

BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

JEFF HATCH-MILLER, CHAIRMAN
WILLIAM A. MUNDELL
MIKE GLEASON
KRISTIN K. MAYES
BARRY WONG

IN THE MATTER OF THE APPLICATION OF
ARIZONA-AMERICAN WATER COMPANY,
AN ARIZONA COPORATION, FOR A
DETERMINATION OF THE CURRENT FAIR
VALUE OF ITS UTILITY PLANT AND
PROPERTY AND FOR INCREASES IN ITS
RATES AND CHARGES BASED THEREON
FOR UTILITY SERVICE BY ITS MOHAVE
WATER AND WASTEWATER DISTRICTS

DOCKET NO. WS-01303A-06-0014

REBUTTAL TESTIMONY
OF
BENTE VILLADSEN
ON BEHALF OF
ARIZONA-AMERICAN WATER COMPANY

OCTOBER 5, 2006

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1 **I. INTRODUCTION AND SUMMARY**

2 **A. INTRODUCTION**

3 **Q1. Please state your name, address and position.**

4
5 A1. My name is Bente Villadsen and I am a Senior Associate at *The Brattle Group*, 44 Brattle
6 Street, Cambridge, MA 02138

7 **Q2. Did you previously file testimony in this proceeding?**

8 A2. Yes, I filed Direct Testimony (“Villadsen Direct”) on behalf of Arizona-American Water
9 Company in January 2006 regarding the cost of equity that the Mohave Water and
10 Mohave Wastewater districts (jointly “Mohave”) should be allowed an opportunity to
11 earn on the rate base.

12 **Q3. Please summarize your background and experience.**

13 A3. I am a Senior Associate at The Brattle Group in its Cambridge, Massachusetts office. My
14 work concentrates in the areas of regulatory finance and accounting issues. Appendix A
15 to this testimony contains up to date details on my professional qualifications.

16 **Q4. Do you have any preliminary comments before you begin your rebuttal?**

17 A4. Yes. I reviewed the Direct Testimony of Mr. Pedro M. Chaves (“Chaves Direct”) on
18 behalf of Arizona Corporation Commission Staff (“Staff”) and the Direct Testimony of
19 Mr. William A. Rigsby (“Rigsby Direct”) on behalf of the Residential Utility Consumer
20 Office (“RUCO”). While cost of capital experts may rely on different models or
21 implement the relied upon models differently, the methods used in the Chaves Direct and
22 in the Rigsby Direct are similar to those relied upon in the Villadsen Direct. Both
23 testimonies recognize the importance of financial risk as well as business risk and adjust
24 the cost of equity estimates obtained for proxy groups in recognition of Mohave’s more
25 leveraged capital structure. The largest source of difference between the Villadsen Direct
26 and the Chaves Direct is that while the Villadsen Direct relies on market value capital

1 structures, the Chaves Direct relies on book value capital structures when comparing the
2 sample companies' capital structure to that of Mohave. There are two key differences
3 between the Rigsby Direct and the Villadsen Direct. First, while the Villadsen Direct
4 explicitly calculates the impact of the difference between the proxy groups' market value
5 capital structure and the regulatory capital structure of Mohave, the Rigsby Direct adds
6 50 basis points to the cost of equity obtained by the testimony's preferred method.
7 Second, the Rigsby Direct relies exclusively on the Discounted Cash Flow ("DCF")
8 model applied to a proxy group of four water utilities while the Villadsen Direct, as well
9 as the Chaves Direct, weights the risk positioning method.¹ As a result of the differences,
10 the Villadsen Direct estimated Mohave's cost of equity (at 40 percent equity) to be in the
11 range of 11¼ to 11¾ while the Chaves Direct recommends a cost of equity of 10.8
12 percent and the Rigsby Direct recommends a cost of equity of 9.10 percent.^{2,3}

13 **Q5. What topics do you cover in this rebuttal testimony?**

14 A5. I discuss the cost of capital recommendations and calculations in the Chaves Direct and
15 in the Rigsby Direct. I also discuss the Chaves Direct and the Rigsby Direct's comments
16 on and discussion of my Direct Testimony filed in January 2006. Specifically, I cover
17 the following topics. Below I summarize the impact on the cost of equity of key
18 decisions made in the Chaves Direct and the Rigsby Direct. In *Section II*, I discuss the
19 impact of financial leverage and the after-tax weighted-average cost of capital
20 ("ATWACC"). *Section III* discusses the selection of sample companies and the
21 implementation of relied upon methods: the discounted cash flow method ("DCF") and
22 the risk positioning methods (including the capital asset pricing model ("CAPM")). This
23 section also discusses the implications and dangers of relying on only one method or
24 sample. *Section IV* discusses topics in the Chaves Direct or the Rigsby Direct not
25 covered anywhere else. Finally, Appendix A contains an updated version of my
26 qualifications. I am also attaching Schedules BV-R1 and BV-R2.

¹ The emphasis differs between the Chaves and the Villadsen Direct.

² Chaves Direct Schedule PMC-1 and Rigsby Direct p. 5, respectively.

³ The Chaves Direct recommends a capital structure with 34.8 percent debt (Schedule PMC-1) while the Rigsby Direct relies on Mohave's requested capital structure of 40 percent equity and 60 percent debt (Rigsby Direct p. 6).

1 **B. SUMMARY**

2 **Q6. Please summarize the recommendations made by the cost of capital witnesses.**

3 A6. Table R-1 below summarizes the cost of capital witnesses' recommendations regarding
4 the cost of equity that Mohave should be allowed to earn on the equity portion of its rate
5 base. In the table all figures take into consideration that Mohave is more leveraged than
6 the companies that were relied upon to estimate the cost of equity.

Table R-1 Cost of Equity Recommendations			
	Chaves	Rigsby	Villadsen
Recommendation	10.8%	9.10%	11¼ to 11¾

7 Sources: Chaves Direct Executive Summary, Rigsby Direct p. 5, Villadsen Direct
8 Executive Summary.

9
10 While Table R-1 shows a rather large variation in recommendation, it is noteworthy
11 that the Chaves Direct obtains raw (before leverage consideration) cost of equity
12 estimates in the range of 9.2 to 10.5 percent⁴ which when adding the Chaves Direct's
13 recommended leverage adjustment of 90 basis points overlaps my recommended range.
14 Similarly, the Rigsby Direct obtains estimates ranging from 8.60 percent to 11.04
15 percent⁵ which also overlaps my recommended range when the 50 basis points leverage
16 adjustment in the Rigsby Direct is considered. Further, the allowed cost of equity
17 recommendation in the Rigsby Direct appears to be based solely on the application of a
18 Discounted Cash Flow ("DCF") model to a sample of four water utilities. A simple
19 average of Mr. Rigsby's estimates without the geometric CAPM, which I exclude for
20 reasons discussed below, results in a raw cost of capital estimate of about 9.8 percent
21 which with a 50 basis points addition for financial leverage results in 10.3 percent.

22 Furthermore, the Rigsby Direct relies on a non-standard adjustment to the sustainable
23 growth model. Specifically, the Rigsby Direct adjusts the observed market-to-book ratio
24 downward in his sustainable growth model resulting in a downward adjustment to the

⁴ Chaves Direct Executive Summary.

1 cost of equity estimates. Had the Rigsby Direct not used this downward adjustment in
2 the DCF method, the cost of equity estimates would have been approximately 150 basis
3 points higher for the water utility sample and about 50 basis points higher for the natural
4 gas LDC sample.⁶ Thus, the DCF model applied to the water sample without this non-
5 standard adjustment would indicate a cost of equity in the order of 11 percent after the
6 recommended 50 basis points upward adjustment is made. A simple average of Mr.
7 Rigsby's results for the arithmetic CAPM model and the standard sustainable growth
8 DCF using the Rigsby Direct's figures applied to the Rigsby Direct's two samples results
9 in an average cost of equity of about 10.75 percent.

10 As noted above, the Chaves Direct's raw cost of equity estimates are in the range 9.2
11 to 10.5 percent, so adding the 90 basis points adjustment for financial leverage, the
12 Chaves Direct recommends, results in a range of about 10.1 to 11.4 percent. However,
13 the Chaves Direct relies on book values when estimating the adjustment for leverage.
14 Had Chaves Direct instead relied on the market value capital structure, as does the
15 Hamada article, the Chaves Direct references as the basis for its adjustment, the
16 adjustment would increase by about 90 basis points, and the lower bound would be
17 around 11 percent. Henceforth, the ranges obtained by the Chaves Direct, the Rigsby
18 Direct, and the Villadsen Direct overlap and once non-standard adjustments are
19 eliminated all estimates point to a cost of equity in excess of 10.8 percent.⁷

⁵ Rigsby Direct p. 8.

⁶ Schedule BV-R1 calculates the exact impact for the water utility sample. However, the external growth rate in the Rigsby Direct's Schedule WAR – 4 page 1 and page 2 differ for the natural gas LDC sample, so I undertook the calculation using the data in Schedule WAR – 4 p. 2. See Schedule BV-R1.

⁷ Obtained from Table No. R-3 and Schedule BV-R1.

1 **II. FINANCIAL LEVERAGE AND COST OF CAPITAL**

2 **Q7. What topics do you cover in this section?**

3 A7. I address two topics. First, I address the need for an explicit adjustment for financial
4 leverage and second, I discuss the testimonies' comments on the shape of the ATWACC
5 curve.

6 **Q8. Do the Chaves Direct and the Rigsby Direct include an explicit adjustment for
7 financial leverage?**

8 A8. Yes. Both the Chaves Direct and the Rigsby Direct explicitly adjust for financial
9 leverage. The Chavez Direct relies on Robert S. Hamada (1969)⁸ for the adjustment and
10 the Rigsby Direct uses a 50 basis points upward adjustment.

11 **Q9. Do you agree with the adjustments made in the Chaves Direct and the Rigsby
12 Direct?**

13 A9. I certainly agree that an adjustment is merited because Mohave is significantly more
14 leveraged than the sample companies used in the estimation process. However, I do not
15 agree with the Chaves Direct or the Rigsby Direct's implementation methods. First,
16 while the Chaves Direct relies on an adjustment based upon finance theory, the model on
17 which the Chaves Direct relies uses market-value capital structures but the Chaves Direct
18 uses book values. If the Chaves Direct had instead relied on the market-value capital
19 structure, the leverage adjustment would have increased to about 190 basis points rather
20 than the recommended 90 basis points. If the Chaves Direct had relied on a leverage
21 adjustment based on market values as indicated in the Hamada article, the cost of equity
22 estimate would, everything else equal, have been above 11.50 percent. Second, the
23 Rigsby Direct does not provide a specific calculation of his adjustment for financial risk,
24 so I cannot comment specifically on its derivation although it is too low given the large
25 differences between the capital structure of Mohave and those of the sample companies.

⁸ Robert S. Hamada (1969), Portfolio Analysis, Market Equilibrium and Corporate Finance, *Journal of Finance* 24, 13-31.

1 **Q10. Why is it important to use market values when determining the sample companies**
2 **cost of equity?**

3 A10. As discussed in the Villadsen Direct,⁹ the risk of the capital structure's equity depends on
4 the market-value not on the book-value and cost of equity is determined in the market
5 place. Hence, investors are concerned about market values not book values. Going
6 through an example, the text of Brealey, Myers and Allen (2006) states¹⁰

7 The market-value balance sheet shows assets worth \$1,250 million. Of
8 course we can't observe this value directly, because the assets themselves
9 are not traded. But we know what they are worth to debt and equity
10 investors ... This value is entered on the left of the market-value balance
11 sheet.

12 Why did we show the book balance sheet? Only so you could draw a big
13 X through it. Do so now.

14 When estimating the weighted-average cost of capital, you are not
15 interested in past investments but in current values and expectations for
16 the future.
17

18 In other words, the cost of equity is determined in the market place and is based upon
19 market values. Thus, the cost of equity estimates obtained in the market place pertains to
20 companies with a market-value capital structure whereas a regulated utility such as
21 Mohave is afforded an allowed cost of equity on a much lower equity percentage.
22 Investors require compensation for the difference.

23 It is also noteworthy that in the 1969 paper where Professor Hamada developed the
24 leverage adjustment relied upon in the Chaves Direct, the author explicitly referred to the
25 "the market value of firm A's equity ..." in the derivation for the formula.¹¹

26 Lastly, the Chaves Direct states that

27
28 "[r]egulatory agencies in the United States utilize book values when
29 estimating the cost of capital of a public utility. The use of a market value
30 capital structure to estimate the Applicant's cost of equity is not consistent
31 with the U.S. regulatory environment."¹²

⁹ Villadsen Direct pp. 10-19.

¹⁰ Richard A. Brealey, Stewart C. Myers, and Franklin Allen (2006), *Principles of Corporate Finance*, 8th Edition, McGraw-Hill, pp. 504-505.

¹¹ Hamada (1969), Op. Cit., p. 22.

¹² Chaves Direct p. 38.

1 It is true that many U.S. regulatory agencies rely on book value, but there are
2 regulators who rely on market values. In a recent decision, the Missouri Public Service
3 Commission accepted the reliance on market value capital structures in the estimation of
4 the sample companies' overall cost of capital. The overall cost of capital was then
5 applied to the applicant's regulatory capital structure.¹³ Similarly, the Surface
6 Transportation Board relies on market value capital structures for cost of capital
7 estimation.¹⁴

8
9 **Q11. What comments do you have regarding the Chaves Direct or the Rigsby Direct's**
10 **discussion of the after-tax weighted average cost of capital in regulatory**
11 **proceedings?**

12 A11. Both the Chaves and the Rigsby Direct discuss the application of the after-tax weighted-
13 average cost of capital ("ATWACC") in regulatory matters. I will address the comments
14 in the Chaves Direct first. The Chaves Direct comments that "the ATWACC
15 methodology to estimate the cost of equity capital ... is not widely accepted in the
16 regulatory environment."¹⁵ While it is true that most U.S. jurisdictions do not rely on the
17 ATWACC for regulatory proceedings, the Missouri Public Service Commission has
18 accepted the methodology.¹⁶ Mr. Rigsby comments

19 While I believe that the ATWACC may have weight in regard to business
20 entities that operate in a truly competitive environment, the higher rate of
21 return that she [Villadsen] advocates for the Mohave District is not
22 warranted. While Arizona-American may have a higher degree of
23 financial risk, as a result of the Company's leveraged capital structure, it is
24 still a regulated entity that can apply for rate relief when the need arises.¹⁷
25

26 I agree that Mohave is a regulated entity and can apply for rate relief when the need
27 arises as can all regulated entities, this is not a reason to provide an inadequate rate of

¹³ See the decision in Missouri Public Service Commission, Case No. ER-2004-0570, Tariff File No. YE-2004-1324, for Empire District Electric Company, issued March 10, 2005 ("Missouri Decision").

¹⁴ Surface Transportation Board, Decision, STB Ex Parte No. 558 (Sub-No. 9). Railroad Cost of Capital – 2005. Decided December 19, 2005.

¹⁵ Chaves Direct p. 35-36.

¹⁶ Missouri Decision.

¹⁷ Rigsby Direct p. 65.

1 return. The cost of capital for Mohave is determined in the market as is the cost of
2 capital for firms in competitive industries. There is no difference in the applicability of
3 the ATWACC in these two situations.

4
5 **Q12. Do you have any comments on Staff's response to AAW 2.2?**¹⁸

6 A12. Yes. Question AAW 2.2 asked,

7 Would Staff agree that the overall cost of capital to any firm is constant
8 across a broad middle range of capital structures? If the answer is no,
9 please explain why not.

10
11 The response was

12
13 No. Based on studies of Dr. Robert Hamada, there is a relationship
14 between a firm's beta and leverage where beta on a firm increases with
15 leverage.

16
17 The response does not specify which study of Dr. Hamada is being referenced, but the
18 "no" conclusion does not appear in Hamada's 1969 Hamada paper on capital structure
19 and asset pricing.¹⁹ I agree that the Hamada paper shows a specific relationship between
20 beta and leverage and between investors expected return on equity and leverage.
21 However, the paper does not discuss the shape of the overall cost of capital and is not
22 inconsistent with it being flat in a broad middle range.

23
24 **III. COST OF CAPITAL ESTIMATION**

25 **A. THE SAMPLES: WATER UTILITIES AND GAS LDCS**

26 **Q13. Please summarize the sample selection in the Chaves and Rigsby Direct.**

27 A13. The Villadsen Direct and the Rigsby Direct utilize a sample of water utilities and a
28 sample of natural gas distribution companies while the Chaves Direct relies only on a

¹⁸ Arizona Corporation Commission Staff's Responses to Arizona-American Water Company's Second Set of Data Requests, Docket No. WS-01303A-06-0014.

¹⁹ Hamada (1969), *Op. Cit.*

1 sample of water utilities. For the water sample, the Villadsen Direct included all water
2 utilities followed by *Value Line* in January 2006. The Chaves Direct included the six
3 water utilities followed by *Value Line* that earn most of their revenues from regulated
4 operations and that have sufficient data to perform a sustainable growth analysis. The
5 Rigsby Direct included the water utilities included in *Value Line*'s large capitalization
6 water industry segment. While both the Villadsen Direct and the Rigsby Direct selected
7 a group of natural gas distribution utilities from *Value Line*, the proxy groups differs
8 slightly. The Villadsen Direct included eight gas distribution companies which, prior to
9 January 2006, had a five year history of no major (and publicly announced) merger or
10 acquisition activities, no accounting restatements, investment grade bond ratings, and
11 whose revenue was primarily regulated. The Rigsby Direct also selected its gas
12 distribution sample from *Value Line*, but excluded two of the Villadsen Direct's proxy
13 companies: Cascade Natural Gas and KeySpan Corp. These two companies announced
14 merger activities in February and July of this year, after my Direct Testimony was filed.²⁰
15 If I undertook the analysis today, I would exclude these companies from my sample. The
16 Rigsby Direct also included AGL Resources in his sample for a sample of seven
17 companies.²¹

18 **Q14. Do you have any comments regarding the proxy groups presented in the Chaves**
19 **Direct or the Rigsby Direct?**

20 A14. Yes. I will address the Rigsby Direct first. As noted in the Rigsby Direct, *Value Line*'s
21 Standard Edition currently follows only four water utilities: American States Water, Aqua
22 America, California Water, and Southwest Water. These are the four water utilities
23 include in the Rigsby Direct's water company sample. Of the four companies in *Value*
24 *Line*'s Standard Edition, Southwest Water does not earn the majority of its revenues from
25 water activities and Aqua America is actively pursuing acquisitions. I therefore agree

²⁰ In addition, Peoples Energy, which is part of both the Rigsby Direct and the Villadsen Direct's natural gas LDC proxy samples, announced on July 10, 2006 that it and WPS Resources Corporation will combine to create a diverse energy company. See Peoples Energy Press Release, July 10, 2006. While the growth rates and beta estimates in the Rigsby Direct were obtained prior to the merger announcement, the stock prices include observations following the information and consequently the dividend yield may be affected.

²¹ AGL Resources was not part of the Villadsen Direct because of its 2004 acquisition of NUI Corp.

1 with the Rigsby Direct on the need of a second sample as a check. However, I disagree
2 with the Rigsby Direct in not utilizing the information from the natural gas distribution
3 sample to inform his cost of equity recommendation for Mohave. There are two key
4 reasons why basing the final recommendation solely on the four company water sample
5 is unwise. First, two of the four companies in the sample are problematic. Southwest
6 Water earns less than half its revenues from the water industry and Aqua America has
7 been actively pursuing acquisitions. The estimated cost of equity for these two
8 companies may be affected by their unique circumstances and not representative for the
9 water industry. At the same time, dropping these two companies would result in too
10 small a sample size. Second, among the cost of equity estimates in the Rigsby Direct
11 those obtained from the four-company water sample are lower than those obtained from
12 the natural gas distribution sample, and the DCF estimate is lower than the CAPM
13 estimate. I therefore believe that the figures reported in the Rigsby Direct indicate that
14 the DCF estimate from the four company water sample is downward biased. The Chaves
15 Direct also relies on a *Value Line* water sample but does not include Southwest Water
16 whose revenue is not concentrated in the water industry. The testimony adds Connecticut
17 Water, Middlesex Water and SJW Water from *Value Line*'s Small and Mid-Cap Edition
18 as I do.²² The final cost of equity recommendation in the Chaves Direct relies on an
19 average of four estimation methods applied to the sample of water companies. The
20 addition of companies to the water sample and relying on several estimation methods
21 significantly reduces the possibility that any one number from a company with unique
22 circumstances would bias the results. Because of the small number of water utilities with
23 complete data and significant trading activity, in my judgment, a second sample of highly
24 regulated utilities adds substantial value to the determination of the cost of equity for a
25 water utility.

²² I also consider York Water and a subsample of companies without Southwest Water.

1 **B. THE DCF METHOD**

2 **Q15. Please summarize the DCF methods relied upon in the Chaves and Rigsby Direct**
3 **Testimonies.**

4 A15. The Chaves Direct relies on a constant growth rate DCF and on a multi-stage DCF model.
5 In the constant growth rate model, the growth rate is estimated as the average of 6 growth
6 rates: historical and predicted dividend growth, historical and predicted earnings growth,
7 and historical and predicted sustainable growth.²³ The historical growth rate is calculated
8 using 10 years of *Value Line* data while the projected growth rate uses current *Value Line*
9 estimates.²⁴ The Chaves Direct calculated the dividend yield as the expected annual
10 dividend (per *Value Line*) divided by the stock price as of June 7, 2006. In the multi-
11 stage DCF model, the Chaves Direct relied on *Value Line* projected dividend growth for
12 the first four years and historical GDP growth for the long term (“Stage-2 growth”). The
13 Rigsby Direct relies on a constant growth DCF model with a sustainable growth rate.
14 The sustainable growth rate is determined based on five years of historical and projected
15 data from *Value Line* and Zacks. The standard sustainable growth model states that

16
$$g = b \times r + s \times v \qquad (1)$$

17 where b earnings retention ratio

18 r return on common equity

19 s growth in shares

20
$$v = [(\text{Market Value per Share}) / (\text{Book Value per Share}) - 1] \qquad (2-a)$$

21 However, the Rigsby Direct relies on a model where v is replaced by²⁵

22

23

24
$$v^* = \{[(\text{Market Value per Share}) / (\text{Book Value per Share}) + 1] / 2 - 1\} \qquad (2-b)$$

²³ The sustainable growth rate consists of an internal growth rate, the (earnings) retention ratio multiplied with return on equity, plus an external growth ratio, growth financed through the issuance of new shares.

²⁴ Schedule PMC-4 and PMC-5 of the Chaves Direct.

²⁵ Rigsby Direct p. 17 and Schedule WAR-4, page 2.

1 As v^* is less than v whenever the stock price per share is higher than the book value per
2 share, the formula in (2-b) results in a lower growth rate than the standard formula for
3 companies with a market-to-book (or price to book value per share) above one.
4

5 **Q16. What are the consequences of the Rigsby Direct's adjustment to the sustainable**
6 **growth model?**

7 A16. In essence, the adjustment lowers (increases) the sustainable growth rate when the
8 market-to-book ratio is higher (lower) than one. Table R-2 below reports the results from
9 using the data in the Rigsby Direct's Schedules WAR-2 and WAR-4 page 2 but removing
10 the adjustment factor. For the water companies the cost of equity estimate increases by
11 about 150 basis points while the cost of equity estimate for the gas LDC sample increases
12 by about 50 basis points.²⁶

Table R-2		
The Impact on the Cost of Equity of the Rigsby Direct's Adjustment to the Sustainable Growth Model		
	Water Utility	Natural Gas LDC
Rigsby-based DCF without Adjustment	10.17%	9.33%
Rigsby DCF (with Adjustment)	8.60%	8.86%
Difference	1.57%	0.47%

13 Source: Rigsby Direct p. 36 and Schedule No. BV-R1.
14

15 Given that the Rigsby Direct relies exclusively on the DCF estimate for the water
16 utility proxy group, the implications of the adjustment is quite severe. Had the Rigsby
17 Direct instead relied on the standard sustainable growth models, as does the Chaves
18 Direct, the results would have indicated a cost of equity of the order of 10.6 to 10.7
19 percent for the water sample after addition of the Rigsby Direct's recommended 50 basis
20 point adjustment for leverage. In other words, removing this one adjustment makes the

²⁶ I derived the figure using the following data. The dividend yield is the dividend yield provided in the Rigsby Direct, Schedule WAR – 2, the internal growth rate is the growth rate provided in column (A) of WAR – 4 p. 1, and the external growth rate uses columns (A) and (B) of Schedule WAR – 4 p. 2. See also

1 results from the data in the Rigsby Direct very comparable to the results obtained by Staff
2 witness Chaves. The calculations relied upon to obtain these results are presented in
3 Schedule BV-R1. The schedule calculates the cost of equity that would result if the
4 Rigsby Direct's data and assumptions were used, with the one exception that the external
5 growth rate is calculated in the standard manner, rather than using the adjustment in (2-b).
6 As can be seen from Table R-2 above, the impact of this one adjustment is significant and
7 biases the DCF estimates obtained in the Rigsby Direct downward.
8

9 **Q17. Why did you modify calculation of the external growth rate?**

10 A17. The adjustment made in the Rigsby Direct is founded on the notion that "[t]he market
11 price of a utility's common stock will tend to move toward book value, or a market-to-
12 book ratio of 1.0, if regulators allow a rate of return that is equal to the cost of capital."²⁷
13 Thus, it appears that the Rigsby Direct relies on the so-called market-to-book test, which
14 is based on the assumption that the value of a utility's stock equals the present value of
15 the returns of and on a rate base equal to the net book value of the utility's equity. To
16 illustrate the consequences of a strict belief in the market-to-book test,²⁸ I will discuss a
17 hypothetical example.

18 Assume the market-to-book test worked, and that all parties agreed that at a cost of
19 equity of 11 percent is appropriate for Utility A.²⁹ For simplicity, assume that Utility A
20 has an actual and ratemaking capital structure consisting of 40 percent equity. Assume
21 that Utility A's market-to-book ratio is 2, which if the market-to-book test were valid
22 would signal that 11 percent is above the cost of equity at the regulatory equity ratio.
23 Suppose also that the book value of the utility is expected to grow at a long-term annual
24 rate of 5 percent. Lastly, suppose that investors expected an extreme form of regulatory
25 lag: regulators will leave allowed rates of return at the current 11 percent level for X

RUCO Response to Arizona-American's Fourth Set of Data Requests to RUCO. The calculations are in Schedule BV-R1.

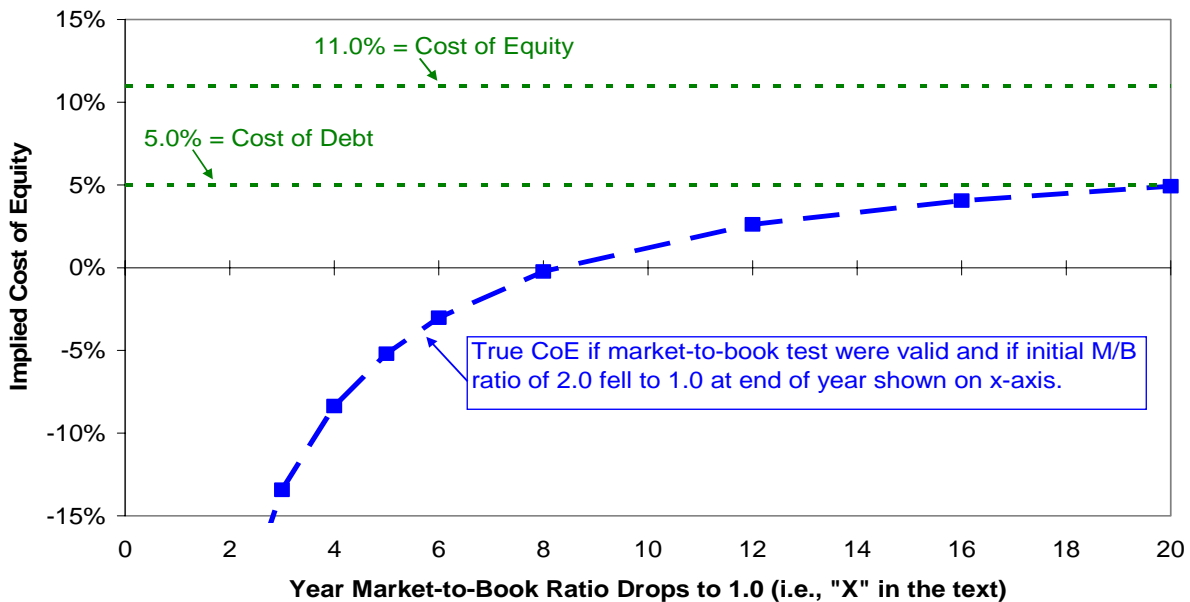
²⁷ Rigsby Direct p. 17.

²⁸ Neither the Chaves Direct nor the Rigsby Direct appear to argue that regulators should seek a market-to-book ratio of one.

²⁹ The 11 percent is used for illustrative purposes only.

1 years. On the last day of the Xth year, regulators will readjust the allowed rate of return
 2 down to the cost of equity, so that the market-to-book ratio falls to 1.0 on that day. In
 3 short, the assumptions are that (1) investors put up \$2 now for every \$1 of book equity
 4 rate base, (2) earn an allowed rate of return of 11 percent (which by hypothesis is above
 5 the cost of capital) on the book value of the equity rate base (which grows at 5 percent
 6 per year) for X years, and (3) then end up with a stock value equal to only the book-value
 7 rate base, i.e., they lose 50 percent of their original investment after X years. If the
 8 market-to-book test were valid, the discount rate that makes the present value of these
 9 hypothesized returns equal to twice the book value of the stock is the utility's true cost of
 10 equity. Figure R-1 plots the implied true cost of equity associated with values of "X"
 11 running out to 20 years. As benchmarks, it adds the assumed 11 percent allowed rate of
 12 return on equity and the associated long-term bond rate, 5 percent.

Market-to-Book Test Implies an Unrealistic True Cost of Equity (CoE)
 (Allowed RoR on Book Equity = Estimated Cost of Equity = 11%. M/B
 Ratio Falls from 2.0 to 1.0 at the End of the Year Indicated on the X-Axis.)



13
 14 **Figure R-1**

15
 16 The curved line (blue in color copies) depicts the true cost of capital as the length of the
 17 regulatory lag (X) grows from three years to 20 years. With a loss of 50 percent of the
 18 original investment due at the end of the regulatory lag, X must exceed 8 years for the true

1 cost of equity to become positive, and during the 20-year period considered it never
2 exceeds the risk-free rate. As investors clearly expect a return in excess of the risk-free
3 rate, trying to regulate to obtain a market-to-book ratio of one is not viable. The example
4 illustrates that it is unlikely that the simple market-to-book test works. Because the test
5 does not work, I firmly believe the regulators should not attempt to maintain, increase, or
6 decrease a utility's market-to-book ratio.³⁰

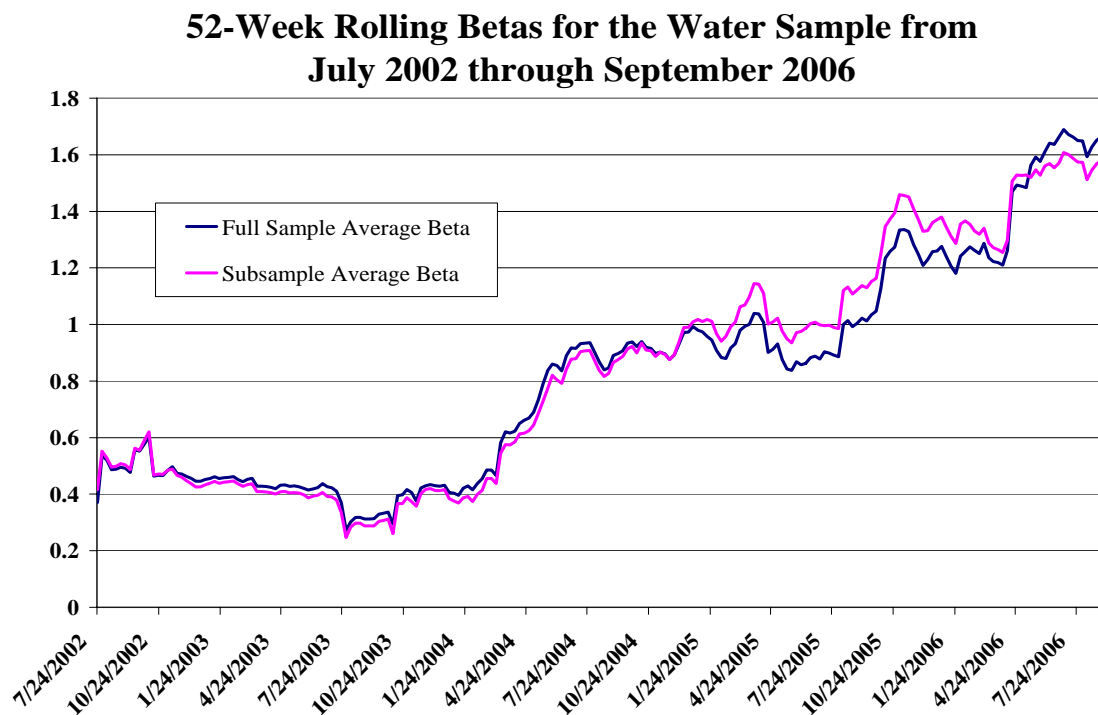
7
8 **Q18. Do you have any general comments regarding choice of growth rates in the Chaves**
9 **Direct and Rigsby Direct?**

10 A18. Yes, both testimonies rely on historical growth rates as well as projected growth rates.
11 The Chaves Direct also argues that analyst forecasts are overly optimistic.³¹ Because, as
12 discussed below, the water industry currently is in transition, historical growth rates may
13 not be representative for future growth. Currently, the water utility industry is expected
14 to make significant infrastructure investments, the industry is facing a number of mergers
15 and acquisitions, and the water utility companies' risk appears to be increasing. For
16 example, *Value Line*, January 2005 and July 2006 discuss the water industry's need for
17 substantial investment in infrastructure over the next decade or two.³² Additionally, the
18 water utility industry's risk is clearly increasing as indicated by, for example, increasing
19 beta estimates. This is shown in Figure R-2 below for the water utility sample relied upon
20 in the Villadsen Direct. The betas in the figure are rolling 52-week betas which means
21 that each beta is based on the previous 52 weeks of return data. Specifically, the water
22 utility sample companies' weekly returns were regressed on the S&P 500 weekly return.

³⁰ There may be circumstances where an extremely low market-to-book ratio indicates a fundamental problem in which case the regulator may need to address the underlying problem - - not the market-to-book ratio.

³¹ Chaves Direct pp. 36-39.

³² *Value Line* Investment Survey, Water Utility Industry, January 28, 2005 and July 28, 2006.



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2 **Figure R-2**
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4 Schedule BV-R2 shows that *Value Line*'s estimated betas for the water industry also have
5 increased in recent years although not as dramatically as shown above because *Value*
6 *Line* uses five years of weekly data to estimate betas. This decreases the pace of change.
7 Because of the rapid changes in the water utility industry the heavy reliance on historical
8 growth rates may bias the cost of capital estimate which, as the Chaves Direct points
9 out,³³ is a forward looking or expected measure. There is a large academic literature that
10 indicates that analysts' forecasts are statistically more accurate than growth forecasts
11 solely based on historical earnings, dividends, book value and equity growth rates.³⁴ For
12 example, a paper by Gordon, Gordon and Gould (1989)³⁵ demonstrates that for utilities,
13 forecasted earnings growth outperform past growth in earnings, past growth in dividends,
14 and past growth in earnings retention in explaining utilities expected return. (Note that

³³ See Chaves Direct p. 3.

³⁴ This literature is summarized in the Villadsen Direct, Appendix C pp. 5-8.

³⁵ David A. Gordon, Myron J. Gordon, and Lawrence I. Gould (1989), Choice Among Methods of Estimating Share Yield, *The Journal of Portfolio Management*, 50-55.

1 one of the authors, Myron J. Gordon, developed the Gordon Growth Model, or DCF
2 model, relied upon in the Rigsby Direct).

3 **Q19. Do you have any comments on the Chaves Direct and the Rigsby Direct's**
4 **discussions of optimism bias in analysts' forecasts?**

5 A19. Yes. I will first address the Chaves Direct's discussion of optimism bias, and then I will
6 address the Rigsby Direct's comments on *Value Line's* projected and actual rates of
7 return on equity.

8 **Q20. Please address the Chaves Direct's discussion of optimism bias in analysts' forecasts.**

9 A20. The Chaves Direct argues that "it is reasonable to assume that investors also rely on past
10 growth."³⁶ The Chaves Direct also cites studies that found that analysts' forecasts of
11 future earnings are optimistic.³⁷ The Villadsen Direct³⁸ discussed the optimism bias in
12 analysts' forecast which, I agree, the academic literature has documented. As noted in
13 the Villadsen Direct, Chan, Karceski, and Lakonishok (2000)³⁹ found that for companies
14 in the lowest quintile when sorted by size, there was no obvious bias. Because utilities
15 and especially water utilities tend to be small in size, the results indicate that analysts'
16 optimism bias may be much less in the water industry than in many other industries.
17 Among the text cites in the Chaves Direct, it appears that only Professor Malkiel
18 explicitly includes utilities.⁴⁰ Professor Malkiel⁴¹ discusses the findings, the utility
19 industry and the "unpredictable events" in the industry that presumably cause analysts'
20 forecasts to over or underestimate earnings. He cites, among other factors, the fuel costs
21 of the 1970's, the 1979 Three Mile Island accident, unexpected unfavorable rulings of
22 public utility commissions, and in the 1990's the impact of deregulation and competition.
23 These factors pertain primarily to a segment of the electric utility industry, so it is not

³⁶ Chaves Direct p. 36, lines 19-20.

³⁷ Chaves Direct p. 37-38 references David Dreman (1998), *Contrarian Investment Strategies: The Next Generation*, Simon & Schuster ("Dreman"), Jeremy J. Siegel (2002), *Stocks for the Long Run*, McGraw-Hill ("Siegel"), and Burton G. Malkiel (2003), *A Random Walk Down Wall Street*, W.W. Norton & Co.

³⁸ Villadsen Direct, Appendix B, pp. 6-8.

³⁹ L. K.C. Chan, J. Karceski, and J. Lakonishok (2003), "The Level and Persistence of Growth Rates," *Journal of Finance* 58(2):643-684.

⁴⁰ Dreman p. 95-97 discuss 15 industries none of which appear to be dominated by utilities.

⁴¹ Malkiel (2003), *Op. Cit.*, p. 177.

1 obvious to which utilities Professor Malkiel refers in the statement quoted in the Chaves
2 Direct. Without knowing exactly which utilities and companies are included in the
3 studies cited, it is difficult, if not impossible, to determine the study's impact on the
4 choice between analysts' forecasts and other growth rates. After all, there is ample
5 evidence in the academic literature that analysts' forecasts outperform historical growth
6 rates.⁴² Lastly, analysts have ample access to historical information on companies they
7 follow and presumably use whatever information is available to them in projecting future
8 earnings or other factors for a company. Therefore, I believe that historical data are fully
9 incorporated in analysts' forecasts and that to implement a truly forward looking DCF
10 model, only forward looking growth rates should be included.

11 **Q21. Please comment on the Rigsby Direct's comparison of *Value Line's* projected and**
12 **actual returns.**

13 A21. The Rigsby Direct pp. 48-49 presents historical data on *Value Line's* projected rates of
14 return and realized rates of return for the water industry. The projected return is the one-
15 year projection.⁴³ The summary table is replicated in Table R-3 below with a line added
16 for 2005.

Table R-3			
<i>Value Line</i> Projected and Actual Return on Equity			
Year	Actual Book RoE	Projected RoE	Difference
2001	10.7%	11.0%	- 30 basis points
2002	11.2%	11.0%	20 basis points
2003	8.8%	10.5%	170 basis points
2004	10.7%	11.0%	- 30 basis points
2005	9.8%	9.5%	30 basis points

17 Sources: Rigsby Direct p. 48-49 except actual book RoE for 2005 which is from *Value*
18 *Line* Investment Survey, July 28, 2006.⁴⁴

⁴² See footnote 1 p. 6 in Appendix C to the Villadsen Direct.

⁴³ The return on equity in any one given year is much more volatile and difficult to project than is, for example, the average growth rate over the next five years.

⁴⁴ *Value Line* Investment Survey, July 28, 2006 report figures on actual book return on equity that differs from those in Table R-3. This may be due to *Value Line* having changed the companies it includes in the industry.

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The table indicates that there is only one year with a significant discrepancy between projected and actual return on equity. *Value Line*'s projection was significantly above the actual return in 2003 when the water industry saw a very low profit margin due primarily to very unusual weather conditions. Higher operating expenses and capital expenditure related costs also contributed to the lower realized return.⁴⁵ Thus, 2003 was not a representative year in the water industry. For the remaining years in the table, the projected and the actual return on equity differ by at most 30 basis points and while *Value Line* overestimate the return on equity for two years, the publication also underestimate the return on equity for two years.

11

Q22. Do you have any other comments on growth rates?

12

A22. Yes. In commenting on my Direct Testimony and optimism bias, the Rigsby Direct states on p. 57

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This tendency, referred to as optimism bias by Dr. Villadsen, is addressed in Appendix C of her testimony and, according to Dr. Villadsen, is eliminated by the use of a long-term growth rate estimate for gross domestic product ("GDP") in her multi-stage model.

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First, as argued above and in Appendix C of my Direct Testimony, optimism bias is less of an issue for smaller companies and utilities than for the average industry. Second, my multi-stage model serves several purposes. It takes into account that no publicly available analysts' forecasts, to the best of my knowledge, provide information beyond at most five years. Consequently, assumptions have to be made regarding the growth rate of companies beyond that horizon. If a company were to grow at a significantly faster (slower) than the economy as a whole for a very long time, it would become an increasingly larger (smaller) portion of the economy which appears illogical as water companies and utilities in general serve the public. Third, the multi-stage model does adjust for overly optimistic or pessimistic company-specific forecasts.

1

2 **Q23. Are there factors specific to the testimonies at hand that merit discussion?**

3 A23. Yes. First, in calculating the dividend yield, Mr. Chaves relies on the spot price as of
4 June 7, 2006⁴⁶ while Mr. Rigsby relies on the average stock price for the 8-week period
5 ending 8/4/2006.⁴⁷ The current stock price is consistent with financial theory but may on
6 any given day contain biases. This is particularly true if a company has low trading
7 volume or if there are unique circumstances that may bias the price on the day, prices are
8 observed. I therefore prefer an average stock price over a short current period. In this
9 case, I found no price abnormalities around June 7, 2006 but on July 10, 2006 Peoples
10 Energy, a member of the Rigsby Direct's gas LDC sample, announced its intend to merge
11 with WPS Resources Corporation. The stock price of Peoples Energy immediately
12 increased and thereby lowered the dividend yield for the company. The consequence
13 hereof is that the DCF cost of equity estimate for the natural gas LDC sample is lower
14 than it would otherwise have been by a small amount (about 0.05 percent).

15 **C. THE RISK POSITIONING METHOD**

16 **Q24. Please summarize the risk positioning model relied upon in the Chaves and Rigsby**
17 **Direct Testimonies.**

18 A24. Both the Chaves Direct and the Rigsby Direct report results from risk positioning models
19 and both witnesses rely on the standard Capital Asset Pricing Model ("CAPM") using
20 betas from *Value Line* Investment Survey. The Chaves Direct reports results from two
21 models. The first model uses a market risk premium ("MRP") equal to the average
22 historical arithmetic difference between the S&P 500 and the intermediate-term
23 government bond income return and a risk-free rate of 5 percent. The second model uses
24 a projected market risk premium where the projection is based on *Value Line's* expected
25 dividend yields and the current yield on 30-year Treasury notes. The Chaves Direct

⁴⁵ See *Value Line* Investment Survey, January 30, 2004 (Water Utility Industry, American States Water, Aqua America, California States Water).

⁴⁶ Chaves Direct p. 14.

⁴⁷ Rigsby Direct Schedule WAR-3 and RUCO Response to Arizona-American's Second Set of Data Requests to RUCO, No. 2.5.

1 relies on the average yield on three-, five-, seven, and ten-year Treasury securities as of
2 June 7, 2006. The Rigsby Direct also reports results from two risk positioning models.
3 In one model, the Rigsby Direct relies on the average historical arithmetic difference
4 between the S&P 500 and the current yield on 91-day treasury bills for the MRP. In a
5 second model, the Rigsby Direct relies on the average geometric difference between the
6 S&P 500 and the current yield on 91-day treasury bills for the MRP. The Rigsby Direct
7 uses the average yield on the 91-day Treasury bills over the six week period ending
8 August 4, 2006.

9 **Q25. Do you have any comments on the implementation of the risk positioning model in**
10 **the Chaves or Rigsby Direct Testimonies?**

11 A25. Yes. The Rigsby Direct reports results that rely on a geometric estimate of the market
12 risk premium. Current finance theory and practice has ruled out the reliance on the
13 geometric MRP for cost of capital estimation.

14 **Q26. Please address the issue of geometric versus arithmetic market risk premia.**

15 A26. While the magnitude of the market risk premium currently is the subject of scrutiny in the
16 academic literature⁴⁸ there is no doubt among academics that the geometric market risk
17 premium does not apply to cost of capital estimation. For example, Ibbotson Associates
18 state

19 The equity risk premium data presented in this book are arithmetic
20 average risk premia as opposed to geometric average risk premia. The
21 arithmetic average equity risk premium can be demonstrated to be most
22 appropriate when discounting future cash flows. For use as the expected
23 equity risk premium in either the CAPM or the building block approach,
24 the arithmetic mean or the simple difference of the arithmetic means of
25 stock market returns and riskless rates is the relevant number. The is
26 because both the CAPM and the building block approach are additive
27 models, in which the cost of capital is the sum of its parts. The geometric
28 average is more appropriate for the reporting past performance, since it
29 represents the compound average return.⁴⁹
30

⁴⁸ See Villadsen Direct, Appendix B pp. 3-9 for a discussion.

⁴⁹ Ibbotson Associates, *Stock, Bonds, Bills and Inflation, Valuation Edition*, 2006 Yearbook, p. 77.

1 Similarly, the *New Regulatory Finance* text by Roger A. Morin (2006) argues that

2 Only arithmetic means are correct for forecasting purposes and for
3 estimating the cost of capital. There is no theoretical or empirical
4 justification for the use of geometric mean rates of returns as a measure of
5 the appropriate discount rate in computing the cost of capital or in
6 computing present values. There is no dispute in academic circles as to
7 whether the arithmetic or geometric average should be used for purposes
8 of computing the cost of capital.⁵⁰
9

10 Finally, the text by Bode, Kane, and Marcus (2005) states,

11 [I]f our focus is on future performance, then the arithmetic average is the
12 statistic of interest because it is an unbiased estimate of the portfolio's
13 expected return (assuming, of course, that the expected return does not
14 change over time). In contrast, because the geometric return over a
15 sample period is always less than the arithmetic mean, it constitutes a
16 downward-biased estimator of the stock's expected return in any future
17 year.^{51,52}
18

19 Based on the academic and other literature, the geometric average based MRP is invalid.
20 It leads to downward biased cost of capital estimates and should be ignored. Table R-4
21 below shows the difference between the Rigsby Direct's cost of equity estimates using
22 the arithmetic and geometric MRP.

⁵⁰ Roger A. Morin (2006), *New Regulatory Finance*, Public Utilities Reports, Inc., pp. 116-117.

⁵¹ Zvi Bode, Alex Kane, and Alan J. Marcus (2005), *Investments*, 6th Edition, McGraw-Hill, p. 865.

⁵² See also Richard A. Brealey, Stewart C. Myers, and Franklin Allen (2006), *Principles of Corporate Finance*, 8th Edition, McGraw-Hill, p. 150-151.

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Table R-4 Arithmetic versus Geometric CAPM Cost of Equity Estimates in the Rigsby Direct		
	Water Companies	Natural Gas LDC
Arithmetic MRP	10.56%	11.04%
Geometric MRP	9.11%	9.47%
Difference	1.45%	1.57%

2

Source: Rigsby Direct Schedule WAR – 7. Difference calculated.

3

4

As can be seen from the table, the Rigsby Direct's cost of equity estimates is 145 basis points lower for the water utility sample when relying on the geometric MRP than when relying on the arithmetic MRP. For the gas LDC sample the difference is slightly larger at 157 basis points. The Rigsby Direct estimates a cost of equity of 10.56 percent for the water utility sample using the arithmetic MRP before any adjustments for Mohave's higher leverage. Considering the 50 basis points upward adjustment for financial leverage that the Rigsby Direct relies upon, the arithmetic MRP based CAPM cost of equity estimate presented in the Rigsby Direct is a bit above 11 percent and between the recommendation of Staff and the Company's request.

13

14 **Q27. Are there other issues in the implementation of the risk positioning model that you**
15 **need to address?**

16 A27. Yes. Both the Chaves Direct and the Rigsby Direct relied on *Value Line* betas as did the
17 Villadsen Direct. However, both the Chaves Direct and the Rigsby Direct relied on betas
18 as reported by *Value Line* while the Villadsen Direct unadjusted *Value Line*'s betas. The
19 Villadsen Direct choose to unadjust *Value Line*'s betas as a conservative estimate
20 although current 52-week estimates of betas for both the water and gas LDC companies
21 indicate that the companies' betas are of the magnitude reported by *Value Line* and
22 increasing (See Figure 1 above).

1 **D. RELYING SOLELY ON THE DCF APPLIED TO WATER UTILITY COMPANIES**

2 **Q28. The Rigsby Direct appears to rely solely on the constant-growth DCF model applied**
3 **to four water utility companies. Please comment.**

4 A28. The Chaves Direct, the Rigsby Direct, and the Villadsen Direct all estimated the cost of
5 equity that Mohave should be allowed an opportunity to earn using several models. The
6 Chaves Direct's recommendation is based on the average of the DCF and CAPM
7 estimates that it obtains.⁵³ The Rigsby Direct reports results from four methods but relies
8 exclusively on the DCF method applied to the water utility sample.⁵⁴ I find it
9 troublesome that the Rigsby Direct disregards all information contained in estimates
10 other than the DCF applied to four water utilities for several reasons. First, two of the
11 water utilities in the Rigsby Direct's water utility sample may have specific issues. Aqua
12 America has in recent years engaged in several acquisitions and Southwest Water earns a
13 majority of its revenues from non-water related activities. Thus, the sample relied upon
14 consists of only two companies without company specific factors. A two company
15 sample is too small to provide reliable estimates. Second, the water industry has
16 undergone significant changes due to consolidations in recent years making historical
17 growth rates less reliable as benchmarks for future growth. Third, the low DCF cost of
18 equity estimate for the four water utility companies (and for the natural gas LDCs) is
19 obtained using a non-standard downward adjustment when calculating the sustainable
20 growth. Fourth, all other estimates presented in the Rigsby Direct indicate that the cost
21 of equity is higher than the 8.60 percent estimate relied upon for the recommended 9.10
22 percent. In other words, the data presented in the Rigsby Direct support a cost of equity
23 well above the recommended 9.10 percent. To see this I used data presented in the
24 Rigsby Direct to calculate the average estimated return on equity without non-standard
25 adjustments. The results are presented in Table R-5, Panels A through C below.

53 Chaves Direct p. 32.

54 Rigsby Direct p. 36 and Response to Arizona-American's Second Set of Data Requests to RUCO No. 2.3.

Table R-5, Panel A		
Summary of the Rigsby Direct's Estimates and Averages		
	Water Utility	Natural Gas LDC
Constant Growth DCF	8.60%	8.86%
Arithmetic CAPM	10.56%	11.04%
Geometric CAPM	9.11%	9.47%
Sample Average	9.42%	9.79%
Average	9.61%	
Average plus 50 basis points	10.11%	

Source: Rigsby Direct p. 36. Averages were calculated.

Table R-5, Panel B		
Summary of Rigsby Direct's Estimates and Averages Without Geometric CAPM		
	Water Utility	Natural Gas LDC
Constant Growth DCF	8.60%	8.86%
Arithmetic CAPM	10.56%	11.04%
Sample Average	9.58%	9.95%
Average	9.77%	
Average plus 50 basis points	10.27%	

Source: Rigsby Direct p. 36. Averages were calculated.

Table R-5, Panel C		
Summary of Rigsby Direct's Estimates and Averages Without Geometric CAPM and Standard External Growth		
	Water Utility	Natural Gas LDC
Sustainable DCF without Adjustment	10.17%	9.33%
Arithmetic CAPM	10.56%	11.04%
Sample Average	10.37%	10.19%
Average	10.28%	
Average plus 50 basis points	10.78%	

Sources: Rigsby Direct p. 36 and Schedule BV-R1. Averages as well as the Constant Growth DCF without Adjustment were calculated.

As can be seen from Table R-5, Panel A the average of the cost of equity estimate obtained in the Rigsby Direct is more than 100 basis points higher than the recommendation in the Rigsby Direct. Ignoring the geometric MRP CAPM results which, for reasons discussed above, should not be used for cost of capital estimation, the average is almost 120 basis points higher than the recommendation. Finally, Table R-5, Panel C

1 shows that if the results based on the geometric MRP are ignored and the external growth
2 rate is calculated in the standard manner, then the Rigsby Direct's data are about
3 consistent with a cost of equity of about 10.8 percent once the 50 basis points
4 recommended in the Rigsby Direct are added. In my opinion, these tables indicate that
5 the cost of equity recommendation in the Rigsby Direct is biased downward, and that the
6 data reported in the Rigsby Direct's schedules are consistent with a cost of equity
7 significantly higher than that recommended in the Rigsby Direct. Thus, by eliminating
8 two implementation choices that have no justification in finance theory and averaging the
9 estimated results, the estimated cost of equity is about 10.8 percent rather than the 9.1
10 percent recommended in the Rigsby Direct.
11

12 **IV. RESPONSE TO COMMENTS ON THE VILLADSEN DIRECT**

13 **Q29. Do you have any responses to comments made in the Chaves or the Rigsby Direct**
14 **regarding the Villadsen Direct that has not been made elsewhere?**

15 A29. Most of my comments on both the Chaves and Rigsby Directs are included above.
16 However, I will address one comment made in the Rigsby Direct. The Rigsby Direct
17 states⁵⁵

18 Dr. Villadsen makes the upward adjustments advocated by Dr. Kolbe in
19 order to arrive at an after tax weighted average cost of capital
20 ("ATWACC") for the Mohave District.
21

22 The statement is confusing. First, I object to the statement that the Villadsen Direct make
23 "upward adjustments." Any difference between the sample companies cost of equity
24 estimates and the recommendation for Mohave is caused by differences in financial risk.
25 Second, I am not sure if the Rigsby Direct implies that I make "upward adjustments" to
26 the ATWACC or to the recommended cost of equity. I calculate the cost of equity for
27 two samples using standard cost of equity estimation techniques. Then I calculate the
28 after-tax weighted-average cost of capital for each sample company using market-value

⁵⁵ Rigsby Direct p. 56.

1 capital structures for reasons discussed in the Villadsen Direct and *Section II* above.
2 Finally, I determine the leverage equivalent cost of equity for Mohave which is
3 significantly more leveraged than the sample companies. Because of the higher leverage,
4 the recommended cost of equity is higher than the cost of equity estimated for the sample
5 companies whose financial risk is lower. As the Chaves Direct, the Rigsby Direct, and
6 the Villadsen Direct all agree, Mohave is significantly more leveraged than the sample
7 companies or the water industry in general, and hence shareholders are exposed to more
8 financial risk. All witnesses agree that Mohave therefore has a higher cost of equity than
9 the proxy groups relied upon.

10

11 **Q30. Does the fact that you do not address all issues or findings discussed in the Chaves**
12 **Direct or Rigsby Direct imply that you accept their positions or findings?**

13 A30. No, not necessarily.

14 **Q31. Is this the conclusion of your rebuttal testimony?**

15 A31. Yes

1 APPENDIX A: QUALIFICATIONS OF DR. BENTE VILLADSEN

Bente Villadsen's work concentrates in the areas of finance and accounting. Her work has included analyses of the cost of capital, credit issues, valuation, accounting disclosure and principles including mark-to-market accounting, accounting for hybrid securities, and accounting for investments. Recent topics include rate-regulated companies' allowed rates of return, the valuation of and accounting for power contracts, a contract dispute in the petroleum industry, and various income tax disputes. Depending on the project, she may serve as a business or litigation advisor or as an expert witness.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management. She has a joint degree in mathematics and economics (BS and MS) from University of Aarhus in Denmark. Prior to joining *The Brattle Group*, she was a Professor of Accounting at the University of Iowa and at Washington University in St. Louis. Dr. Villadsen also worked as a consultant for Risoe National Laboratories in Denmark.

REPRESENTATIVE EXPERIENCE

ENERGY AND PUBLIC UTILITY FINANCE

- Dr. Villadsen has filed cost of capital testimony for two water and wastewater utilities in connection with rate hearings before state regulatory commissions.
- She has considerable experience in estimating the cost of capital for major U.S. and Canadian utilities and pipelines. The work has been used in connection with the companies' rate hearings before the Federal Energy Regulatory Commission, the Canadian National Energy Board, and state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, and water utilities.
- For a large integrated utility in the U.S., Dr. Villadsen participated in all aspects of the company's rate filing, including the company's cost of capital, incentive based rates, and certain regulatory accounting issues.
- She was part of a team evaluating the capital structure and cost of capital for a Canadian crown corporation.
- In connection with rate hearings for electric utilities, Dr. Villadsen has estimated the impact of power purchase agreements on the company's credit ratings and calculated appropriate compensation for utilities that sign such agreements to fulfill, for example, renewable energy requirements.

- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluated the impact of accounting fraud on an energy company's credit rating and assessing the company's credit rating but-for the accounting fraud.
- For a large electric utility, Dr. Villadsen modeled cash flows and analyzed its financing decisions to determine the degree to which the company was in financial distress as a consequence of long-term energy contracts.
- For a large electric utility without generation assets, Dr. Villadsen assisted in the assessment of the risk added from offering its customers a price protection plan and being the provider of last resort (POLR).
- Dr. Villadsen is evaluating the appropriate regulatory framework and rates a utility should be able to charge for providing access to its facilities to outside companies.

ACCOUNTING AND CORPORATE FINANCE

- Dr. Villadsen filed testimony and rebuttal testimony in an arbitration proceeding between two major oil companies involved in a contract dispute. The testimony pertained to the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities.
- Currently, she is working on two litigation matters involving the proper application of mark-to-market and derivative accounting in the energy industry. The work relates to the proper valuation of energy contracts and the application of accounting principles.
- Dr. Villadsen has worked on accounting issues in connection with several tax shelter cases. The focus of her work has been the application of accounting principles to evaluate intra-company transactions and the accounting treatment of security sales.
- She evaluated the accounting practices of a mortgage lender and the mortgage industry to assess the information available to the market and ESOP plan administrators prior to the company's filing for bankruptcy. A large part of the work consisted of comparing the company's and the industry's implementation of gain-of-sale accounting.
- Dr. Villadsen has modeled the cash flows of several companies to estimate the impact of specific (energy) contracts or to determine the impact of specific loans.
- For a company in the energy sector, she modeled cash flows to evaluate the company's need for additional funds over time and to assess its viability.
- She assisted in the estimation of net worth of individual segments for firms in the consumer product industry. Further, she built a model to analyze the segment's vulnerability to additional fixed costs and its risk of bankruptcy.

- For a large integrated oil company, Dr. Villadsen estimated the company's cost of capital and assisted in the analysis of the company's accounting and market performance.
- In connection with commercial litigation, Dr. Villadsen estimated the cost of capital for companies in the chemical industry and for companies in the cement industry.

PUBLICATIONS

"Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low," *Public Utilities Fortnightly*, August 2005 (with A. Lawrence Kolbe and Michael J. Vilbert).

"The Effect of Debt on the Cost of Equity in a Regulatory Setting," (with A. Lawrence Kolbe and Michael J. Vilbert, and with "*The Brattle Group*" listed as author), published by the Edison Electric Institute (dated January 2005, issued April 2005).

"Communication and Delegation in Collusive Agencies," *Journal of Accounting and Economics*, Vol. 19, 1995.

"Beta Distributed Market Shares in a Spatial Model With an Application to the Market for Audit Services" (with M. Hviid), *Review of Industrial Organization*, Vol. 10, 1995.

PRESENTATIONS

"Current Issues in Cost of Capital," (with M.J. Vilbert). EEI Electric Rates Advanced Course, Madison, 2005.

"Issues for Cost of Capital Estimation," (with M.J. Vilbert). EEI Cost of Capital Conference, Chicago, 2004.

"Discussion of 'Are Performance Measures Other Than Price Important to CEO Incentives?'" Annual Meeting of the American Accounting Association, 2000.

"Contracting and Income Smoothing in an Infinite Agency Model: A Computational Approach," (with R.T. Boylan) Business and Management Assurance Services Conference, 2000.

"Computational Methods and Theoretical Accounting Research," Big 10 Doctoral Consortium, 1999.

"Discussion of 'Analytical Research in Managerial Accounting,'" Annual Meeting of the American Accounting Association, 1996.

TESTIMONY

Testimony on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0491, July 2006.

DOCKET NO. WS-01303A-06-0014
Arizona-American Water Company
Rebuttal Testimony of Bente Villadsen
PAGE 4 of 4

Testimony on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0403, June 2006.

Testimony on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0014, January 2006.

Affidavit and rebuttal affidavit in an arbitration proceeding on behalf of a major oil company regarding the equity method of accounting and classification of debt and equity, August and November, 2004.

DOCKET NO. WS-01303A-06-0014
Arizona-American Water Company
Rebuttal Testimony of Bente Villadsen

SCHEDULES BV-R1 AND BV-R2

Schedule BV - R1
DCF Cost of Equity Estimates Without Adjustment Using Rigsby Direct Data

Stock Symbol	Company	Dividend Yield [1]	Internal Growth [2]	Share Growth [3]	Market to Book [4]	External Growth [5]	Sustainable Growth [6]	Estimated Cost of Equity Capital [7]
AWR	AMERICAN STATES WATER CO.	2.49%	5.00%	4.00%	2.13	4.50%	9.50%	11.99%
CWT	CALIFORNIA WATER SERVICE GROUP	3.26%	3.25%	3.75%	2.12	4.18%	7.43%	10.69%
SWWC	SOUTHWEST WATER COMPANY	1.72%	4.45%	2.00%	1.80	1.61%	6.06%	7.78%
WTR	AQUA AMERICA, INC.	1.96%	6.00%	1.00%	3.27	2.27%	8.27%	10.23%
WATER COMPANY AVERAGE								10.17%
ATG	AGL RESOURCES, INC.	3.93%	4.00%	0.13%	1.85	0.11%	4.11%	8.04%
LG	LACLEDE GROUP, INC.	4.22%	4.00%	2.00%	1.75	1.51%	5.51%	9.72%
NWN	NORTHWEST NATURAL GAS CO.	3.78%	4.25%	0.50%	1.65	0.33%	4.58%	8.36%
PGL	PEOPLES ENERGY CORPORATION	5.61%	2.25%	1.75%	1.93	1.63%	3.88%	9.48%
SJI	SOUTH JERSEY INDUSTIES, INC.	3.22%	6.10%	1.25%	1.95	1.19%	7.29%	10.51%
SWX	SOUTHWEST GAS CORPORATION	2.62%	6.00%	3.00%	1.59	1.78%	7.78%	10.40%
WGL	WGL HOLDINGS, INC.	4.66%	4.00%	0.25%	1.63	0.16%	4.16%	8.81%
NATURAL GAS LDC AVERAGE								9.33%

Sources and Notes:

- | | |
|---|----------------------|
| [1]: Rigsby Direct Schedule WAR - 2, column (A). | [5]: [3] x ([4] - 1) |
| [2]: Rigsby Direct Schedule WAR - 4 page 1, column (A). | [6]: [2] + [5]. |
| [3]: Rigsby Direct Schedule WAR - 4 page 2, column (A). | [7]: [1] + [6]. |
| [4]: Rigsby Direct Schedule WAR - 4 page 2, column (B). | |

Schedule BV-R2**Beta on Market for the Value Line Universe of Water Companies - 1995 - 2005**

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AWR	0.6	0.7	0.7	0.65	0.6	0.6	0.65	0.6	0.65	0.7	0.7
WTR	0.65	0.65	0.55	0.5	0.5	0.55	0.55	0.7	0.7	0.75	0.8
ARTNA						0.4	0.5	0.5	0.5	0.55	0.5
ARTNB										0.35	0.3
BIW	0.35	0.5	0.35	0.35	0.45	0.4	0.35	0.45	0.45	0.4	0.45
CWT	0.5	0.5	0.65	0.7	0.55	0.6	0.65	0.6	0.6	0.7	0.75
CTWS	0.5	0.45	0.45	0.4	0.4	0.45	0.45	0.55	0.6	0.65	0.7
EMA.TO	0.6	0.65	0.6	0.7	0.65	0.65	0.55	0.5	0.45	0.45	0.4
HERC										0.8	0.7
MSEX	0.4	0.4	0.45	0.5	0.45	0.4	0.45	0.55	0.55	0.6	0.7
PNNW							0.35	0.5	0.45	0.5	0.45
SJW	0.45	0.4	0.45	0.5	0.5	0.5	0.5	0.55	0.5	0.55	0.6
SWWC	0.45	0.6	0.55	0.55	0.55	0.5	0.45	0.55	0.6	0.65	0.65
SNHY					0.6	0.6	0.55	0.55	0.5	0.5	0.55
WWTRQ										1.35	1.35
YORW									0.5	0.55	0.5
Average Water Universe	0.50	0.54	0.53	0.54	0.53	0.51	0.50	0.55	0.54	0.63	0.63
Average Villadsen Water Sample	0.51	0.53	0.54	0.54	0.51	0.51	0.53	0.59	0.59	0.64	0.68

Sources and Notes:

Value Line Investment Survey, Plus Edition, August 2006.