

Appendix 3. Input parameters for the Western Margin Marcellus Assessment Unit (50670469), Devonian Shale-Middle and Upper Paleozoic Total Petroleum System, Appalachian Basin Province. [bcfg, billion cubic feet of gas; mmcf, million cubic feet of gas; ccf, cubic feet of gas; mmbo, million barrels of oil; bo, barrel of oil; bliq, barrel of liquid; bngl, barrel of natural gas liquids; m, meters; A.U., assessment unit]

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

IDENTIFICATION INFORMATION

Assessment Geologist:	<u>J.L. Coleman and R.C. Milici</u>	Date:	<u>17-Mar-11</u>
Region:	<u>North America</u>	Number:	<u>5</u>
Province:	<u>Appalachian Basin</u>	Number:	<u>5067</u>
Total Petroleum System:	<u>Devonian Shale-Middle and Upper Paleozoic</u>	Number:	<u>506704</u>
Assessment Unit:	<u>Western Margin Marcellus</u>	Number:	<u>50670469</u>
Based on Data as of:	<u>State data (Ohio, West Virginia, and Pennsylvania)</u>		
Notes from Assessor:	<u></u>		

CHARACTERISTICS OF ASSESSMENT UNIT

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

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

Number of tested cells: 1133

Number of tested cells with total recovery per cell ≥ minimum: >9

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

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

1st 3rd discovered	<u></u>	2nd 3rd	<u></u>	3rd 3rd	<u></u>
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Assessment-Unit Probabilities:

<u>Attribute</u>	<u>Probability of occurrence (0-1.0)</u>
1. CHARGE: Adequate petroleum charge for an untested cell with total recovery ≥ minimum.	<u>1.0</u>
2. ROCKS: Adequate reservoirs, traps, seals for an untested cell with total recovery ≥ minimum.	<u>1.0</u>
3. TIMING: Favorable geologic timing for an untested cell with total recovery ≥ minimum.	<u>1.0</u>
Assessment-Unit GEOLOGIC Probability (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 25,500,000 minimum 24,225,000 mode 25,500,000 maximum 26,775,000

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

calculated mean 117 minimum 20 mode 90 maximum 240

uncertainty of mean: minimum 92 maximum 142

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

calculated mean 99 minimum 99 mode 99.5 maximum 99.9

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Assessment Unit (name, no.)
 Western Margin Marcellus, 50670469

**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 7 minimum 0.5 mode 6.5 maximum 15

Geologic evidence for estimates:

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 0.13 minimum 0.02 median 0.05 maximum 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 (bnlg/mmcfg)	<u> </u>	<u> </u>	<u> </u>
<u>Gas assessment unit:</u>			
Liquids/gas ratio (bliq/mmcfg)	<u>40</u>	<u>60</u>	<u>80</u>

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Assessment Unit (name, no.)
Western Margin Marcellus, 50670469

SELECTED ANCILLARY DATA FOR UNTESTED CELLS

(values are inherently variable)

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

Drilling depth (m)

minimum	F75	mode	F25	maximum
_____	_____	_____	_____	_____

Gas assessment unit:

	minimum	mode	maximum
Inert-gas content (%)	0.00	0.10	1.00
CO ₂ content (%)	0.00	0.50	1.00
Hydrogen sulfide content (%)	0.00	0.05	0.10
Heating value (BTU)	1000	1100	1400
Depth (m) of water (if applicable)	0	10	40

Drilling depth (m)

minimum	F75	mode	F25	maximum
1200	_____	1700	_____	3400

Success ratios:

	calculated mean	minimum	mode	maximum
Future success ratio (%)	45	20	40	75

Historic success ratio, tested cells (%) 50

Completion practices:

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| 1. Typical well-completion practices (conventional, open hole, open cavity, other) | conventional |
| 2. Fraction of wells drilled that are typically stimulated | 1 |
| 3. Predominant type of stimulation (none, frac, acid, other) | slickwater, CO ₂ , N ₂ |
| 4. Fraction of wells drilled that are horizontal | 0.1 |