



Natural Gas Extraction

We Can

~~Can We~~[^] Cultivate Energy and Protect Water?

2012 Pretreatment and P2 Workshop

May 10, 2012

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EPA Office of Water

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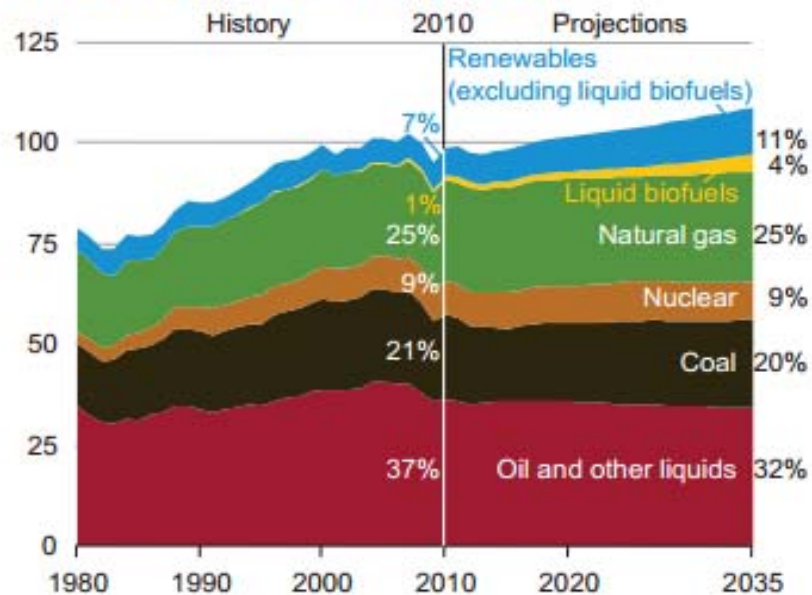


- Natural gas is a critical source of energy for the U.S.
- Need to develop our oil and gas resources in a responsible manner
- Opportunities and concerns:
 - National
 - Regional
 - State and Local
- A number of State and EPA initiatives are underway

US Energy Use and Production

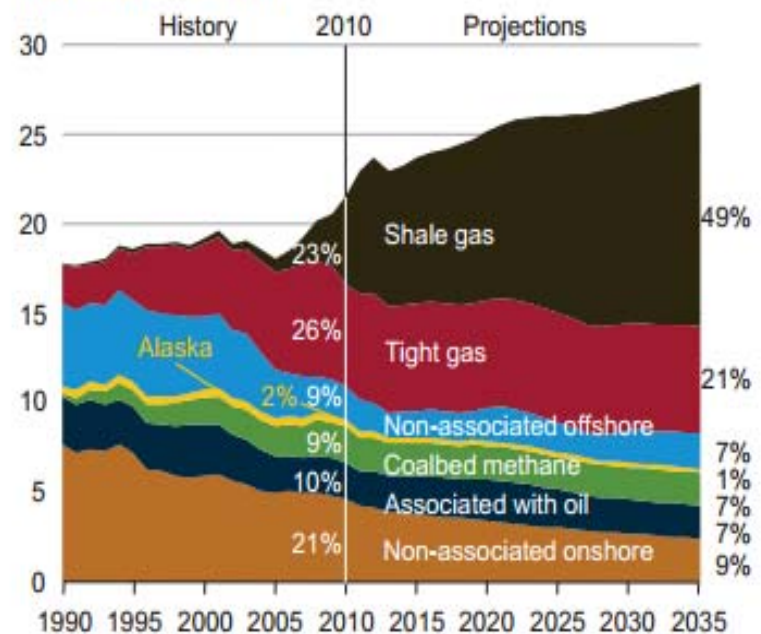


Figure 8. U.S. primary energy consumption by fuel, 1980-2035 (quadrillion Btu per year)



Source: US Energy Information Administration, *Annual Energy outlook 2012*. Accessed online
[http://www.eia.gov/forecasts/aeo/er/pdf/0383er\(2012\).pdf](http://www.eia.gov/forecasts/aeo/er/pdf/0383er(2012).pdf)

Figure 2. U.S. natural gas production, 1990-2035 (trillion cubic feet)

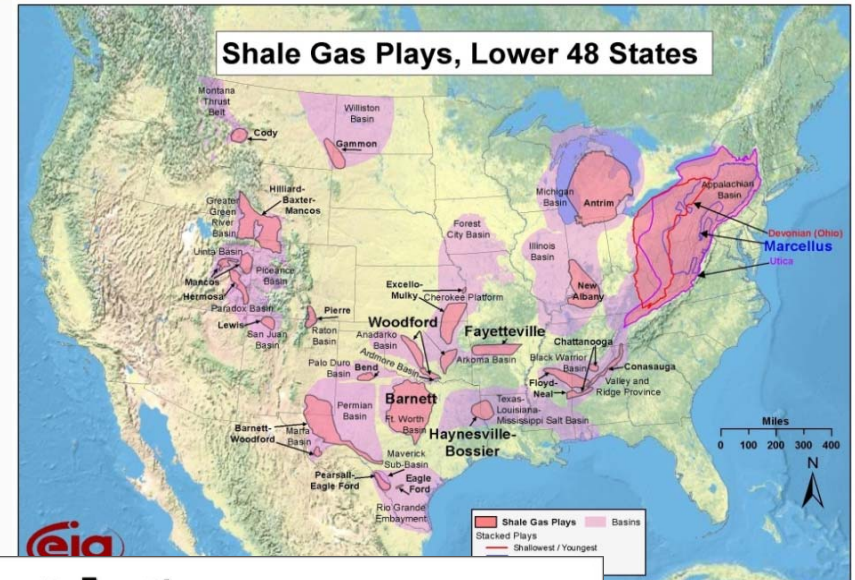


Source: US Energy Information Administration, *Annual Energy outlook 2012*. Accessed online
[http://www.eia.gov/forecasts/aeo/er/pdf/0383er\(2012\).pdf](http://www.eia.gov/forecasts/aeo/er/pdf/0383er(2012).pdf)

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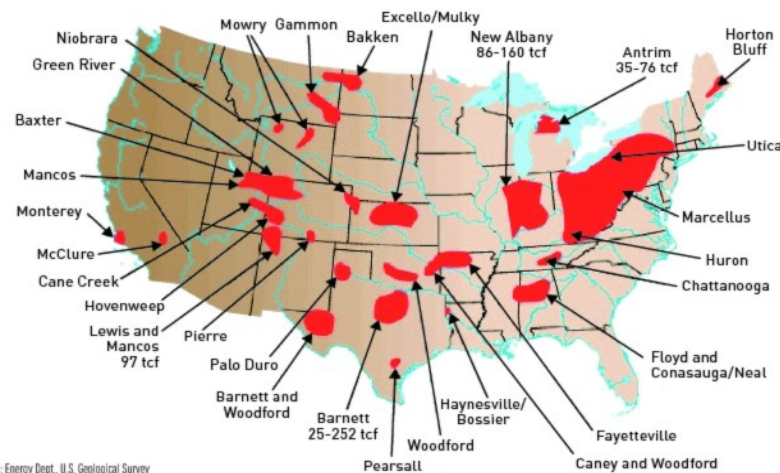


- National, Regional, State and Local Opportunities:
 - Enhance domestic energy options
 - Reduce dependence on foreign supplies
 - “Bridge” to renewable energy sources
 - Provide greater certainty about future energy reserves
 - Stabilize energy prices



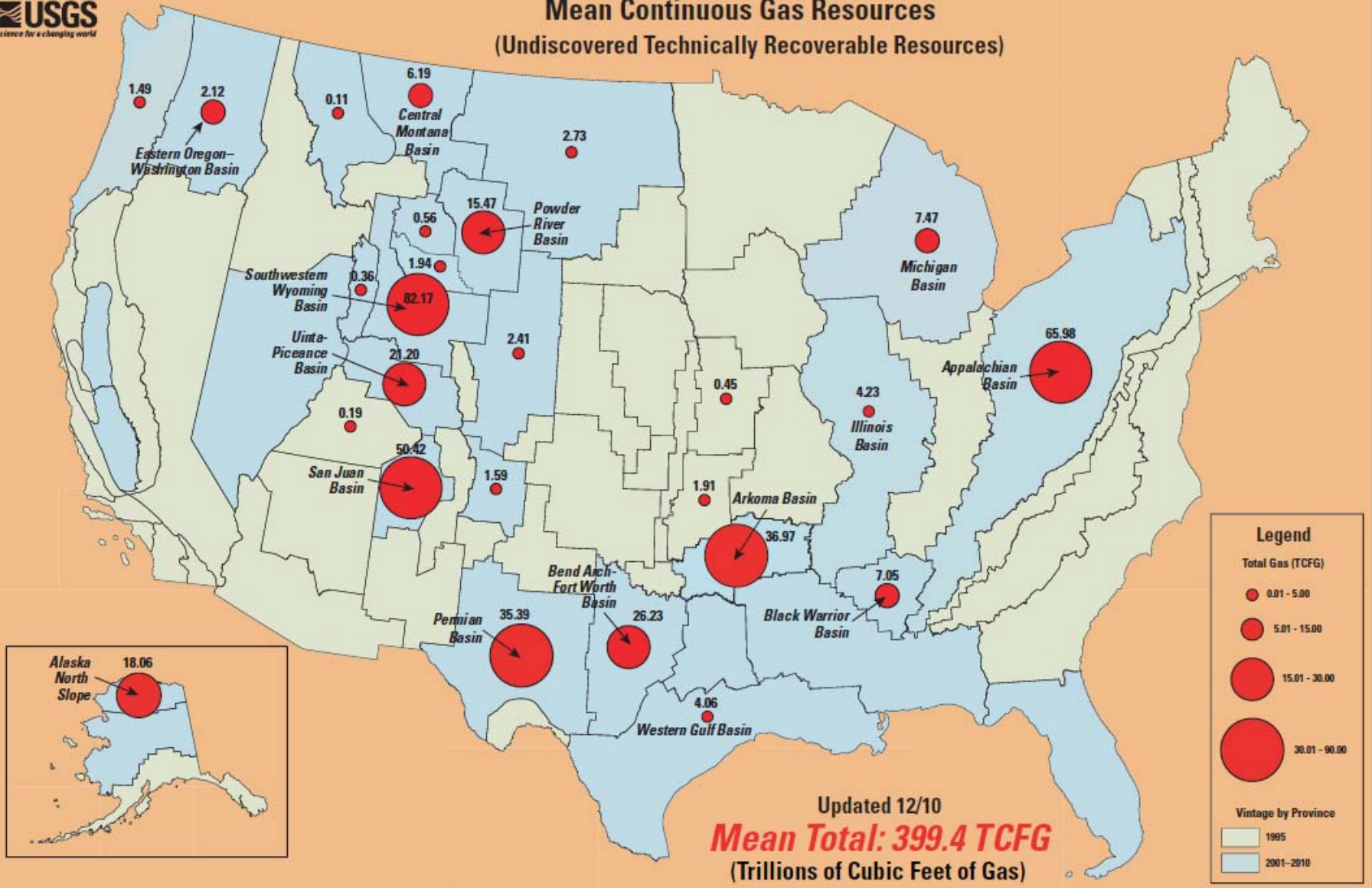
America's Next Energy Frontier

Shale formations in the U.S. hold trillions of barrels of oil and trillions of cubic feet (tcf) of natural gas



Sources: Energy Dept., U.S. Geological Survey

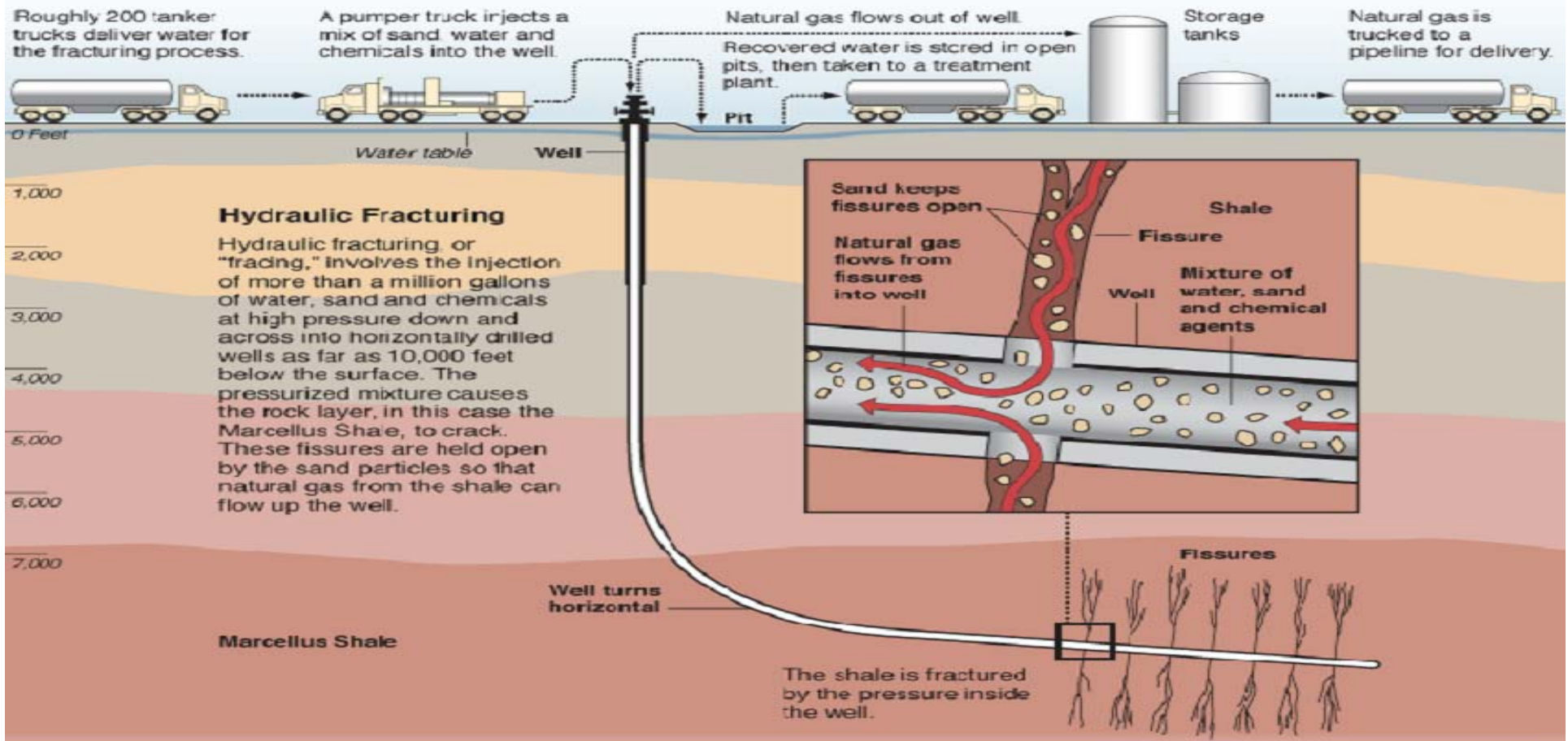
Mean Continuous Gas Resources (Undiscovered Technically Recoverable Resources)



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What is Hydraulic Fracturing?



Shale Gas Extraction (SGE)



- U.S. Dept of Energy estimates SGE as natural gas source will increase from 14% to 45% over next 25 years
- 40 CFR 435, Oil & Gas Extraction. tho' no PSES, PSNS

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- National, Regional, State and Local Concerns:
 - Ground and surface water contamination
 - Wastewater disposal
 - Air emissions
 - Fracturing fluids disclosure
 - Public safety and worker safety
 - Water availability



Niagara Falls council votes to ban treatment of wastewater from gas drilling operations

Duke University Study Connects Water Contamination to Fracking Natural Gas Wells



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Ohio Earthquake Likely Caused by Fracking Wastewater

Bloomberg

Natural Gas 'Fracking' Ban Upheld in Second New York Town

February 27, 2012, 8:32 AM EST

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Federal Water Authorities

Clean Water Act

- Water quality criteria and standards
- Effluent Limitations Guidelines (ELG)
- National Pollutant Discharge Elimination System Permitting

Safe Drinking Water Act

- Underground Injection Control Program regulations
 - Hydraulic fracturing using diesel fuels
 - Produced water/flowback injection

EPA Hydraulic Fracturing Study Plan



EPA directed by Congress to Study (ORD Lead)

- Draft to EPA Science Advisory Board (SAB): 2/8/2011
- SAB Review of Plan: 3/7-8/2011
- Initial Results to public: 12/2012
- Report of further research: 2014

- Scope: “Lifespan of Water,” focus on drinking water impacts

- Report:
“Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources, ” February 2011

- EPA/600/D-11/001 www.epa.gov/research
[http://yosemite.epa.gov/sab/sabproduct.nsf/02ad90b136fc21ef85256eba00436459/D3483AB445AE61418525775900603E79/\\$File/Draft+Plan+to+Study+the+Potential+Impacts+of+Hydraulic+Fracturing+on+Drinking+Water+Resources-February+2011.pdf](http://yosemite.epa.gov/sab/sabproduct.nsf/02ad90b136fc21ef85256eba00436459/D3483AB445AE61418525775900603E79/$File/Draft+Plan+to+Study+the+Potential+Impacts+of+Hydraulic+Fracturing+on+Drinking+Water+Resources-February+2011.pdf)

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Clean Water Act Efforts

- When not injected, wastewater might be sent to a Centralized Waste Treatment Facility (CWT) and/or a Publicly Owned Treatment Works (POTWs)
- In March 2011 EPA released FAQs related to shale gas flow back and produced water discharge including how issues may be addressed under existing NPDES regulations
 - http://www.epa.gov/npdes/pubs/hydrofracturing_faq_memo.pdf
 - http://www.epa.gov/npdes/pubs/hydrofracturing_faq.pdf
- EPA recently announced that the Agency will initiate development of Categorical Pretreatment Standards under 304(m) of the CWA
 - Coal Bed Methane
 - Shale Gas Extraction

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Safe Drinking Water Act

- The Safe Drinking Water Act (SDWA) requires EPA to protect underground sources of drinking water (USDWs) from contamination caused by underground injection (Sections 1421, 1422, 1425).
 - § 1421 provides minimum standards for underground injection
 - § 1422 provides for state primary permitting & enforcement authority
 - § 1425 provides for alternative showing of effectiveness of program by state UIC Programs (injection wells associated with oil and gas production only)
- § 1431 contains provisions to address imminent and substantial endangerment to health.

Voluntary Information Request



9 Natural Gas Service Companies

BJ Services

RPC, Inc.

Complete Production Services

Schlumberger

Halliburton

Superior Well Services

Key Energy Services

Weatherford

Patterson-UTI

- Chemical Composition of fluids used in fracturing
- Data on impacts of chemicals on human health and the environment
- Standard operating procedures at sites
- Locations of sites where fracturing was conducted

SDWA UIC HF Permitting Guidance



- May 4, 2012, EPA released draft underground injection control (UIC) program permitting guidance for class II wells that use diesel fuels during hydraulic fracturing activities.
- EPA developed the draft guidance to clarify how companies can comply with the Energy Policy Act of 2005's amendment to the Safe Drinking Water Act, which exempted hydraulic fracturing operations from the requirement to obtain a UIC permit, except in cases where diesel fuel is used as a fracturing fluid or propping agent.
- Outlines for EPA permit writers, where EPA is the permitting authority:
 - Requirements for diesel fuels used for hydraulic fracturing wells,
 - Technical recommendations for permitting those wells, and
 - A description of diesel fuels.
- Recommendations build on best practices from industry and state oil and gas programs.
- Companion federal register notice includes questions for public comment.

Next Steps



Draft
Guidance
Released:
May 4, 2012

Federal
Register
Notice
Publication:
May 10, 2012

60-Day Public
Comment
Period: May
10 – July 9,
2012

Agency
Comment
Review: Late
Summer-Fall
2012

Final
Guidance
Development:
Fall-Winter
2012-2013

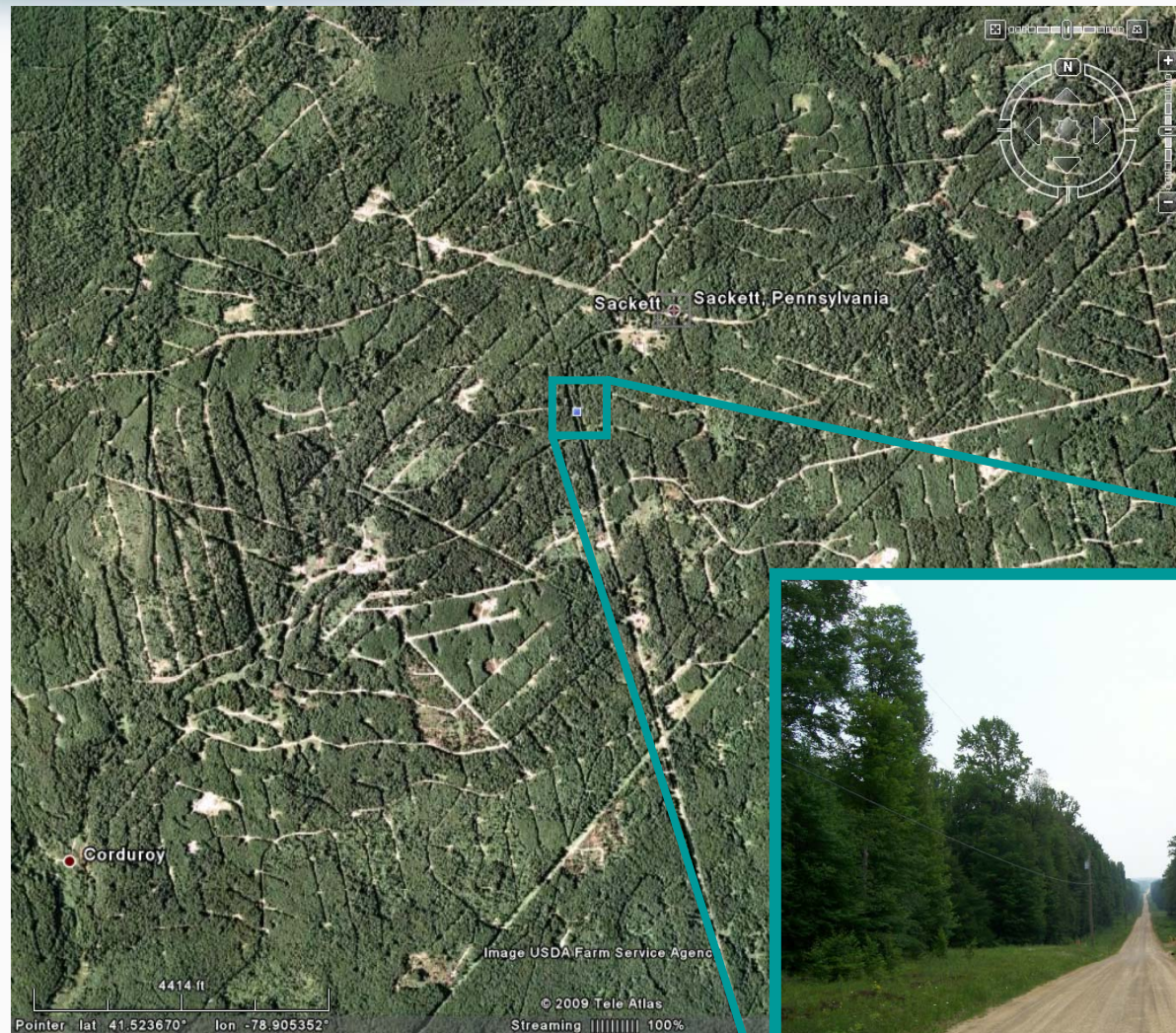
- During 60-day comment period EPA will:
 - Hold outreach calls to state and tribal regulators
 - Host a public meeting in Washington, DC
 - Public meeting information to be published in Federal Register and at http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydroout.cfm
- The draft guidance, link to a Federal Register notice and detailed instructions for how to comment are available on EPA's website at <http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/hydraulic-fracturing.cfm>

Characteristics of FracWater



Parameter	Range/Expected Average
Flow (1,000gal/day)	0-225/50
TDS (mg/l)	4,800-200,000/25,000
Chloride (mg/l)	200-140,000/10,000
Sulfate (mg/l)	10-190/150
Bicarbonate (mg/l)	150-940/450
Calcium (mg/l)	170-3,600/900
Magnesium (mg/l)	40-200/150
Iron (mg/l)	1-35/15
Barium (mg/l)	0-2/0.5
Sodium (mg/l)	1,600-15,100/7,000
pH (SU)	6.7-8.0/7.1
Ionic Strength	0.03-0.85/0.25

Landscape Impacts, Elk County, PA



(images from GoogleEarth, 2009)

(from Coleman and others, 2009)

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Thank You!

