

# CO2 Sequestration in Coal Seams Central Appalachian Basin - SECARB

Presented to:  
Regional Carbon Sequestration Partnerships  
Initiative Review Meeting  
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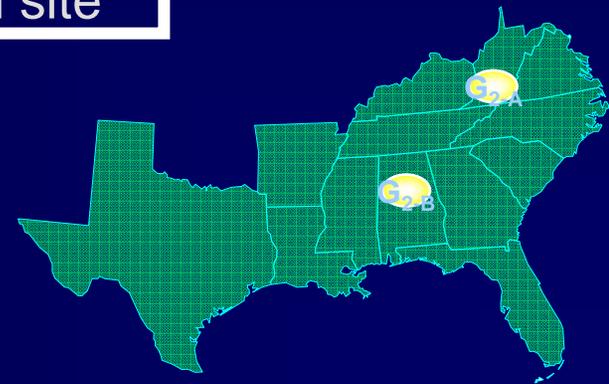
# SECARB Coal Group - Phase II

## CO<sub>2</sub> ECBM recovery:

- Unmineable coals can provide sequestration and add economic value
- At least 1,000 MMT CO<sub>2</sub> of feasible capacity in the targeted areas

## Two Field Validation Sites:

- Central Appalachian Basin, G<sub>2-A</sub>
- Black Warrior Basin, G<sub>2-B</sub>
- 1,000 tons of CO<sub>2</sub> injected on each site



# SECARB Coal Group Research Team

- ❖ Virginia Center for Coal and Energy Research – Virginia Tech
- ❖ Marshall Miller and Associates, Inc.
- ❖ Geological Survey of Alabama/Univ. Alabama/Southern Company
- ❖ Kentucky Geological Survey
- ❖ Advanced Resources International
- ❖ Eastern Coal Council

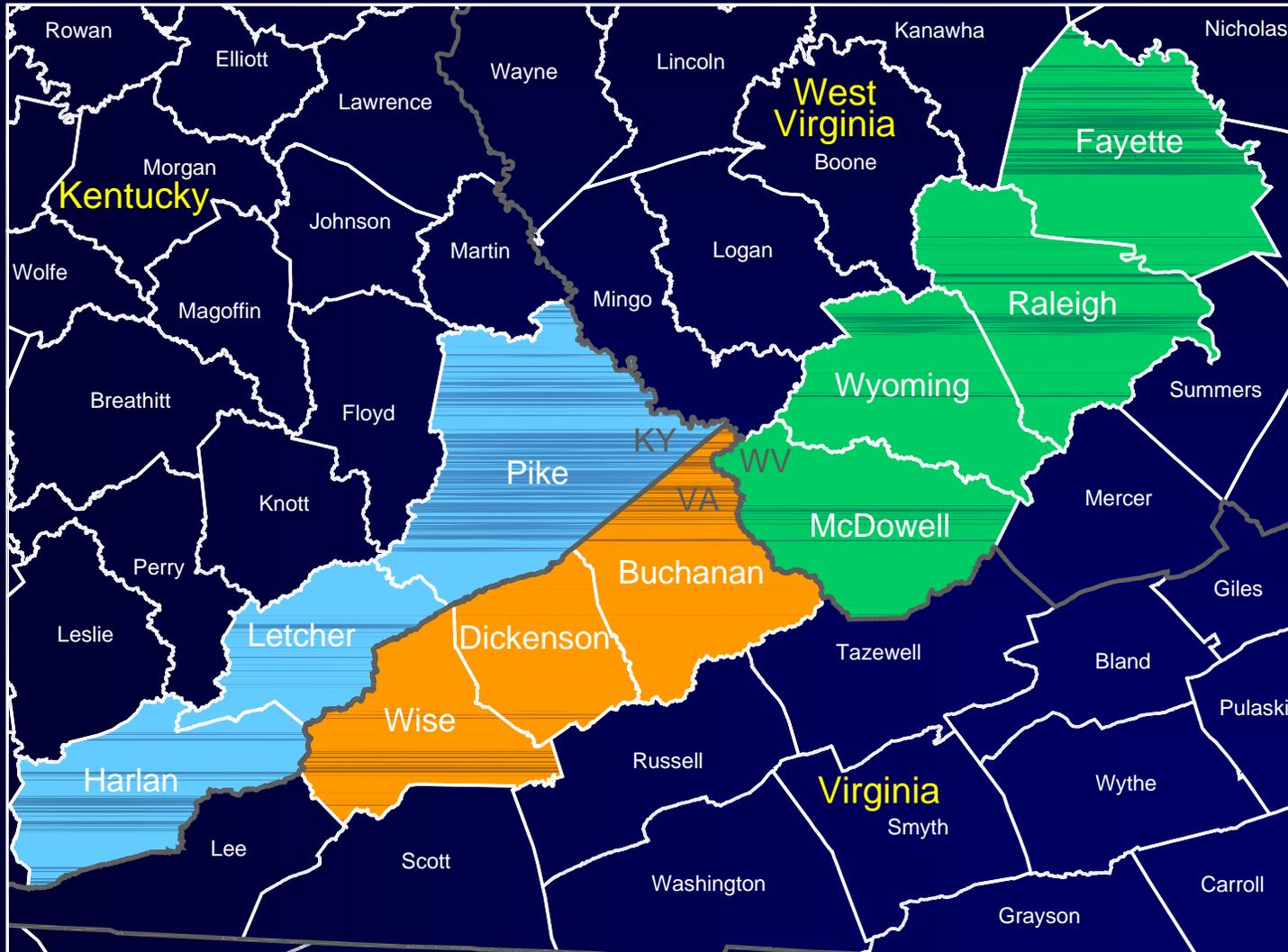
# SECARB Coal Group Working Teams

- ❖ Outreach Working Group
  - SSEB
  - Virginia Center for Coal and Energy Research
  - Eastern Coal Council
  - Websites
    - [secarbon.org](http://secarbon.org)
    - [www.energy.vt.edu/Secarb](http://www.energy.vt.edu/Secarb)
    - [portal.gsa.state.al.us/CO2/CO2.htm](http://portal.gsa.state.al.us/CO2/CO2.htm)
- ❖ Regulatory Working Group
  - Augusta Systems
  - Field Teams
  - State and Federal Agencies
    - DMME, Virginia
    - OGB, Alabama

# Central Appalachian Basin Phase II Goals

- ❖ Expand geologic and production characterization Central Appalachian Basin coal seams
- ❖ Identify the high potential areas for sequestering carbon dioxide in unminable coal seams
- ❖ Select a pilot carbon dioxide injection test site
- ❖ Initiate a coring program adjacent to the pilot site to enable better reservoir characterization
- ❖ Conduct carbon dioxide injection testing in targeted coal seams
- ❖ Quantify the sequestration and enhanced coalbed methane recovery potentials of the study area coal seams

# Central Appalachian Basin Phase II Study Area



# Central Appalachian Basin Phase II Major Industrial Partners (Cost Share, Data, Wells)

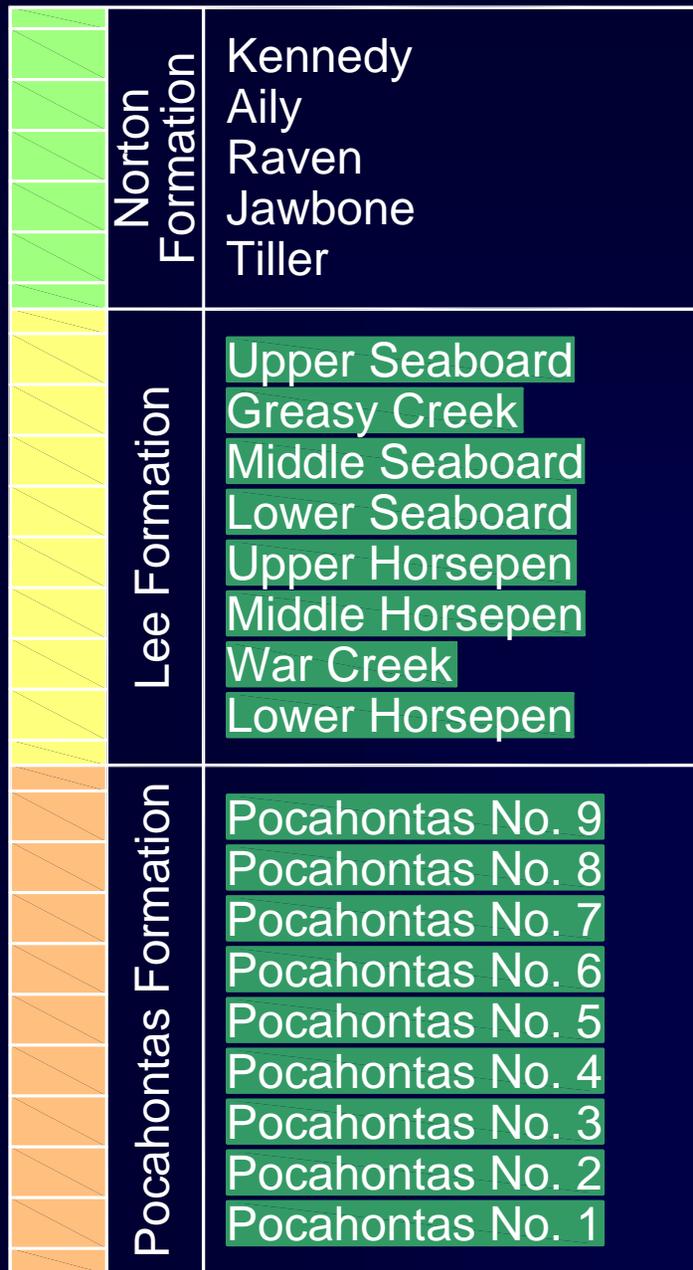
- ❖ Alpha \*\*
- ❖ AMVEST \*\*
- ❖ Buckhorn Coal \*
- ❖ CDX Gas \*\*
- ❖ CNX Gas \*\*
- ❖ Dart Oil and Gas \*\*
- ❖ GeoMet \*
- ❖ McJunkin Appalachian \*
- ❖ Natural Resr. Partners \*\*
- ❖ Penn Virginia \*\*
- ❖ Piney Land \*
- ❖ Pocahontas Land \*\*

\* Phase II Partner

\*\* Phases I & II Partner

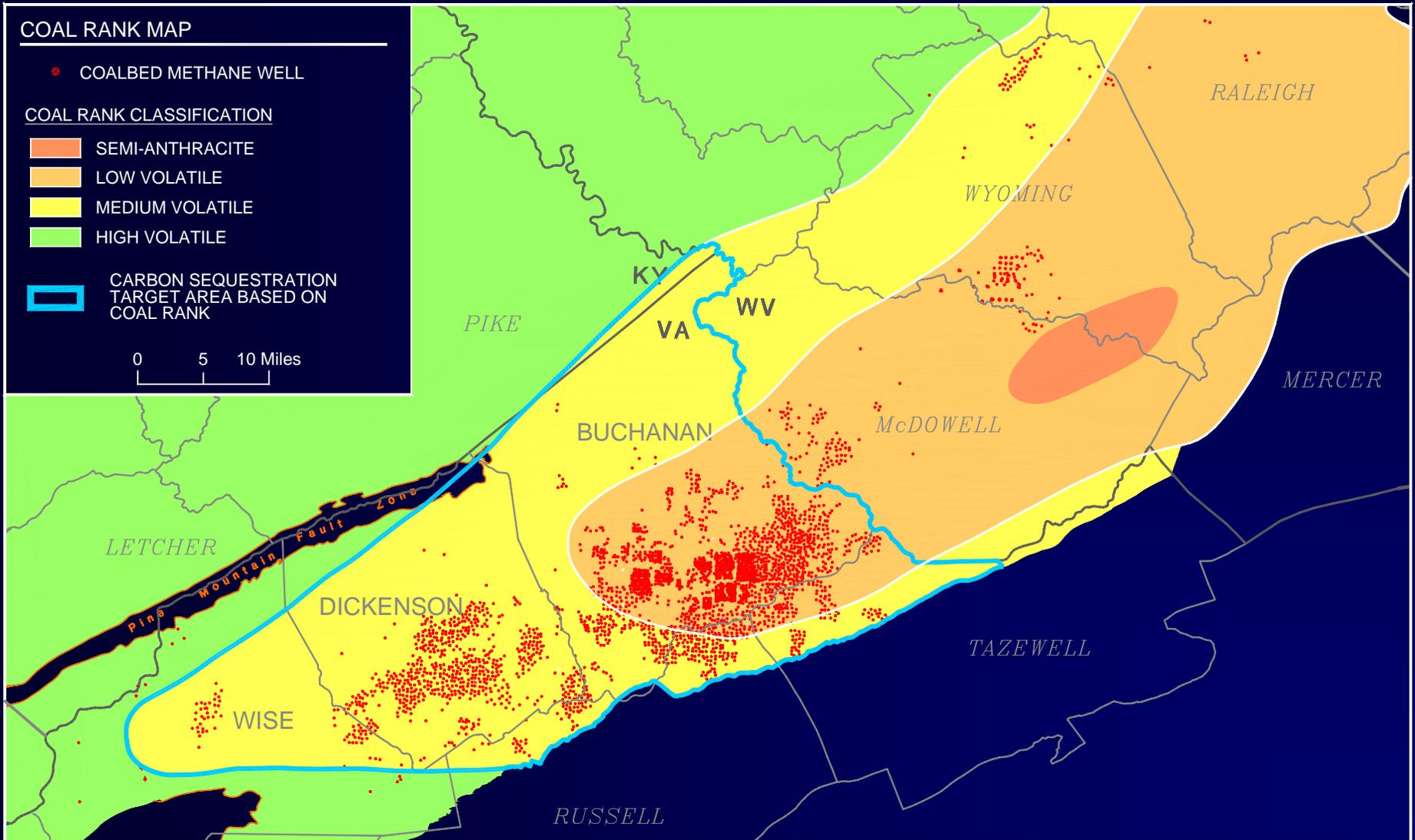
# Central Appalachian Basin

## Generalized Stratigraphic Column

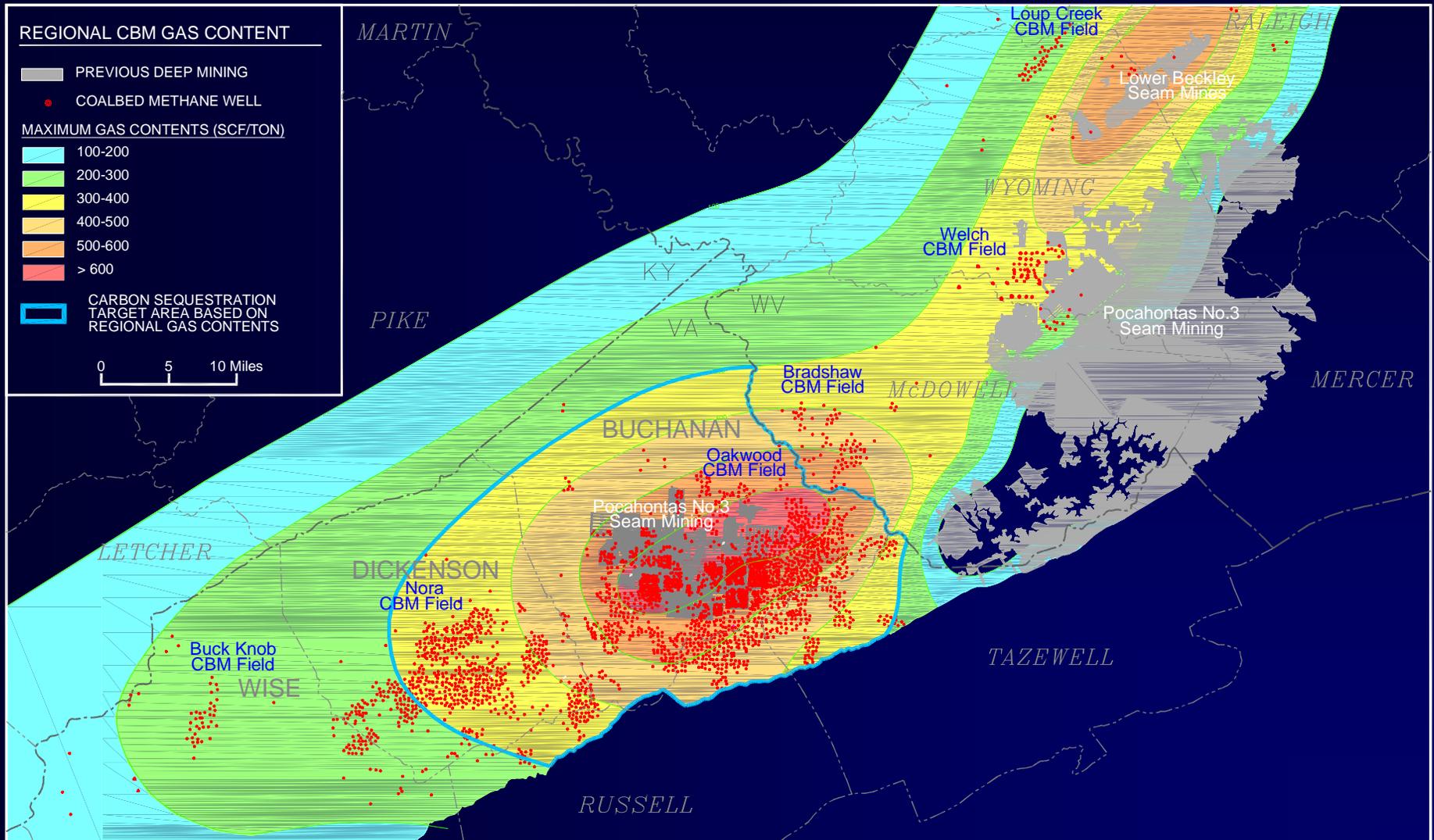


 Prospective Coalbeds For Carbon Sequestration

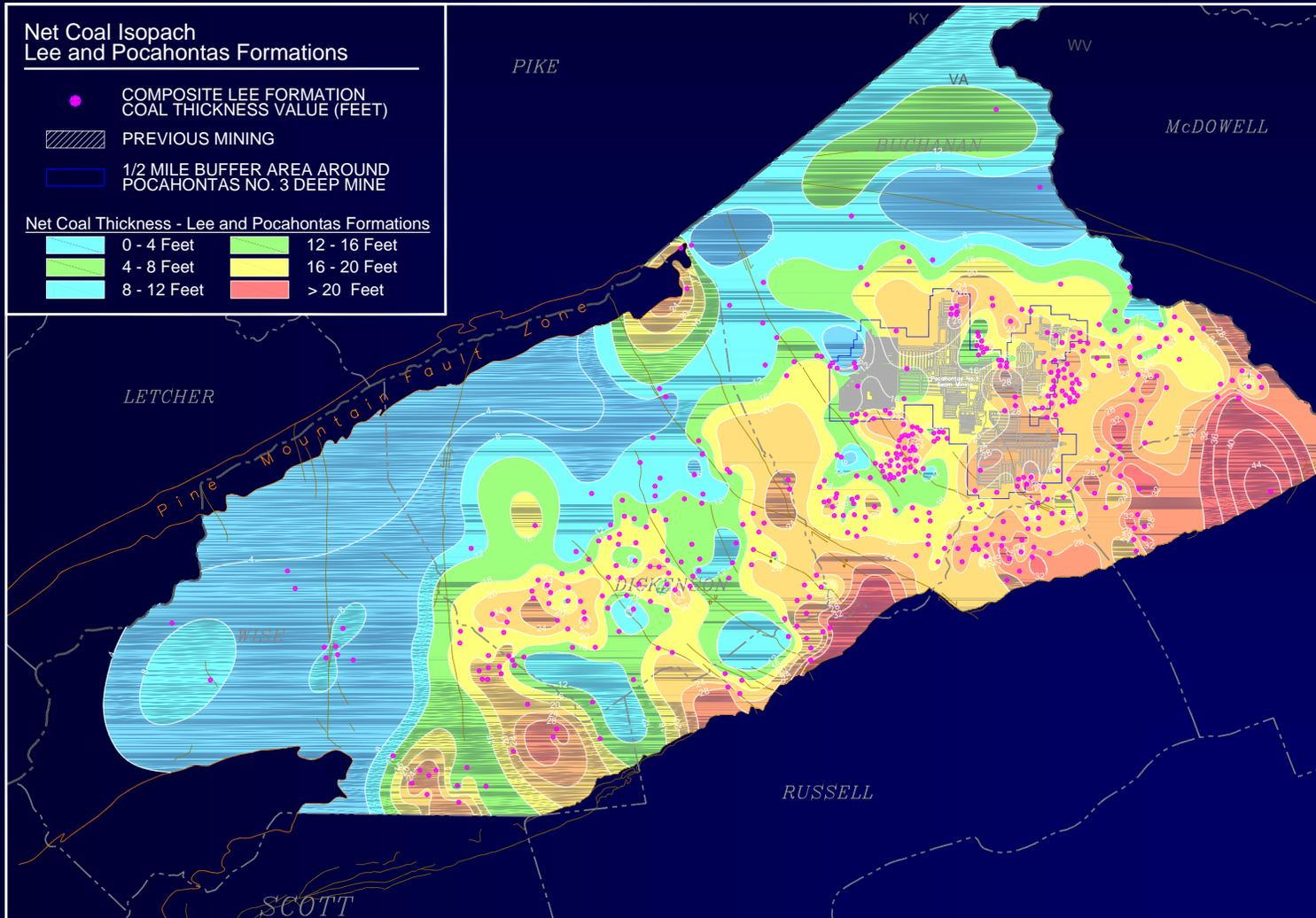
# Regional Coal Rank



# Regional Coal-Seam Gas Content

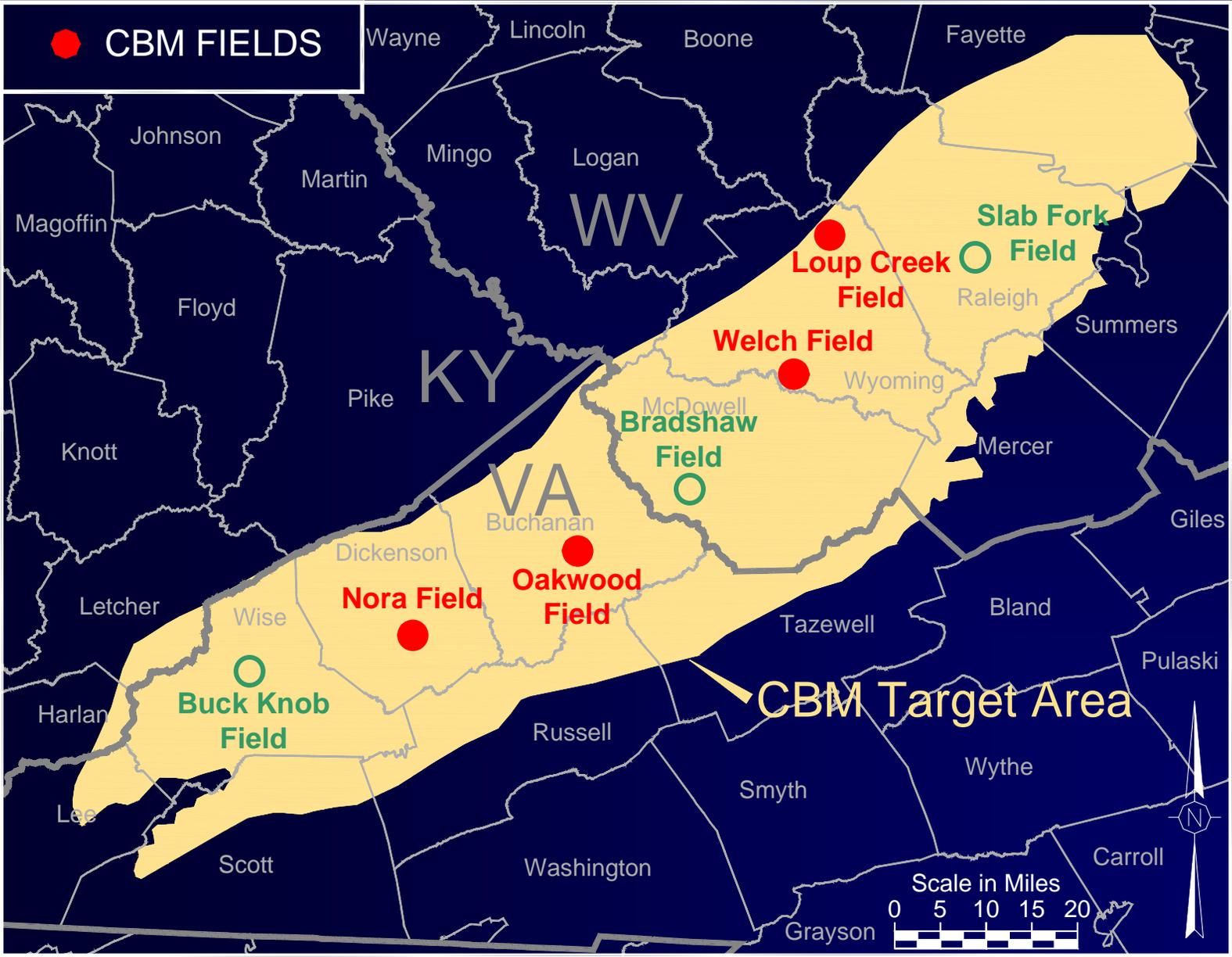


# Southwest Virginia Lee and Pocahontas Formations Net Coal Isopach





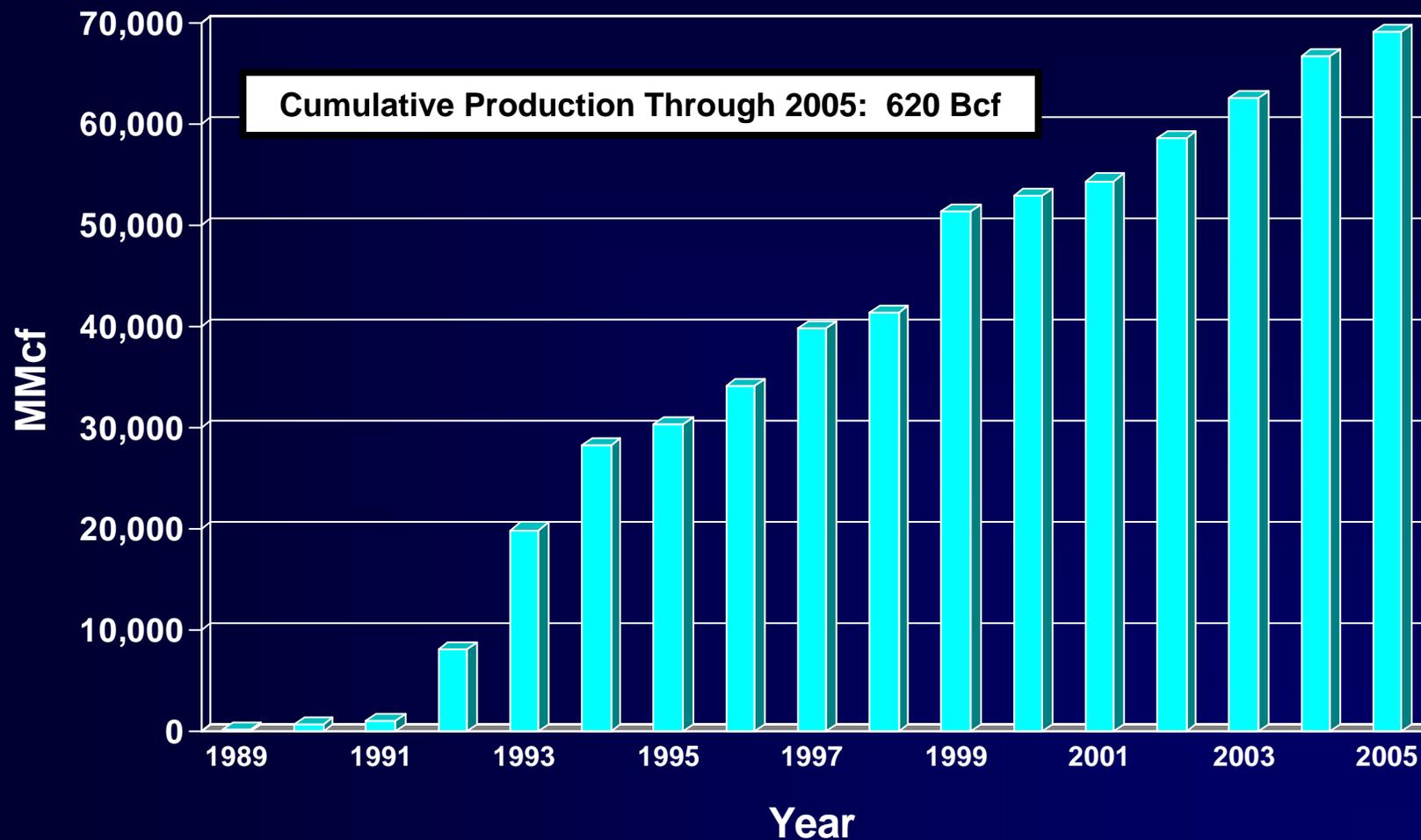
# Coalbed Methane Fields



## Central Appalachian Basin CBM Completions by Operator (12/31/04)

COMPANY	PRIMARY GEOGRAPHIC AREA	PRIMARY FIELD NAME	CBM WELLS
CNX Gas (CONSOL)	Buchanan Co., VA	Oakwood	2,675
Equitable Production	Dickenson Co., VA	Nora	985
	Wise Co., VA	Buck Knob	46
	McDowell Co., WV	Bradshaw	47
CDX Gas / USX	Wyoming Co., WV	Welch	133
GeoMet	McDowell Co., WV	Bradshaw	121
Penn Virginia	Wyoming Co., WV	Loup Creek	70
Pine Mountain	Buchanan Co., VA	Oakwood	15
Appalachian Energy	Buchanan Co., VA	Oakwood	9
AMVEST	Raleigh Co., WV	Slab Fork	9
Energy Search	Raleigh Co., WV	Slab Fork	4
<b>TOTAL</b>			<b>4,114</b>

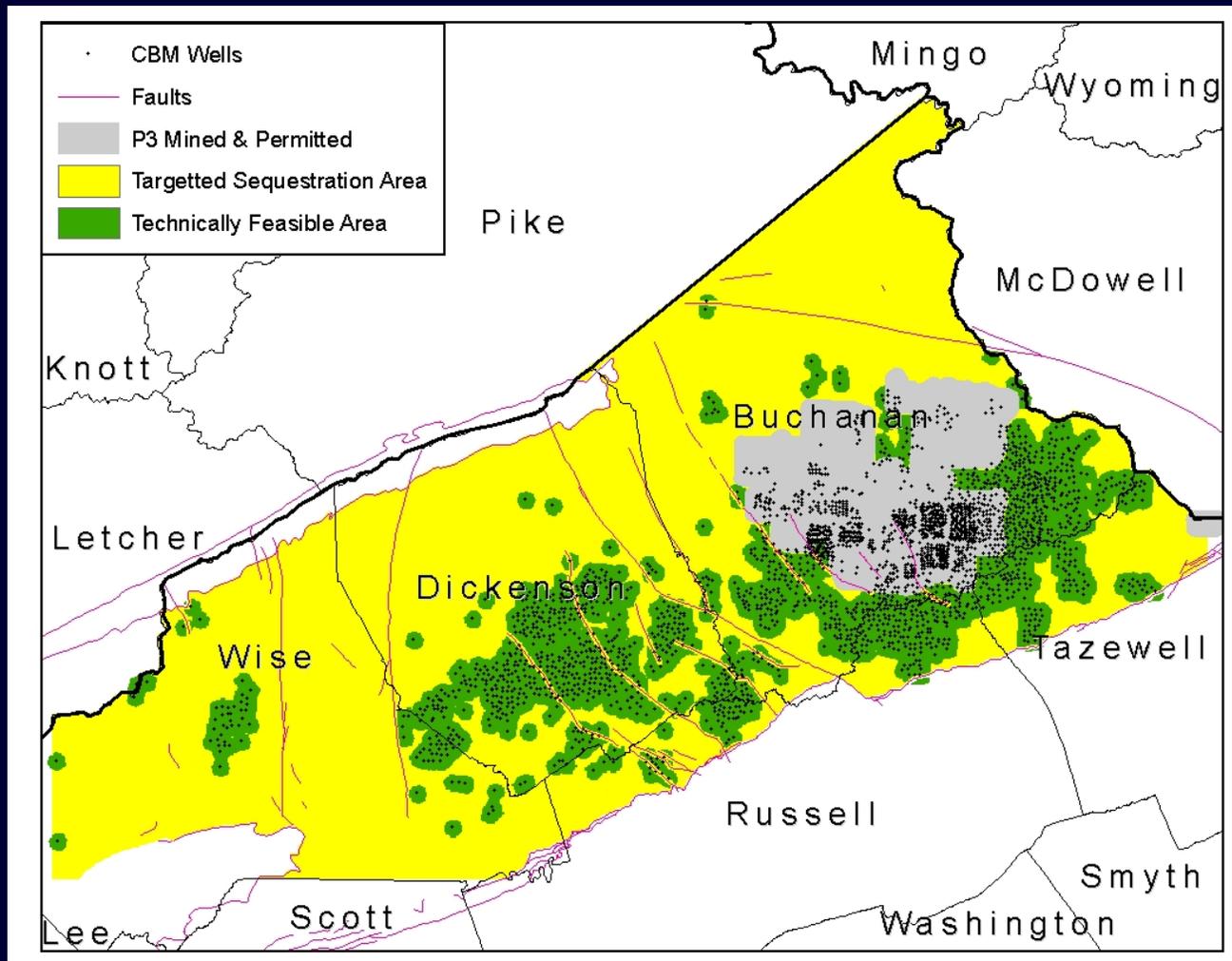
# Southwest Virginia Annual CBM Production (1989 – 2005)



# Preliminary Sequestration and ECBM Potential

- ❖ Phase I initial study area
- ❖ Only areas where coalbed methane production has been established (*higher expected carbon dioxide injectivity and existing infrastructure*)
- ❖ Excludes active and permitted deep mine areas (*potential leakage of injected carbon dioxide because of subsidence*)

# Evaluated Sequestration Area



# Preliminary Sequestration Potential

## Phase I Study Area – SW Virginia

Storage capacity in all non-mining areas*	14.1 Tcf (818 MMt)
Storage only in developed CBM areas**	5.3 Tcf (308 MMt)

\*Assumes no carbon sequestration potential in Pocahontas No. 3 mining areas.

\*\*Assumes sequestration feasibility is limited to established CBM development areas.

# Preliminary Enhanced CBM Potential

## Phase I Study Area – SW Virginia

ECBM potential in all non-mining areas*	1.50 Tcf
ECBM only in developed CBM areas**	0.66 Tcf

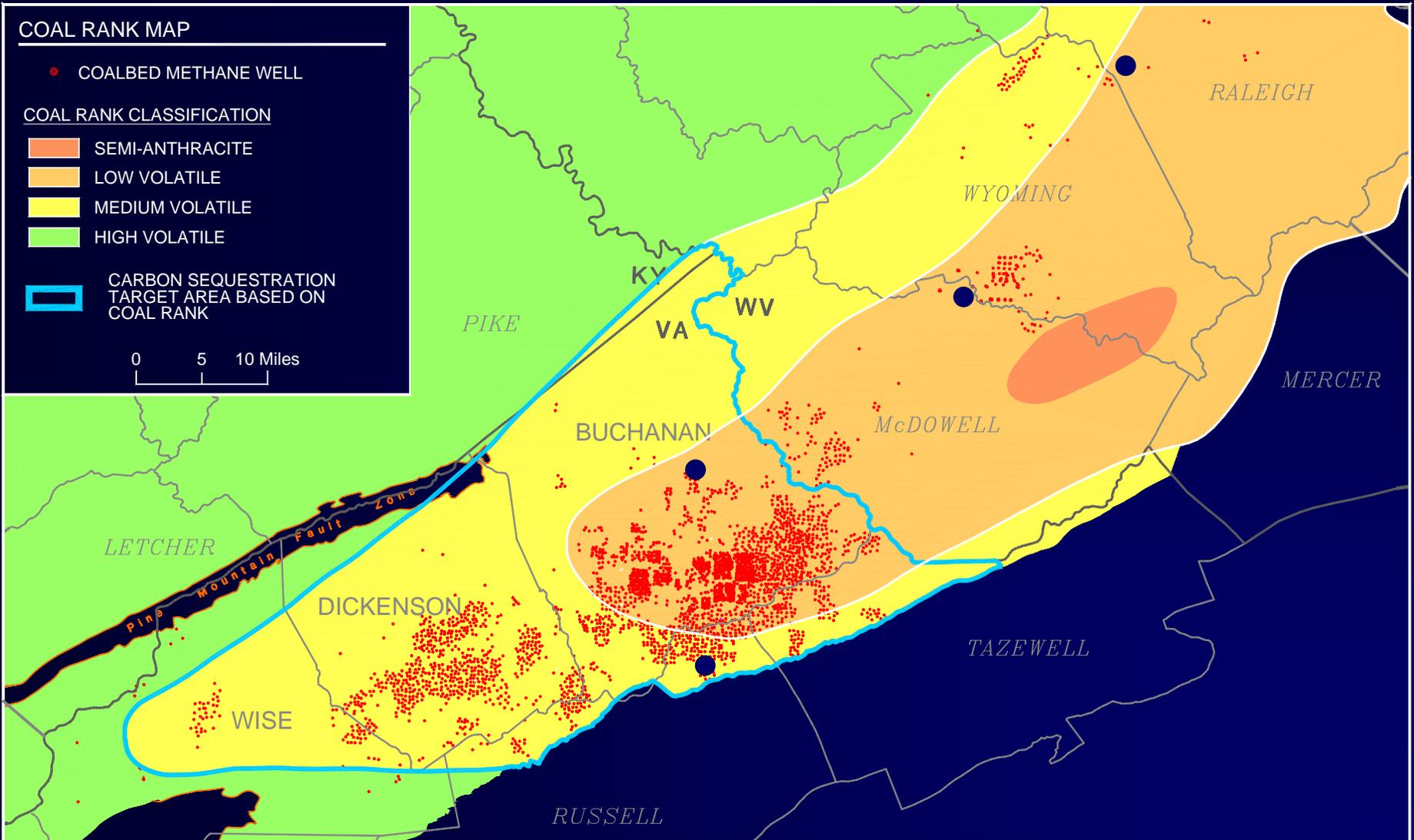
\*Assumes no ECBM potential in Pocahontas No. 3 mining areas.

\*\*Assumes ECBM feasibility is limited to established CBM development areas.

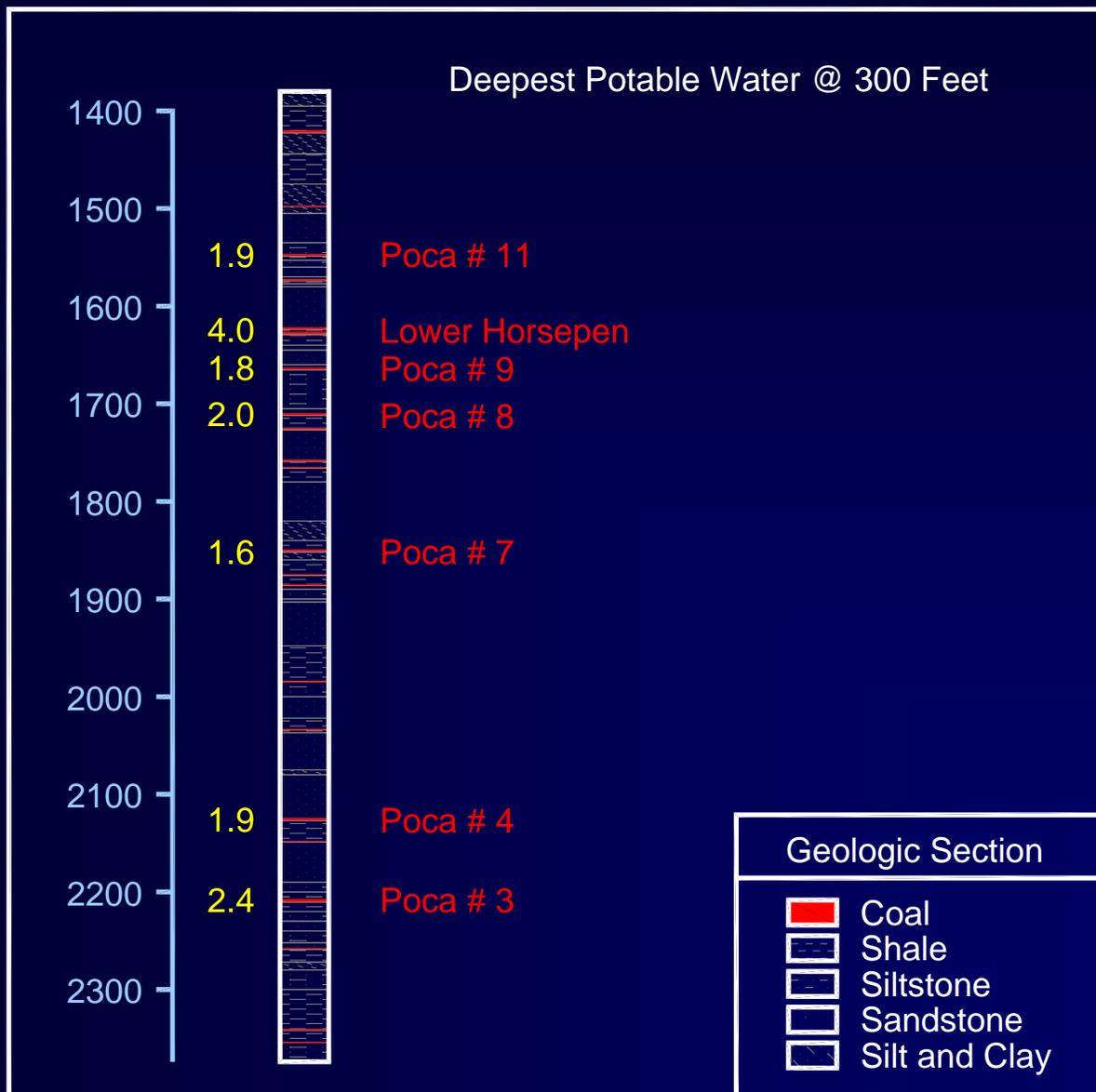
# Potential Pilot Sites

- ❖ Three companies have offered to donate a CBM well for use as a pilot injection well
- ❖ Have evaluated four proposed pilot sites in Southwestern Virginia and Southern West Virginia
- ❖ Nearing final site selection

# Potential Pilot Test Sites



# Southwestern Virginia Proposed Pilot Test Site



## Test Schedule

- ❖ Site selection: 4/06 – 12/06
- ❖ Coring: 7/07 – 11/07
- ❖ Pressure transient testing: 12/07 – 3/08
- ❖ Install monitoring equipment: 4/08 – 6/08
- ❖ Injection testing: 7/08 – 3/09
- ❖ Site closure: 4/09 – 9/09