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Techniques for Valuing Acreage with Unproved Oil and Gas Potential

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Abstract

The purchase and sale of petroleum assets frequently involve unproved acreage that is rank to prospective in nature. The buyer and the seller are faced with estimating a value for this acreage which cannot easily be accomplished with a heavily risked oil and gas production forecast. This paper presents alternative techniques for valuing unproved or speculative acreage, since limited discussion of this subject exists in the literature. The techniques described in this paper are based on appraisal methods developed by the real estate profession and are commonly referred to as the Market, Income and Cost Approaches.

When appraising speculative acreage, the critical first steps in valuation are defining the rights being appraised and establishing the highest and best use of the property. It is also important to characterize the oil and gas potential subject in order to establish guidelines for finding comparable sales in the market. Market data can be obtained from lease sales, county courthouse records, oil and gas auctions, and from publicly-reported corporate financial statements. In addition, exploration costs are considered.

The relevant market data are then analyzed in detail and used in the various appraisal methods. These methods provide estimates of value, which are then reconciled for the final opinion of value. Examples of the types of data obtained and analyses performed will be presented.

Introduction

There is not much discussion in the literature regarding

techniques for the valuation of unproved oil and gas reserves. Questions often asked are "What is it worth?" and "How do you value it?" when the task at hand is the Fair Market appraisal of undeveloped properties that are not considered proved reserves. This paper serves to illustrate methods for estimating value for these types of oil and gas properties where income from oil and gas production is uncertain or even speculative.

The methods shown are based on data derived from the market which include lease bonuses and rentals, and sales of mineral interests and prospects. They are presented as alternatives to the approach of projecting income from a risked, hypothetical oil and gas production stream based on statistical success ratios.

The steps necessary to prepare a credible appraisal are also presented and are based on standard practices developed by the real estate appraisal profession. Adherence to these standards are particularly important when the assignment involves estimating the just compensation from eminent domain proceedings or for estate planning.

Definition of Rights Being Appraised

An accurate definition of the mineral rights being valued is a critical first step to conducting an appraisal. The Appraiser should check the mineral ownership for any special considerations such as vertical depth segregation, split of executory and non-participating royalty interests along with the terms of any existing leases.

When valuing a leasehold interest, attention should be directed toward drilling commitments, eminent domain or force majeure clauses and the specific agreements in place. For a recent case involving properties in the Bakersfield area, the leases were granted in the early 1900's and were structured such that the lessee had a "preferential right to renew". This allowed the lessee to hold the leases in perpetuity if he so desired.

Once the mineral interests have been accurately described, it is then necessary to proceed with the determination of the highest and best use of the property.

Determination of Highest and Best Use

In the Dictionary of Real Estate¹, the highest and best use is defined as follows:

“The reasonably probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value. The four criteria the highest and best use must meet are legal permissibility, physical possibility, financial feasibility, and maximum profitability.”

In order to perform this type of analysis, the petroleum geology for the property must be characterized on both a regional and local basis. Exploratory work on the property or in the area is assessed in order to see the improvements or stages of development that have taken place on or before the as-of date.

The various stages of highest and best use for an oil and gas property are shown conceptually on Figure 1, adopted from Gustavson². It is important for the Appraiser to characterize the stage of development to which the property has been advanced. In addition, the Appraiser must employ four objective tests on the contemplated uses for the mineral rights on the property.

The standards³ dictate that the contemplated use for the property must be legally permissible, physically possible, financially feasible and maximally productive. “Legally permissible” implies that the proposed use for mineral extraction (such as oil and gas drilling) has obtained approval from the governmental authorities regulating the activity. This test is especially important for properties located in environmentally sensitive areas where exploration may be costly and face strict regulatory restrictions. Items such as the acceptance of a development plan in an EIS document or the issuance of drilling permits and seismic right-of-way are indications that the proposed use for oil and gas development may be legally permissible.

The test for “physically possible” explores whether the access and logistics for the testing and development of the property can be realized. In the case of unproved properties, accessibility for acquisition of seismic data is particularly important so that prospects can be defined.

“Financially feasible” tests whether the proposed improvements can be financed and can yield a reasonable rate of return on the investment. Obviously, exploration is a risky business with an uncertain outcome. Nevertheless, this test should be considered from the standpoint of what the proposed development is at the time of the as-of date.

“Maximally productive” implies a use that gives the greatest

value to the land given that the contemplated use has passed the three tests mentioned previously. For unproved properties with speculative oil and gas reserves, the Appraiser should consider uses that can support realistic expectations of future income to the property. This would include income from seismic option fees, leasing revenues, prospect promotion and sale or an outright sale of the mineral interests to an interested party.

It should be noted that there is substantial debate regarding potential uses and how this affects value for a given property. Potential uses are based on the principle of anticipation and this relates to what stage of development the property had achieved on the as-of date of the appraisal (Figure 1). A test for a potential highest and best use is that the potential use was of such a probable nature that it influences the value of the property⁴.

Once a reliable highest and best use determination has been conducted, the Appraiser can begin to collect and analyze the data that will support his or her opinions on the Fair Market Value of the property.

Data Collection

For undeveloped oil and gas properties, the best sources of information include the local county courthouse records, results of federal and state leasing sales and discussions with local mineral owners, landmen and operators involved in the area. A diligent search of the courthouse records will provide lease and mineral deed transactions mostly for fee properties. In addition, recorded assignments of leasehold or operator interests and seismic option agreements should also be collected.

This information provides a statistical sampling of the traffic or market for unproved properties where production has not yet been established. Most recorded fee leases do not contain an accurate disclosure of the bonus and rental. As a result, the Appraiser is tasked with contacting the parties involved in order to establish the terms of the transaction. This is sometimes difficult depending on the confidential nature and on how amenable the parties are about disclosing this information.

Leasing activity on federal and state lands provide good sampling since the results of sale are considered public domain. This information can be used to check the reasonableness of the indicated terms of the fee lease transactions; however, it is not always possible to use the data, if for example the federal government is a party to a dispute.

There is also now a trend in some areas for operators to first pay a seismic option fee in advance of leasing. Depending on the results of the 3D seismic survey, the operator will be selective about how much of the property he desires to lease

from the landowner. Therefore, fees from seismic option agreements are also an indicator of the future income stream that an unproved property might receive and also how much subsequent income the acreage might generate from leasing even if oil production is way out in the future, if ever.

Mineral deeds or the outright sale of a mineral interest are good sources of what undeveloped mineral interests are worth on a per-acre basis. These transactions are typically for cash and are considered "comparable sales". These sales can be used to compare to the subject property in order to assess value patterns in the market. Terms regarding the sale of fee mineral transactions are sometimes equally difficult to confirm but provide a very reliable indicator of value when this information is available.

Assignments of leasehold or operating interests in undeveloped properties indicate value to a particular leasehold interest. Frequently, companies will lease tracts in order to promote prospects to other companies or may simply lose interest if their exploration capital is committed to other projects.

These transactions may involve a cash consideration to cover the original land costs or work commitments in order for the new operator to earn an interest in the property. Also, the assignor may simply reserve an overriding royalty interest on the hope that the assignee drills a well and discovers new oil and gas reserves.

Certain criteria must be established when discussing terms with the parties involved with the market transactions described above. The most important criteria is that the transaction was an arms length sale and that there was no undue duress to either the buyer or the seller. Intra-family or intra-company transactions should be disregarded unless there are special circumstances.

Other criteria include that the buyer and the seller were knowledgeable and that the property was exposed to the market for a reasonable period of time. Because of this criterion, it is important to get a good statistical sampling of the market data. A good sampling will establish reasonable ranges of value which will not be severely impacted if some of the data must be disregarded because it does not qualify.

The next step in the appraisal process is the analysis of the data itself which will ultimately provide estimates of value.

Appraisal Methodology

Once the data has been compiled, it is then necessary to interpret the value patterns in the market. This is accomplished by statistical analysis and by posting the data on trend maps. In addition, the Appraiser needs to synthesize the information obtained from interviews with the parties involved

in the various transactions.

There are two main methods for appraisal which consist of the Market and the Income Approaches. The market approach is based on prior sales of similar type properties while the Income Approach is based on a reasonable future income stream that the property could realize.

Figure 2 is a simplified overview of an assignment that involved an appraisal of several individual tracts located adjacent to an Air Force bombing range in Roosevelt County, New Mexico. The tracts were located approximately eight miles to the north of a small gas field. Because the acreage was considered exploratory, it was considered too speculative to project income from a hypothetical oil and gas production stream..

Market Approach. The basis for the Market Approach consists of the information collected from the mineral deed transactions. The comparable transactions are compared to the subject on the basis of various elements such as distance from production, stage of development, regional and local developments, exploration potential and surface access considerations.

This is a subjective analysis for the most part but a confidence level can be gained by establishing upper and lower ranges for the various sales. For example, acreage located some distance from production and not considered prospective may sell in the range of \$25 per net mineral acre versus highly prospective acreage that sells in the range of \$100. If the oil and gas potential for the subject is better than rank but not highly prospective, then the value indicated is \$50 to \$75 per acre.

In the example presented in Figure 2, a few mineral deeds were found and interviews with the parties involved indicated the mineral rights were sold for around \$35.00 per acre for generally prospective but exploratory acreage. The acreage involved in these transactions compare favorably with the subject and therefore can be considered as "comparable sales" for use in establishing value for the subject. The tract being appraised consists of 3,779 acres.

Generally, there are not many arm's-length mineral deed transactions for a given area. Consequently they must be calibrated with the lease and prospect data.

Income Approach. This approach makes use of an estimate of oil and gas reserves in place in the appraisal tract, and of an analysis of production and income therefrom and from surrounding appraisal tracts. This estimate is sometimes determined by volumetric computations involving thickness and porosities of producing formations, water saturation levels, drainage areas, and fluid properties. In some cases the

reserves are estimated by analogy, or the average of oil and gas reserves for other wells in the area. Probabilities of success are sometimes introduced because the confidence level in the estimate reduces with the distance away from actual production.

The approach described above has a low confidence level for exploratory acreage. Consequently, a derivative method of the Income Approach is used and is referred as the Lease Bonus Method.

The value of interests to be appraised under this method derive from the potential future income stream from the receipt of bonus and rentals through oil and gas leasing. For exploratory acreage, this represents the highest and best use of the mineral rights. The method is based on a present value analysis of the future income stream from oil and gas leasing. This method can be used to appraise all rights for properties with no production and only speculative potential therefor.

As stated previously, recorded fee leases do not contain accurate bonus terms. Therefore, it is necessary to confirm bonuses on fee leases through telephone interviews with the lessors and lessees. In most cases, the annual rental and lease term are noted on the recorded documents and this criterion is usually established easily. For the example in Roosevelt County, New Mexico, the data compiled from the leasing activity is presented on Table 1.

Results of state and federal lease sales do disclose bonus amounts tendered which can be used to complement the data obtained from fee lease transactions.

Similar comparisons (described in Market Approach) are used for establishing market lease terms for the area of study. Oil and gas development activity on or in the vicinity of the appraisal tract give indications of how prospective or attractive the subject property might be to an oil and gas operator.

The market data is posted on trend maps in order to compare and contrast the comparable acreage with the subject. In addition, the bonuses derived from the market research are analyzed statistically. Good prospective acreage will usually command a higher bonus than rank wildcat acreage. Figure 3 is a histogram for leasing activity along a Niagaran reef trend in the Michigan Basin. The higher bonuses reflect amounts the market is willing to pay for good prospective acreage.

The analyses described above will then establish estimates of market bonus, rental and term for a lease on the acreage being appraised. It is now possible to project income from leasing cycles over the economic life of the property (Table 2). For exploratory properties, this is considered a realistic projection of a future income stream.

The gap between leasing cycles is meant to simulate a hiatus that the property would encounter as leases expire and are picked up again by other operators. These hiatuses can be modified depending on the market conditions in the general area on the as-of date of the appraisal. This will effect the net present value of the income stream and relies on the judgment and interpretation by the Appraiser.

The as-of date for this appraisal was December 1991, hence a discount rate of 10 percent was used to reflect the petroleum industry's cost of capital at that time. The net present value of the projected future income from leasing (\$136,900) reflects the valuation of the appraisal tract using this approach. The market also buys and sells minerals by a factor of 2 1/2 times the market bonus. This is a general rule of thumb and can be used when a quick evaluation is conducted.

Seismic Option Agreements. With the advent of higher resolution 3D seismic surveys, it is now possible for the explorationist to filter large tracts of raw land into prospective versus non-prospective areas. This isolates acreage that have seismic leads or anomalies that warrant further reconnaissance that may include exploratory drilling.

As a result, oil and gas companies will typically enter into seismic option agreements with a potential mineral owner. In this arrangement, the oil and gas company pays a fee to the mineral owner to acquire seismic across their land in advance of any leasing arrangement. Depending on the results of the 3D survey, the oil and gas company has the option to lease all or selected parcels from the mineral owner.

Unless the competition is high, the amounts paid under this arrangement are usually low on a dollar-per-acre basis. On a recent assignment in North Texas, this Appraiser found that the going rate was around \$25 per acre for a seismic option fee.

This trend appears to be prevalent in some areas but less in others. It all depends on how successful and expensive the 3D seismic is in a given area. The prevalence of seismic option agreements in the study area should be assessed by the Appraiser as part of the overall analysis.

Prospect Promotion and Sale. As a property is improved to the prospect stage, an oil and gas company can barter, sell, or trade prospects to other companies. This may or may not result in a cash consideration for the prospect itself. Typically, the party offering the prospect will at least attempt to recoup his land cost plus any exploration costs expended to date. Alternatively, the seller may gain a drilling commitment plus a carried working interest in lieu of a cash consideration.

Under these conditions, the value of the property can possibly be estimated based on the total exploration costs

prudently expended in advance of drilling. However, care should be taken when employing this methodology because much will depend on how the market perceived the oil and gas potential of the property.

A recent assignment in the Michigan Basin found that leads or seismic anomalies in the Niagaran Reef trend sold for around \$50,000 for an 80-acre prospect. Seismic anomaly acreage are areas that have been determined to have specific potential based on seismic evaluation, but in which the leads were not sufficient to drill without confirmation from positive interpretation of additional seismic data.

Acreage identified as containing confirmed drilling prospects were reported to sell in the range of \$600,000 for an eighty-acre parcel. Consequently, a property can command significantly higher acreage values if it is improved and advanced to the prospect stage. At this stage, it is the leasehold rather than the mineral owner that gets the maximum benefit from the selling of the prospect in advance of any drilling.

Reconciliation of the Various Methodologies

The results of the various methods are then considered as part of the overall opinion of value. The confidence level in each approach is weighed based on the data available and how the individual approaches best reflect the market.

Estimates of value were described earlier for the 3,779 acres in Roosevelt County, New Mexico. The Market and Lease Bonus Approaches provided an estimated Fair Market Value of \$132,300 (\$35 per acre * 3,779 acres) and \$136,900, respectively. The two value estimates compare favorably but the Market Approach only found one or two mineral deeds in the public records. Consequently, the Income Approach or Lease Bonus Method has the highest confidence level and was the basis for an estimated Fair Market Value of \$136,900 for the subject property.

Conclusions

There is little discussion in the literature regarding techniques for appraising exploratory properties where income from oil and gas production is speculative. The techniques presented in this paper are alternatives to the approach of projecting income from a risked and hypothetical oil and gas production stream based on statistical success ratios.

When appraising the market value for these types of properties, the oil and gas development in the area should be characterized along with the petroleum geology. A highest and best use analysis must also be conducted for the property so that the correct appraisal methodology can be employed. Market data in the form of oil and gas leases, mineral deeds, exploration costs and sales of prospects are compiled and analyzed in order to assess value patterns in the market.

The Income and Market Approaches are two appraisal methods commonly employed for estimating the Fair Market Value. The Market Approach utilizes mineral deeds or sales of mineral rights as comparable sales in the market place. The Income Approach projects income from oil and gas leasing over 15 to 20 years or four lease cycles. The Cost Approach utilizes the cost of exploration in advance of drilling as an indicator of value.

The various approaches are reconciled for a final opinion of value based on the confidence level in each one. Reliable estimates of Fair Market Value are important for eminent domain cases, estate planning and gifting and for corporate divestiture.

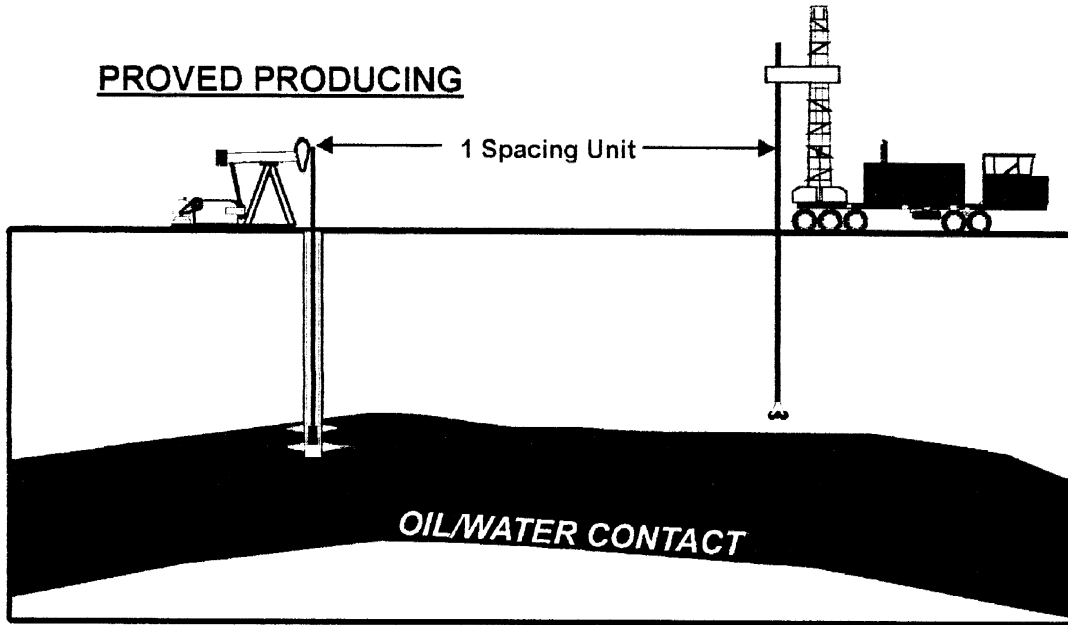
References

1. Shea-Joyce, S.,: "The Dictionary of Real Estate Appraisal," Appraisal Institute, Chicago (1993).
2. Gustavson, J.B., "Appraisal of Oil and Gas Properties," University of Tulsa, Division of Continuing Education (Annual).
3. Interagency Land Acquisition Conference, "Uniform Appraisal Standards for Federal Land Acquisitions," U.S. Government Printing Offices, Washington, D.C. (p. 8).
4. Eaton, J.D.,: "Real Estate Valuation in Litigation," American Institute of Real Estate Appraisers, Chicago (1989).

FIGURE 1

HIGHEST and BEST USE

PROVED UNDEVELOPED



HIGHEST and BEST USE

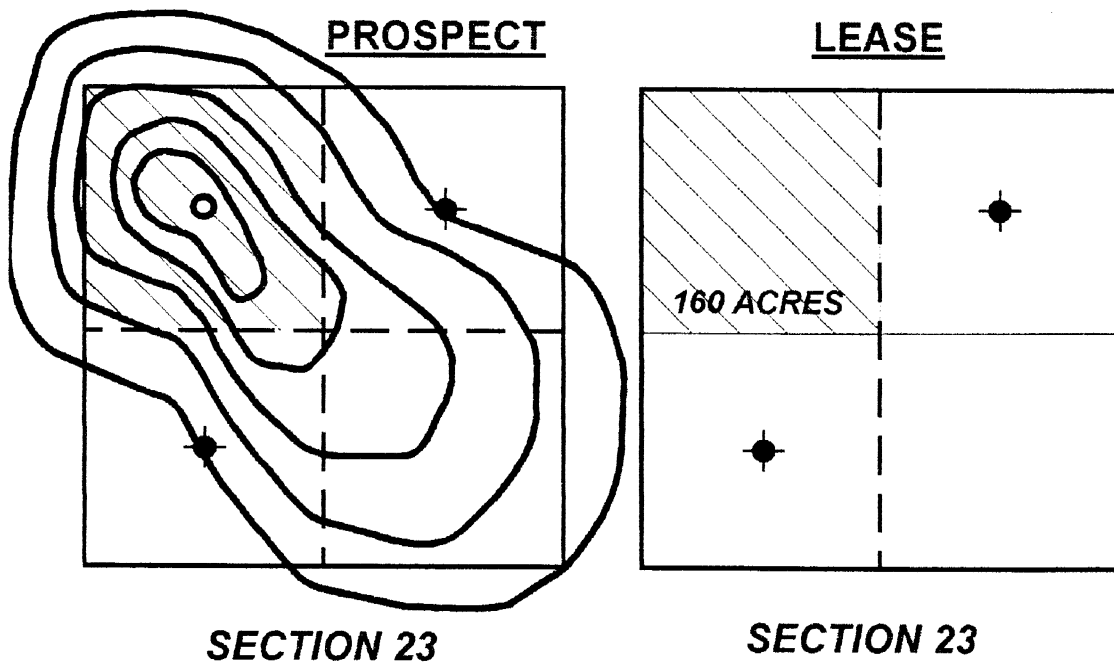
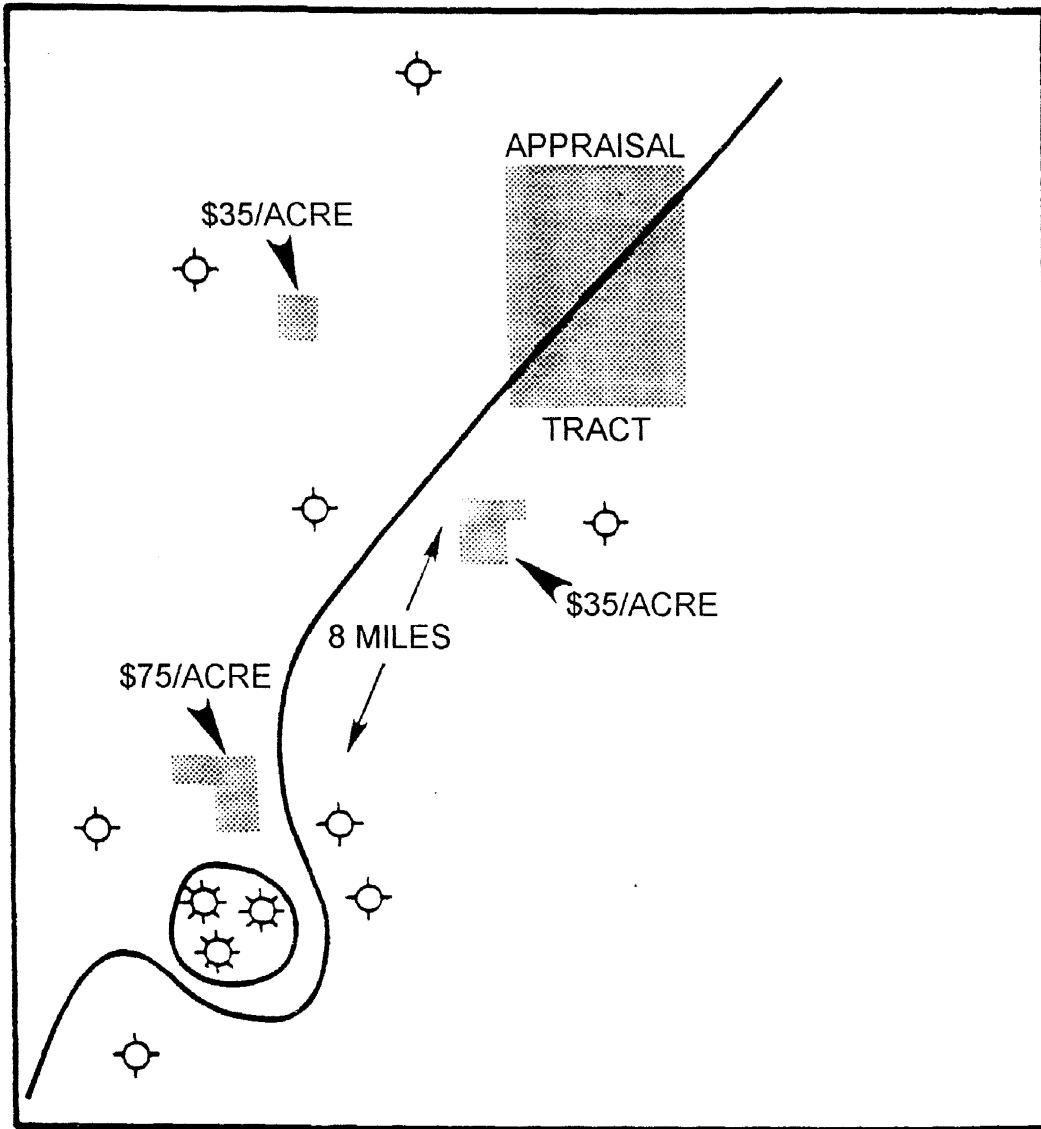


TABLE 1

RECORD OF LEASING ACTIVITY

| LOCATION | DATE LEASED | ACREAGE LEASED | LEASE TERM | BONUS PAID | COMMENTS |
|--------------------------|--------------------|-----------------------|-------------------|-------------------|---------------------|
| Sec. 19, 21, 23-T1S-R31E | Dec. 1988 | 720 | 5 | \$15/acre | confirmed by lessor |
| Sec. 2-34-T1S-R29E | Dec. 1988 | 3620 | 8 | \$15/acre | confirmed by lessor |
| Sec. 25-T1S-R30E | Dec. 1988 | 670 | 5 | \$15/acre | confirmed by lessor |
| Sec. 2-34-T1S-R29E | Dec. 1988 | 3965 | 8 | \$20/acre | confirmed by lessor |
| Sec. 20, 29-T1S-R31E | Dec. 1988 | 400 | 5 | \$15/acre | confirmed by lessor |
| Sec. 21, 28-T1S-R31E | Dec. 1988 | 150 | 5 | \$15/acre | confirmed by lessor |
| Sec. 25-T1S-R30E | Mar. 1989 | 40 | 5 | \$20/acre | confirmed by lessor |
| Sec. 21, 28, 31-T1S-R30E | May 1989 | 345 | 7 | \$20/acre | confirmed by lessor |
| Sec. 21, 32-T1S-R30E | May 1989 | 240 | 7 | \$15/acre | confirmed by lessor |

FIGURE 2



LOCATION OF COMPARABLE SALES IN RELATION TO APPRAISAL TRACT

TABLE 2
TRACT 202M
ESTIMATED DISCOUNTED CASH FLOW*

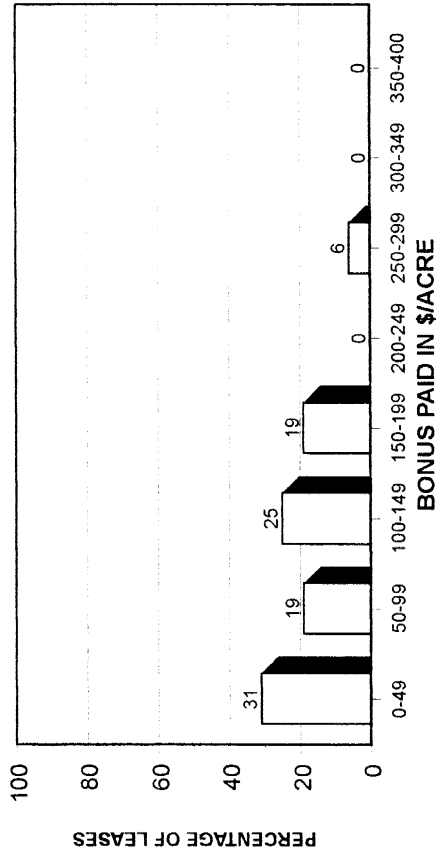
| Calendar Year | Total Annual Income (\$) | 10.00 PCT Disc.** (\$) | 10.00 PCT Cum. Disc. (\$) | REMARKS |
|----------------------|---------------------------------|-------------------------------|----------------------------------|----------------|
| 1 | 64,243 | 61,253 | 61,253 | Bonus |
| 2 | 3,779 | 3,276 | 64,529 | Rental |
| 3 | 3,779 | 2,978 | 67,506 | Rental |
| 4 | 3,779 | 2,707 | 70,213 | Rental |
| 5 | 3,779 | 2,461 | 72,674 | Rental |
| 6 | 0 | 0 | 72,674 | Interval |
| 7 | 64,243 | 34,576 | 107,250 | Bonus |
| 8 | 3,779 | 1,849 | 109,099 | Rental |
| 9 | 3,779 | 1,681 | 110,780 | Rental |
| 10 | 3,779 | 1,528 | 112,308 | Rental |
| 11 | 3,779 | 1,389 | 113,697 | Rental |
| 12 | 0 | 0 | 113,697 | Interval |
| 13 | 64,243 | 19,517 | 133,214 | Bonus |
| 14 | 3,779 | 1,044 | 134,258 | Rental |
| 15 | 3,779 | 949 | 135,207 | Rental |
| 16 | 3,779 | 863 | 136,069 | Rental |
| 17 | 3,779 | 784 | 136,853 | Rental |
| TOTAL | 238,100 | 136,900 | 136,900 | |

- Totals rounded to next highest \$100
- Bonus of \$17/net mineral acre
- Term of five years
- Annual delay rental of \$1/net mineral acre/year
- Total acreage - 3778.98 acres
- * Mid-year discounting
- ** Present value of 10.00% is used to reflect prevailing interest rates under current petroleum industry economic conditions.

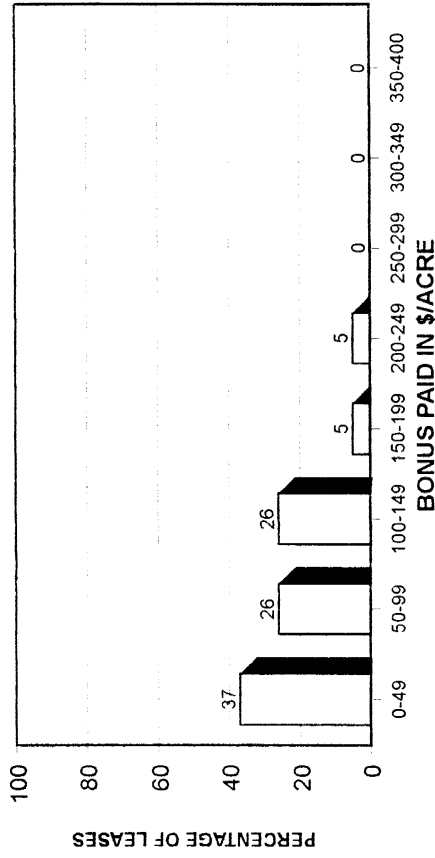
FIGURE 3

PERCENTAGE OF LEASES VS BONUS PAID IN \$/ACRE

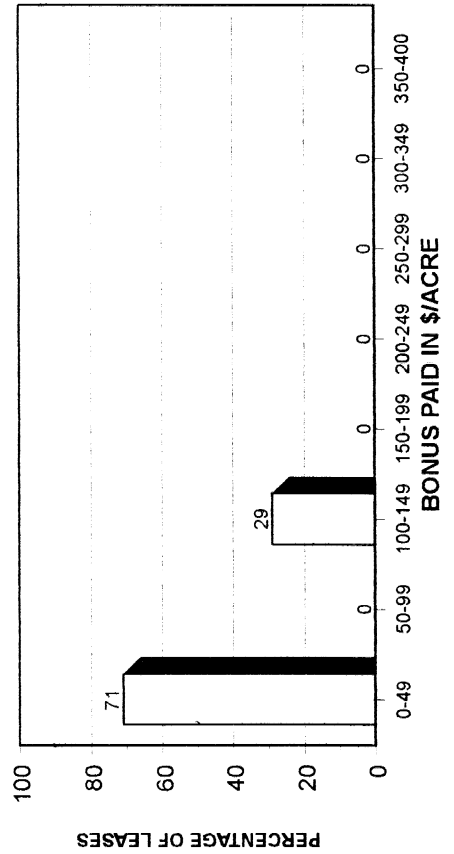
SECTOR 3



NORTH VICTORY PROJECT AREA



HAMLIN-VICTORY AREA



OTHER MASON COUNTY

