

**THE EFFECT OF MINERAL INTERESTS ON LAND APPRAISALS
IN SHALE-GAS REGIONS**

The Case of the Barnett Shale

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Abstract

Mineral interests and the issues that appraisers must consider in regions impacted by shale-gas formations are the subject of this paper. The Barnett Shale in north central Texas is the example; however, the issues and concepts apply to many states with shale-gas formations. We emphasize the need for appraisers to focus on mineral estates attached to or severed from subject properties and comparable sales when valuing land. The effects of severing the mineral estate from the surface estate and the resulting value implications, including the dominance of the mineral estate, are major topics in this paper. In this paper we cite references to case law on mineral estate dominance, oil and gas law in Texas, and oil and gas valuation for court. We conclude with an example of the sales comparison approach to estimating the value of land with and without the underlying mineral estate.

Introduction

When advances in drilling and fracturing technology made shale-gas production feasible, mineral estates, once believed to have little or no value, became potentially very valuable and appraising land became more complex than a routine appraisal of the “fee simple estate.” For years, geologists had reported the existence of significant quantities of natural gas in the subterranean strata known as the Barnett Shale, but economically feasible methods of extracting the gas did not exist. Appraisers, as well as buyers and sellers paid little attention to whether or not mineral interests were included in land sales. As the market realized that almost every acre in several Texas counties above the Barnett Shale could produce natural gas profitably, the appraisal of land became more problematic. Similar shale-gas formations create the same appraisal challenges in over 15 other states (see Appendix).

In this paper we highlight and discuss many of the relevant issues in appraising properties in the Barnett Sale, including: severance of the mineral estate from the surface estate and the value implications thereof, the dominance of the mineral estate over the surface estate, and the nature of the interest created by oil and gas leases. We present a discussion of when the sales comparison approach should be used versus when an oil and gas appraisal expert should be called on for a valuation assignment. We finish with a simple example of appraising shale-gas land with and without mineral estates attached.

Appraisal Requirements, Regulations and Guidance

Requirements, regulations, and guidance for valuing mineral interests, and more particularly their influence on land values, are dispersed among several regulatory bodies, laws,

and standards of professional practice.¹ In the United States, mineral property valuation is addressed by regulations and standards from no fewer than eight sources including:

American Institute of Mineral Appraisers

Appraisal Institute

Federal Financial Institutions Reform, Recovery and Enforcement Act (FIRREA)

International Valuation Standards (IVS),² Section GN 14

International Accounting Standards Board

Securities and Exchange Commission (SEC),

Uniform Appraisal Standards for Federal Land Acquisitions, Section D11

Uniform Standards of Professional Appraisal Practice (USPAP),

“Determining the value of oil and gas properties is a continuing problem in litigation. There are a number of issues to be addressed in considering the value of oil and gas assets. Primary among these are (1) substantive issues relating to the methodology of valuing oil gas assets; and (2) evidentiary issues”.³

¹ Trevor R. Ellis. The U.S. Mineral Property Valuation Patchwork of Regulations and Standards
Mr. Ellis’ webpage states the following: Since 2001, Mr. Ellis has been the international leader of standards development for valuation appraisals within the minerals and petroleum (oil and gas) industries. His numerous professional papers on mineral property and business value appraisal, and associated minerals appraisal standards (extractive industries valuation standards) and regulations are well recognized internationally.

² The IVS Council has a committee addressing appraisal standards for the Extractive Industries.

³ “Valuing Oil & Gas Assets in the Courtroom”, by Rhett G. Campbell © 2002, Thompson & Knight, LLP. [http://tkbpl.com/resources/documents/Valuing Oil and Gas Assets in the Courtroom \(Campbell,OR.\).pdf](http://tkbpl.com/resources/documents/Valuing%20Oil%20and%20Gas%20Assets%20in%20the%20Courtroom%20(Campbell,OR.).pdf). p1.

Mineral and Surface Estates

Severing land into two estates, surface and minerals, is a common practice in the United States. The Texas Railroad Commission, the entity charged with regulating oil and gas production in the state, has spoken to the severance issue in the following quotation:

“Under Texas law, land ownership includes two distinct sets of rights, or “estates,” the **surface estate** and the **mineral estate**. Initially, these two estates were owned by the same person and they may continue to be owned together by one person. However, in many areas of Texas, especially those where there has been extensive historical oil and gas development, it is common for the mineral estate and surface estate to be owned by different people. The division, or “severance,” of the mineral estate and surface estate occurs when an owner sells the surface and retains all or part of the minerals (or, less commonly, an owner sells the minerals and retains the surface). *If an owner does not expressly retain the minerals when selling the surface, the mineral estate he owns automatically is included in the sale.*”⁴

Surface estate means an interest in the estate overlying a mineral estate. The **mineral estate** is a collection of subsurface rights: “the rights to the use and profits of the underground portion of a designated property; usually refers to the right to extract minerals such as oil, gas or

⁴ <http://www.rrc.state.tx.us/about/faqs/SurfaceOwnerInfo.pdf>

other hydrocarbon substances as designated in the grant; *may include a right-of-way over designated portions of the surface.*”⁵

The severance issue is important when valuing mineral estates. Once minerals are severed from the surface, the two estates cannot be put back together.⁶ Prior to severance, you simply have surface with minerals, which is the case in the valuation example at the end of this paper. If the surface owner, or a prior owner, has leased a portion of the minerals or conveyed away an undivided interest in a portion of the mineral estate, as with a mineral deed, then that portion of the mineral estate has been severed. A logical way for land appraisers to view property rights with respect to the severance issue is to think in terms of:

1. Surface with minerals never having been severed, in which case conveyance would include the whole property, surface and mineral estates unless the mineral are reserved in the deed.
2. Surface with all or some of the minerals conveyed away, as by mineral deed; and
3. Surface with minerals under lease, with royalty and possibility of a reversion in the event the lease expires.⁷

The appraiser must be clear about which property rights are to be appraised and if or when there are separate rights requiring multiple value opinions.

⁵“Appraisal Institute; Dictionary of Real Estate Appraisal, Fifth Edition; Page 190; Subsurface Rights.”

⁶ Rhett G. Campbell, Attorney, private email to the authors on May 29, 2012.

⁷ Ibid

Dominance of the Mineral Estate

The mineral estate has dominance over the surface estate in virtually every state. Were that not the case, the severed mineral estate would be of little or no value to the owner.⁸ The ramifications of mineral estate dominance are considerable. Lisa Vaughn, attorney, explained the dominance issue in Texas this way:

“The basic premise of the dominant estate rule is that the mineral owner (or the operator as a lessee) is permitted to use as much of the surface as is reasonably necessary to explore for and produce the minerals. That means that unless lease provisions, statutes or local ordinances intervene and impose more stringent requirements, the operator has the right of ingress and egress over the surface, need not pay for using the surface to install tanks or machinery, may use the tract’s water whether above or below ground, and need not even restore the surface after completion and abandonment of drilling activities.”⁹

In the United States, the concept of mineral estate dominance came from English common law and Mexican law. Ned Stratton has written a comprehensive analysis of case law and statutes pertaining to mineral estate dominance for most states.¹⁰ Almost every court that deals with surface damage and surface usage has now adopted four basic common law rules or principles:

“ (1) The mineral estate is the dominant estate, (2) the mineral estate has the right to access minerals and use as much of the surface as reasonably necessary to

⁸ A private letter written by Joe Kimball, Attorney at Law.

⁹ “Is the mineral estate losing the upper hand in Texas?” Lisa Vaughn, Fort Worth Business Press, October 5, 2009.

¹⁰ Ned Stratton: Surface Use and Damage Statutes: The Needed Balance in the Ongoing Battle Between the Surface Owner and the Mineral Owner, an unpublished paper found on the internet.

<http://www.nedstratton.com/media/Surface%20Owner%20v%20Mineral%20Owner.pdf>

Quoted with permission of the author.

extract and carry away the minerals, (3) the mineral owner does not have the right to destroy the surface unless that right was expressly granted in the conveyance, (4) the mineral owner was only liable to the surface owner for damages to growing crops and existing structures, but not for any other damages to the surface resulting from *reasonably necessary* surface activity”.¹¹

The mineral dominance issue is consistently litigated in the west. The root of the question is the extent of surface use that is allowed for mineral development. States have two perspectives: due regard and reasonable accommodation. Most states follow the due regard principle which allows the mineral owner to use as much of the surface as reasonably necessary, but compensate for damage to crops and structures.¹²

An “Accommodation Doctrine”, adopted by several states, Colorado and Texas among them, provides some relief to the surface owner inasmuch as the mineral lessee must respect, as far as is practical, the surface owner’s uses and not lay waste to the property.¹³ Examples include specified distances from drill sites to buildings, restrictions on water use from the property, and location and depth of pipelines. The burden of proof in using the accommodation doctrine is on the surface owner. There must be an existing use or planned use. The planned use must be more than a statement of “I was planning to subdivide this property” but need not be actual construction; however, platting of the land would show clear intent. Notwithstanding the foregoing comments, the mineral owner’s surface activities and appurtenances needed to exploit the minerals may hinder the surface owner’s future development of the land. Severing the mineral estate from the surface almost always diminishes the value of the surface. “An

¹¹ Ibid

¹² Justin Rammell, Attorney, Private email to the authors, September 12, 2011.

¹³ Getty Oil v. Jones, 470 s.w. 2d 618, 622 (Tex. 1971)

encumbrance that unbundles rights in a parcel of real estate and transfers some rights to another entity cannot fail to diminish the value of the encumbered property.”¹⁴

While these are common law principles, some states have enacted statutes to protect surface owners. The evolution of surface owners' statutory rights began in 1978 with the State of North Dakota passing the state's Oil and Gas Production Damage Compensation Act ("the North Dakota Act") which served as the model for affording surface owners legislative protection with respect to oil and gas leases.¹⁵ The North Dakota Act withstood court challenges by the oil and gas industry.¹⁶ Oklahoma, Montana and South Dakota followed with legislation to give surface owners some amount of protection.¹⁷ In Oklahoma, surface owners and mineral interest owners must agree to a dollar amount to compensate the surface for damages, which may involve both parties hiring separate appraisals to come to a settlement. Wyoming is another example, where the mineral owner (or their lessee) must engage in good faith negotiation for a surface use agreement before mineral development. However, the mineral owner can post a bond with the conservation commission if the surface owner is recalcitrant.¹⁸

A **surface waiver** limits the mineral lessee's rights to operate on the surface, including ingress and egress, placing a drilling rig or well on the surface, or even setting foot on the surface above the mineral estate leased and controlled by the lessee. This is possible and often acceptable because the lessee can access the minerals from a distant property using horizontal

¹⁴ Asabere/Huffman: *The value Discounts Associated with Historic Façade Easements*.

¹⁵ “A Journey Through Mineral Estate Dominance, The Accommodation Doctrine, And Beyond: Why Texas Is Ready To Take The Next Step With A Surface Damage Act”. Comment by Andrew M. Miller, *Houston Law Review*, Summer, 2003, p 471.

¹⁶ *Ibid.*, 471

¹⁷ *Ibid.*, 471

¹⁸ Justin Rammell, Attorney, at Rammell Law, Murry UT, Email to the authors, September 12, 2011.

drilling techniques. A surface waiver protects the surface estate from oil and gas well development activity.¹⁹

The Nature of Interests Created by an Oil and Gas Lease

Prior to severance, the owner of the mineral estate typically grants a **mineral lease** to an exploration and production company, the **mineral lessee**. The owner of the mineral estate, i.e., the **lessor**, will receive **royalty payments** from the lessee if and when minerals are produced and sold. The size of the share agreed upon in the lease is typically between $\frac{1}{8}$ and $\frac{1}{4}$ of the gross sales. A mineral lease is an actual conveyance of real property. In Texas, an oil and gas lease conveys a fee simple determinable interest in the oil and gas in place. There is a reversionary interest back to the lessor when and if the lease expires.²⁰ Even so, the mineral interest is still severed.²¹

Valuation Issues

When the mineral interests are relevant, the appraiser must take extra care to adequately describe the interest being appraised and the scope of the work. The appraiser must specify that the value estimate is for the “surface estate” or the “mineral estate,” or a combination thereof if the two have not been severed.²² If the subject property includes the surface and mineral estates

¹⁹ The owner of the mineral estate is the only one who can negotiate and grant a waiver of surface rights. When a land owner of the combined surface and mineral estate severs and sells the mineral estate, he or she can impose a surface waiver on the buyer of the minerals who will then lease to a producer subject to the surface waiver.

²⁰ Texas Oil and Gas Property Rights, Bearden Law Firm. (Although the concept of a “fee simple determinable” interest in the minerals is customary in Texas, some professionals take issue with anything less than a complete bundle of real property rights being designated as a “fee simple interest”.)

²¹ Rhett G. Campbell, Attorney, private email to the authors on May 29, 2012

²² The Uniform Standards of Professional Appraisal Practice (USPAP) Standard 1-2 (e) requires the appraiser to

combined, the “unit rule” prohibits a summation of two separate appraisals to arrive at a single value the subject, especially if the values were provided by two different appraisers. The Uniform Appraisal Standards for Federal Land Acquisitions provides solid advice on the importance of the unit rule when appraising land with minerals:

“The courts have recognized that property must be valued as a whole for federal acquisition purposes, with due consideration of all of the components that make up its value ... In the case of land that is underlain with marketable minerals ... the existence of those minerals is a factor of value to be considered in determining the market value of the property, but ... it is improper for an appraiser to estimate the value of the surface of the property, add to it a valuation of the minerals, as estimated by a separate minerals expert, and thereby conclude a total market value for the property”.²³

In describing the **interest being appraised**, the appraiser should verify and disclose the status of the mineral interest included. If all or part of the mineral interest has been severed from the surface estate, disclosure of the percentage of the mineral interest included in the appraisal is essential. Regarding comparable sales, the appraiser must determine the percentage of the mineral interest conveyed and, if it differs from the subject, make the necessary adjustments.

The **scope of work** should describe the lengths to which the appraiser has gone to estimate value, such as using comparable sales with similar mineral interests discussed in enough detail to satisfy the scope of work rule.²⁴ For appraisals using the discounted cash flow approach, the scope will describe steps taken to estimate reserves and net cash flows.

“identify the characteristics that are relevant to the type and definition of value and intended use of the appraisal”.

²³ Uniform Appraisal Standards for Federal Land Acquisitions, Section D-11

²⁴ USPAP Standard 1-2(h) and Advisory Opinions 28 and 29

When Does an Appraisal Assignment Require an Oil & Gas Appraiser?

When is a land appraiser qualified to opine on the value of oil and gas properties? There are no hard and fast rules but in general, if there is no production in the area and no proprietary or public seismographic data, and even though there is production in the same shale formation but at a distance, a land appraiser is qualified and perfectly capable of using the sales comparison approach to value the property.²⁵

On the other hand, if there is oil and gas production on or in close proximity to the subject property and, if properties in the area are trading primarily for their mineral value, the subject should be valued using an income approach (i.e., Discounted Net Cash Flow) and the appraisal should be conducted by an expert in the appraisal of oil and gas properties. Geologist and petroleum engineers (reservoir engineers) have an accepted methodology of classifying and quantifying recoverable reserves based on information obtained from drilled wells on or near the subject property or from seismic studies in the area. In shale-gas areas, geologists consider the shale formation's thickness, porosity, and permeability. Quantities of recoverable reserves, which the Society of Petroleum Engineers classifies as either proved, probable, possible, or exploratory, are estimated by a geologist or reservoir engineer. Based on the reservoir report, a decline curve is used to estimate hydrocarbon production, which is then translated into cash flows based on estimates for future oil or gas prices. Estimated drilling and production costs are deducted from gross oil and gas sales to arrive at net cash flows. The estimated future net cash flows are then discounted to a present value using a discount rate that is in the magnitude of 10 percent. That present value is further reduced to reflect the degree of uncertainty about future

²⁵ Rhett G. Campbell, Attorney private email on May 29, 2012. Mr. Campbell has expertise in litigating valuation issues for oil and gas properties.

production and prices. The important point is that appraising oil and gas properties requires the use of complex production forecasts and a sophisticated income approach which most land appraiser are not qualified to employ.²⁶

If comparable sales are available and recoverable reserves can be estimated, both the sales approach and the income approach should be used. The Uniform Appraisal Standards for Federal Land Acquisitions states the following:

“As in the valuation of other property for federal acquisition purposes, if adequate sales data is available, the sales comparison approach is usually considered the best evidence of value”.²⁷

One land appraiser in the Barnett Shale reported that he accepted an assignment to appraiser land and minerals in production. Recognizing that he was unqualified to value the mineral estate, he personally valued the surface and engaged an expert in oil and gas appraisal to value of the mineral estate. Instead of reporting the sum of the two appraisals, thus violating the unit rule, he reported two separate values.

Sales Comparison Approach

The sales comparison approach is the primary focus of this paper. **Comparability of sales data** selected for the sales comparison approach requires consideration of many factors pertaining to the surface and mineral estates. The surface estate factors include the usual list: time of sale, size, highest and best use, surface improvements and location. The list of factors relating to the mineral estate includes: 1) rights conveyed, 2) percentage of mineral interest

²⁶ This subject is far more complex than space permits. For a thorough discussion of oil and gas appraisal, see “Valuing Oil & Gas Assets in the Courtroom” **Finish this**

²⁷ Uniform Appraisal Standards for Federal Land Acquisitions

conveyed, 3) time of sale, and 4) suitability of the site for drilling. If significant information is available regarding potential production, that should be utilized in an income approach.

Rights conveyed with the comparable sale should mirror the interests being appraised. If the surface and mineral estates have been severed, the surface estate appraisal must consider the consequences of the mineral owner's surface activities. Is there a surface waiver in place on the subject or the comparable sales? If not, what effect does current or future production activity have on the market value of land? With regard to the mineral interests, which elements of the possible rights remain attached to the subject and comparable sales? The owner of a mineral interest has **executive rights**. These rights have value because they include the decision of when and whether to lease the property. Executive rights also include a claim to any leasing fee or signing bonus. A signing bonus can be a very large part of the value in the mineral interest.

Time of sale, always a factor considered in the sales comparison approach, is especially important in the Barnett Shale because of the effect volatile oil and gas prices have on prices paid for mineral interests. We observed that in the most productive geographical regions of the Barnett Shale, lease signing bonuses went from as low as \$1,000 per acre to as high as \$25,000 and back down again at times that were highly correlated with the rise and fall of natural gas prices, which went from \$3.00 to \$13.00 per MMBTUs²⁸. Prices paid for land with mineral interests behaved accordingly.

Surface improvements complicate the comparison process, especially when the subject and comparable sales have significantly different improvements. The authors are aware of a neighborhood shopping center purchased for use as a drill site. The company demolished the center, which was located at the intersection of a freeway and major street. They are drilling several directional wells at the site and allegedly plan to redevelop the unused acreage. Clearly

²⁸ MMBTUs is the acronym for one million British thermal units.

the drilling company believed the highest and best use had changed from shopping center to drill site.

Suitability of the surface for drilling and production affects the cost of getting the gas out of the ground and to the market. Operating companies will pay more for properties that present fewer inhibitors to drilling and production. Suitability issues include: a) legal or regulatory jurisdiction, b) access to product markets, c) surface terrain, d) suitable drilling location, and e) availability of large quantities of water for fracking.

The **percentage of minerals owned and conveyed** is a key factor in comparing land sales. It is common for owners, when selling their land, to reserve all or part of the minerals for themselves; thus, selling the surface only or the surface and part of the mineral interest. . The owner of a mineral interest has executive rights, which include the right to sign an oil and gas lease, assuming there is no current lease, and the right to a share of the signing bonus.

Alternatively, a seller can reserve a **non-participating royalty interest (NPRI)**, which carries no executive rights. The owner of the NPRI has no ability to lease his or her interest and will not receive any of the bonus money. The NPRI owner benefits from the mineral interest after a well is paying royalties. Before the oil and gas lease has been signed, a mineral interest can be more valuable than a royalty interest. After the signing bonus, there is no difference in value.

The **existence of a surface waiver** can be a very important factor. The value of the severed surface estate can be greater if there is no possibility of the mineral interest owner operating on or encumbering the surface. This is particularly true for smaller properties. The value of the mineral interest beneath land with a surface waiver will be diminished if there is no nearby site from which the lessee can drill and gain access to the minerals.

A **mineral deed** is the best way to accurately ascertain the amount paid for a mineral estate. However, seldom if ever are two mineral estates the same. Mineral estate sales can differ in many ways, including geographical area, leased or not lease, and quantity of recoverable reserves.

On average, the Barnett Shale is 300 feet thick, but it varies from 30 feet at the outer edges of the formation to 700 feet at its thickest point. Over a period of years, 2006-2008, geologists conducted seismographic studies to map the depth and thickness of the Barnett Shale. Gas exploration and production companies paid much greater signing bonuses to lease the land above the thickest regions of the shale formation. Once the map of this geological information was available, around 2008, shale thickness, as well as porosity and permeability became important drivers of leasing bonuses and sale prices for mineral interests.

Sales Comparison Example:

Analyzing Comparable Sales to Estimate the Value of Land with and without Minerals²⁹

The impetus for this paper came from an appraisal assignment requested by a title company that was liable for failing to discover and inform a buyer that the land he was purchasing did not include the underlying mineral estate. To establish a settlement amount, the title company instructed the appraiser to value the land, first with all of the mineral interest attached and a second without the mineral estate. The client and intended users of the appraisal are the title company (which shall go unnamed), its representatives and the Court. The appraisal will be used to provide an opinion of market value of the subject property with the insured risk and without the insured risk, i.e. the mineral estate.

²⁹ This example draws some of the facts from an actual assignment, but certain facts and procedures have been substantially abbreviated to better demonstrate adjusting for the percentage of minerals conveyed and also to protect the confidentiality of the parties.

Market value is defined as:

“The price which the property would bring when it is offered for sale by one who desires, but is not obliged to sell, and is bought by one who is under no necessity of buying it, taking into consideration all of the uses to which it is reasonably adaptable and for which it either is or in all probability will become available within the reasonable future.” City of Austin v. Cannizzo, 267 S. W. 2d 808 (Tex 1954)

The interest valued is the Fee Simple title, encumbered by any easements not to be extinguished, less oil, gas and other hydrocarbons, i.e. surface only; and the Fee Simple title including both the surface and mineral estate.

The property is identified as 500 acres of ranchland consisting of mostly native pasture. It is further identified by a survey drawing and metes and bounds description. The appraiser personally inspected all of the ranch. Highest and best use is the present use as an agricultural operation. The effective date of valuation is the date of the claim that the title policy failed, December of 2005. The final value estimates will reflect the value of the property with and without the mineral estate, the difference being the contributory value of the mineral estate.

The scope of work included verification of each comparable sale with one of the parties to the transaction or the agent(s) involved in the sale. Verification included the sale price, terms, the reservation or conveyance of minerals and any special circumstances, such as a surface waiver, that may have influenced the consideration. These sales were then paired as to surface only conveyances or conveyance of surface and minerals. In this example case, we solve for an

adjustment factor and use that information to arrive at a value of the land with and without minerals as indicated by the sales comparison approach.³⁰

Five sales of ranch land with different percentages of mineral interest reserved or conveyed were found and confirmed. All of the comparable sales were vacant land in the same soil conservation district. The surface estate characteristics were very similar and judged to be of equal value per acre. Thus, no other adjustments were needed and the primary price difference between the tracts was attributed to the mineral interests.

Finding sales of minerals-only in the Barnett Shale proved to be difficult. We did find one example in the vicinity of the subject that had aspects of a minerals-only sale. However, we reasoned that price information gained from a sale of mineral interests without the land is theoretically different than the contributory price of minerals, either some or all, when sold with the surface estate. Therefore we took special care in using that sale. The best alternative is to find vacant or minimally improved surface-only sales to compare to land sales with all or some of the minerals intact. Comparable sales of land with differing percentages of minerals intact provide useful information.

In this example, a collection of five recent ranch land sales in a single Texas county in the Barnett Shale will provide a basis for discussion of some of the issues affecting the sales comparison approach to valuing land with and without minerals. The subject property, as well as all of the sales, were above the Barnett Shale, but near its farthest reaches. At the date of value, it was not known if drilling activity would reach this far south. Consequently, land and mineral sales were based solely on the sales comparison approach, as insufficient information existed to allow for an income approach to value.

³⁰ A thorough scope of work would include surveying other buyers, sellers, landowners and related real estate professionals in the area, including petroleum landmen, to gain additional familiarity and a better sense of the market.

Mineral Estate-Only Sales

Sale No.1 has a minerals-only component. This sale occurred on October 1, 2004. The buyer agreed to purchase 160 acres of land with all of the minerals for \$407,000 (\$2,545 per acre) plus an additional \$48,375 (\$645 per mineral acre) for 100% of the minerals under an adjoining 75 acre tract of land.

In this transaction, both the buyer and seller were in a position to have exceptional knowledge of the value of the estates conveyed. The seller was an oil and gas attorney, and the buyer was a speculator in oil and gas properties. Consequently, we believe that the information gleaned from these sales carries special credence. Sale No 1a provides a value indication of \$645 per mineral acre and indicates that land sold for \$1,900 per acre.

Sale No. 1a	Surfaces and 100% Minerals	160 acres	\$2,545 per acre
Sale No. 1b	Minerals Only	75 acres	\$645 per acre

Surface Estate Only

Sale No. 2 was a 120 acre surface estate only, i.e. no minerals attached. It sold on April 1, 2005, for \$2,345 per acre. The property is easily accessible and mostly native grassland pasture. The terrain features are relatively level and there is an approximate 25% canopy.³¹ This sale provides a good base case for the value of the surface estate only.

Sale No. 2	Surface Only	120 acres	\$2,345 per acre
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Surface Estate with 100% of the Minerals

³¹ Percent of canopy is a descriptive used by veteran land appraisers to indicate the degree to which the land is shaded by trees and tall brush.

Sale No. 3 was 128 acres of land with 100 percent of the minerals. It sold for \$2,686 per acre on October 20, 2005, six months after Sale No.2. The surface characteristics of Sales 2 and 3 are comparable, thus providing a good pairing with the only difference being the minerals in Sale 3. That is, both tracts fall into the same land use classification and are similar in all other characteristics except for the mineral estate conveyed. A comparison between Sales 2 and 3 indicates that the contributory value of the mineral estate is \$341 per acre.

Sale No. 3	Surface and 100% Minerals	128 acres	\$2,686 per acre
Sale No. 2	Surface Only	120 acres	\$2,345 per acre
Difference	100% Minerals	Value per Mineral Acre	\$341 per acre

Sale No. 1a was also for land and 100% minerals at the price of \$2,545 per acre. Comparing that to Sale No. 2 indicates that the minerals contributed \$200.

Sale No. 1a	Surface and 100% Minerals	160 acres	\$2,545 per acre
Sale No. 2	Surface Only	120 acres	\$2,345 per acre
Difference	100% Minerals	Value per Mineral Acre	\$200 per acre

Surface Estate with Less than 100% of the Mineral Estate

Sale No. 4 was 120.86 acres of land with 75 percent of the mineral estate conveyed. The sale price was \$2,488 per acre and the sale date was August 12, 2005, very near the time of the second and third sale. If we compare Sales 2 and 4, Sale 2 had no mineral interest but Sale 4 had a 75 percent mineral interest. The difference was \$143 more per acre for Sale 4, which indicates

that the contributory value of a mineral acre when sold with the surface estate is \$191 per acre (\$143/.75).

Sale No. 4	Surface and 75% Minerals	120.86 acres	\$2,488 per acre
Sale No. 2	Surface Only	120 acres	\$2,345 per acres
Difference	75% Minerals	Value of Mineral Acre	\$143/.75 = \$191

Alternatively, if we compare Sale 3, which had 100 percent minerals and Sale 4 with only 75 percent minerals, the difference in price is \$198 (\$2,686-\$2488). The difference in minerals was 25 percent. Assuming there are no physical characteristics or infrastructure differences of significance, this pairing indicates that minerals are worth \$792 (\$198/.25) per acre.

Sale No. 3	Surface and 100% Minerals	128 acres	\$2,686 per acre
Sale No. 4	Surface and 75% Minerals	120.86 acres	\$2,488 per acre
Difference	25% Minerals	Value of Minerals	\$198/.25 = \$792

Sale No. 5 was a 396 acre tract that included 50% of the mineral estate and sold for \$2,502 per acre on July 1, 2005. The surface estate is similar to Sale 2, a surface only sale for \$2,345 that occurred three months earlier. With a price difference of \$157 that we attribute to the 50% mineral difference, Sale No. 5 indicates that minerals are worth \$314 per acre (\$157/.50).

Typically there is an inverse relationship between size and price. In this case the larger parcel brought a higher price per acre than did the smaller tract. The difference can be

attributable to the mineral estate, although a size adjustment might have indicated an even higher price for the mineral estate.

Sale No. 5	Surface and 50% Minerals	396 acres	\$2,502 per acre
Sale No. 2	Surface Only	120 acres	\$2,345 per acres
Difference	50% Minerals	Value of Minerals	\$157/.50 = \$314

This brings up an important point. Knowledgeable buyers will pay more for a surface estate if they also control the mineral estate because there are fewer issues regarding the mineral owner using the surface.³² A surface waiver could mitigate this concern.

Summary of the Values Indicated by Comparable Sales

One may draw several conclusions from the preceding sales and paired analyses. Sale No. 1b, a minerals only sale, indicated that the mineral estate was worth \$645 per acre. A pairing of Sales 2 and 3 indicate that minerals are worth \$341 per acre. Sale 2 compared to Sale 4 indicates \$191 per mineral acre. Sale 3 with 4 indicates \$792 per acre and Sale 5 with 2 indicates \$314.

Sales and Pairings	Indicated Mineral Value
Sale No. 1b (minerals only)	\$645
Sale No. 1a minus Sale No. 2	\$200
Sale No. 3 minus Sale No. 2	\$341
Sale No. 4 minus Sale No. 2	\$191
Sale No. 3 minus Sale No. 4	\$792

³² There is an often cited grandfather's advice to never buy land without the minerals and always retain all or part of the minerals when you sell land.

Sale No. 5 minus Sale No. 2	\$314
Weighted Average Value	\$414

We have presented five indications of value. If we weight the resulting difference from each pair equally, the average contributory value is \$413.83 (say \$414) per acre. Using \$414 as our adjustment factor, we can estimate the value of land with and without minerals.

Sales Adjustment Grid

Sale #	Surface Acres	Percent of Minerals Conveyed	Mineral Acres Conveyed	Price per Acre	Price Per Acre of Land With 100% of the Minerals	Price Per Acre of Land with No Minerals
1a	160	100%	160	\$ 2,545	\$ 2,545	\$ 2,131
2	120	0%	0	\$ 2,345	\$ 2,759	\$ 2,345
3	128	100%	128	\$ 2,686	\$ 2,686	\$ 2,272
4	121	75%	91	\$ 2,488	\$ 2,591	\$ 2,178
5	396	50%	198	\$ 2,502	\$ 2,709	\$ 2,295
Average	185				\$ 2,658	\$ 2,244

Base on the information from the adjustment grid, the value of land with all of the mineral estate attached is \$2,658. That same land without minerals is worth \$2,244. The standard deviation of the land values indicated by the paired sales is \$78.40 for land with or without minerals. The charge by the client, an attorney for the title company is to find the value of the land with and without the minerals in December 2005. The indications that we can draw from this analysis are the value of the 500 acres of ranch land with minerals was worth \$1,329,000, and without minerals, the value was \$1,122,000.

Summary and Conclusion

It is imperative that appraisers overtly consider mineral interests attached to both the subject and the comparable sales when valuing properties in regions known to have shale formations rich in natural gas like the Barnett Shale in North Central Texas. Extra care must be taken in stating the interest being appraised, and the scope of work where mineral interests are of significant value. Failure to consider the minerals can result in erroneous value estimates. In the introduction of this paper, we list eight sources of standards and guidance for appraising land with mineral interests. Much of the case law pertaining to valuing oil and gas assets can be found in a comprehensive paper written by Rhett G. Campbell and posted it on the internet in 2002.

Where subsurface minerals have value, it is common to separate the mineral estate from the surface estate. Once severed, the two estates can be bought and sold separately and they will remain separate estates even if owned by a single entity. The mineral estate is dominant over the surface. That means that even though the mineral owner does not own the surface, he or she can, within reason, come onto the property with equipment and drilling rigs, build roads and well sites, use the surface water or drill water wells with little or no consultation with the landowner. The concept of mineral estate dominance is well established in U.S. common law. Appraisers must consider the adverse impact of mineral estate dominance on the value of the surface. In Texas, the Accommodation Doctrine provides some relief to landowners. A surface waiver written into the mineral lease will change the dominance issue to favor the landowner and protect the value of the surface but at a cost to the mineral owner and lessee. Ned Stratton, attorney, posted on the internet a comprehensive paper discussing the common law roots of the mineral

estate dominance theory and citing case law and statutes on the subject in various states. Stratton points out that recently written laws in some states offer surface owners a level of protection against mineral dominance.

Appraisers must clearly specify that they have estimated the value of the surface estate, or the mineral estate, or a combination of the two. One of the valuation issues highlighted in this paper is the “unit rule” which prohibits the valuing the surface estate and the minerals separately and adding the two together to arrive at a single value estimate for the whole property. In a situation where the two estates must be valued separately, two separate values, one for the surface and the other for the minerals should be reported.

When estimating the value of a mineral interest that is currently producing oil and gas, the income approach is appropriate, but requires special expertise. The Uniform Appraisal Standards for Federal land Acquisitions states that when adequate sales comparison data is available, the sales comparison approach is preferable. Once seismologists have adequately mapped an area for the location, thickness, porosity, and permeability of the shale formation, that information is central to the value of mineral estates. The Barnett Shale thickness ranges from 30 to 700 feet. The 700 foot thick areas are the most valuable.

In this paper we focus primarily on the sales comparison approach. Important elements of comparison include interests conveyed, time of sale, and suitability for drilling and production. The appraiser must know the importance of a mineral interest with executive rights versus a non-participating royalty interest and the value of a surface waiver to the landowner.

The case study presented in this paper is a modified real case that demonstrates how to use comparable sales to estimate the market value of land with minerals and without the minerals. In the example, we use a land only sale, i.e., no minerals attached, and compare that

value to sales of land with 100 percent of the minerals attached. We also show examples of how to estimate values using sales of land with less than all of the minerals.

In conclusion, we encourage land appraisers presented with the opportunity to estimate land values in shale-gas regions to familiarize themselves with the concepts presented in this paper and to review the key sources of information pertaining to appraisal standards, oil and gas valuation, dominance law and oil and gas law as cited in our footnotes.

Appendix

Table of Shale-Gas Formations in the United States³³

The following is a list of the major shale formations and the state in which the majority of the formation is located.

Antrim Shale in Michigan,

Barnett Shale in Texas,

Caney Shale in Oklahoma,

Conesauga Shale in Alabama,

Fayetteville Shale in Arkansas,

Floyd Shale in Mississippi and Alabama,

Gothic Shale in Colorado,

Haynesville Shale on the Louisiana/Texas border,

New Albany Shale between Illinois and Ohio,

Pearsall Shale in South Texas,

Eagle Ford Shale in South Texas,

Marcellus Shale under much of the Northeast United States.

There are many other shale gas formations in the western states including California.

³³ http://www.ehelpfultips.com/list_of_shale_gas_formations_in.htm