



Marcellus and Me:

Commercial A Lab's Perspective on the Challenges and Opportunities of Shale Exploration

APHL Annual Meeting

June 2, 2013

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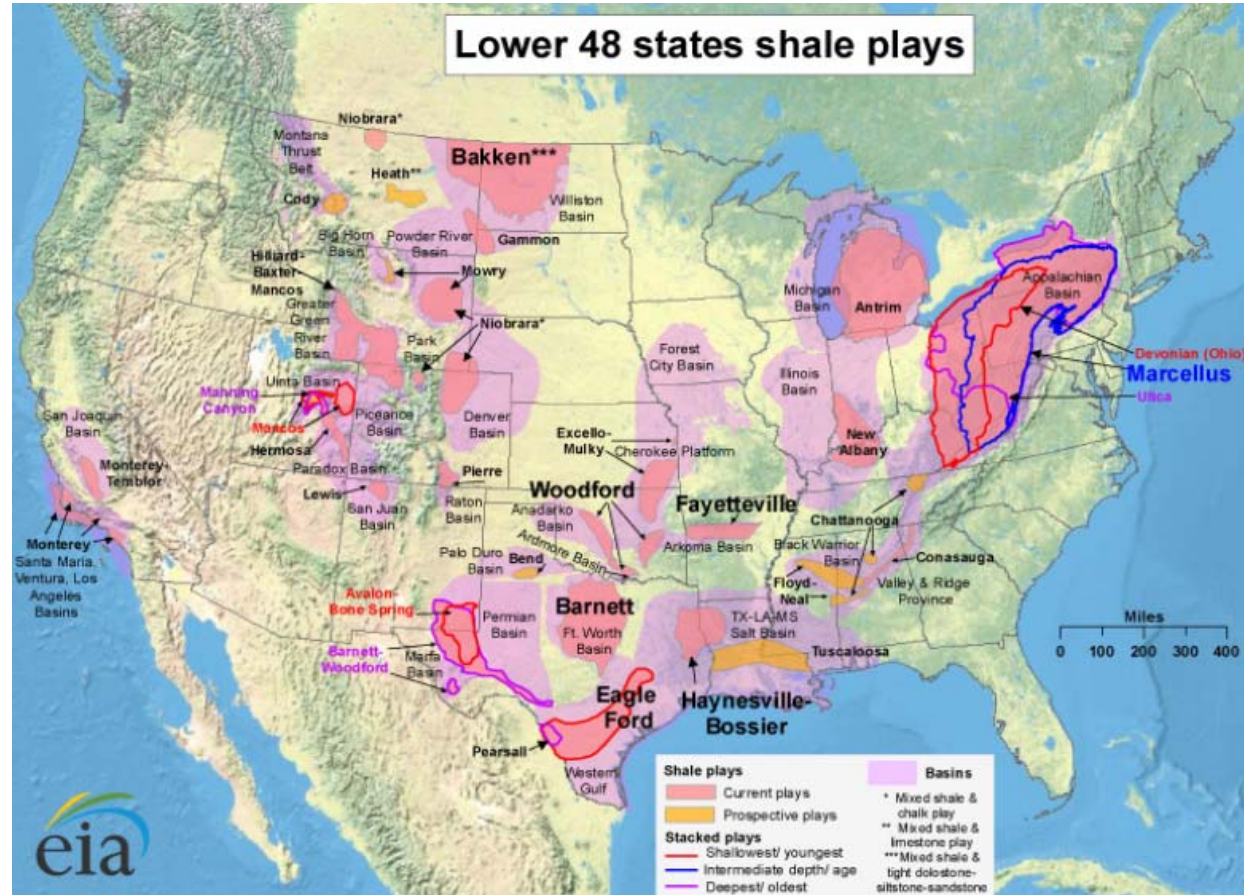
An Unconventional History

- Hydraulic Fracturing began in 1947
 - Haliburton commercialized in 1949
 - Used to treat superfund ground water
- Horizontal drilling
 - Directional since 1934
 - True horizontal in the 70's
- $1 + 1 > 2$
 - Barnett shale in early 90's





Geographical Distribution



PA Exploration

- World's first oil well in 1859
 - 350,000 conventional
 - About 70,000 producing
 - 2500 wells per year
 - Less than 5000 Marcellus
 - *Quadrupled* state gas output
- Minimal change in well starts
- Risk, reward, perception changed





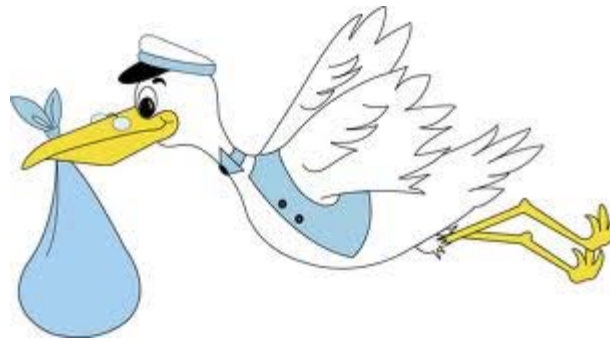
OPPORTUNITY

The Next Time The Universe Knocks On My Door,
I Will Pretend I Am Not Home



Shale Gas Exploration

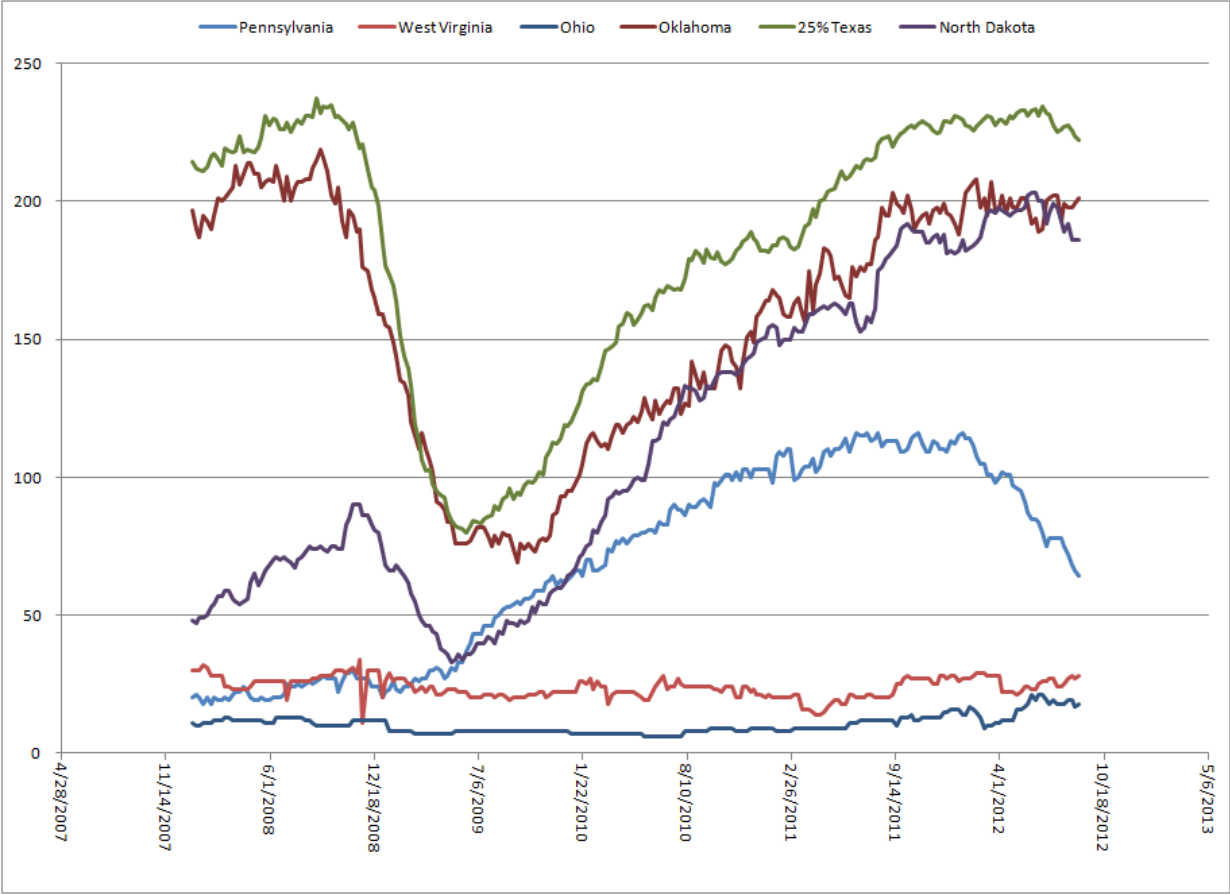
- Birth of a new market



- Multiple supply chain needs
 - Pre-drill studies
 - Water re-use and treatment
 - Waste disposal



The Shale Boom (and bust?)





CHALLENGES

I EXPECTED TIMES LIKE THIS - BUT I NEVER THOUGHT THEY'D BE SO BAD, SO LONG, AND SO FREQUENT.

www.despair.com

A square image with a black border showing a silhouette of a person climbing a steep mountain slope. The sky is a mix of blue, purple, and orange, suggesting a sunset or sunrise. The person is a small silhouette on the left side of the slope, which rises towards the right.

Matrices

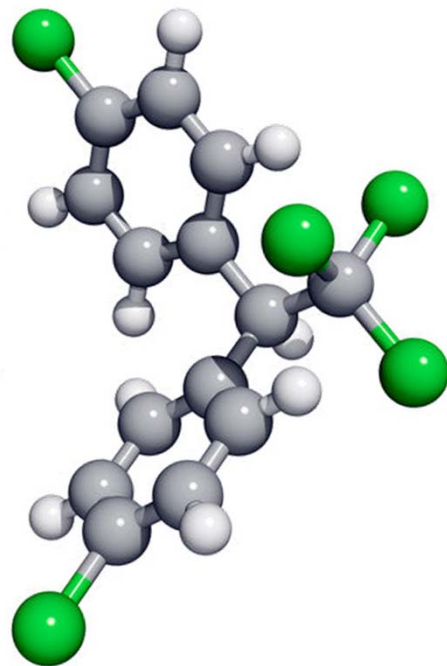
- Concentrated brines
- Multi-phase
 - Drilling muds
 - Treatment sludges
- Heterogenous
 - Filter socks
 - Cuttings
- Natural Gas
- NORM!



Analytes

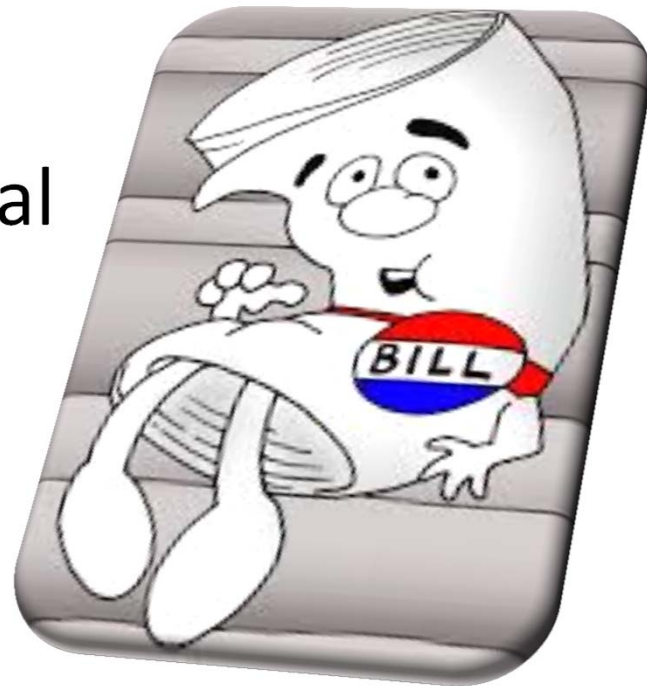
- New Contaminants of Concern

- Bromide
- Total chloride in soil
- Strontium
- Dissolved gases
- Radionuclides



Regulations

- Non-existent
- Outdated
- Word of mouth
- Proposed not final



Certifications



- Radiochemistry
- New contaminants of concern
- Client location?

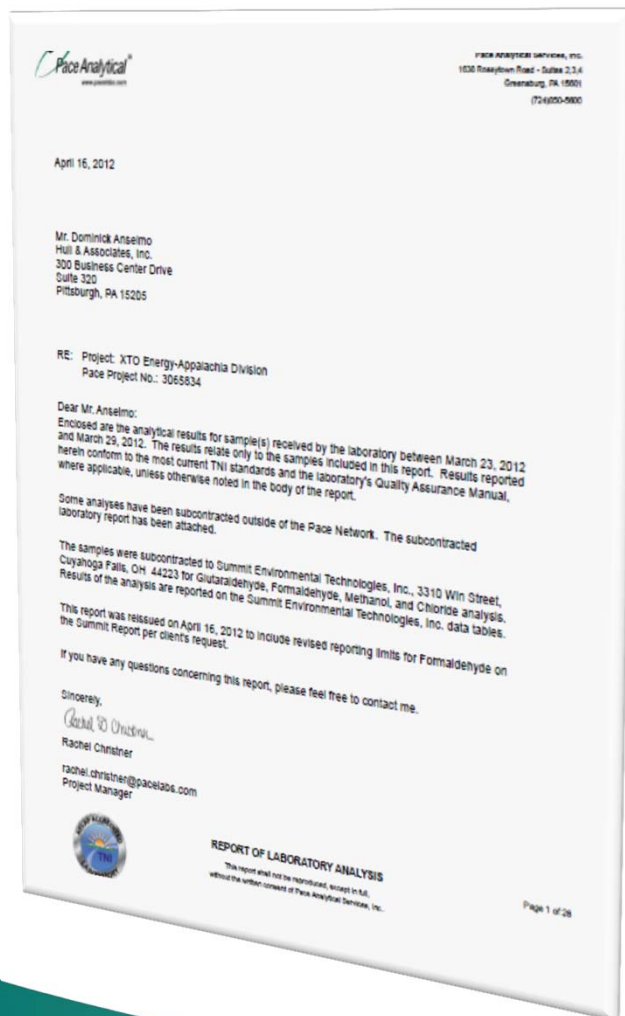


Expertise

- New to everyone
- New or unclear regs
- Risk mitigation
- Multiple sources
 - Universities
 - Government
 - NGO
 - Industry



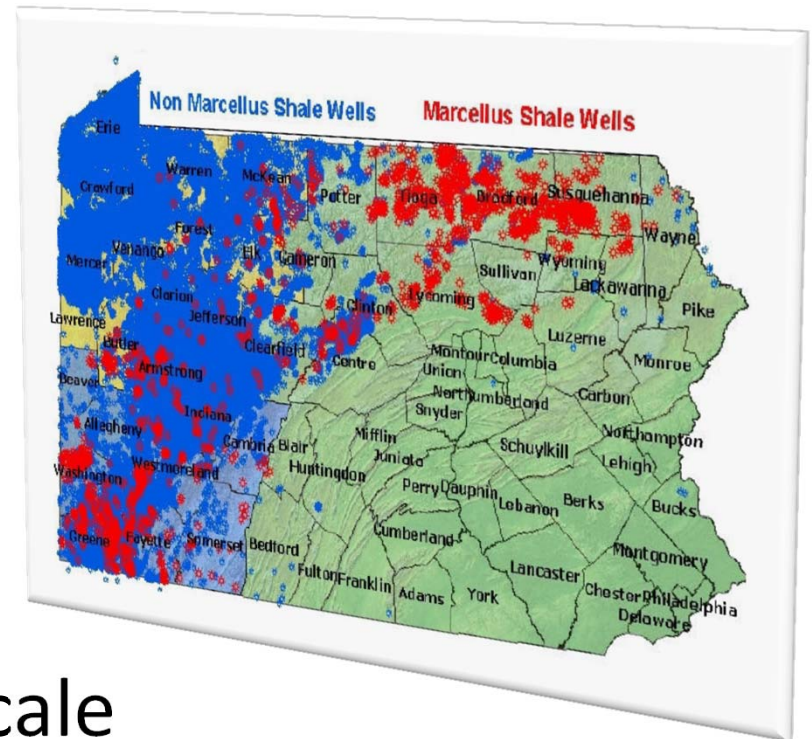
Logistics



- Contracts
- Contacts
- Report formats
- EDDs
- QAPPs

Locations

- Remote
- Holding times
- Communication
- Courier service
- Fed-ex/UPS?
- End data user locale



Unpredictable



- Feast or famine
 - Staffing
 - Instrumentation
- Price fluctuations
 - Well starts
- Regulatory shifts
 - New disposal outlets

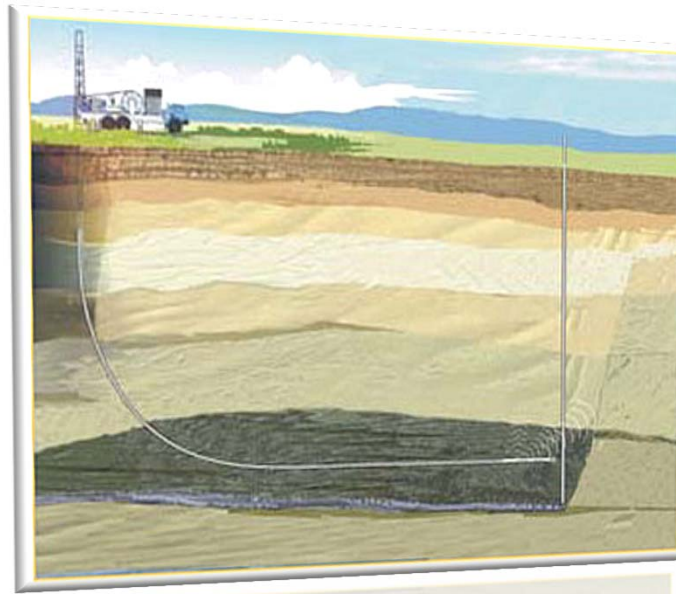


Schedules

- 24/7
- Business days?
- Evening collections
- Rush work
- Emergency response
- Hold times



In Summary



- **Matrices**
- **Analytes**
- **Regulations**
- **Certifications**
- **Expertise**
- **Logistics**
- **Locations**
- **Unpredictable**
- **Schedules**



THANK YOU!

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*Working together to
protect our environment
& improve our health*