From Deed to Bank
Valuing Mineral and Royalty Interests

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Bryce leads Mercer Capital’s Oil & Gas Industry Group. He is a regular contributor to Mercer Capital’s blog, *Energy Valuation Insights* and the Energy sector of *Forbes.com* addressing valuation and economic trends in the oil & gas industry. He has over 20 years of oil and gas industry and valuation experience both in the U.S. and internationally. He has presented on upstream, mineral and royalty valuation issues on multiple occasions.

Bryce provides oil and gas companies, midstream operators, and oilfield servicers, as well as mineral & royalty owners, with corporate valuation, asset valuation, litigation support, transaction and due diligence advisory, and other related services.
Putting A Number On It:
How to Value a Mineral Interest

• Overview of Mineral Space & Value Considerations
• Methodologies: Different Interests – Different Methods
• DCF Dashboard
• Examples
Mineral / Royalty A&D Trends Over Time

Timeline

2004 – 2011:
Highly Diversified Packages
- E.g. - 5 states, 50 counties, 5,000 wells
- Flat production profile / conventional
- Traded on a cash flow multiple

2012 – Mid 2014:
Emergence: Minerals in Unconventional Basins
- Bakken minerals enter the picture
- DCF analysis more important as buyers model all future locations
- PDP now only a piece of the equation
- Midland and Delaware mineral positions quietly aggregated

Mid 2014 – Mid 2017:
Delaware / Midland Basins Change Mineral Landscape
- Enter Viper / changed the game
- $/acre valuations / minimal cash flow
- Acreage flips prevalent
- No historical cadence for operators
- Limited data for type curve development

Mid 2017 – Present:
Buyer Sophistication Reaches New Heights / Valuations Impacted
- Ground game increasingly difficult
- Attention focused on next 12-24 mo. CF
- Future development cadence driving valuations
- Operator matters
- Well-defined type curves on proven benches

Historical Mineral / Royalty A&D Activity

Mineral / Royalty Deals as a % of All US Deals

- 10x increase in mineral A&D over the last 10 years
What Are Mineral Interests?

"The ownership of all rights to gas, oil, and other minerals at or below the surface of a tract of land"

– U.S. Mineral Exchange
### Why Do Minerals Transact?

<table>
<thead>
<tr>
<th>THE OWNERSHIP TRANSFER MATRIX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VOLUNTARY</strong> (THINGS YOU MAKE HAPPEN)</td>
</tr>
<tr>
<td>Sale to Outside Investor(s)</td>
</tr>
<tr>
<td>Gifting Programs</td>
</tr>
<tr>
<td>Asset Transfer</td>
</tr>
<tr>
<td>Collateralization</td>
</tr>
<tr>
<td>Liquidity Needs</td>
</tr>
<tr>
<td><strong>IN.voluntary</strong> (THINGS THAT HAPPEN TO YOU)</td>
</tr>
<tr>
<td>Divorce</td>
</tr>
<tr>
<td>Bankruptcy</td>
</tr>
<tr>
<td>Death</td>
</tr>
</tbody>
</table>

- Asset Level (Entity considerations wouldn’t be prudent at this juncture)
- Royalty / ORRI / Non-Producing Minerals
- Producing / Non-Producing
Considerations in Valuing Oil & Gas Interests

Summary of Treasury Reg 1.611-2(g) & GAAP Fair Value Standards

<table>
<thead>
<tr>
<th>Considerations for an Oil and Gas Valuation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maps and descriptions of property</td>
<td>Number of acres by reserve type</td>
</tr>
<tr>
<td>History of the property</td>
<td>Lease terms</td>
</tr>
<tr>
<td></td>
<td>Date of initial acquisition and cost basis</td>
</tr>
<tr>
<td></td>
<td>Cost of mineral improvements</td>
</tr>
<tr>
<td>Valuation date</td>
<td></td>
</tr>
<tr>
<td>Accounting information</td>
<td>Allocation of value and/or cost to the mineral property and property improvements</td>
</tr>
<tr>
<td></td>
<td>Method used to determine property improvements</td>
</tr>
<tr>
<td></td>
<td>Depletion/depreciation expense details</td>
</tr>
<tr>
<td>Reserve estimates</td>
<td>Break down of reserves by mineral type (oil, gas, NGL)</td>
</tr>
<tr>
<td></td>
<td>Break down of reserves by classification (PDP, PDNP, PUDs)</td>
</tr>
<tr>
<td></td>
<td>Other pertinent geological information</td>
</tr>
<tr>
<td>Reserve characteristics</td>
<td>Number of producing zones and average depth of each</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>Changes in proration, flooding, vacuum, etc.</td>
</tr>
<tr>
<td>Details regarding previous transactions</td>
<td>Including dates of transactions and the terms of the leases</td>
</tr>
<tr>
<td>Interest characteristics</td>
<td>Type of interest (royalty, overriding royalty, working interest)</td>
</tr>
<tr>
<td></td>
<td>Percent/fraction of interest owned</td>
</tr>
<tr>
<td>Well descriptions</td>
<td>Number of wells, date of completions, and/or abandonment</td>
</tr>
<tr>
<td></td>
<td>Annual production per well per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Necessary Items</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales history</td>
<td>Revenue generated from reserves over the last five years</td>
</tr>
<tr>
<td>Historical oil and gas prices</td>
<td>Important in understanding benchmark price differentials</td>
</tr>
<tr>
<td>Future NYMEX pricing</td>
<td>Important in estimating future cash flow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fair Value (GAAP)</th>
<th>ASC 820</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>“The amount at which an asset (or liability) could be bought (or incurred) or sold (or settled) in a current transaction between willing parties, that is, other than in a forced or liquidation sale.”</td>
</tr>
<tr>
<td>Proven Reserves:</td>
<td>Typically the discounted cash flow method</td>
</tr>
<tr>
<td>Unevaluated Acreage:</td>
<td>Typically the comparable transaction method</td>
</tr>
</tbody>
</table>
Considerations in Valuing Oil & Gas Mineral Interests

**Asset-Based Approach**

**Adjusted Book Value:** Typically not employed when valuing mineral interests. Sometimes can be used to adjust book value on a portfolio.

**Income Approach**

**Discounted Cash Flow (DCF):** Analysis informed by business and industry trends

**Lease Bonus Method:** Occasionally utilized for non-producing inactive acreage

**Market Approach**

**Comparable Transaction Method:** (i) Multiples of RMR, (ii) $ per acre, (iii) production multiples, etc.

**Guideline Public Company Method:** Public yields and implied metrics

**Producing – PDP:**
- Income - DCF
- Market - Comparable Transactions

**Non-Producing – Probable / Possible:**
- Income - DCF
- Income/Market Hybrid - Lease Bonus Method

**Non-Producing – PUD’s:**
- Income - DCF
- Market - Comparable Transactions
General Methodologies by Basin

**NAV / DCF Analysis**

- Delaware / Midland Basins
- STACK / SCOOP / Merge

**Blended**

- Marcellus
- Eagle Ford

**Yield Driven Valuations**

- Bakken
- Barnett / Fayetteville / Conventional Permian/ETX

**Delaware / Midland Valuations**

- PDP PV8-10, +
- DUC PV12-15, +
- Permit PV15, +
- PV20-30 for 1-3 benches developed over a 10-year period (varies by location)

**Eagle Ford**

- $25k - $35/NRA in core areas with strong cash flow and near-term development by key EF operators
- PV20-30 for 1 EF bench at proven spacing / value for Chalk assessed on a unit by unit basis
- 10-12% yield (FTM cash flow)

**Bakken**

- Core mineral packages with strong upside can trade at 9x-12x FTM cash flow
- Value received for Bakken and 1 Three Forks bench / operator is key
- $/acre valuations typically don’t play a role in a sale process
Why the Valuation Approach Differs in the Permian vs. Other Plays: Basin Lifecycle

- The best way to accurately value and account for the Permian’s rapid growth: thoughtful NAV analysis.
- Year-over-year growth notably more gradual in other basins.
- This results in more yield-driven valuations whereby the next 12-24 months of forecasted cash flow is the key determinant of value.
- Near-term yield is important, but the presence of multiple proven benches and pad drilling makes the long-term development plan a critical value component.
Methodology Comparisons

Good Comparable Transactions are Best (But Can Be Rare) – Otherwise the DCF is Prominent

DCF: (SPEE says its most utilized method)
- Strength: is the purest and most intrinsic method but may not always be the best method
- Weakness: lots of assumptions

Comparable Transactions & Guideline Public Data:
- Strength: Simple and Relevant
- Weakness: Devil is in the details and what is a “comparable”?

Interplay:
- Methods and inputs have symbiotic and interchangeable relationships to each other and can/should be tested against each other for reasonableness
  - Public Yields / Returns
  - Implied Pricing Metrics
DCF “Dashboard”

Critical Inputs To A Mineral Oriented Discounted Cash Flow Model

5 Key Component Areas and Assumptions:

1. Ownership Interest
2. Production Oriented Assumptions
3. Pricing / Differentials / Post-Production Deductions
4. Expected Returns (PDP / DUC-Permits / P2-P3)
5. Timing of Production / Drilling (PDP / DUC-Permits / P2-P3)
Ownership Interests

Know What You Own (Or What You’re Buying)

- Deed
- Lease
- Pooling
- Division Orders
- Net Revenue Interest
- “Cleanliness” of Title
Knowledge is Value: Know Your Assets

- How are you converting NMAs to NRAs?
- What is the current cash flow and what do the next 1-3 years look like?
- In the same breath, what is your total DUC and Permit Count?
- Can you walk me through your historical and forecasted development timing?
- Does your acreage support long-lateral development?
- For both the Delaware and Midland Basins, who are my operators?
- Can you explain your type curve methodology?
- What’s your average tract size?
- What do your permit-to-spud and spud-to-completion times look like by operator?
Production Assumptions

Estimating What & How Much to Value

**PDP:**
- Location on Decline Curve?
- What is Overall Decline Curve?
- Production Issues?

**PUD’s:** (critical analysis is lynchpin)
- Comparable activity
- DUC’s / Permits
- Well Spacing / Operator / Parent-Child
- I.P. rates
- Decline curve
- Mix of hydrocarbons

**Probable / Possible:**
- Wilderness of Uncertainty
- Diminishing Acreage Values? (Market / Lease Bonus Method)
Pricing Assumptions

What Do I Get For What I Produce?

Where to Begin
- NYMEX?
- Local Pricing? (Midland Argus)

Differentials
- Infrastructure / Transportation
- Water Issues
- Other Issues

Post-Production Deductions
- Lease issues

Check Stub
- Always correct?
## Expected Returns

### Risk & Returns Increase as They Go Down the Certainty Scale

<table>
<thead>
<tr>
<th>Royalty and ORRI</th>
<th>Discount Rate Ranges</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDP</td>
<td>7%-10%</td>
<td>- Market transactions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Public yields</td>
</tr>
<tr>
<td>Non-Producing:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DUC</td>
<td>12% - 15%+</td>
<td>- Mineral aggregator returns &amp;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implied Transaction Pricing</td>
</tr>
<tr>
<td>Permit</td>
<td>15%+</td>
<td>- Market place transactions</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>20%-80% (Avg. 30%-40%)</td>
<td>- Implied Transaction Pricing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&amp; SPEE Survey*</td>
</tr>
</tbody>
</table>

*While the SPEE Survey applies primarily to working interests, these published ranges generally hold consistent with rates observed in mineral interest discounts.*
Expected Returns: Commentary

Why are PDP Royalties Less Than PV10? Simple: Less Risk

**PDP:**

Shared Risks with Working Interests:
- Price volatility risk
- Geologic risk
- Decline curve (Depletion) risk
- Infrastructure risk

Non-Shared Risks:
- Fewer liability risks
- No operating expense risk
- No plugging & abandonment risk
- Other

Pure royalty/minerals retain ownership while W.I. operates under a lease (ORRI typically does not);

**Non Producing:**

More Volatility = Higher Discount Rate

- Lower end of discount rate range for:
  - DUC’s
  - Permits

- Higher returns a function of uncertainty:
  - Title “Cleanliness”
  - Operator profile
  - Drilling trends
  - Field maturity
  - Other
Cadence: Timing Assumptions Are Critical

1. DUCs and Permits
   - Common theme in mineral buyer investor presentations: “visible production growth”
   - Typical development schedule has DUCs and Permits coming online in the first 12-18 months

2. Location Timing
   - Most proven, delineated benches are scheduled first
   - Small adjustments to this development program = wide variations in valuation

3. Location Scheduling
   - Order of locations has significant impact on value
   - Show realistic sensitivities to create a potential high, mid, and low case future cash flow profile

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![Development Timeline Example](chart.png)

- # of Spuds
- 2019: 663
- 2020: 693
- 2021: 727
- 2022: 764
- 2023: 805
- 2024: 831
- 2025: 831
- 2026: 831
- 2027: 831
- 2028: 831
- 2029: 831
- 2030: 831
- 2031: 831

Legend:
- HISTORIC
- PERMITS
- WOLFCAMP A
- LOWER SPRABERRY
- UPPER WOLFCAMP B
- LOWER WOLFCAMP B
- MIDDLE SPRABERRY
- UPPER SPRABERRY
- WOLFCAMP C
- WOLFCAMP D / CLINE
Holding Period Timing

Your IRR is Waiting…

12-18 Months? Longer?

Operator Disclosure

• Capex budget variance

Core vs. Non-Core Acreage

• DCF Sensitive To This
Operator Prominently Factored into the Timing/Cadence Equation

- Mineral buyers scrutinizing operators of their acquisition targets more than ever
- Common theme in mineral buyer investor presentations: “competent operators”, “high-quality operators”
- Buyers are analyzing an operator’s total capital budget for a basin vs. what that operator spent on their acquisition target’s position in that basin

Example - Operator Capex Analysis

Midland Basin vs. Delaware Basin

- Midland Basin:
  - ~$4.9B
  - Operators: Pioneer, Apache, Endeavor, OXY, Concho, Other

- Delaware Basin:
  - ~$860MM
  - Operators: OXY, Mewbourne, WPX, Noble, Matador, Centennial, Other

PUD Example – Delaware Basin

- Investor decks from operators in region also in early stage helps to determine production profile
  - 24-Hour IP Rates, IP-30, and 8 month cumulative production used to extrapolate year 1 production

- Rely on regional research or engineering report to estimate decline rate

- Well-spacing drives number of wells on the subject area (varied widely in this example)

- Local pricing discussions and investor decks were useful for determining pricing differentials

- Discount rate based on implied transaction prices among other sources

- No permits yet. Model very sensitive to timing assumption at a 20% discount rate

### Projected Future Cash Flows

<table>
<thead>
<tr>
<th>February-21</th>
<th>February-22</th>
<th>February-23</th>
<th>February-24</th>
<th>February-25</th>
<th>February-26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Cash Flow</td>
<td>$462,532</td>
<td>$1,161,023</td>
<td>$924,297</td>
<td>$638,945</td>
<td>$506,869</td>
</tr>
<tr>
<td>Discounting Periods</td>
<td>1.50</td>
<td>2.50</td>
<td>3.50</td>
<td>4.50</td>
<td>5.50</td>
</tr>
<tr>
<td>Discount Factor</td>
<td>0.76</td>
<td>0.63</td>
<td>0.53</td>
<td>0.44</td>
<td>0.37</td>
</tr>
<tr>
<td>Present Value of Cash Flow</td>
<td>$351,860</td>
<td>$736,017</td>
<td>$488,289</td>
<td>$281,286</td>
<td>$185,951</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>February-27</th>
<th>February-28</th>
<th>February-29</th>
<th>February-30</th>
<th>February-31</th>
<th>February-32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Cash Flow</td>
<td>$374,077</td>
<td>$325,732</td>
<td>$285,048</td>
<td>$251,047</td>
<td>$221,538</td>
</tr>
<tr>
<td>Discounting Periods</td>
<td>7.50</td>
<td>8.50</td>
<td>9.50</td>
<td>10.50</td>
<td>11.50</td>
</tr>
<tr>
<td>Discount Factor</td>
<td>0.25</td>
<td>0.21</td>
<td>0.18</td>
<td>0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>Present Value of Cash Flow</td>
<td>$95,302</td>
<td>$69,154</td>
<td>$50,431</td>
<td>$37,013</td>
<td>$27,218</td>
</tr>
</tbody>
</table>

### Terminal Value

- Year 12 Cash Flow | $195,172
- Ongoing Cash Flow | $171,752
- Discount Rate | 20.00%
- Terminal Capitalization Rate | 32.00%
- Terminal Capitalization Factor | 3.13

- Indicated Terminal Value | $536,724
- Discount Factor | 0.10

### Present Value of Terminal Value

- Sum of Present Value of Discrete Cash Flows | $2,474,653
- Indicated Terminal Value | $54,952

- Indicated Value | $2,529,605

- Indicated Value: DCF Analysis | $2,529,600

- Implied $/NMA | $15,810
PDP Example – West Texas

- Similar DCF framework for PDP
- Historical wellhead pricing helps to determine differential
- Historical production and regional research determine decline rate
- Discount rate & “OpEx” / monitoring costs derived using public royalty trusts in the Permian Basin (PBT and Cross Timbers) as a starting benchmark

- Client received numerous unsolicited offers over time $365k - $563k
  - $44,160 / NMA
  - 120x Monthly Check stub
- Client then opts to sell via online auction
- Received modest premium to our value

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**Projected Future Cash Flows**

<table>
<thead>
<tr>
<th>Owner's Revenue</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well #1</td>
<td>$14,284</td>
<td>$12,910</td>
<td>$11,935</td>
<td>$11,268</td>
<td>$10,833</td>
<td>$10,532</td>
</tr>
<tr>
<td>Well #2</td>
<td>42,471</td>
<td>38,386</td>
<td>35,487</td>
<td>33,505</td>
<td>32,210</td>
<td>31,317</td>
</tr>
<tr>
<td>Well #3</td>
<td>69,383</td>
<td>62,710</td>
<td>57,975</td>
<td>54,736</td>
<td>52,630</td>
<td>51,161</td>
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<tr>
<td>Well #4</td>
<td>223</td>
<td>229</td>
<td>220</td>
<td>216</td>
<td>214</td>
<td>213</td>
</tr>
<tr>
<td>Total Owner's Revenue</td>
<td>$126,361</td>
<td>$114,235</td>
<td>$105,617</td>
<td>$99,726</td>
<td>$95,877</td>
<td>$93,223</td>
</tr>
<tr>
<td>- Owner's Taxes¹</td>
<td>$(5,686)</td>
<td>$(5,141)</td>
<td>$(4,753)</td>
<td>$(4,488)</td>
<td>$(4,314)</td>
<td>$(4,105)</td>
</tr>
<tr>
<td>Total Owner's Revenue, Net of Production Taxes</td>
<td>$120,675</td>
<td>$109,095</td>
<td>$100,864</td>
<td>$95,238</td>
<td>$91,563</td>
<td>$89,028</td>
</tr>
<tr>
<td>- Annual Owner Expenses²</td>
<td>$(6,318)</td>
<td>$(5,712)</td>
<td>$(5,281)</td>
<td>$(4,986)</td>
<td>$(4,794)</td>
<td>$(4,661)</td>
</tr>
<tr>
<td>Net Cash Flow</td>
<td>$114,357</td>
<td>$103,383</td>
<td>$95,583</td>
<td>$90,252</td>
<td>$86,769</td>
<td>$84,367</td>
</tr>
<tr>
<td>Discounting Periods</td>
<td>1.00</td>
<td>2.00</td>
<td>3.00</td>
<td>4.00</td>
<td>5.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Discount Factor</td>
<td>7.00%</td>
<td>7.00%</td>
<td>7.00%</td>
<td>7.00%</td>
<td>7.00%</td>
<td>7.00%</td>
</tr>
<tr>
<td>Present Value of Cash Flow</td>
<td>$106,875</td>
<td>$90,299</td>
<td>$78,024</td>
<td>$68,853</td>
<td>$61,865</td>
<td>$56,217</td>
</tr>
</tbody>
</table>

Sum of Present Value of Discrete Cash Flows $715,556
+ Present Value of Terminal Value 373,991
Indicated Value $1,089,548

Indicated Value: DCF Analysis $1,090,000
Example: Rockies Region – Smaller ORRI and Royalty Transactions

Transactions from 2017 – Early 2019

Multiples of Monthly Revenues

<table>
<thead>
<tr>
<th>Multiples of Monthly Revenues</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>55.38</td>
</tr>
<tr>
<td>Median</td>
<td>37.45</td>
</tr>
<tr>
<td>Minimum</td>
<td>8.95</td>
</tr>
<tr>
<td>1st Quartile</td>
<td>23.27</td>
</tr>
<tr>
<td>3rd Quartile</td>
<td>65.74</td>
</tr>
<tr>
<td>Maximum</td>
<td>603.73</td>
</tr>
</tbody>
</table>
About Mercer Capital

Mercer Capital provides business valuation and financial advisory services to royalty owners in the oil and gas industry.

Mercer Capital is a national business valuation and financial advisory firm. Offering a broad range of services, we have provided thousands of valuations, which are well-reasoned and thoroughly documented.

We understand the unique position of royalty owners as well as the broader energy industry. Whether in reaction to an event or for strategic planning purposes, Mercer Capital can help capture the value of your mineral rights.

Services Provided

- Valuation of oil and gas companies
- Transaction advisory for acquisitions and divestitures
- Valuations for purchase accounting and impairment testing
- Fairness and solvency opinions
- Litigation support for economic damages and valuation and shareholder disputes

Published quarterly, our Exploration & Production Newsletter provides an overview of the industry through supply and demand analysis, commodity pricing, and public market performance. In addition, each issue of this quarterly newsletter focuses on a region, including, Eagle Ford, Permian Basin, Bakken, and Appalachia, examining general economic and industry trends.

For an additional resource regarding the valuation of mineral royalty interests within the oil and gas industry, view our whitepaper, How to Value an Oil & Gas Royalty Interest.
Questions?