

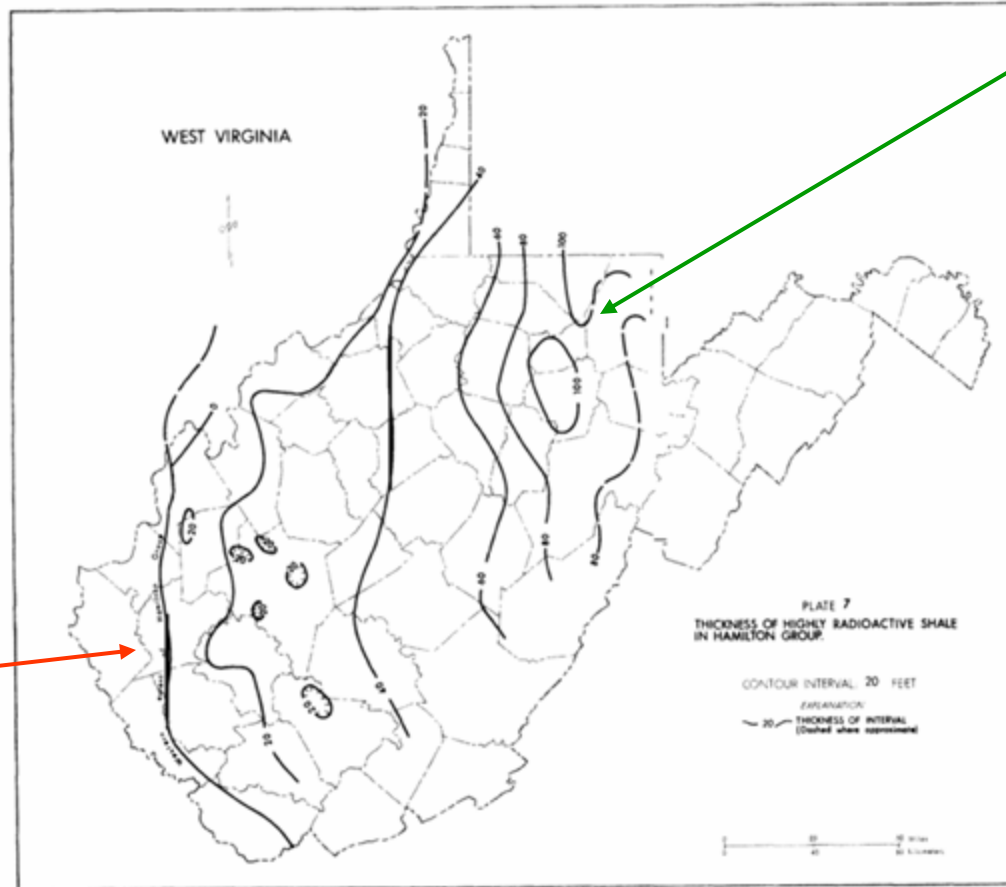
MARCELLUS SHALE
DRILLING
IN
WEST
VIRGINIA

Where is the Marcellus present in WV?

- ▣ It is present below the surface, at varying depths throughout much, but not all of WV.
- ▣ It is not present in extreme eastern or western WV.
- ▣ It crops out at the surface in parts of the Valley and Ridge province in eastern WV.
- ▣ It varies in thickness across WV.

Thickness in feet and extent of Marcellus Shale in subsurface

Area of thicker Marcellus



Marcellus not present west of this line

Total Permitting Activity

- ▣ Permits Issued in 2007
 - 3238

- ▣ Permits Issued in 2008
 - 3246

Activity Levels

Number of Marcellus Permits in Last Two Years

Approx. 682 (includes vertical and horizontal)

Number of Marcellus Wells Drilled in Last Two Years

Approx. 427 (includes vertical and horizontal)

Taylor County



Taylor County



Taylor County



What's Different About This Play??

Water

Water

Water—Much Larger
Volumes For Drilling/
Fracturing

Roughly 10 Times More
Water

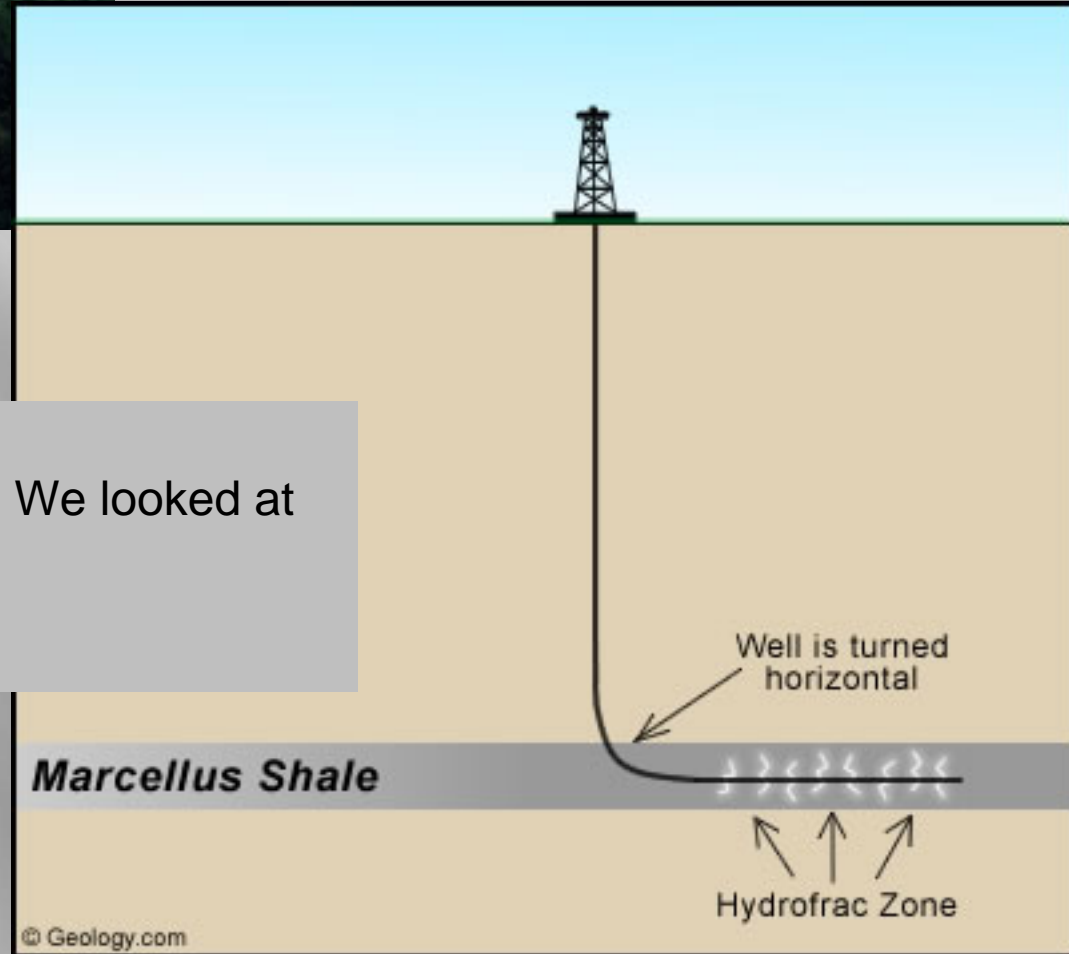


3-6 million gallons needed to
Drill & Frac Horiz. Well

Source water?

What happens to the water?

30-70% of water used flows back. We looked at
one well



Well Development Issues

Water Withdrawal—Impacts to States' Water Resources

Site Construction—Larger Sites, Greater Erosion/Sedimentation Challenges; Larger Pits/Ponds, Greater Focus on Design Criteria (Industry Inspection Directive)

Water Disposal—Limited Options; Some Land Application, UIC, NPDES, Reuse/Recycle

What's on the Horizon

Industry Guidance Document

Permit Addendum

Water Characterization—Industry and DEP

Water Use Registration w/DWWM

Parameter	Day 1	Day 5	Day 10	Day 20	unit
Aluminum	ND	ND	ND	ND	mg/L
Barium	0.121	136	159	238	mg/L
Boron	ND	26.3	31.2	43.7	mg/L
Calcium	157	7,630	9,010	11,400	mg/L
Iron	0.083	38.3	63.6	82	mg/L
Magnesium	47.1	829	1,020	1,290	mg/L
Manganese	0.933	7.15	8.25	10.4	mg/L
Sodium	51.8	21,400	23,000	33,100	mg/L
Selenium	0.0173	0.42	0.32	ND	mg/L
TPH (Diesel Range)	72.6	57.9	69.6	20	mg/L
Phenol	0.0113	0.013	0.0101	.01	mg/L
TPH (Gasoline Range)	0.86	39.8	8.57	14.5	mg/L
Benzene	288	1,350	246	1,760	ug/L
Ethylbenzene	7.1	ND	24.4	52	ug/L
Toluene	340	2,140	430	2,040	ug/L
MBAS	0.043	ND	1.65	.181	mg/L
Biochemical Oxygen Demand	452	528	48	171	mg/L
Chemical Oxygen Demand	1,130	1,180	838	2,580	mg/L
Bromide	700	570	750	550	mg/L
Chloride	27,700	67,300	65,000	71,200	mg/L
Fluoride	3600	3500	ND	103	mg/L
Sulfate	11,400	ND	ND	1,460	mg/L
Nitrogen, Total as N	113	9.22	33.2	33.6	mg/L
Phosphorus, Total	0.47	1.97	0.78	.7	mg/L
Oil & Grease	ND	ND	ND	ND	mg
Specific Conductivity	117,000	417,000	649,000	160,000	umhos/cm
Total Dissolved Solids	43,800	84,000	93,700	124,000	mg/L
Total Suspended Solids	127	193	328	388	mg/L
Radium 226	147	302	740	621	pCi/L

Davis Well
Marshall County

Still waiting on results
from Day 20 and 30
as well as all
radioactivity results