

## SUMMARY OF ANALYTICAL RESULTS AND CONCLUSIONS

The purpose of the study presented in this report is to identify and to define the economic parameters used by knowledgeable and informed persons who may be engaged in the operating and buying or selling of oil and gas producing properties for the valuation and appraisal of California oil and gas<sup>1</sup> properties. While the focus of the study is upon (a) the effective discount rates that equate to Fair Market Value, and (b) the escalation rates used to project product prices and operating costs, the study also examines other economic parameters and valuation criteria that have influence on the appraisal process

Two methods are used to derive discount rates which can be used as a foundation for oil property appraisal in the marketplace and/or in regulated valuation situations such as ad valorem tax applications. These methods are: (1) derivation of effective market value discount rates from market transactions, and (2) calculation of an appropriate discount rate using the "*Cost-of-Capital*" approach. Both of these discount rates are derived on a Before Income Tax ("*BFIT*") basis. Escalation rates for product prices and operating costs were derived from market sales.

The major objectives of the study, which are emphasized in this report, are:

1. To determine the most appropriate method and source(s) of data for estimating the fair market value discount rate for use in appraisal of oil and gas properties.
2. To define the relation between (a) the Cost-of-Capital and market derived discount rates, and (b) modern financial practice in the oil and gas industry.
3. To rationalize the data obtained from market sales with traditional and contemporary evaluation methods used in modern real estate and oil property appraisal practice.
4. To use the data developed at completion of objectives 1 through 3 to investigate, analyze, and resolve issues and questions regarding the use and application of discount rates and other economic parameters in the appraisal of oil properties in California and elsewhere in the United States and Canada.

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<sup>1</sup> Hereinafter, unless otherwise stated, "*oil properties*" will refer to properties which produce hydrocarbons including crude oil, associated gas, dry gas, condensate and other products.

## Summary of Cost-of-Capital Analysis

A group of 40 public oil and gas companies was analyzed to estimate the weighted average Cost-of-Capital ("WACC") at year-end 2000 for the Major/Integrated and Independent/Non-Integrated segments of the industry and for the combined segments. The companies provide a representative sample of prospective and actual purchasers of oil properties. The WACC determined in this study is a Before Federal Income Tax ("BFIT") value. The results of this part of the study are summarized below.

### WEIGHTED AVERAGE COST-OF-CAPITAL (BFIT) @December 31

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>
Integrated, %	14.6	13.2	15.6	15.5	16.1	14.2	16.6	15.1	15.7
Independent, %	15.9	14.0	18.2	14.5	15.9	14.0	16.1	15.8	15.6
Combined, %	15.5	13.8	17.3	14.8	16.0	14.1	16.2	15.6	15.6

The determination of a BFIT WACC allows direct comparison of WACC to the discount rates derived from the market sales. This comparison indicates that the annual mean market derived discount rate is consistently greater than the annual WACC.

	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>
Discount Rate, %	25.5	24.2	25.6	22.4	23.6	20.6	25.5	17.1	ND
WACC, %	15.5	13.8	17.3	14.8	16.0	14.1	16.2	15.6	15.6

Work done in previous studies was expanded in order to determine (a) the extent to which the difference between the WACC and the market derived discount rate can be quantified, and, if the difference can be quantified, then (b) determine the extent to which that quantification can be applied to WACC derived discount rates to simulate market rates of return.

Analysis was done using standard real estate appraisal methods to estimate that portion of the difference between Cost-of-Capital discount rates and market rates. This analysis found that use of the Hoskold Method is of measurable but limited utility in adjusting the Cost-of-Capital derived discount rate.

## Summary of Market Sales Analysis

*Unless otherwise specifically stated, market sales discount rate data reported in this study is in the form of the risk-inclusive<sup>2</sup> Internal Rate-of-Return of the cash equivalent purchase price on the buyer's BFIT cash flow. Only transactions with Proved reserves, as defined by the purchaser of the property (hereafter "the Buyer"), are considered for this study. In those cases where transactions include Unproved reserves, only the Proved portion of the reserves and the cash flow derived therefrom are used in the analyses provided that the Buyer has specifically apportioned the purchase price and cash flows between or among the Proved and Unproved reserves.*

*No adjustments of any kind are made to the Buyer's evaluation(s) except through the use of the data supplied by the Buyer as part of the evaluation. No changes, alterations or adjustments were made to the Buyer's evaluations through the imposition of factors not considered by the Buyer.*

Based on information obtained for this study, there have been over 700 transfers of interests in oil and gas properties during the period from January 1, 1983 to December 31, 2001 that could be classified as market value transactions. Detailed appraisal information has been obtained and analyzed on 267 of these transactions.<sup>3</sup> This information includes, but is not limited to, the engineering and economic property evaluations and supporting data provided by the buyers of the properties and which was reported to have been used as the basis for the decision to acquire the property. The 267 transactions represent 80-90% of those transactions that were fair market value and for which the buyer conducted an engineering evaluation.

The 267 transactions are reduced to a Working Database of 239 fair market value transactions by excluding those transactions having a discount rate of 42% BFIT or greater. This Working Database is the foundation for all the analyses done in this study. Of the 239 transactions in the Working Database, 14 occurred in the 1998-2001 period. Data from a number of other sales that occurred in 1999, 2000 and 2001 were obtained, but they were not included in the study because they were not received in time and/or analysis was not complete in time.

1. For this study, the fair market value discount rate is determined by comparing of

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<sup>2</sup> The term "risk-inclusive," as used in this report, refers to the capture of any perceived risk attributed to the property and/or the operation thereof in the discount rate rather than through the use of specific risk adjustment factors applied to the production projection, cash flow, and/or other component of the income stream. In those transactions where the Buyer made use of identifiable specific risk-adjustment factors to reduce the production projection or cash flow, those same factors were used to remove the adjustment to render the projection and cash flow "risk-inclusive."

<sup>3</sup> A large number of the 700+ transfers that are considered to be market transactions are relatively small (>\$100,000) and were concluded between the parties with no formal evaluation of the property. The 267 sales for which data was obtained are those that did include an engineering evaluation of the property by the buyer.

the cash equivalent purchase price to the future BFIT income stream for the property as projected by the Buyer. Only the cash flow from Proved reserves is used in this analysis. The discount rate is determined at the Date of Transfer<sup>4</sup> of the property as reported by the Buyer unless another date is specified or is obviously appropriate. For statistical analysis purposes, a Working Database was created using only those sales with effective discount rates between 0% and 42%. The mean fair market value discount rate for the acquisition of all types of oil properties over the nineteen year period (1983-2001 inclusive) is 24.0%. The following table presents arithmetic mean and median discount rates for three representative periods.

**MEAN FAIR MARKET VALUE DISCOUNT RATE (0-42%)  
BEFORE FEDERAL INCOME TAX**

	<u>1983-89</u>	<u>1990-2001</u>	<u>1983-2001 Combined</u>
No. of Sales	140	99	239
Mean, %	24.5	23.1	23.9
Median, %	22.9	21.9	22.6

2. Examination of market sales data through the use of single and multiple regression analysis indicates that the only readily identifiable market parameter that can be used to estimate fair market value discount rates is the percentage of Proved Developed Reserves (PDP) in the total volume of Proved reserves attributed to a property. This relation is referred to as “%PDP” in further discussion.

A. Numerous parameters were tested using single regression (correlation) methods. Several were found to have some relation to discount rate, particularly as the database was narrowed to reduce systematic variation, but the %PDP was found to have a much stronger relation than any other factor. The correlation coefficient of the %PDP relation generally exceeded that of any other variable by a factor of 2.0 to 3.0.

B. When multiple regression of %PDP in combination with other factors was done,

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<sup>4</sup> The Date of Transfer is a specific date reported on the Change in Ownership form. This is the date at which the Buyer became the beneficiary of the income from the property. While a transaction may be agreed upon at an earlier date and may be “closed” at a later date, the Date of Transfer is the point at which the Buyer may begin to recoup his investment and earn a return. In some rare circumstances, use of the Date of Transfer, rather than the starting date of the evaluation, may require adjustment of the capital investment schedule in the evaluation.

virtually all the relation is defined by %PDP with only modest to insignificant contribution by other variables. When %PDP is removed as a variable by reducing the database to only 100%PDP properties, there are no other variables that indicate any significant influence on the discount rate.

3. There is a relatively strong relationship between the discount rate and the percentage of PDP reserves, which can be used to select discount rates for oil property appraisal. The statistical analysis done for this study indicated that the marketplace would discount %PDP cash flows at  $22\% \pm 3\%$  and would discount 100%PUD (0%PDP) properties at about 29-30%.
4. Sales of properties with 100% Proved Developed Producing (PDP) reserves account for 160 sales or 67.8% of all sales in the Working Database. Analysis of market derived discount rates for 100% PDP properties indicates an average discount rate of 23.2% with a standard deviation of 6.3 percentage points.

## Statement of Compliance

This report presents the results of a study of market value transactions that have occurred in California over the period from 1983 through 2001. The purpose of the study and the framework for the report structure was defined by WSPA in 1985 to be a general market value analysis that was not to be oriented to adhere to any specific rules, regulations or evaluation criteria. The direction was to (a) identify market value transactions, (b) obtain the requisite data and (c) extract and/or derive representative evaluation parameters including, but not limited to, discount rates and price/cost escalation rates. The introduction of the Cost-of-Capital analysis in 1988 expanded the study by adding an entirely different but related line of inquiry. The use of the study reports and, in some limited circumstances, the supporting documentation for various purposes in different legal and/or regulatory jurisdictions has often raised questions about the applicability of the WSPA Study to (a) the evaluation purpose in question, and/or (b) the regulations and requirements of the jurisdiction in which the evaluation is being considered. While experience since 1985 has generally shown that the WSPA Study and the annual reports satisfy all extant criteria, this Statement of Compliance is intended to address certain issues.

### Fair Market Value of Transactions

The WSPA Study attempts to define those evaluation criteria and/or market parameters that could be used by an appraiser to estimate the market value of an oil and gas producing property. In the WSPA Study, the derived parameters are extracted only from sales transactions that satisfy the most commonly accepted definitions of "*Fair Market Value*." This is done by (a) obtaining as much authoritative data as is possible regarding each transaction, (b) reviewing the transaction information to attempt to determine the extent to which (i) the buyer and seller were knowledgeable of the property and its uses, (ii) the motivation of both parties, (iii) any circumstances that might have influenced the actions of either party, and (iv) the degree to which the transaction could be considered to be representative of the market for oil and gas properties in the context of the location of the property and the timing of the transaction. For most transactions, particularly where there may be questions regarding the conditions or circumstances of the transaction, the buyer and seller were interviewed to resolve those questions. Particular attention is given to those transactions where the property does not appear to have been acquired for the purpose of continuing oil production but for another purpose. This situation is common in urban/suburban areas where mineral rights are acquired for the purpose of clearing surface real estate for development for homes, schools and/or commercial uses.

## Generally Accepted Appraisal Practice

For the most part, there is no distinction between the market value criteria described in the many legal definitions of fair market value and the conception of market value as it may be construed in general appraisal practice. A review of the standard applications of “fair market value” in appraisal practice for purchase and sale of property, eminent domain, estate tax and other uses indicates that the procedures used in the WSPA Study to identify and evaluate transactions comply with the standards that are imposed by the Federal Government for land acquisitions, by the Internal Revenue Service for tax analysis, and the several other authorities that promulgate standards for the appraisal of properties.

## California State Board of Equalization (“SBE”)

The WSPA Study complies with the requirements of SBE with regard to the derivation of parameters for use in evaluating income producing properties. Specifically:

- (a) The discount rates derived from market sales comply with the requirements of SBE Rule 8(g)(1). The transactions from which discount rates are derived are determined to be market value under definitions of fair market value applicable to California law.
- (b) The Cost-of-Capital discount rates calculated as part of the WSPA Study comply with the requirements of SBE Rule 8(g)(2). The source data is taken from the published financial information of companies that can be considered to be potential purchasers of California oil properties.
- (c) The evaluations that are used as the source of Rule 8(g)(1) discount rates are, to the extent possible, in compliance with SBE Rule 8(c). Discount rates are derived from pre-income tax cash flows with no allowance for or deduction of depletion, depreciation, amortization, income taxes or debt interest.<sup>6</sup>

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<sup>5</sup> See Appendix A, Part 1, pg. A-1

<sup>6</sup> SBE Rule 8(c) does not allow deduction of property tax or other taxes based on the value to be determined. Many evaluations deduct estimated property taxes as an operating cost. SBE procedures do not recommend adding these deductions back into the cash flow prior to deriving a discount rate. The WSPA Study adheres to that restriction but also does a separate calculation to determine the effect of the deduction of those anticipated taxes on the effective discount rate.

## **Texas Property Tax Code**

Texas property tax regulations require that property be evaluated at Fair Market Value. The data presented in the WSPA report is derived from market value transactions that comply with this requirement. Further, the data derived in the WSPA Study are generic as to application and location of property. Studies of the WSPA discount rate data show that there is no bias introduced in the evaluation of properties in Texas or any other jurisdiction through the use of data derived from California transactions.

## **Industry Standards**

There are no specific oil industry standards for the derivation of discount rates from market sales, primarily because there are very few sources of such data. The WSPA Study database includes transactions that conform to the commonly accepted industry definition of fair market value, to the generally accepted SPE definitions of Proved reserves classes and to the commonly accepted industry and financial analysis procedures for estimating the rate-of-return on investments.

## **Application of Analytical Results to Fair Market Value Appraisal**

The primary derivatives of the WSPA Study are market value discount rates that are obtained from an analysis of actual market transactions. Cost-of-Capital discount rates are calculated from an industry sample of companies using standard financial methods. The market derived discount rates provide a measure of the returns anticipated by buyers of properties in the marketplace while the Cost-of-Capital results provide a comparison point and a benchmark for the market sales data.

The Cost-of-Capital and the market sales discount rates serve somewhat different purposes within the evaluation process. The Cost-of-Capital serves a financial purpose by defining the minimum return that a company must earn in order to maintain the market value of the company. Individuals and other non-corporate entities are not exempt from this logic. Financial management texts and papers, as well as established practice, identify the Cost-of-Capital as a minimum rate-of-return. The WACC or a variation thereof is used as the foundation discount rate for comparison of projects for corporate capital budgeting/investment. In many cases, increments are added to the WACC to account for perceived risk in the investment and/or as a required increment of return.

The market derived rates encompass all the perceived issues and conditions that are related to the property being valued, including the anticipated risk. This relation is demonstrated by the data derived in the WSPA Study, which indicate that:

1. Over 90% of the discount rates derived from market transactions (1983-2001) exceed the mean Cost-of-Capital over a concurrent period (1985-2000).
2. The annual mean market-derived discount rate consistently exceeds the calculated annual WACC by several percentage points in every year.

The data provided by the WSPA Study, along with research from other sources, provides the rationale for the relationship between Cost-of-Capital and derived discount rates. The market derived rates are shown to be risk-related and represent the returns that buyers anticipate from acquired properties. These discount rates show no definable relation to the date of the transaction, prevailing interest rates or equity returns, the physical characteristics of the property, or the economic parameters used in the evaluation. The calculated WACC is, by construction, limited to being a return-on-investment that is derived from highly-liquid assets, which are based on multiple income streams. Each of these considerations acts to cause the WACC to be a lower return, in general, than the return anticipated for actual transactions.

## **Application of the Cost-of-Capital**

In order to be useful in the appraisal of a specific property, the WACC must be calculated from a representative sample of potential buyers (and sellers) of oil and gas properties. This WACC should be calculated as a pre-tax value in order to avoid the effects of issues which are taxpayer-specific. The limitations of the WACC as a specific property discount rate must be recognized, and appropriate adjustments made, for return-of-investment, liquidity, multiple income streams. These adjustments are difficult to quantify, however, methods, procedures and data have been developed in business valuation and real estate appraisal to do so. The process of adjustment of the corporate pre-tax WACC to a property specific discount also requires that the WACC be adjusted for the risk related to a specific property.

The result of these adjustments should be a discount rate appropriate to a producing property with lower risk (100% Proved Developed Producing) reserves. Third party studies and analysis of the WSPA Cost-of-Capital data suggests that discount rates in the 19-21% BFIT range would be obtained with proper adjustments. The WSPA data from actual sales finds that this is the representative range for properties with 100% PDP reserves.

## **Application of the Sales Derived Discount Rate**

The adjusted WACC provides a baseline discount rate; the market sales data provides the means for general risk adjustment. The WSPA Study has found that there is a relation between the derived discount rate and the percentage of PDP reserves attributed to the property in the evaluation. This analysis indicates that properties with 100% PDP reserves would have considerably lower discount rates than would properties with 100%PUD reserves (or 0%PDP) reserves. While the relation is not statistically robust, it is the only measurable relation that can be developed from the sales data, and it has a rational foundation in the risk-reward trade-off mechanism, which is generic in all investment models.

The combination of WACC and market sales data provides a rational and objective methodology for the selection of discount rates for the appraisal of specific oil and gas properties. The appraiser can start from a standard textbook WACC calculation, the procedure for which is presented in detail in numerous publications including real estate texts and manuals developed by taxing authorities to obtain a Cost-of-Capital that is representative of the minimum required return anticipated by prospective purchasers of oil properties. The WACC is then adjusted to account for (1) return-of-investment, (2) illiquidity and (3) income diversity to align the discount rate with a minimum risk level appropriate to 100%PDP properties. The appraiser then determines the relative volumes of PDP and other classes of reserves in the evaluation and assigns an appropriate risk increment based on Figure 8 or another well-researched source. The selection of the risk-related rate is a judgement issue, not a matter of picking a number off a graph or table. The %PDP relation provides only a guideline to the range of discount rates. There may be other issues that influence the choice of discount rate from within the range.