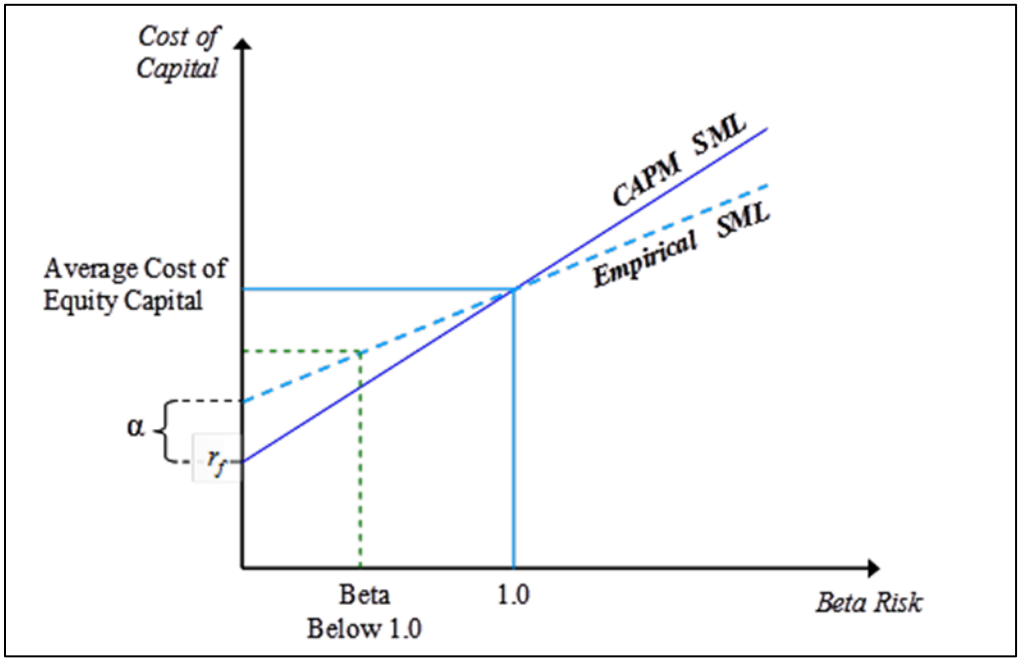
I call this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 1, which results in a Security Market Line that more closely matches the results of empirical tests. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

Q45. Why do you use the ECAPM?

[57] See Exhibit BV-02 for references to relevant academic articles.

A. Research shows that the analysis performs better empirically, when paired with the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. Exhibit BV-02 discusses the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, (α).

Figure 10: The Empirical Security Market Line



3. Results from the CAPM Based Models

Q46. Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A. The parameters for the two scenarios are displayed in Figure 11 below. The basis for using the scenarios is the empirical observation that the yield spread is higher than normal as is the forecasted MRP. The increased yield spread could reflect the increase in the MRP or downward pressure on the yield of government bonds due to a flight to quality or other factors. Therefore, I used the unadjusted forecast risk-free rate with a higher estimate of the MRP, and the unadjusted historical average MRP with the increased estimate of the risk-free interest rate as illustrated in Figure 11. I could alternatively look to a scenario where the risk-free interest rate reflected part of the elevated yield spread, while another portion of the increased yield spread was reflected in the MRP. However, I believe the two scenarios span a reasonable range of scenarios. Scenario 1 normalizes the risk-free rate and uses a historical MRP while Scenario 2 uses an unadjusted forecast of the risk-free rate and a forecasted MRP. Because I did not simultaneously normalize both the government bond rate and the MRP, my estimates are more likely to be downward than upward biased.

Figure 11: Parameters Used in CAPM-based Models

	Scenario 1	Scenario 2
Risk-Free Interest Rate	3.90%	3.60%
Market Equity Risk Premium	6.90%	7.90%

Q47. Please explain the difference between the data relied upon to estimate the cost of equity and the regulatory rate base to which the cost of equity is applied.

A. Both the CAPM and the DCF models rely on market data to estimate the cost of equity for the sample companies, so the results reflect the value of the capital that investors hold during the estimation period (market values). The allowed return on equity is applied to the fair value rate base, which could be financed differently than the sample companies.

Q48. Why is this difference important to the estimation of the cost of equity?

A. Taking differences in financial leverage into consideration does not change the value of the rate base, but it does consider the fact that the more debt a company has, the higher the financial risk associated with an equity investment is.[58] To see this I constructed a simple example below, where only the financial leverage of a company varies. I assumed the return on equity is 11% at a 50% equity capital structure and determined the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 45%.

Figure 12
Illustration of Impact of Financial Risk on Allowed ROE

	Company A (50% Equity)	Company B (45% Equity)
Rate Base	$1,000	$1,000
Equity	$500	$450
Debt	$500	$550
Cost of Debt (5%)	$25	$27.5
Return on Equity	$55	$52.5
Total Cost of Capital (7.5%)	**$80**	**$80**
ROE / Implied ROE	11%	11.67%

The table above illustrates how financial risk affects returns and also the allowed ROE: the overall return does not change, but the allowed ROE required to produce the same return goes up in recognition of the increased risk to equity investors caused by the higher degree of financial leverage.

[58] See Exhibit BV-02 for a description of common practice and underlying finance principles related to the impact of financial risk on the cost of equity.

The principle illustrated in Figure 12 is an example of the adjustments I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to ASU and AWU. I considered financial risk using several commonly used methods including the method commonly referred to as the Hamada method in textbooks[59] to avoid undue influence from any one set of assumptions.[60] The Hamada method looks to the equity beta that is estimated from market data and derives an equivalent asset beta that assumes the assets are financed 100% by equity. The method then re-levers the beta to be consistent with the capital structure relied upon by the target company. There are multiple versions of the Hamada method that are differentiated by the assumptions they make about the systematic risk of debt (e.g., debt betas) and the impact of taxes. To avoid unduly biasing the estimation by the specific assumptions, I estimate the cost of equity using three different methods: (1) as in Figure 12 above, I assume the overall cost of capital remains constant regardless of capital structure, (2) I use the Hamada method assuming taxes are irrelevant, and (3) I use the Hamada method assuming taxes are relevant. As there is no consensus in the academic literature about which method is the most accurate in general, I present all three methodologies.

Q49. How does CIAC impact ASU and AWU?

[59] See, for example, Berk & DeMarzo 2014, Chapter 14. A detailed explanation is also included in Exhibit BV-02.

[60] These methods include calculating the ROE implied by the overall cost of capital as illustrated in Figure 12, as well as two versions of the so-called Hamada method for levering and unlevering betas in the CAPM and ECAPM. See Exhibit BV-02 for further discussion and detail.

A. Just like increased leverage increases the financial risk for a utility, the magnitude of CIAC magnifies the volatility in income or change in net position. The following example illustrates this.

Assume as above that both Companies A and B have a rate base of $1,000 and that the allowed ROE is 10.25% while the cost of debt is 5%. Further assume that operations, maintenance, administrative and general costs are $800. The only difference between the two companies is how their rate base is financed. Specifically, Company A is financed 50-50 with debt and equity, while Company B is financed with 40% debt, 40% equity, and 20% CIAC, which earns a return of zero. The base case is illustrated in Figure 13 below.

Figure 13: The Impact of CIAC on Income Volatility – Base Case

	Company A	Company B
Rate Base	$1,000	$1,000
Debt	$500	$400
Equity	$500	$400
CIAC	$0	$200
O&M and A&G cost	$800	$800
Debt Cost	$25	$20
Allowed Equity Return	$51	$41
Revenue Requirement	$876	$861
Income	**$51**	**$41**

Note that income divided by equity is exactly 10.25%.

Now assume for simplicity that both Companies A and B experience a five percent increase in cost with no impact on revenue. The realized income and return is shown in Figure 14 below.

Figure 14: The Impact of CIAC on Income Volatility – Cost Increase

	Company A	Company B
Revenue	$876	$861
Cost	$866	$861
Income	$10	$0
Realized ROE	2.0%	0.0%

It is clear from Figure 13 and Figure 14 above that the presence of CIAC makes the utility more vulnerable to fluctuations in cost (or revenues). Hence, an increase in CIAC increases the volatility of a utility's income or change in net position, everything else being equal. Given the large volumes of CIAC that are present on ASU and AWU balance sheets, they are exceptionally vulnerable to changes in its operating cost or operating revenues. In other words, ASU and AWU's significant level of CIAC results in higher business risk relative to the water utility sample.

Q50. Can you summarize the results from applying the CAPM-based methodologies?

A. Yes. The results using ASU's proposed capital structure are presented in Figure 15 below.[61] Similar data using AWU's actual capital structure are in Exhibit BV-03, Table No. BV-Water 12 and BV-Water 15.

[61] Tables and supporting schedules detailing my cost of capital calculations for Water Utility sample are contained in Exhibit BV-03.

Figure 15: Water Utility Sample CAPM-Based Results

Return on Equity Summary and Sensitivity Analysis Water Sample and Subsample		
Estimated Return on Equity	Scenario 1 [1]	Scenario 2 [2]
Full Sample		
Financial Risk Adjusted Method		
CAPM	11.1%	11.6%
ECAPM (α = 1.5%)	11.6%	12.1%
Hamada Adjustment Without Taxes		
CAPM	10.5%	11.2%
ECAPM (α = 1.5%)	10.6%	11.2%
Hamada Adjustment With Taxes		
CAPM	10.0%	10.6%
ECAPM (α = 1.5%)	10.2%	10.8%
Sources and Notes: Scenario 1: Long-Term Risk Free Rate of 3.90%, Long-Term Market Risk Premium of 6.90% Scenario 2: Long-Term Risk Free Rate of 3.60%, Long-Term Market Risk Premium of 7.90%		

ASU and AWU do not pay federal income taxes like the comparable companies, but ASU and AWU pays a Municipal Utility Service Assessment ("MUSA"), which is a payment in lieu of taxes. To ensure my range encompasses all possible aspects, I present the estimates with and without taxes, where "with taxes" scenario is a lower bound in that I assume statutory taxes. Consequently, the estimated cost of equity for a water / wastewater utility with 52% equity is presented using all three methods is fairly wide and range from 10% to 12%. However, if I focus on the CAPM that in the past has been preferred by the Commission and on Scenario 1, which relies on the historical MRP of 6.9%, the range is 10.0% to 11.1% with a midpoint of about 10.5%. I focus on Scenario

1 because the Commission in past decisions has relied on the historical average
2 arithmetic MRP.[62]

3 D. **THE DCF BASED ESTIMATES**

4 **1. Single- and Multi-Stage DCF Models**

5 **Q51. Can you describe the DCF approach to estimating the cost of equity?**

6 A. The DCF model attempts to estimate the cost of capital for a given company directly,
7 rather than based on its risk relative to the market as the CAPM does. The DCF method
8 simply assumes that the market price of a stock is equal to the present value of the
9 dividends that its owners expect to receive. The method also assumes that this present
10 value can be calculated by the standard formula for the present value of a cash flow—
11 literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate.
12 When the cash flows are dividends, that discount rate is the cost of equity capital:

13 $$\boldsymbol{P_0} = \frac{\boldsymbol{D_1}}{\boldsymbol{1+r}} + \frac{\boldsymbol{D_2}}{\boldsymbol{(1+r)^2}} + \frac{\boldsymbol{D_3}}{\boldsymbol{(1+r)^3}} + \cdots + \frac{\boldsymbol{D_T}}{\boldsymbol{(1+r)^T}} \qquad (3)$$

14 Where $\boldsymbol{P_0}$ is the current market price of the stock;

15 $\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

16 $\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

17 $\boldsymbol{r}$ is the cost of equity capital.

18 Importantly, this formula implies that if the current market price and the pattern of
19 expected dividends are known, it is possible to "solve for" the discount rate, r that makes

62 Order 10, p. 41.

the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications assume the growth rate lasts forever, so the formula can be rearranged to estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g} \qquad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model. I note that this is the DCF model relied upon by the Commission in Order 10.[63]

Q52. Are there different versions of the DCF model?

A. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[64] One such alternative expands the Gordon Growth model to three stages. In the multistage

[63] Order 10, pp. 34-38.

[64] The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009.

model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period. [65]

A common implementation of the multi-stage DCF is to assume that companies grow their dividend for 5 years at the forecasted company-specific rate of earnings growth, the growth then tapering over the next 5 years toward the growth rate of the overall economy (i.e., the long-term GDP growth rate forecasted to be in effect 10 years or more into the future). Variations of this model have historically been used by me and others in a large number of jurisdictions and although I have utilized them, I consider many of the model's features problematic in the current environment. The model may combine two conservative elements: (1) The current dividend yield may be lower than expected going forward for the reasons discussed in Figure 8 above, and (2) the current GDP forecast is much lower than its historical average. Thus, the combination of these two elements may lead to unusually low DCF estimates of the cost of equity. As a result, I believe the result merits less weight than the Gordon growth model discussed above.[66] However, the model has the advantage of allowing for different growth rates at different future points.

Q53. What are the relative strengths and weaknesses of the DCF versus CAPM based methodologies for estimating the cost of equity capital?

A. Current market conditions affect all cost of capital estimation models to some degree, but the DCF model has at least one advantage over the CAPM-based models as it includes contemporaneous stock prices and forward-looking growth, whereas the CAPM relies on historical data to estimate systematic risk and (in some cases) the market risk premium.

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[65] See Exhibit BV-02 for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

[66] I include the estimation results to be consistent with my prior filing in e.g., U-13-201 and U-13-202.

2. DCF Inputs and Results

Q54. What growth rate information did you use?

A. I looked to a sample of investment analysts' forecasted earnings growth rates for companies in my samples. I used investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters *IBES*, which is consistent with Order 10's reliance on analysts' forecasts from several public sources.[67] For the multi-stage version, I also use Blue Chip growth forecasts.

Additionally, I relied on the dividend yield of the companies, which I estimate using the most recently available dividend information (currently) and the average of the last 15 days of stock prices ending August 18, 2017.[68] As the single largest advantage of the DCF model is that it uses current market information, I find it is important to use a relatively short time period to determine the dividend yield – yet to avoid the bias caused by any one day. I believe a 15-day average accomplishes that goal. Because the stock price of utilities currently is higher than they historically have been and because some companies engage in share buybacks, the dividend yield underestimates the yield on cash distributions to investors.

Q55. Please address the input data in the DCF model.

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[67] Order 10, p. 37 cites growth forecasts from Value Line, First Call, Zacks, and Reuters. I note that First Call / Reuter is now part of Thomson Financial and that Zacks obtain many of its forecasts from IBES.

[68] The Commission in Order 10 (p. 35) used a six month average – because it was the most current.

A. The Gordon Growth/single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for 3-5 years.

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies in my samples use share repurchases, the DCF model using dividend yields will underestimate the cost of equity for these companies. While there are companies in my sample that have engaged in share buybacks in the past, the magnitude is currently not large.

A second issue is that the flight to quality has resulted in higher than usual stock prices for water utilities and hence lower than usual dividend yields. As a result, the dividend yield may be downward biased. The multi-stage DCF model additionally requires a measure of the long-term GDP growth and I report the results from two potential inputs – Blue Chip's forecasted GDP growth and the historically experienced GDP growth.

Q56. What are the DCF based cost of equity estimates for the samples?

A. The results are presented in Figure 16 below.[69] I note that the growth rates in the model (shown in Exhibit BV-03, Table BV-Water 6) range from 4.8% to 8.1% and average about 6.7%, so that there appears to be no extreme observations.

[69] Tables and supporting schedules detailing my cost of capital calculations are included in Exhibit BV-03.

Figure 16: DCF Results for Water Utility Sample

	Cost of Equity Estimates
Single-Stage DCF	11.8%
Multi-Stage DCF	8.6%

In Order 10, the Commission emphasized the simple Gordon Growth model and I believe that it is a much more reasonable estimate at the current time than the multi-stage DCF, which is impacted by both the very low dividend yield and low GDP rate. As a result, I believe the multi-stage DCF deserves limited weight.

Q57. How do you interpret the results of your DCF analyses?

A. The DCF model estimates range from 8.6% to 11.8% (midpoint 10.2%), but note that the combined impact of the elevated P/E ratios and the low GDP growth render the multi-stage DCF downward biased. However, if the impact of the elevated P/E ratios due to low interest rates is considered, the estimates increase by about 0.25% for a range of 8.95% to 12.05% and a midpoint of 10.5%, which is similar to my CAPM-based midpoint.

E. RISK PREMIUM MODEL ESTIMATES

Q58. Did you estimate the cost of equity that results from an analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A. Yes. In this type of analysis, sometimes called the "risk premium model", the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs

were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecasted) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium$$

Q59. What are the merits of this approach?

A. First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied upon figure is directly applicable to a rate base. Second, the allowed returns are clearly observable to market participants, who will use this one data input to making investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze spread between the allowed ROE at a given time and the then prevailing interest rate to ensure that I properly consider the interest rate regime at the time the ROE was awarded. This implementation ensures that I can compare allowed ROE granted at different times and under different interest rate regimes.

Q60. How did you use rate case data to estimate the risk premiums for your analysis?

A. The data from 2004-2014 is derived from AUS Consultants, the data for 2015 was collected from the sample companies 10-Ks and data for 2016-2017 was obtained from SNL.[70] Using this data I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in water utility rate cases to the average 20-year Treasury bond yield that prevailed in each quarter.[71] I calculated the allowed

[70] The data sources varied as I do not have access to one consistent source.

[71] I rely on the 20-year government bond to be consistent with the analysis using the CAPM and to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares (OLS) regression to estimate the parameters of the linear equation:

$$Risk\ Premium\ =\ A_0\ +\ A_1\ \times\ (Treausury\ Bond\ Yield) \qquad (5)$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and find that the regression has a high degree of explanatory power in a statistical sense (R^2=0.96) and the parameter estimates, A_0=0.0890% and A_1= -0.6864, are statistically significant. The negative slope coefficient reflects the empirical fact that regulators grant smaller risk premiums when risk-free interest rates (as measured by Treasury bond yields) are higher. This is consistent with past observations that the premium investors require to hold equity over government bonds increases as government bond yields decline. In the regression described above, the allowed ROE on average declined by less than 100 basis point when the government bond yield declined by 100 basis points. Based on this analysis, I find that the current market conditions are consistent with an ROE of 10.0 – 10.1%.

I also determine the ROE that is consistent with the risk premium granted over the past 12 years, which result in an ROE estimate of 10.2 – 10.4%.

It is important to recognize that the allowed ROE is granted on the equity portion of water utilities' rate base. The rate base is commonly measured using book value and the average allowed equity percentage is about 52%, so there is no need to consider financial leverage if an equity percentage of 52% is used. However, assuming AWU's regulatory

capital structure is set at 40%, then the equivalent ROE that is consistent with the 10.0 – 10.4% is approximately 12.3% to 12.8%.

Q61. What conclusions did you draw from your risk premium analysis?

A. While the Commission did not rely on the risk premium models in Order 10 and the risk premium models based on historical allowed returns are not underpinned by fundamental finance principles in the manner of the CAPM or DCF models,[72] I believe they can provide useful benchmarks for evaluating whether the estimated ROE is consistent with recent practice. My risk premium model cost of equity estimates demonstrate that the results of my DCF and CAPM analyses are in line with the actions of utility regulators. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision was issued, it provides a useful benchmark for the cost of equity in any interest environment.

V. RISK CHARACTERISTICS AND THE COST OF EQUITY

A. BACKGROUND

Q62. Please summarize your ROE evidence assuming a hypothetical capital structure with 52% equity for ASU.

A. Assuming a hypothetical capital structure that includes 52% equity for ASU and based on my analysis, I find the range of ROE estimates for ASU displayed in Figure 17 below.

[72] The data available for water utilities is limited and not from a consistent source. I therefore do not consider the risk premium results a primary estimate but a confirmation that the CAPM and DCF based results are reasonable.

Figure 17: Range of ROE Estimates at 52% Equity

	Range	Midpoint Estimate
CAPM*	10.0% - 11.1%	10.5%
ECAPM*	10.2% - 11.6%	10.7%
DCF**	8.6% - 11.8%	10.5%
Risk Premium	10.0% - 10.3%	10.2%
Reasonable Range		10.25% - 10.75%

Notes: * Midpoint estimates include only Scenario 1 results.

** Midpoint estimates moves slightly towards the single-stage DCF.

I note that if I assign 40% weight to the CAPM and 60% weight to the DCF as did Order 10, then the ROE is approximately 10.5% and higher if only the single-stage DCF results are relied upon. This figure is supported by the risk premium analysis.

Q63. What if an actual capital structure with 40% equity is used for AWU?

A. Assuming AWU uses its actual capital structure that includes 40% equity, I find the range of ROE estimates displayed in

A. Figure 18 below.

Figure 18: Range of ROE Estimates at 40% Equity

	Range	Midpoint Estimate
CAPM*	11.3% - 13.7%	12.5%
ECAPM*	11.2% - 14.4%	12.8%
DCF**	10.6% - 14.7%	12.6%
Risk Premium	12.3% - 12.8%	12.5%
Reasonable Range		12.25% - 12.75%

It is evident that at 40% equity AWU's required ROE would be approximately 200 basis points higher than at 52% equity.

I note that if I assign 60% weight to the Simple Gordon Growth Model (DCF) and 40% weight to the CAPM as did Order 10, the resulting ROE is about 12.5% and higher if only the single-stage DCF is relied upon. I agree that the multi-stage DCF deserves less weight than does the Gordon growth model. Further, as ASU and AWU both face unique risks in the form of (i) their smaller size, (ii) a very high level of CIAC relative to other balance sheet items, and (iii) challenges earning their allowed ROEs, I believe that ASU needs to be placed above the midpoint and AWU at or above the midpoint.

Q64. Please summarize your findings regarding ASU's and AWU's capital structures and costs of equity.

A. Based on the analysis discussed above and supported by my workpapers, I find that a hypothetical capital structure including 52% equity and a ROE of 10.5% is reasonable for ASU. Using AWU's actual capital structure that includes only 40% equity, I recommend a ROE of approximately 12.5%. These recommendations are consistent with my empirical analysis using the DCF model and CAPM and also with the risk premium model. I also note that the primary methods relied upon such as the CAPM and DCF are similar to those used in Order 10 and result in a lower recommended ROE than would have been the case under the methodology used in Order 10.

Q65. Does this conclude your pre-filed direct testimony?

A. Yes.