Analysis of the weighted average cost of capital for SunWater

Submission to the Queensland Competition Authority by

Network Economics Consulting Group Pty Ltd

www.necg.com.au contactus@necg.com.au
Canberra ○ Sydney ○ Brisbane ○ Auckland ○ New Orleans
NETWORK ECONOMICS CONSULTING GROUP PTY LTD ABN 72 006 819 969

22 March 2002

Contents

List of Tables

List of Figures

1 Introduction

SunWater has asked the Network Economics Consulting Group (NECG) to prepare a submission for the Queensland Competition Authority (QCA) on the weighted average cost of capital (WACC) to assist the QCA determine the appropriate WACC for pricing the provision of water infrastructure services for the Burdekin Haughton Water Supply Scheme.[1]

In this report, we have estimated a weighted average cost of capital (WACC) for SunWater, broadly following the approach that has been adopted by the QCA in its previous decisions in the water, rail, electricity and gas sectors. The report is structured as follows:

- section 2 sets out parameters adopted in previous QCA decisions SunWater accepts;
- section 3 addresses the appropriate market risk premium to apply;
- section 4 assesses systematic risk;
- section 5 deals with the evaluation of imputation credits;
- section 6 addresses non-WACC issues that are relevant for consideration; and
- section 7 covers the calculation of WACC.

When adopting a conservative bias to each of the parameters, the nominal post-tax "vanilla" WACC for SunWater as of 1 March 2002 is estimated to be 9.85% based on:

- risk free rate based on the 20-day average yield on 10 year Commonwealth bonds;
- a market risk premium (MRP) of 6.5%; and
- an asset beta of 0.60.

---

[1] It should be noted that the Water Reform Unit developed a WACC primarily for the purpose of business valuation for SunWater upon corporatisation, and had no bearing on the determination of lower bound prices for rural irrigation water.

2 Non-contentious matters

In developing its submission, SunWater considers that the following issues are not contentious:

- application of the weighted average cost of capital to be determined by applying the capital asset pricing model (CAPM);
- the WACC and the underlying cash flows to be based on a post tax nominal basis;
- the risk free rate being determined on the basis of the 10 year Commonwealth bond rate with that rate being determined on the basis of the 20 day average yield.

Nevertheless, if the QCA considers departing from its previous practice on any of these issues, SunWater would appreciate the opportunity to make submissions on the matter before the QCA reaches a concluded view.

3 Market risk premium

The market risk premium ("MRP") is the amount that an investor expects to earn from a well diversified market portfolio above the return that can be earned on a risk free investment. The MRP is an expectation and therefore is not directly observable. Estimating the MRP is a difficult process and is generally chosen from a range of plausible values, most commonly at the midpoint. For example, the Water Reform Unit adopted this approach when assessing the MRP at 7%.

In determining the appropriate MRP to apply, we consider:

- use of historical data to generate a range; and
- the assessment of an appropriate point in that range.

3.1 Historical estimates of the MRP

The use of historical estimates of MRP has been the predominant method of estimating a forward-looking MRP in Australia. In assessing historical evidence, the generally accepted range among corporate finance professionals in Australia has been 6% to 8%.[2] This range is largely favoured because of empirical evidence of the historical, realised MRP in Australia over time periods ranging as far back as 1882. In the absence of additional evidence, the mid-point of 7.0% was often picked as the point estimate. Major historical estimates are outlined in Table 3-1.

[2] For example, see R. Officer, "Rates of Return to Shares, Bond Yields and Inflation Rates: An Historical Perspective," in *Share Markets and Portfolio Theory*, 2nd ed, 1989 University of Queensland Press, St Lucia, 1989, pp. 207-11.

Table 3-1 Historical estimates of MRP

Source	Market risk premium (%)
Officer (1989) (based on 1882-1987)[3]	7.9
Hathaway (1996) (based on 1882-1991)[4]	7.7
Hathaway (1996) (based on 1947-1991)[5]	6.6
NEC (based on 1952-1999)[6]	6.6
AGSM (based on 1964-1995, including October 1987)[7]	6.2
AGSM (based on 1964-1995, excluding October 1987)[8]	8.1

The historic data set out above confirms that a range of 6.0 to 8.0% is appropriate for a long term MRP. The mid point of this range, 7.0% is well above the 6.0% figure that has generally been used by regulators in Australia.

3.2 Assessment of point estimate within the range

Regulators have adopted 6.0% on the basis of a belief that the MRP has declined in recent years. In assessing the issues that have led to the adoption of this view, the following considerations are relevant:

3 Op cit.

4 N. Hathaway, "Market Risk Premia" unpublished manuscript.

5 Op cit.

6 National Electricity Code, schedule 6.1, section 3.2.

7 IPART, "Regulation of New South Wales Electricity Distribution Networks," section 5.4.2, Table 5.4, December 1999.

8 Ibid.

- recent trends in the MRP;
- the difference between *ex ante* and *ex post* assessments of the MRP;
- underlying reasons advanced for the adoption of a point in that range;
- international benchmarks; and
- policy considerations.

These are discussed in turn.

3.2.1 Recent trends in MRP

The mean *ex post* MRP as measured on the basis of stock market returns appears to have been lower in the last decade than in previous decades. The QCA has shown this in its Working Paper 4, issued as part of its draft decision on QR's draft undertaking which outlined data on *ex post* MRP for each decade since 1888. [9] This material is reproduced in Table 3-2, which shows relatively low *ex post* MRP over the decade 1988-97.

Table 3-2 Estimates of *ex post* MRP by decade 1888-1997

Period	Mean (%)
1888-97	6.06
1898-1907	8.87
1908-17	6.26
1918-27	11.61
1928-37	8.40
1938-47	6.02
1948-57	7.83
1958-67	9.60
1968-77	-0.07
1978-87	11.82

[9] QCA Working Paper 4, Issues in the Estimation of Queensland Rail's Below Rail Coal Network Expected Rate of Return December 2000

1988-97	3.89 (5.28 when imputation credits are included with a gamma set at 0.50)

However, considerable care must be taken with interpreting this data on account of the standard deviation of the estimates which is sufficiently large to indicate that no statistical inference can be warranted from the data.[10] In other words, the data on MRP does not provide statistically significant results to support the hypothesis that the MRP has reduced over recent years. In a recent paper, Gray estimates that for the period 1883-2000 there is no 'breakpoint' between the years 1960 and 1985 where it can be concluded at a 95% confidence level that the MRP in the second period is lower than the MRP in the first.[11] This result is not surprising - Table 3-2 confirms that the volatility of the MRP on a year-to-year basis has seen many periods in which the *ex post* MRP has been below (above) the historical trend for a significant period, only to exhibit returns above (below) the historical trend in later years. Indeed, every decade showing a mean MRP of below 6.5% has been followed by another with a mean MRP materially above 6.5%. This is the most important aspect about Table 3-2.

3.2.2 *Ex ante ex post* distinction

An important issue in using historical data to set the regulatory MRP is to understand the distinction between *ex ante* (i.e., expectations going forward) and *ex post* (i.e., historical) data on MRP and the relationship between these measures. This is illustrated by the examples contained in Box 1. In broad terms:

- if the *ex ante* MRP is constant, the *ex post* MRP will also be constant and equal to the *ex ante* MRP;

---

[10] This was acknowledged by the QCA "The standard deviation [for the period 1988-1997] was 19.98% which highlights that extreme caution is warranted in interpreting these numbers".

[11] S. Gray, "Issues in Cost of Capital Estimation", submission to Office of the Regulator General Victoria, University of Queensland Business School, 19 October 2001.

- an increase (decrease) in the *ex ante* MRP will result in a decrease (increase) in the *ex post* MRP in the period that the change in expectation occurs. In the period when the *ex ante* MRP is changing, the *ex post* MRP will move in the opposite direction;
- a small movement in the *ex ante* MRP can cause a much larger impact on the *ex post* MRP - in the example contained in Box 1, an increase of only 0.1% in the *ex ante* MRP resulted in a decrease in the *ex post* MRP of 0.99% (7% - 6.01%); and
- the *ex post* MRP moves down and then up before settling on the new equilibrium. The *ex ante* MRP moves directly to the new equilibrium.

Accordingly, a declining MRP over the past decade is entirely consistent with the forward-looking MRP increasing, perhaps substantially. In fact, in the US, the very high returns and *ex post* MRP in the stock market over much of the 1990s was used to support arguments that the *ex ante* MRP was declining. The key point is that a period when the *ex post* MRP departs significantly from the long-run average is likely to be a period when the *ex ante* MRP is changing but in the opposite direction.

Box 1 Examples of relationship between *ex ante* and *ex post*

Assume a simple market that is expected to earn $100,000 of cash flow to distribute to shareholders as a dividend in perpetuity (i.e. no growth). If the risk-free rate of interest is a constant 3% and the *ex ante* MRP is 7%, the cost of equity capital is 10%.[1] Since the earnings is a perpetuity, the value of the market is the earnings divided by the cost of equity capital:

Value of the market = $100,000 / 10% = $1,000,000

If the parameters of the valuation do not change, the value of the market will not change, and the annual return to the shareholders will be the perpetuity. As time passes the *ex ante* MRP of 7% will also be observed as the *ex post* MRP.

Now assume the *ex ante* MRP increases to 7.1% over the course of a year. By the end of the year the cost of equity capital will be 10.1%, and the value of the market will be

Value of the market = $100,000 / 10.1% = $990,099

During this year the shareholders will realise a return by dividend of $100,000 but a loss of value of the investment of $9,901 ($1,000,000 - $990,099) for a net return of $90,099 on the investment of $1,000,000. This gives the shareholder an *ex post* return in this year of 9.01% and a MRP after deducting the risk-free return of 6.01%.

If in the subsequent year the *ex ante* MRP remains at 7.1%, the value of the market will not change and the *ex post* MRP will also be 7.1%.

Alternatively, consider a case where the *ex ante* MRP increases gradually from 7% to 10% over a period of ten years. That is a very gradual change in the MRP, averaging only 0.3% per annum. Using the same assumptions as above, the *ex ante* increase of 3% will increase cost of equity capital to 13% and decrease the value of the market to $769,231. The *ex post* MRP over the ten years will be 5.44%. For the *ex ante* MRP to increase from 7% to 10% over ten years, the *ex post* MRP would have to be observed as decreasing, averaging about 5.44% over the same 10-year period.

3.2.3 Lack of data to support structural change

In its draft decision on GAWB, the QCA identified the following as possible reasons why in its view the recent volatility in the MRP should be extrapolated as a future trend:

- low interest rates, low inflation and stability in the Australian economy;
- high levels of private share ownership and increased institutional ownership of shares arising from changes in superannuation;
- reduced information risks due to improved communication and technology; and
- following the introduction of dividend imputation, the risk premium could have fallen to reflect the additional value of franking credits received on an investment.

The QCA uses this evidence in arguing for the low end of the 6% to 8% range. However, with respect, we question whether these arguments provide a valid basis to draw conclusions of a lower MRP. These factors are considered in turn.

Low interest rates, low inflation and stability

The QCA argues that a period of relative stability may reduce the overall MRP. However, what is not clear is why, under these conditions, the return available on a market portfolio reduces in relation to other available investments, in particular the risk free rate which has reduced significantly over the past decade. Whilst of course lower interest rates reduce the return on the market as a whole, it is not clear why it would reduce the return of the market relative to the risk free rate that is the factor of immediate interest. Indeed, available empirical evidence suggests precisely the opposite effect – interest rates and the MRP are negatively correlated.[12]

---

[12] See Fama, E., and G Schwert (1977), "Asset Returns and Inflation," *Journal of Financial Economics* (v5), pp 115-146; Campbell, J. (1987), "Stock Returns and the Term Structure," *Journal of Financial Economics* (v18), pp 373-399; Ferson, w. (1989), "Changes in Expected Security Returns, Rick, and the Level of Interest Rates," *Journal of Finance* (v44), pp 1191-1217; Shanken, J. (1990), Intertemporal Asset Pricing, *Journal of Econometrics* (v45), pp 99-120;

Moreover, in global capital markets, these factors would be expected to affect currency rates rather than the returns for particular assets (or classes of assets) in the economy. It is therefore clear that other factors have dominated the valuation of the Australian currency in recent times. Accordingly, it would appear unlikely that the factors cited have materially altered the MRP.

Changes in shareholder mix

In its GAWB draft decision, the QCA notes higher level of private shareholding and an increasing role for institutional investors as possible factors in suggesting a reduction in the *ex post* MRP.

Kortian has suggested one possible avenue for this effect.[13] Kortian argued that an increasing proportion of younger shareholders is consistent with a lower MRP as younger workers have longer investment horizons, and the longer the investment horizon, the lower is the risk of equity investments relative to government bonds.

However, data from 2001 suggests these 'trends' may only be short lived. Compared with 2000, not only has the proportion of the population holding shares fallen, but the reductions are the most marked in younger age groups. This is set out in Figure 3.1 As a result, the data does not support the proposition and further suggests caution in moving away from historical trends for policy purposes. The key point is that it is dangerous to infer changes in the long run MRP on the basis of short-term trends in shareholder mix, especially in the absence of a robust empirical relationship between the shareholder group and the MRP.

Brennan, M. 1997, "The Term Structure of Discount Rates," *Financial Management* (v26), pp81-90.

[13] Tro Kortian, "Australian Sharemarket Valuation and the Equity Premium", September 1998, working paper.

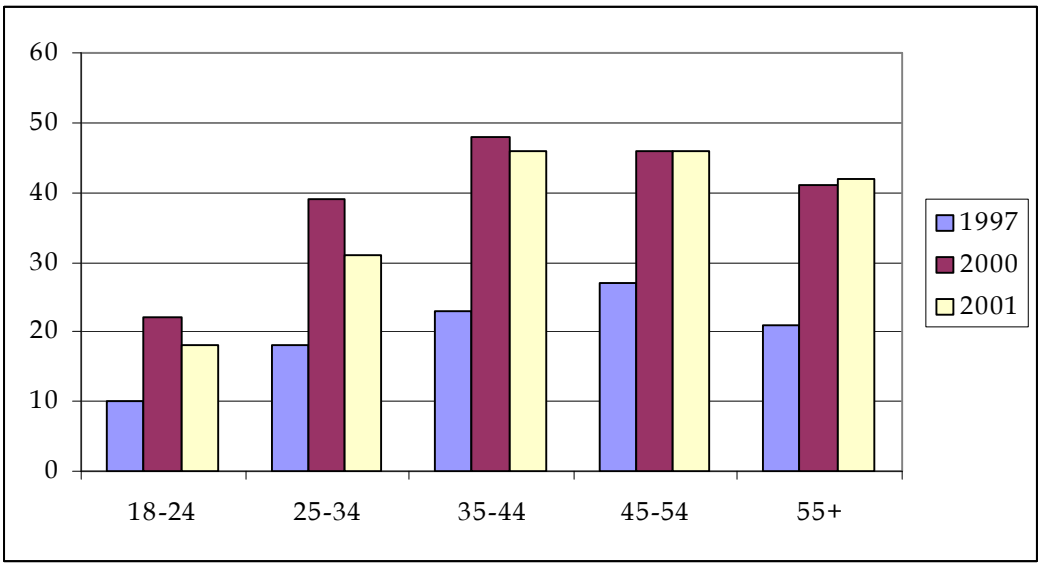


Figure 3.1 Proportion of direct share-ownership by age group, 1997-2001

Moreover, in a competitive market, marginal investors set security prices. For reasons set out in section 5 below, the marginal investor in the Australian stock market is most likely to be an overseas investor. It is therefore this shareholder group that is most likely to influence the *ex ante* MRP.

In this respect, it would be odd to overlook the 100 years of empirical data on the MRP on the basis of a short term change in shareholding, especially given the importance of the MRP as an investment signal for extremely long life assets.

Information flows

The QCA notes that the presence of reduced information risks due to improved communication and technology may have reduced the MRP over recent years. Again,

however, it is not clear why this would reduce the risk of a diversified portfolio relative to the risk free rate. Indeed, if this were the case, we would expect to see less risk averse investors and a reduction in the volatility of the market portfolio. However, recent events suggest that neither of these has occurred as one commentator has observed:[14]

> Recent events would seem to make either of these arguments extremely tenuous. Events that have occurred since September 2001 are usually associated with increased volatility in financial markets and a "flight to quality" as investors collectively move to low-risk assets. This implies that the premiums being offered by high-risk assets are considered to be insufficient, which is certainly inconsistent with a decrease in risk aversion.

Impact of dividend imputation system

There are no statistically robust estimates to support the proposition that the introduction of the dividend imputation system has resulted in a lower MRP. This was stated by the QCA in Appendix C of Working Paper 4:

> There is no conclusive empirical evidence to support the argument that dividend imputation has had a systematic effect on the market risk premium in recent years.[15]

These findings are not surprising. In a small open economy such as Australia, international investors are likely to be the price setting investors. As a result, domestic tax changes are likely to have little or no impact on the overall MRP, given that imputation credits have little or no value to international investors.

---

[14] S. Gray, "Issues in Cost of Capital Estimation", submission to Office of the Regulator General Victoria, University of Queensland Business School, 19 October 2001.

[15] Op cit, p72.

3.2.4 Benchmarking approach to MRP

An alternative way of setting a forward-looking MRP is through a benchmarking approach. Australia is an open and international economy. Investment funds move freely into and out of the country and the currency. For example, as of September 2000 non-resident investors owned 37.5% of the value of the Australian Stock Exchange, the largest single shareholder group by far.[16] In addition, as of 31 December 2000, non-residents held over 30% of all Commonwealth government securities.[17]

The Australian debt and equity markets have only been integrated into world markets for around 20 years. Prior to deregulation, market prices (and in turn the MRP) were significantly affected by government intervention, in particular the restrictions on foreign ownership of shares and exchange rate controls. This resulted in prices of shares and government bonds being predominantly determined by domestic (rather than international) factors. Given these circumstances, it is unlikely that the *ex post* MRP in this market provides the best estimate of an *ex ante* MRP in the current (international) market.

In the absence of sufficient relevant historical information from the current market, an alternative approach to estimating the MRP is through a benchmarking approach. With this approach, a benchmark country is chosen based upon it having a reliable estimate of MRP. Then the potential differences between the MRP in that country and the MRP in Australia are evaluated. These could include taxation, country risk, estimation time horizon and market composition differences.

Bowman recently estimated the Australian MRP from the US MRP using a benchmarking approach to be 7.8% on the basis of:[18]

- a US MRP in the range of 6.0 to 9.0%; and

---

16 Information provided by Australian Stock Exchange. Figures for 19 September 2001

17 Reserve Bank of Australia, "Bulletin Statistical Tables," http://www.rba.gov.au/Statistics/Bulletin/EO3hist.xls

18 R. Bowman "Estimating the Market Risk Premium," *JASSA*, Spring 2001.

- an increment of 0.1% to 2.35% on the US MRP for differences in taxation, market composition, country risk and estimation time horizon between the US and Australia, with 0.3% considered an appropriate adjustment.

Similarly, Ibbotson Associates suggest that the US market risk premium is 7.76% and that based on Australia's country credit rating, the expected return on the Australian market is 1.53% to 2.26% higher than for the U.S.[19]

This benchmarking approach suggests that a figure at least at the upper end of the 6.0 to 8.0% range would be appropriate for Australia.

3.2.5 Policy considerations

As noted above, the historical range for the MRP favoured by finance professionals has been 6.0 to 8.0%. While a number of arguments have been produced to suggest that a figure at the low end of this range may be appropriate, each of these arguments are not supported theoretically nor are they supported by empirical evidence. Other evidence, notably on international benchmarking approaches to the MRP suggest a figure at the high end of the range may be appropriate.

As a result, there is not a strong case for using a figure at the low end of the range. The regulatory consequences of setting too low a MRP/WACC in the form of insufficient investment are greater than those of setting too high a WACC (short run super-normal profits), a point noted by the Productivity Commission.

> The possible disincentives for investment in essential infrastructure services are the main concern. In essence, third party access over the longer term is only possible if there is investment to make these services available on a continuing basis. Such investment may be threatened if inappropriate provision of access, or regulated terms and conditions of access, lead to insufficient returns for facility owners.

---

[19] Ibbotson Associates, (2001), "International Cost of Capital Report 2001," valuation.ibbotson.com.

> While the denial or monopoly pricing of access also impose costs on the community (see above), they do not threaten the continued availability of the essential services concerned. Thus, over the longer term, the costs of inappropriate intervention in this area are likely to be greater than the costs of not intervening when action is warranted. The substantial information and other difficulties that confront regulators in establishing access terms and conditions, make this asymmetry in the benefits and costs of access regulation even more important in a policy context.[20]

This suggests that there is a strong public interest argument in favour of a higher MRP than has been customary in Australian regulatory decision making in recent years.

3.3 Recommendation

It is recommended that the QCA adopt a MRP between 6.5% and 7%. Whilst SunWater considers the higher figure more appropriate, it accepts that a MRP of 6.5% would not be inappropriate given the regulatory precedent in Australia.

---

[20] Productivity Commisssion, "Review of the National Access Regime. Position Paper", March 2001, pp xviii-xix.

4 Systematic risk

The assessment of systematic risk normally involves:

- the appropriate asset beta for SunWater;
- the capital structure that might be assumed for the purposes of assessing the rate of return;
- the appropriate cost of debt, and based on the asset beta and the debt beta, the appropriate measure of the equity beta.

These issues are considered in turn.

4.1 Asset beta

Three sets of considerations were applied in estimating an appropriate asset beta for SunWater:

- an assessment of comparable companies;
- regulatory decisions; and
- an assessment of the factors that impact on the sensitivity of SunWater's returns to movements in the economy.

This section considers these factors in turn, and concludes with a brief summary.

4.1.1 Assessment of comparable companies

Since SunWater, is not listed, there is no time-series of market returns to use to estimate beta. Accordingly, one method that is applied is to consider estimated betas of comparable companies. Ideally, domestic water companies would be used as a basis for comparison to avoid the difficulties associated with comparing betas sourced from different markets.

However, there are no comparable listed entities on Australian stock exchanges. This means that in order to gain an appreciation of the undiversifiable risk associated with SunWater's

business, it is necessary to consider companies listed on other stock exchanges around the world. Whilst this approach clearly has its limitations, in this case there is little alternative.

Accordingly, the process followed was to search globally for publicly listed companies in these industries. The financial markets information was obtained from Bloomberg. Bloomberg calculates and publishes Beta and financial analysis data on all publicly listed companies.

Between thirty and sixty firms by industry sub category (water, filtration and separation and water treatment) were sampled. The samples were large to enable an examination of indicative firms that had betas there were statistically significant.

The down loaded firms were ranked on level of significance of the calculated equity beta based on monthly observations. Monthly observations were taken where possible as beta calculated over longer intervals helps to overcome the infrequency of trading problem.[21]

The returns were regressed on the returns of the appropriate market index. For example US firm returns were regressed on the S&P 500. Data including debt to equity ratio, credit rating and description of business operations was also down loaded.[22] The final sample was reduced to 23 companies through a filtering process based on the similarity of business operations and the statistical significance of the beta.[23]

In this process companies were sought that were reflective of the water industry. For those firms in the water industry the t statistic was calculated to measure statistical significance

---

[21] Equity betas were calculated was using monthly data for a 60 month period. Where it was not possible to obtain 60 monthly observations, the differencing interval was shortened. For example if only one and one half years of data was available, weekly observations were used so that the beta could be calculated over 60 observations.

[22] This is consistent with the Brealey Myers approach to levering and delevering betas from previous decisions. It is also particularly appropriate in this case given the need for an international sample of comparators.

[23] Nevertheless, there was little difference between the final results based on the sample of 23 and those from the unfiltered sample.

and accuracy of each beta calculation. Generally any Beta with an associated t statistic less than 2 was ignored in the analysis. A t statistic of less than 2 indicates that the standard deviation of individual beta observations is unacceptably high such that the average beta is not a meaningful estimate. Raw betas were adjusted in accordance with the standard Bloomberg adjustment.[24] This process resulted in the sample that is set out in Table 4-1.

Table 4-1 International review of asset betas for water companies

Name	Ex	Adjusted $ß_e$	Debt to value	Adjusted $ß_a$
Suez-Strip Vvpr	France	0.55	0	0.55
Cia Saneamento Basico De Sp	Brazil	1.03	0.55	0.54
Shanghai Municipal Raw Water	China	1.00	0.10	0.92
Aguas Andinas Sa-A	Chile	0.73	0.04	0.70
Athens Water Supply & Sewage	Greece	0.93	0.02	0.91
Aguas De Barcelona	Spain	0.71	0	0.71
American Water Works Co Inc	Spain	0.60	0	0.60
Shenyang Public Utilities-H	Hong Kong	0.84	0.18	0.72
Acque Potabili Spa	Italy	0.85	0	0.85
Acquedotto Nicolay Spa	Italy	0.69	0	0.69
Acquedotto De Ferrari	Italy	0.60	0	0.60
Acquedotto De Ferrari- Rnc	Italy	0.55	0	0.55
Mayanot Eden	Israel	0.89	0.22	0.72
South Staffordshire Grp Plc	United Kingdom	0.69	0.09	0.64
Brockhampton Holdings Plc	United Kingdom	0.62	0.12	0.56
Brockhampton Holdings A	United Kingdom	0.58	0.12	0.53
Aguas De Barcelona	Spain	0.85	0.45	0.54
SJW Corp	United States	0.76	0.25	0.61
American States Water Co	United States	0.73	0.38	0.51
Philadelphia Suburban Corp	United States	0.71	0.31	0.54
Southwest Water Co	United States	0.67	0.33	0.49
American Water Works Co Inc	United States	0.64	0.49	0.40
Artesian Resources Corp-Cl A	United States	0.62	0.51	0.38

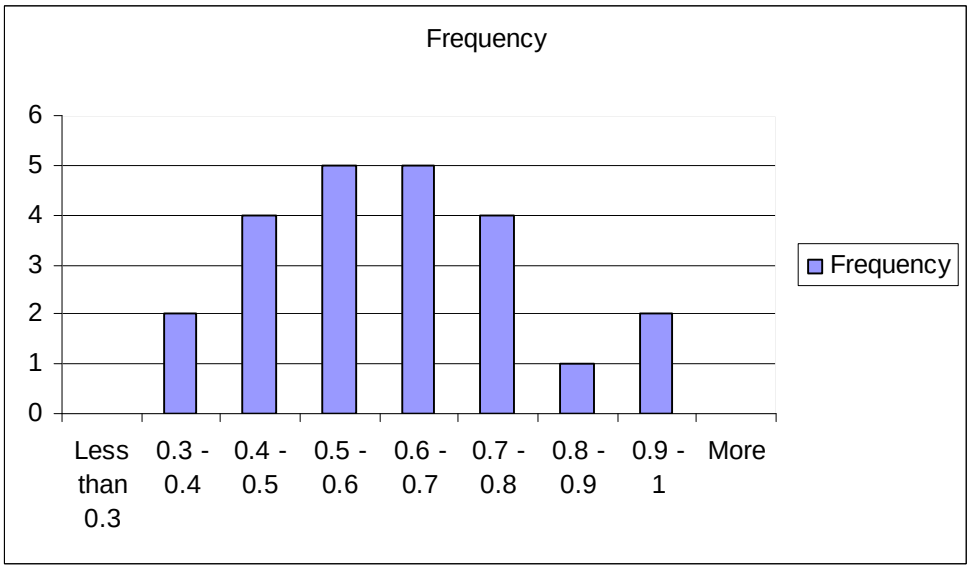
[24] International studies supporting the use of adjusted betas include Sharpe, W.F., Alexander, G.J. and Bailey, J.V. (1995), *Investments*, 5th edition, Englewood Cliffs, Prentice Hall, Blume, M.E. (1971), 'On the Assessment of Risk', *Journal of Finance*, March pp. 1-10; and Blume, M.E. (1975), 'Betas and their Regression Tendencies', *Journal of Finance*, June, pp. 785-795. A conservative debt beta of 0.145 was assumed consistent with the average "A" rating of sample companies. If the QCA considers departing from its previous practice on beta adjustment, SunWater would appreciate the opportunity to make submissions on the matter before the QCA reaches a concluded view.

Average	**0.62**

Source: Bloomberg

A frequency distribution of the asset betas from Table 4-1 is set out in Figure 4.1 below.

Figure 4.1



Frequency distribution of asset betas

The mean of the adjusted asset beta was 0.62 with a standard deviation of 0.14. Consequently, the 95% confidence interval for the asset beta falls between 0.34 and 0.90, broadly reflecting the range of the sample. This confirms the statistical robustness of the estimated adjusted beta of between 0.60 and 0.70, which suggests that an asset beta of 0.60 is entirely appropriate, and, indeed conservative for SunWater.

4.1.2 Regulatory decisions

A breakdown of recent decision on asset beta by regulators in the water sector is given in Table 4.2.

Table 4-2 Recent regulatory decisions – asset betas for the water sector

Year	Regulator	Decision	Asset beta
Australia			
2001	QCA	Gladstone Area Water Board (draft)	0.45
2001	GPOC	Bulk Water	0.30-0.55
2000	IPART	Water authorities	0.30-0.45
2000	IPARC	ACTEW	0.30-0.50
England & Wales			
1999	Ofwat	England & Wales water & sewerage	Approx 0.35-0.45
2000	Competition Commission	Mid Kent and Sutton & East Surrey water	0.50

As seen in Table 4-2, regulatory decisions in Australia have considered a wide range for the asset beta of particular water business of between 0.30 and 0.50. Clearly these estimates of asset beta are materially below those outlined in Table 4-1 above. Nevertheless, to the extent of the inconsistency, it is suggested that the benchmarked beta information contained in Table 4-1 is to be preferred over the regulatory decisions outlined in Table 4.2.

4.1.3 Sensitivity of SunWater's returns to movements in the economy

In assessing SunWater's sensitivity to movements in the economy, the following considerations are relevant:

- operating leverage;
- market power;

- income elasticity;
- terms of contractual arrangements and nature of regulatory regime.

Operating leverage

A company's operating leverage refers to the ratio of fixed to variable costs and the capital intensity of its activities.

SunWater's pricing arrangements distort the analysis of operating leverage to the extent that a firm subject to lower bound charges will exhibit materially lower operating leverage ratios than would be the case if the prices had been set according to the equivalent of "upper bound" pricing principles.

Accordingly, for schemes like Burdekin Haughton, where regulatory arrangements impose prices much closer to lower bound rates, a misleading view of the underlying volatility of the businesses cash flow relative to the economy can be created. Accordingly, in regulating lower bound prices, a consequence is that the variation in returns is much lower than would be the case if SunWater's prices were determined consistently with other entities in the regulated infrastructure sector. Indeed, in the extreme, all covariance with the economy can be removed by insisting that the prices be lowered sufficiently to remove that volatility.

Nevertheless, it is submitted that the critical issue for resolution of the WACC, and with it the asset beta for SunWater is to attract capital to the sector for new investment. By focussing on this rather than the volatility of the cash flows per se some of the distortions induced by the current pricing arrangements are avoided. If this approach is adopted, then SunWater's operating leverage increases substantially to a level that is higher than for other regulated infrastructure businesses.

Market power

Whilst approximately half of the consumptive water in Queensland is sourced using privately owned infrastructure, it is recognised that those growers in the Burdekin Haughton region who do not have access to groundwater have limited alternative sources of water. Accordingly, SunWater possesses a degree of market power in the region, although caution must be applied in extending this market power to the other regions serviced by SunWater's infrastructure.

Income elasticity

Whilst SunWater's demand is not highly correlated with economic activity, its cash flows are sensitive to interest rate movements.

Historically, SunWater has experienced a low level of bad debts. This is partly due to the low level of charges for the services provided by water infrastructure providers relative to other industries. Nevertheless, if SunWater's charges were to reflect upper bound principles, then it would be expected that credit risks would more closely mirror other utility businesses.

Terms of contractual arrangements and regulatory environment

The current regulatory regime provides SunWater with the certainty of long-term contracts. However, it also imposes price limits so that SunWater's charges are near SCARM lower bound levels. As discussed above, this distorts the assessment of the sensitivity of SunWater's cash flows to the economy.

Typically in Australia, regulatory processes develop prices or revenue limits based on the equivalent of the SCARM upper bound, rather than the SCARM lower bound. A significant implication of these arrangements in the context of SunWater's business is that a substantial degree of price risk would be associated with any new infrastructure development. This is in contrast to several of the other sectors that have been the subject of QCA investigation, including electricity distribution and access charges for coal. It is argued that the uncertainty associated with these investments generates a pricing risk which should be reflected in SunWater's beta.

4.1.4 Summary

It should be noted in undertaking this assessment, consideration must be given to the fact that at the end of the day precise estimates are elusive – in estimating the systematic risk one can be seduced by the illusion of precision. Accordingly, in developing an approach it is proposed to generate a range based on available empirical data, and from that range suggest an appropriate point for SunWater given its particular characteristics.

If such an approach is adopted, then it is submitted that an asset beta of 0.60 is conservative in light of the analysis of international water providers that has been undertaken. This outcome is consistent with an assessment of SunWater's operating environment which

suggests that a relatively high asset beta is appropriate, mainly on account of the operating leverage and pricing risk that would be present were SunWater able to price the provision of its water infrastructure services in a manner that is consistent with the attraction of capital for new investment.

4.2 Capital structure

It is noted that it is commonly regulatory practice to assume a capital structire for a regulated entity.

Currently, SunWater has no net debt. The pricing structure it currently applies provides very little scope for it to assume net debt without being exposed to an unacceptable level of solvency risk. This is a direct and inevitable result of its current pricing structure.

The regulatory practice of assuming a notional level of debt consistent with an efficient level of gearing is recognised. However, it is submitted that it does not make any sense to apply this approach in SunWater's case.

In the current pricing environment, it is submitted it would be inappropriate to assume any level of gearing that is different to that currently applying to SunWater. Moreover, given the QCA has applied the Brealey Myers approach to levering and delevering of the equity beta it is further submitted that the gearing levels that are adopted will not affect the post-tax nominal cost of capital that arises for a given asset beta.

Accordingly, it is recommended that it be assumed that SunWater's capital structure be based on its current capital structure – i.e. be assumed to be 100% equity.

4.3 Debt and equity betas

If SunWater's actual capital structure is adopted as the benchmark for the assessment of the debt and equity betas, then the result is that the asset and equity betas will be identical – as there is no financial risk attached to the equity beta.

4.4 Recommendation

It is recommended that it be assumed that SunWater's equity beta be assumed to be in the range of between 0.60 and 0.70. Accordingly, if a conservative approach were adopted, it would be appropriate to estimate the asset beta at 0.60.

5 Value of imputation credits

The dividend imputation mechanism used in Australia is intended to ensure that profits are taxed only once for Australian resident taxpayers but not for foreign shareholders. Dividends that are paid out of after-corporate-tax profits can be accompanied with a 'franking' credit to the extent of the corporate tax paid. The value of franking credits is represented with the parameter gamma (γ).

The value of franking credits will be determined at the level of the investor and will be influenced by the investor's tax circumstances. As these will differ across investors, the result will be a value of the franking credit between nil and full value (i.e., a gamma value between zero and one). There has been an increasing body of literature focused on estimating the value of gamma. The early literature generally found a value of around 0.5, and this figure has been used in most regulatory decisions to date.

Some of the key issues in determining a gamma for the WACC revolve around:

- the appropriate ownership assumption;
- the identity of the marginal investor; and
- the net impact of recent taxation changes.

5.1 Appropriate ownership assumption

The market value of distributed franking credits should be established at the market level, not the firm level. So for regulatory purposes, current shareholding should be irrelevant. Therefore, we agree in principle with the QCA where it did not take into account the ownership structure of GAWB.[25] Similarly, the gamma for SunWater should not be based on

[25] If the QCA considers departing from its previous practice on this issue, SunWater would appreciate the opportunity to make submissions on the matter before the QCA reaches a concluded view.

its current ownership structure.[26] Nevertheless, this raises the issue as to the identification of the marginal investor for the purposes of assessing imputation credits.

5.2 Identity of the marginal investor

The gamma used in the CAPM is generally derived as a market average. For example in the GAWB decision, the QCA based its valuation of imputation credits of 0.50 reflecting the estimated distribution rate of 0.8 multiplied by the estimated utilisation rate of 0.6, equating to 0.48, or approximately 0.5.

Nevertheless, it is submitted that it is the *marginal* rather than *average* value of gamma that is likely to be more appropriate for setting a forward-looking value consistent with the aims of the CAPM. This is because share prices are set by price setting (marginal) investors.[27]

This set of investors may have little relationship to the shareholder mix of a company at a point in time. For publicly listed Australian companies, the marginal investor is likely to be an international investor. This can be seen in light of the extent of foreign ownership of Australian companies and the relative size of the Australian market in global terms.

Foreign shareholders own over 28% of Australian companies[28], non-resident investors own around 37.5% of the value of the Australian Stock Exchange, the largest single shareholder

---

[26] This is in contrast to the approach adopted by the Water Reform Unit where a gamma of 1 was assumed. Such an assumption relies upon the identity of the shareholder as being the only consideration relevant to the determination of gamma. Nevertheless, in a submission on behalf of QR to the QCA, Green Edwell Consulting, who undertook the analysis of the cost of capital for the Water Reform Unit, argued that the QCA should adopt a gamma of 0.50.

[27] Officer RR (1994) "The Cost of Capital under an Imputation Tax System", Accounting and Finance, 34, 1-18.

[28] ABS statistics, 5302.0 Balance of Payments and International Investment Position, September Quarter 2001

group by far[29] and more than 30% of the trading on the Australian share market is due to foreign investors[30].

It is therefore clear that foreign investors exert substantial influence on Australian stock market prices. Indeed, once it is recognised that Australia is a net importer of capital and that Australian equities represent approximately 1% of the global market, it is difficult to avoid the conclusion that the marginal shareholder is in fact a foreign shareholder who at best will experience considerable difficulty accessing imputation credits.[31]

For example recent tax changes require an investor to hold a stock for 45-days to be eligible for the franking credits. This effectively eliminated arbitraging and dividend stripping, resulting in the end of the secondary market for the credits, reducing the value of franking credits for foreign investors.

These factors suggest that gamma may be as low as zero. This is consistent with a recent study of Cannavan, Finn and Gray,[32]which showed that for companies with substantial foreign ownership, the market value of tax credits is close to zero.[33]

---

29 Information provided by Australian Stock Exchange. Figures for 19 September 2001

30 ASX Fact Book 2001.

31 This holds irrespective of whether or not Australian residents are the first to invest in these companies – such investors are merely inframarginal but do not set equilibrium security prices. See also Officer (1988), "A note on the Cost of Capital and Investment Evaluation for Companies under the Imputation Tax", *Accounting and Finance*, 28, 65-71.

32 Cannavan D, Finn F. and Gray S. (2001) 'The Value of Dividend Imputation Tax Credits, unpublished working paper, Department of Commerce, The University of Queensland.

33 Nevertheless, it is recognised this area is not settled and that the result of dividend drop-off studies have indicated higher values for gamma. Nevertheless, more recent studies still suffer from selection bias, high standard users and create streaming effects in the data analysis that affect the results.

This result is not dissimilar to the outcome we find in all competitive markets. For example, in any market, consumers pay for a product at the margin, irrespective of *their* valuation of the product. The difference between a consumer's valuation of a product (as determined by the demand curve) and the market price for the product (at the margin) is the well-known concept of consumer surplus.

It is submitted that this is precisely the outcome that is relevant in the context of the valuation of imputation credits. Whilst Australian taxpayers may gain the benefit of imputation, in the global market that we face, these benefits are simply not relevant to the valuation of the companies they hold shares in, since, at the margin, the shareholders who set the price do not place a value on imputation credits.

And it is in this context that imputation credits need to be considered – imputation (and by implication taxation) is but one of a host of factors that drive investment decisions. Other factors include diversification, opportunity, growth, synergistic benefits and so on.

Indeed, if the reasoning that imputation credits driving investment decisions were correct, we would be unlikely to see substantial Australian investment abroad since such investments do not gain the benefit of imputation. However, Australian investment overseas is considerable, and accordingly, the importance of accessing imputation credits is unlikely to be of key importance for such decisions.[34] Accordingly, the arguments concerning the valuation of credits does not pay sufficient regard to all of the other factors that determine the identity of the marginal investor and hence security prices.

5.3 Recent changes to taxation law

The QCA has adopted the view in the GAWB decision that it is too early to assess whether changes to capital gains tax and the full flow through of imputation credits has had any impact on the valuation of gamma. NECG agrees with this position to the extent that Australian domestic conditions are relevant to the setting of the gamma for regulatory purposes.

---

[34] For example, total Australian overseas investment amounts to over $375 billion, approximately one half of the capitalisation of the Australian Stock Exchange.

Nevertheless, if the QCA considers departing from its previous practice on any of these issues, SunWater would appreciate the opportunity to make submissions on the matter before the QCA reaches a concluded view.

Moreover, NECG believes that is good reason to suggest there would be little or no change to the valuation of imputation credits based upon the impact on the marginal (that is, foreign) investor. The tax law change will only impact gamma to the extent that the impacted investors play a part in the determination of equilibrium security prices, that is, they are marginal investors. We have already stated that this is not likely to be the case because of the extent of foreign ownership in Australia and the extent of foreign investment by Australian and Australian companies. Tax and Imputation considerations are but one factor influencing valuation decisions.

5.4 Recommendation

SunWater acknowledges that the range of 0.30 to a maximum value of 0.50 for gamma is well established in Australian regulatory decision-making.[35]

Nevertheless, there is clearly much uncertainty over the estimate of gamma. SunWater would like to draw the QCA's comments in relation to the policy issues associated with the setting of the cost of capital and the serious and asymmetric consequences of setting such a rate below the appropriate opportunity cost.

SunWater considers the value of imputation credits should be equal to 0. Clearly, however, if despite the arguments that have been raised in this submission, the QCA feels compelled to adopt a value of gamma that is within the range that has been established in regulatory decisions, then notwithstanding the reservations expressed about the range, it would be more appropriate to estimate gamma at 0.30.

---

35 IPART and IPARC have consistently adopted a range for gamma between 0.30 and 0.50.

6 Other factors indirectly affecting the WACC

6.1 Allowance for asymmetric diversifiable risk

6.1.1 Nature of asymmetric risk

Regulated entities such as water infrastructure providers face a range of risks that are asymmetric: when the possible outcomes in one direction are different than the possible outcomes in the opposite direction. These include:

- assets becoming stranded as customers change consumption patterns;[36]
- regulatory bodies adjusting policies or regulatory frameworks; and
- when extreme events occur, the regulated firm may have to bear the costs when they are negative but not be allowed to commensurately benefit when the gains are positive.[37]

These risks can have a number of characteristics that differentiate them from other risks faced by the company.

First, the risks are unavoidable and asymmetric, i.e., the possible negative outcomes are significantly larger than the possible positive outcomes. Therefore they are risks that cannot be diversified away by a water infrastructure provider. Investment opportunities that would

---

[36] An extreme example of stranded asset risk would be if a water infrastructure facility could not sell any water for a positive price. The water infrastructure assets would be in place but stranded and the owner would not be able to recover its investment. The stranding risk is, itself, dependent on the mode of asset valuation and depreciation used in price setting. Lower asset valuations and accelerated depreciation lead to reduce the firm's exposure to stranding risk.

[37] If a natural disaster such as an earthquake destroyed a dam wall, the firm would likely be expected to bear the cost.

have compensating risk profiles generally do not exist: large upside potential, but little or no downside. Thus it just is not feasible to develop a portfolio of investments in which an unfavourable development in one portfolio area is matched by a favourable development in another area.

Secondly, insurance against these risks is not commercially available. Accordingly, there is no alternative for the water infrastructure provider assuming the risk.

Thirdly, these are risks that cannot be diversified away by investors in the water infrastructure provider. This is a critical point. The reason that they cannot be effectively diversified away is that the counter-parties to the risks are water users rather than public companies in which investors can invest.

Finally, these risks are not accommodated in CAPM, which is used to estimate the cost of equity capital for the WACC approach used here. This is because CAPM assumes a normal distribution of returns, which clearly cannot be met where there are asymmetrical risks.

The provision of water infrastructure services face significant asymmetric risks that meet all of the tests set out above. As these risks clearly exist, the CAPM requires modification or supplementation. The issue then becomes how should these risks be reflected in the regulatory process.

6.1.2 Approach to addressing in regulatory processes

There are three approaches to reflecting asymmetric risks in the regulatory process:

- the risk can be reflected as an actuarially fair insurance premium and that amount imputed to the operating costs of the company. This amount would be included in the determination of an appropriate price for the declared services;
- the risk can be reflected in the WACC so that the result is equivalent to recovering the actuarially fair insurance premium. However, it is submitted that adjusting the cash flows is superior to adjusting the WACC as the latter can only be rigourously calculated by reference to the former; and
- the risk can be handled by recovering the costs once the adverse event occurs through prices. This approach however has significant limitations in terms of:

- there is no asset against which recovery could be made in the event that demand is insufficient - if the project fails due to diversifiable risk associated with demand, there is no other asset against which could underpin recovery of the water infrastructure provider's losses;

- moral hazard problems - the firm is exposed to the risk that the regulator might not allow full recovery when the adverse event actually does occur; and

- intergenerational equity concerns – a different set of customers is likely to bear the cost of the adverse event to those that benefited from the existence of the asset before the event occurred.

It is submitted that the most appropriate approach is to reflect these risks as a cash flow cost for the regulated business in the form of an actuarially fair insurance premium. This effectively compensates the firm for the actuarially fair premium for insuring against this risk. The fact that insurance is not available to cover these risks provides an intuitive explanation of why this risk needs to be recognised and how regulators should handle it.

In other words, it properly reflects the issue as an insurance problem. If insurance was available, the water infrastructure service provider could take out insurance coverage. Of course, if it did so, the expense of the insurance should be accepted by a regulator as an efficient cost of providing the regulated service. So the company could eliminate the risk with no adverse impact on its profit. Since insurance coverage is not available, the company is forced to self-insure.

Accordingly, it is not thought that the asymmetric risk is an issue for the WACC per se but should be comprehended in the context of the cash flow modelling underlying a price setting process. SunWater would appreciate the opportunity of putting its views on the appropriate quantum of the appropriate adjustment should this issue emerge in the context of the current investigation.

6.2 Issuance costs

Another factor indirectly affecting the WACC relates to the issuance costs associated with securing funding from both debt and equity holders.

The cost of debt capital in the WACC is the cost of debt to the entity. However, there is a difference between the rate to the investor (lender) and to the issuer (borrower – in this case,

the regulated firm) on account of the annualised cost to the firm of issuing the debt. These costs are called issuance (or flotation) costs and consist of underwriting and management fees and direct costs such as legal and accounting fees.[38]

A number of studies have investigated the issuance costs of debt offerings to the public. The study that is most cited estimated the total direct issuance costs as a percentage of the total proceeds for US corporations during the period 1990 to 1994. The costs for large issues averaged as follow (proceeds in US$ millions):[39]

Proceeds	Total Costs
$100 – 200	2.31%
$200 – 500	2.19%
>$500	1.64%

Alternatively, debt may be issued by private placement directly to a lender. The issuance costs of a direct placement are considerably lower than a public issue. However, the interest rates paid on private placements are usually higher than those on a public issue. Brealey and Myers state that "a typical differential (between the interest rate on public and private issues) is on the order of 50 basis points."[40] Hays, Joehnk and Melicher conducted an empirical study of the difference in rates between public and private debt issues and found that the

---

38 The importance of debt issuance costs is discussed in many textbooks on corporate finance. For example, see S. Ross, R. Westerfield and J. Jaffe, Corporate Finance (5th ed), 1999 (Irwin/McGraw-Hill, Boston), p 416, or E. Brigham and L. Gapenski, Intermediate Financial Management (5th ed), 1996 (The Dryden Press, Fort Worth), pp 169-171.

39 I. Lee, S. Lochhead, J. Ritter and Q. Zhao, "The Costs of Raising Capital," Journal of Financial Research, Spring 1996, pp 59-74.

40 R. Brealey and S. Myers, Principles of Corporate Finance (5th ed), 1996 (McGraw-Hill), p 401.

yield to maturity on private placements was 0.46% higher than on similar public issues.[41] The differences are significant in that they refer to the rate of return. Nevertheless, private placements have the advantage of speed of issue and more flexible debt contracts.

Whilst the application of this principle for the cost of debt has limited application to SunWater on account of its capital structure, the analysis is nevertheless useful on account of the fact that similar considerations apply to the cost of equity. The key difference is that equity, once issued, is of a more enduring quality to debt that is required to be repaid by definition.

Nevertheless, the idea can be illustrated by the example of an individual selling a house through a real estate agent. If the house is sold for $200,000 and the real estate agent's commission is 5%, the house costs the buyer $200,000, but the seller only receives $190,000. The difference is the selling cost.

Similar considerations apply to the cost of raising equity for two reasons:

- any acquisition of an equity interest will ultimately be subject to costs in connection with exit from the market (whether it is a primary or a secondary market, although the former will be higher than the latter); and
- the need to send an appropriate signal in relation to the cost of raising new equity.

To understand the importance of allowing for the costs associated with the acquisition or sale of an asset in the primary market, the example of the sale of the house alluded to above is useful.

If the returns from the house were considered in the context of the regulatory returns provided, then, the buyer of the house would need to discount the purchase price on account of the discounted net present value of its selling expenses in the future. Failure to accommodate these costs represents a disincentive to invest in the industry. This is because a possible developer would never be able to recover its costs in establishing an asset were it unable to recover its exit costs. This reasoning applies to primary and secondary markets –

---

41 P. Hays, M. Joehnk and R. Melicher, "Determinants of Risk Premiums in the Public and Private Bond Market," Journal of Financial Research, Fall 1979.

although in regulatory exercises, it will normally be the former that is the relevant market for recognising these costs.

Accordingly, consideration of the costs of issuing equity as a cash flow item represent a legitimate cost for a business in the same way as the costs of securing debt are considered. The net present value of the costs associated with the sale of the regulated asset in the primary market therefore should be incorporated into the cash flow modelling for regulatory purposes on a representative basis.

Similarly, unless the costs of issuing equity are considered as a legitimate cost for the owner of a regulated business, there will be a strong disincentive to expand the business to the extent that the expansion requires the issue of equity capital. Just as the WACC is intended to provide an indication of the opportunity cost of an investment in a particular facility, the costs associated with raising equity must be incorporated into the regulatory process. These costs are merely an additional opportunity cost associated with the securing of funds for an investment and should be treated accordingly for regulatory purposes.

Indeed, for a developer such as SunWater, it would be appropriate to consider both sets of costs in the cash flow modelling for a regulatory exercise.

7 Calculation of WACC

In estimating WACC, a number of parameters are typically identified with reference to a range as has been the case with this submission. Adopting conservative values for each parameter in the range yields an estimated post-tax nominal WACC of 9.85% as set out in Table 7-1 below.

Table 7-1 WACC rates

WACC/CAPM parameters	Rate
Risk free rate	5.95%
Debt proportion	0%
Equity proportion	100%
Debt risk margin	0
Cost of debt	NA
Market risk premium	6.5%
Asset beta	0.60
Debt beta	0
Tax rate	30%
Franking credits – gamma	0
Equity beta	0.60
Nominal, post-tax cost of equity	9.85%
Nominal, post-tax "vanilla" WACC	9.85%