AVISTA RATE CASE

UE-991606 UG-991607

APPENDIX D

Exhibit _____ (SGH – 5)

CAPITAL ASSET PRICING MODEL

There are many reasons why the Capital Asset Pricing Model (CAPM) should be used with caution in estimating the cost of equity capital. The CAPM was originally designed as a point-in-time tool for selecting stock portfolios that matched a particular investor's risk/return preference. Its use in rate of return analysis to estimate multi-period return expectations for one stock or one type of stock, rather than a diversified portfolio of stocks, takes the model out of the context for which it was intended. Also, questions regarding the fundamental applicability of the CAPM theory and the veracity of beta have arisen recently in the financial literature.

Over the past few years there has been much comment in the financial literature over the strength of the assumptions that underlie the CAPM and the inability to substantiate those assumptions through empirical analysis. Also, there are three fundamental problems with the key CAPM risk measure (beta) that indicate that the CAPM analysis is not a reliable primary indicator of equity capital costs. The first two have been widely known for some time, but the third, and perhaps most damaging criticism, has emerged only in the past few years.

First, cost of capital analysis is a decidedly forward-looking, or *ex-ante*, concept. Beta is not. The measurement of beta is derived completely with historical, or *ex-post*, information. Therefore, the beta of a particular company, because it is usually derived with five years of historical data, is slow to change to current (i.e., forward-looking) conditions, and some price abnormality that may have happened four years ago could substantially affect beta while, currently, being of little actual concern to investors. Moreover, this same shortcoming which assumes that past results mirror investor expectations for the future plagues the market risk premium in an ex-post, or historically-oriented CAPM.

Second, the beta coefficients for any individual stock have very low "r^2" values and, statistically, must be considered relatively poor indicators of company-specific risk.

The statistical reliability of beta is thought to increase when it is used to identify the risk/return profile of a diversified group of stocks. However, that is not the manner in which beta is used in regulation, and the low statistical reliability of beta is problematic in cost of capital analysis. As a result of the low statistical reliability of beta, different investor services offer different -- and sometimes widely divergent -- estimates of beta.

Third, a recent study performed for the Center for Research in Security Prices at the University of Chicago Graduate School of Business shows that the assumed relationship between beta, risk and return (i.e., beta varies directly with risk and return) simply does not exist in the marketplace. As Value Line reported in its Industry Review published in March of 1992:

> "Two of the most prestigious researchers in the financial community, Professors Eugene F. Fama and Kenneth R. French from the University of Chicago have challenged the traditional relationship between Beta and return in a recent paper published by the Center for Research in Security Prices. In this study, the duo traced the performance of thousands of stocks over 50 years, but found no statistical support for the hypothesis that the relationship between volatility and return is significantly different from random. Indeed, professor Fama concluded, 'The fact is that Beta, as the sole variable explaining returns on stocks, is dead.' These findings support previous studies that have called into question the real-world applicability of the CAPM Beta, including papers by Keim (Financial Analysts Journal, 1986), and Roll (Journal of Financial Economics, 1977). Never before, however, has the lack of a statistically significant relationship between beta and return been so rigorously and dramatically established." (Value Line Industry Review, March 13, 1992, p. 1-8)

A graphical summary of the findings published in the Fama and French article ("The Cross-Section of Expected Stock Returns," The Journal of Finance, Vol. XLVII, No. 2, June 1992, pp. 427-465) is shown below in Chart I:

CHART I.
MONTHLY STOCK RETURNS v. BETA
1963-1990
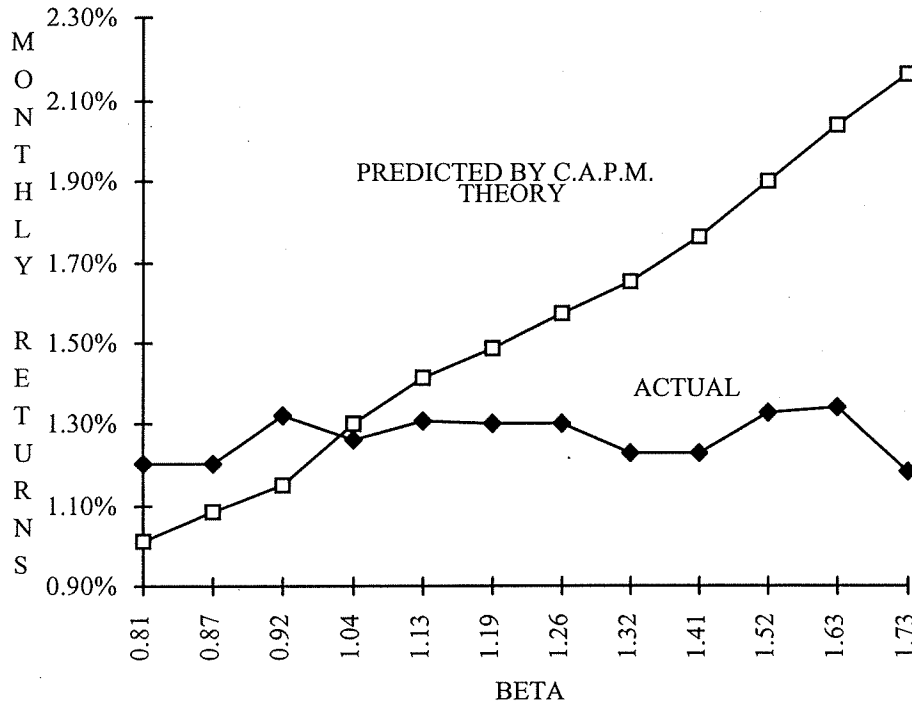
Graphing monthly returns against the average beta for the different stock groupings presented by Fama and French shows that the actual risk/return relationship that has existed over the 1963-1990 period (labeled "actual" in Chart I) is vastly different from that predicted by the CAPM theory. For example, Fama and French found that there was little difference in the average monthly returns of stocks with high betas (beta = 1.73, monthly return = 1.18%) and stocks with low betas (beta = 0.81, monthly return = 1.20%), while the assumption embodied in the CAPM is that the returns for those types of stocks should be substantially different. These findings led the researchers to conclude:

> "In short, our tests do not support the most basic prediction
> of the SLB [Sharpe-Litner-Black, CAPM] model, that
> average returns are positively related to market ßs." (Id., p.
> 428)

Fama and French have continued their investigation of the CAPM since their

1992 article and have postulated that a more accurate CAPM would use two additional risk measures in addition to beta. Their three-factor CAPM uses relative size as measured by market value of the firm's stock compared to that of the market index and relative book value-to-market value ratio compared to that of the market index as additional measures of risk[1]. The continuing research of Fama and French indicate that their three-factor CAPM is theoretically superior to the "standard" CAPM which relies on betas as the sole indicator of relative risk, producing results which more closely mimic historical experience.

However, it is important to note that while those authors tout the superiority of their three-factor CAPM to the single-beta CAPM on theoretical grounds, they recognize that there are significant problems with any type of asset pricing model when it comes to using the model to estimate the cost of equity capital. In "Industry Costs of Equity" a working paper published by the Center for Research in Security Prices (Revised October 1996), Fama and French point out quite clearly that the volatility inherent in the historical data is such that a cost of equity estimate produced by any asset pricing model -- whether the traditional CAPM or their three-factor CAPM -- is subject to wide error:

> "We do not take a stance on which is the right asset pricing model. Instead we use both the CAPM and our three-factor model to estimate industry costs of equity (CE's). Our goal is to illustrate in detail two problems that plague CE estimates from any asset pricing model.
> The first problem is imprecise estimates of risk loadings [betas or beta-equivalents for other risk measures]. Estimates of CAPM and three-factor risk loadings for industries would be precise if the loadings were constant. We find however, that there is strong variation through time in the CAPM and three-factor risk loadings of industries. As a result, if we are trying to measure an industry's current risk loadings and cost of equity, estimates from full sample (1963-1994) regressions are not more accurate than the imprecise estimates from regressions that use only the latest three years of data. And industries give an understated picture of the problems that

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[1] Fama and French postulate that firm size and book-to-market ratio effectively proxy the risk-return characteristics of earnings-price ratios and sales growth, the latter having been determined to have more explanatory power with regard to relative risk and return than beta alone.

will arise in estimating risk loadings for individual firms
and investment projects.

The second problem is imprecise estimates of factor
risk premiums. For example, the price of risk in the CAPM
is the expected return on the market portfolio minus the
risk-free interest rate, $E(R_M)-R_f$. The annualized average
excess return on the Center for Research in Security Prices
(CSRP) value-weighted market portfolio of NYSE, AMEX
and NASDAQ stocks for our 1963-1994 sample period is
5.16%; its standard error is 2.71%. Thus, if we use the
historical market premium to estimate the expected
premium, the traditional plus-and-minus-two-standard-error
interval ranges from less than zero to more than 10.0%.

Our message is that uncertainty of this magnitude
about risk premiums, coupled with the uncertainty about
risk loadings, implies woefully imprecise estimates of the
cost of equity." (Fama, French, "Industry Costs of Equity,"
Center for Research in Security Prices at the University of
Chicago Graduate School of Business (First Draft March
1994, Revised October 1996), pp. 1-2)

While this recently published conclusion as to the imprecision of equity cost

estimates produced by CAPM-type models does not negate the risk/return basis of asset

pricing, it does definitely call for a more accurate measure other than beta (or other risk

indicators) with which asset returns can be more reliably indexed. However, unless and

until such an index is published and widely accepted in the marketplace, CAPM cost of

equity capital estimates should be relegated to a supporting role or informational status.

Therefore, for the reasons set out above, I use the CAPM for informational purposes and

do not rely on that methodology as a primary equity capital cost estimation technique,

and I recommend that the Commission adopt a similar view toward the CAPM cost of

equity capital estimates presented in this proceeding.