

**FORSPAN ASSESSMENT MODEL FOR CONTINUOUS  
ACCUMULATIONS--BASIC INPUT DATA FORM (NOGA, Version 9, 2-10-03)**

**IDENTIFICATION INFORMATION**

Assessment Geologist:	D.K. Higley-Feldman	Date:	9/14/2004
Region:	North America	Number:	5
Province:	Raton Basin-Sierra Grande Uplift	Number:	5041
Total Petroleum System:	Upper Cretaceous-Tertiary Coalbed Gas	Number:	504101
Assessment Unit:	Vermejo Coalbed Gas	Number:	50410182
Based on Data as of:	IHS Energy (PI/Dwights) 2004 (data current through 1 January 2004)		
Notes from Assessor:	Comingled Raton and Vermejo production not included.		

**CHARACTERISTICS OF ASSESSMENT UNIT**

**Assessment-unit type:** Oil (<20,000 cfg/bo) or Gas (≥20,000 cfg/bo), incl. disc. & pot. additions Gas

**What is the minimum total recovery per cell?** 0.02 (mmbo for oil A.U.; bcfg for gas A.U.)

Number of tested cells: 1700

Number of tested cells with total recovery per cell ≥ minimum: 1200

Established (discovered cells): X Hypothetical (no cells):           

Median total recovery per cell (for cells ≥ min.): (mmbo for oil A.U.; bcfg for gas A.U.)

1st 3rd discovered	<u>0.81</u>	2nd 3rd	<u>0.35</u>	3rd 3rd	<u>0.2</u>
--------------------	-------------	---------	-------------	---------	------------

**Assessment-Unit Probabilities:**

<u>Attribute</u>	<u>Probability of occurrence (0-1.0)</u>
1. <b>CHARGE:</b> Adequate petroleum charge for an untested cell with total recovery ≥ minimum.	<u>1.0</u>
2. <b>ROCKS:</b> Adequate reservoirs, traps, seals for an untested cell with total recovery ≥ minimum.	<u>1.0</u>
3. <b>TIMING:</b> Favorable geologic timing for an untested cell with total recovery ≥ minimum.	<u>1.0</u>
<b>Assessment-Unit GEOLOGIC Probability</b> (Product of 1, 2, and 3):	<u>1.0</u>

**NO. OF UNTESTED CELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES**

1. Total assessment-unit area (acres): (uncertainty of a fixed value)

calculated mean 1,312,000    minimum 1,246,000    mode 1,312,000    maximum 1,378,000

2. Area per cell of untested cells having potential for additions to reserves (acres): (values are inherently variable)

calculated mean 147    minimum 80    mode 120    maximum 240

uncertainty of mean:    minimum 125    maximum 180

3. Percentage of total assessment-unit area that is untested (%): (uncertainty of a fixed value)

calculated mean 80    minimum 75    mode 81    maximum 85

Assessment Unit (name, no.)  
Vermejo Coalbed Gas, 50410182

---

---

**NO. OF UNTESTED CELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES  
(Continued)**

4. Percentage of untested assessment-unit area that has potential for additions to reserves (%):  
( a necessary criterion is that total recovery per cell  $\geq$  minimum; uncertainty of a fixed value)

calculated mean 28      minimum 10      mode 25      maximum 50

Geologic evidence for estimates:      Infill drilling of existing sweet spots, extension of drilling to east, west,  
and southeast, and possibility of few new sweet spots in south.

---

**TOTAL RECOVERY PER CELL**

Total recovery per cell for untested cells having potential for additions to reserves:  
(values are inherently variable; mmo for oil A.U.; bcfg for gas A.U.)

calculated mean 0.49      minimum 0.02      median 0.25      maximum 9.5

---

**AVERAGE COPRODUCT RATIOS FOR UNTESTED CELLS, TO ASSESS COPRODUCTS**

(uncertainty of fixed but unknown values)

<u>Oil assessment unit:</u>	minimum	mode	maximum
Gas/oil ratio (cfg/bo)	<u>                    </u>	<u>                    </u>	<u>                    </u>
NGL/gas ratio (bnl/mmcf)	<u>                    </u>	<u>                    </u>	<u>                    </u>
<u>Gas assessment unit:</u>			
Liquids/gas ratio (bliq/mmcf)	<u>0</u>	<u>0</u>	<u>0</u>

---

**SELECTED ANCILLARY DATA FOR UNTESTED CELLS**

(values are inherently variable)

<u>Oil assessment unit:</u>		minimum	mode	maximum
API gravity of oil (degrees)		<u>                    </u>	<u>                    </u>	<u>                    </u>
Sulfur content of oil (%)		<u>                    </u>	<u>                    </u>	<u>                    </u>
Depth (m) of water (if applicable)		<u>                    </u>	<u>                    </u>	<u>                    </u>

Drilling depth (m)

minimum	F75	mode	F25	maximum
<u>                    </u>				

<u>Gas assessment unit:</u>		minimum	mode	maximum
Inert-gas content (%)		<u>                    </u>	<u>                    </u>	<u>                    </u>
CO <sub>2</sub> content (%)		<u>0.00</u>	<u>0.50</u>	<u>2.00</u>
Hydrogen sulfide content (%)		<u>0.00</u>	<u>0.00</u>	<u>0.00</u>
Heating value (BTU)		<u>900</u>	<u>950</u>	<u>1000</u>
Depth (m) of water (if applicable)		<u>                    </u>	<u>                    </u>	<u>                    </u>

Drilling depth (m)

minimum	F75	mode	F25	maximum
<u>30</u>	<u>547</u>	<u>280</u>	<u>1009</u>	<u>1600</u>

<u>Success ratios:</u>	calculated mean	minimum	mode	maximum
Future success ratio (%)	<u>55</u>	<u>35</u>	<u>55</u>	<u>75</u>

Historic success ratio, tested cells (%) 70.6

Completion practices:

- |  |                             |
|--|-----------------------------|
| 1. Typical well-completion practices (conventional, open hole, open cavity, other) | <u>Conventional</u>         |
| 2. Fraction of wells drilled that are typically stimulated                         | <u>                    </u> |
| 3. Predominant type of stimulation (none, frac, acid, other)                       | <u>Possible cavitation</u>  |
| 4. Fraction of wells drilled that are horizontal                                   | <u>0</u>                    |
-

**ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES**  
**Surface Allocations** (uncertainty of a fixed value)

1.	<u>Colorado</u>	represents	<u>59.14</u>	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	<u>40</u>	_____
2.	<u>New Mexico</u>	represents	<u>40.86</u>	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	<u>60</u>	_____
3.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____
4.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____
5.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____
6.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____

Assessment Unit (name, no.)  
Vermejo Coalbed Gas, 50410182

---

7. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

8. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

9. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

10. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

11. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

12. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

---

**ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO GENERAL LAND OWNERSHIPS**  
**Surface Allocations** (uncertainty of a fixed value)

1. <u>Federal Lands</u>		represents	<u>7.81</u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum		mode	maximum
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
<u>Gas in gas assessment unit:</u>				
Volume % in entity	<u>                    </u>		<u>5.4</u>	<u>                    </u>
2. <u>Private Lands</u>		represents	<u>89.23</u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum		mode	maximum
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
<u>Gas in gas assessment unit:</u>				
Volume % in entity	<u>                    </u>		<u>90.4</u>	<u>                    </u>
3. <u>Tribal Lands</u>		represents	<u>                    </u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum		mode	maximum
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
<u>Gas in gas assessment unit:</u>				
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
4. <u>Other Lands</u>		represents	<u>                    </u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum		mode	maximum
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
<u>Gas in gas assessment unit:</u>				
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
5. <u>Colorado State Lands</u>		represents	<u>2.54</u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum		mode	maximum
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
<u>Gas in gas assessment unit:</u>				
Volume % in entity	<u>                    </u>		<u>4</u>	<u>                    </u>
6. <u>New Mexico State Lands</u>		represents	<u>0.41</u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum		mode	maximum
Volume % in entity	<u>                    </u>		<u>                    </u>	<u>                    </u>
<u>Gas in gas assessment unit:</u>				
Volume % in entity	<u>                    </u>		<u>0.2</u>	<u>                    </u>

Assessment Unit (name, no.)  
Vermejo Coalbed Gas, 50410182

---

7. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:  
Volume % in entity \_\_\_\_\_

8. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:  
Volume % in entity \_\_\_\_\_

9. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:  
Volume % in entity \_\_\_\_\_

10. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:  
Volume % in entity \_\_\_\_\_

11. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:  
Volume % in entity \_\_\_\_\_

12. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:  
Volume % in entity \_\_\_\_\_

---

**ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS**  
**Surface Allocations** (uncertainty of a fixed value)

1. <u>Bureau of Land Management (BLM)</u>	represents	<u>1.75</u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	<u>1.4</u>	_____
2. <u>BLM Wilderness Areas (BLMW)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
3. <u>BLM Roadless Areas (BLMR)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
4. <u>National Park Service (NPS)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
5. <u>NPS Wilderness Areas (NPSW)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
6. <u>NPS Protected Withdrawals (NPSP)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____

Assessment Unit (name, no.)  
 Vermejo Coalbed Gas, 50410182

---

7. <u>US Forest Service (FS)</u>	represents	<u>6.06</u>	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	<u>4</u>	_____
8. <u>USFS Wilderness Areas (FSW)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
9. <u>USFS Roadless Areas (FSR)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
10. <u>USFS Protected Withdrawals (FSP)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
11. <u>US Fish and Wildlife Service (FWS)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
12. <u>USFWS Wilderness Areas (FWSW)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____

Assessment Unit (name, no.)  
Vermejo Coalbed Gas, 50410182

---

13. <u>USFWS Protected Withdrawals (FWSP)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
14. <u>Wilderness Study Areas (WS)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
15. <u>Department of Energy (DOE)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
16. <u>Department of Defense (DOD)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
17. <u>Bureau of Reclamation (BOR)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____
18. <u>Tennessee Valley Authority (TVA)</u>	represents	_____	area % of the AU
<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____
<u>Gas in gas assessment unit:</u>			
Volume % in entity	_____	_____	_____

Assessment Unit (name, no.)  
Vermejo Coalbed Gas, 50410182

---

19. Other Federal represents \_\_\_\_\_ area % of the AU

Oil in oil assessment unit:                    minimum                    mode                    maximum  
Volume % in entity                    \_\_\_\_\_                    \_\_\_\_\_                    \_\_\_\_\_

Gas in gas assessment unit:  
Volume % in entity                    \_\_\_\_\_                    \_\_\_\_\_                    \_\_\_\_\_

20. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

Oil in oil assessment unit:                    minimum                    mode                    maximum  
Volume % in entity                    \_\_\_\_\_                    \_\_\_\_\_                    \_\_\_\_\_

Gas in gas assessment unit:  
Volume % in entity                    \_\_\_\_\_                    \_\_\_\_\_                    \_\_\_\_\_

---

**ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS**  
**Surface Allocations** (uncertainty of a fixed value)

1.	<u>Arkansas Tablelands (ARTL)</u>	represents	<u>6.03</u>	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	<u>5</u>	_____
2.	<u>Southern Parks and Ranges (SPRA)</u>	represents	<u>93.97</u>	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	<u>95</u>	_____
3.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____
4.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____
5.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____
6.	_____	represents	_____	area % of the AU
	<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
	Volume % in entity	_____	_____	_____
	<u>Gas in gas assessment unit:</u>			
	Volume % in entity	_____	_____	_____

7. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

8. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

9. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

10. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

11. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

12. \_\_\_\_\_ represents \_\_\_\_\_ area % of the AU

<u>Oil in oil assessment unit:</u>	minimum	mode	maximum
Volume % in entity	_____	_____	_____

Gas in gas assessment unit:

Volume % in entity	_____	_____	_____
--------------------	-------	-------	-------

---

