Upstream Urban Oil & Gas Operations

Brian Chacka – Denbury Resources

Texas Energy Council Ambassador Series

Why don’t people like us (O&G Industry)?

Tuesday, August 28, 2012

Fossil Fuels are the Most Hated Industry in the US

Americans may not like government, but according to a new poll, they hate the oil and gas industry most of all. A new Gallup poll asked thousands of Americans how they feel about 25 of the nation's largest industries -- positive, neutral or negative. A total of 61 percent of those polled gave the fossil fuel industry a negative rating

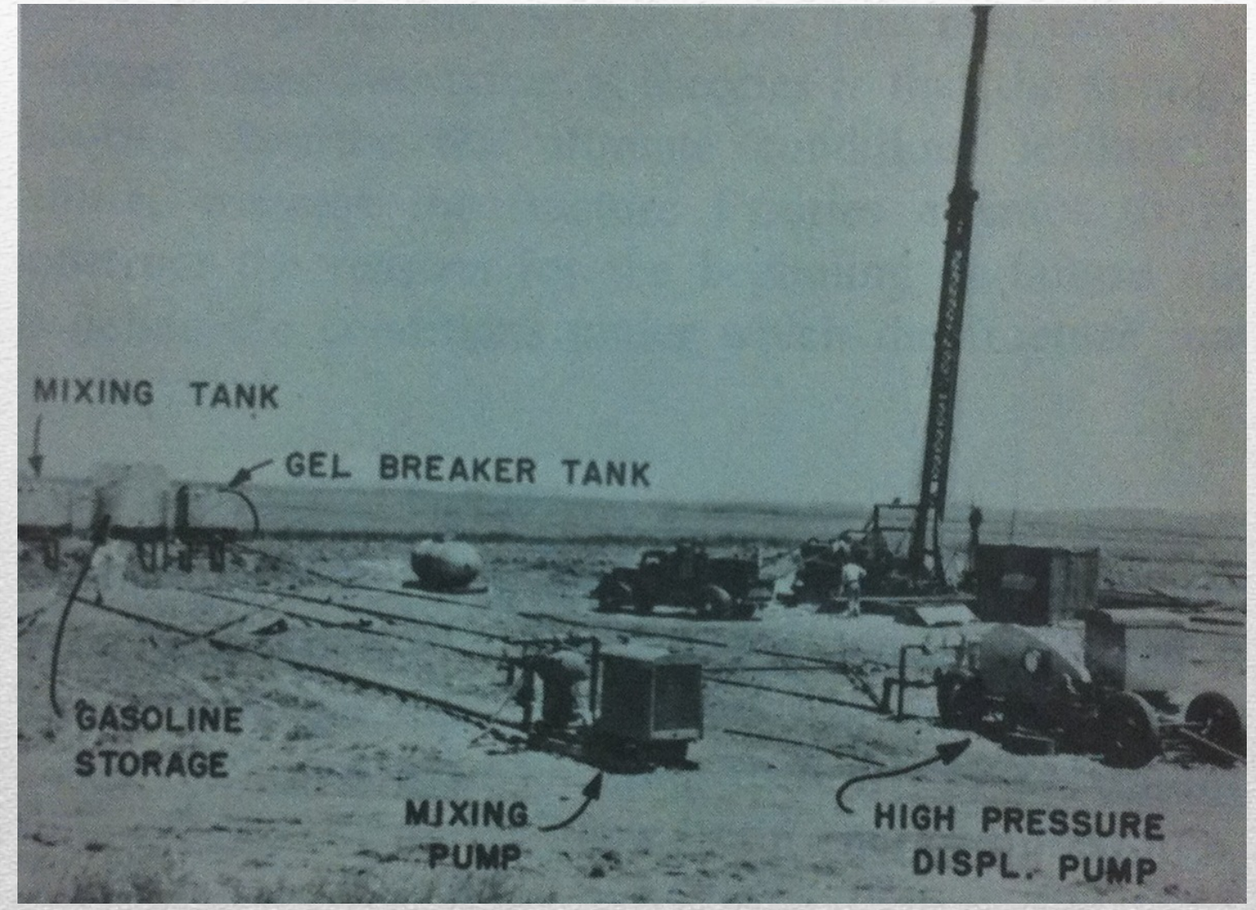
To rank the most hated industries, 24/7 Wall St. reviewed the 10 private sector industries with the most overall negative views among the 25 industries Gallup included in its annual Work and Education survey. They also reviewed the American Customer Satisfaction Index (ASCI), which employs a multiequation econometric model to score industries on a 0-100 scale.

With the oil and gas industry being the most hated industry in the country, it is high time that America removes its support for oil subsidies.

Profit Margin?

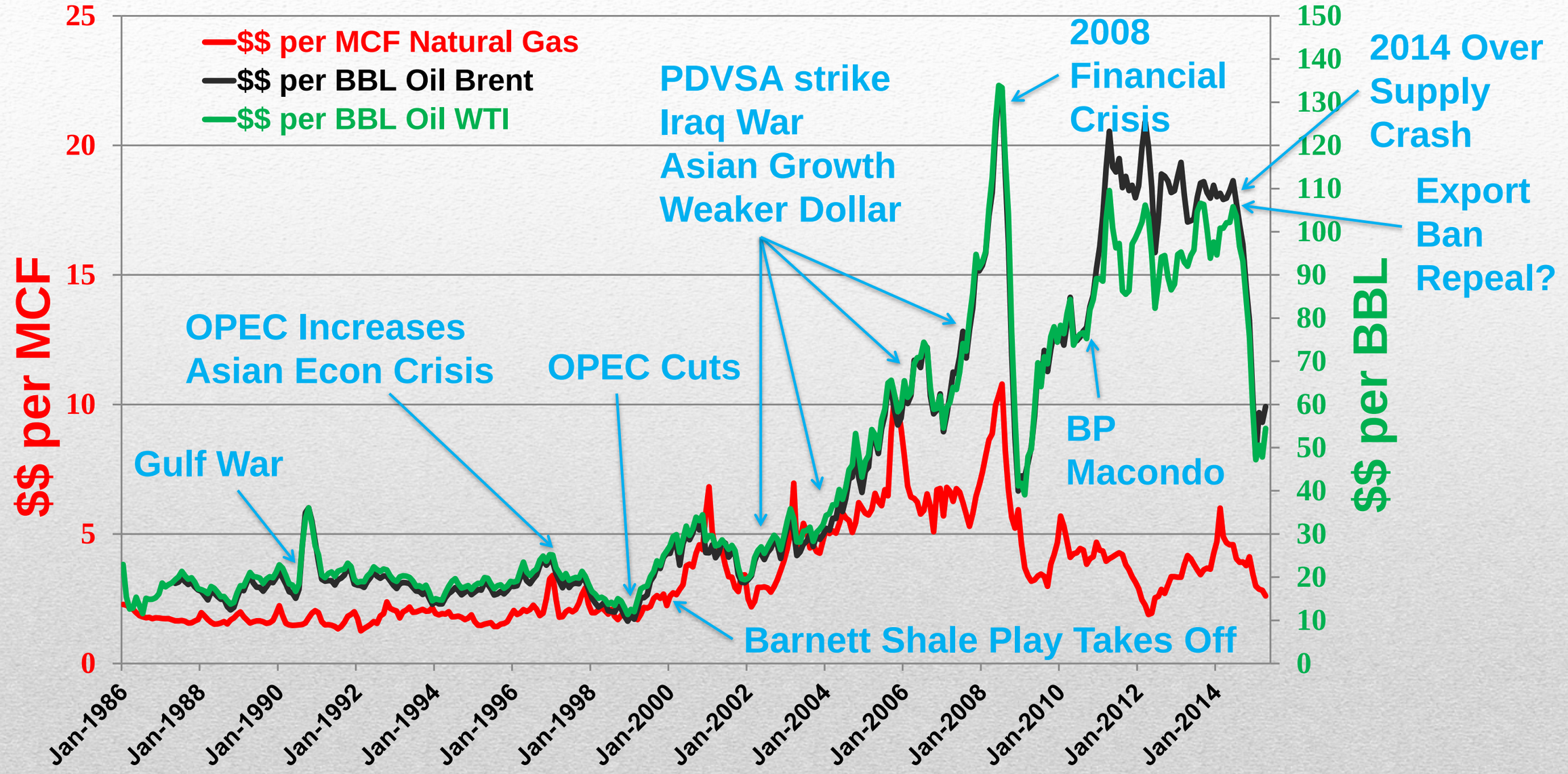
When was the first “frac” job?

1949 in Duncan, OK



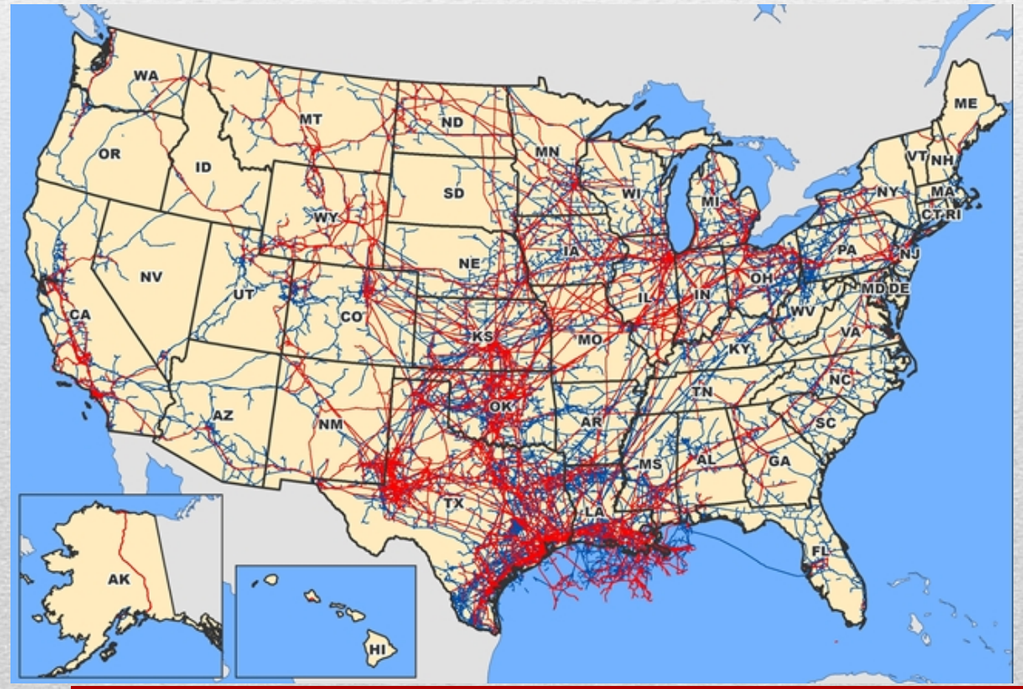
Modern Frac Job

What would energy and gasoline cost without fracing?



Why is the US the O&G Technology & Shale Leader?

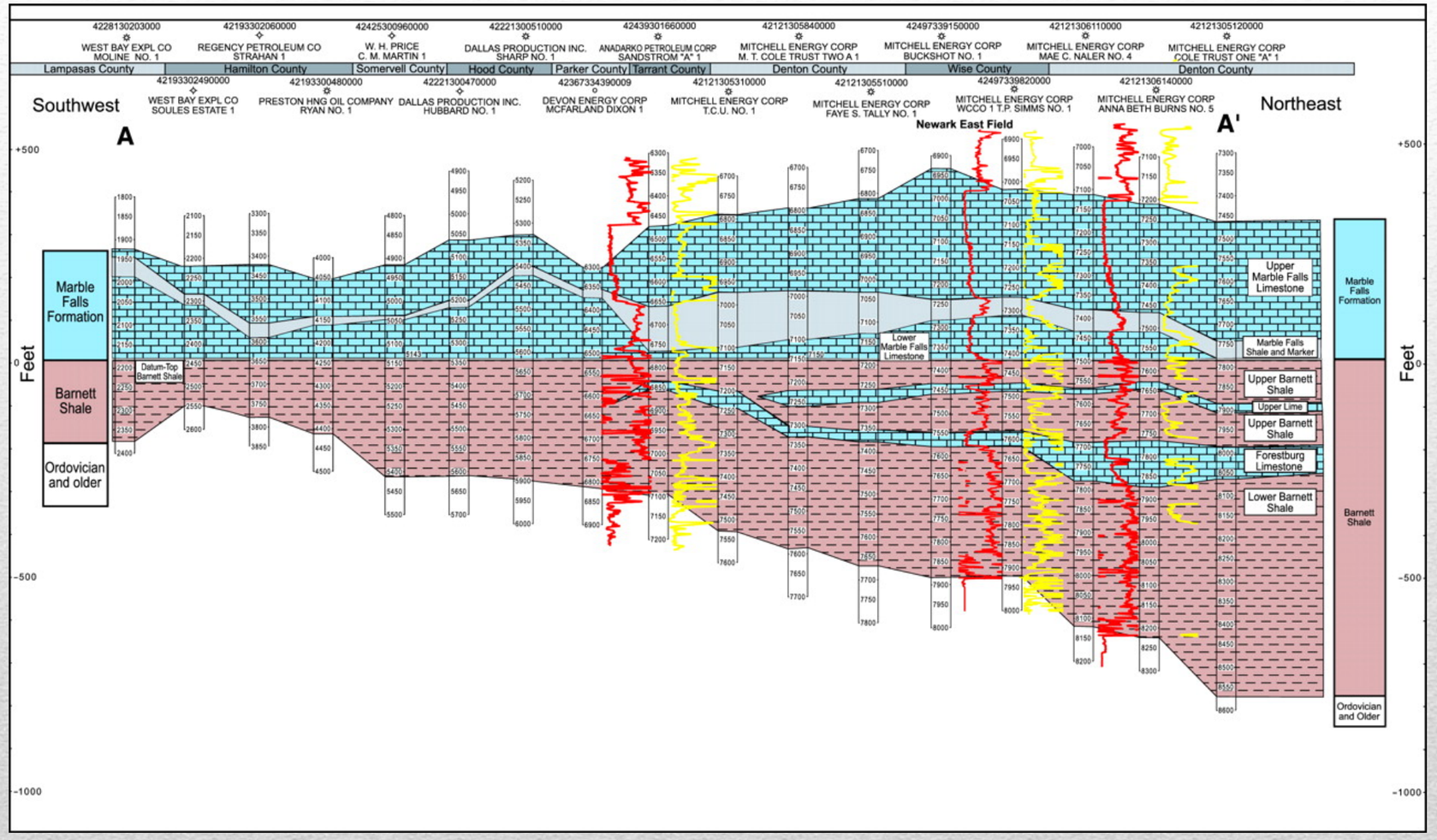
- Mineral ownership
- International political risks
- Regulations & fiscal (PSA) terms
- Infrastructure



- Expertise
- Directional drilling
- Hydraulic fracturing
- Water availability

Pre-Drilling

- Geophysics & geology
- Evaluate economics
- Acquire capital
- Lease minerals
- Determine target(s)
- Design/Plan wells
- Select location
- Design drilling pad
- Stake wells
- File permits
- Build location

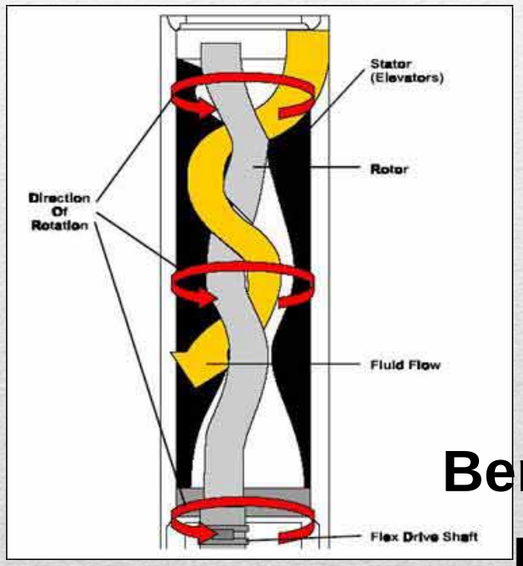


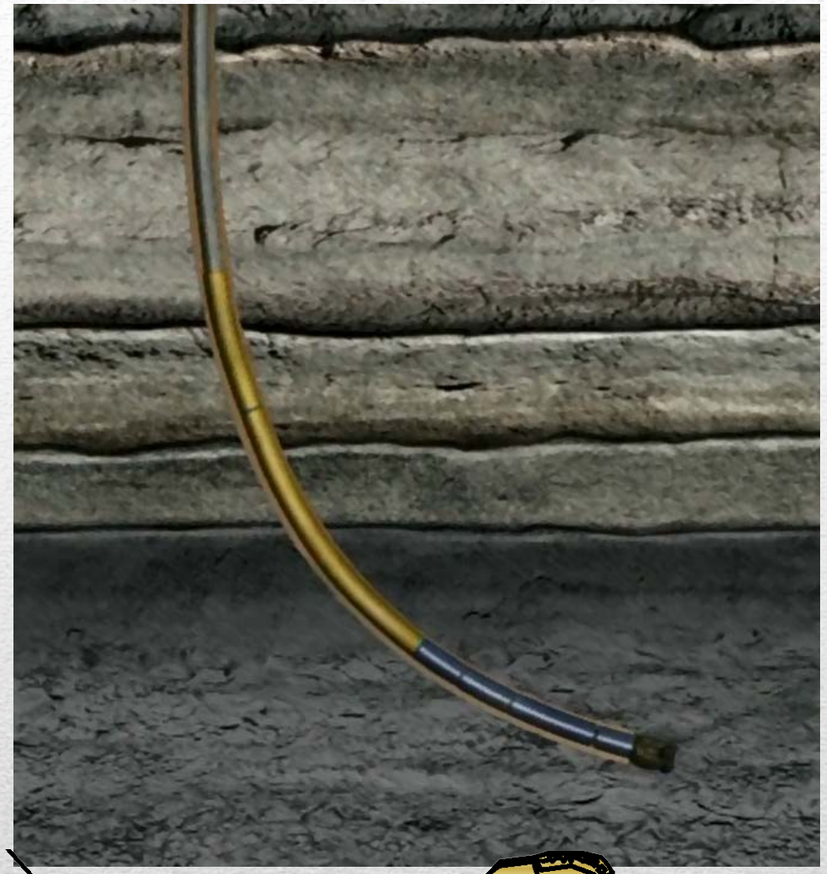
Drilling Basics

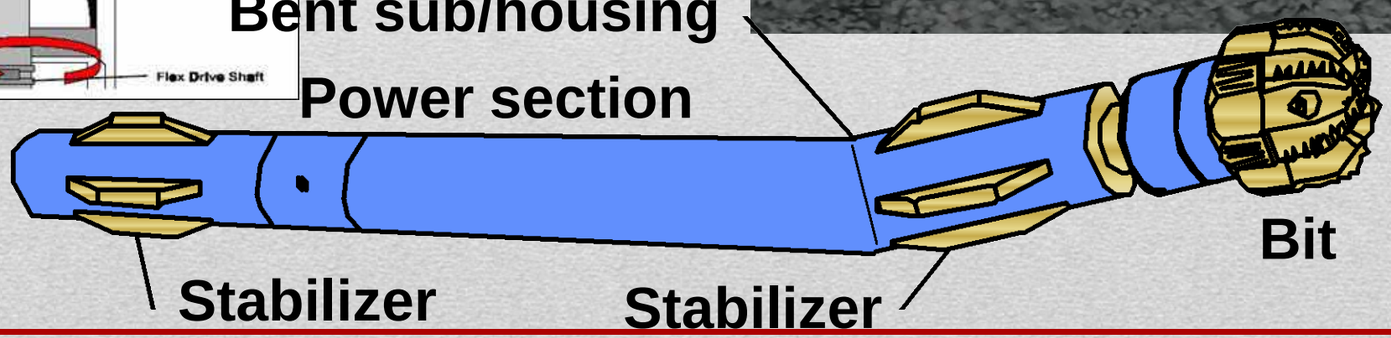
- Mud (hydrostatic pressure control, lifts cuttings, circulation – LCM, lubrication, power fluid, communication)
- Motor turns drill bit
- Steering equipment
- Drill pipe

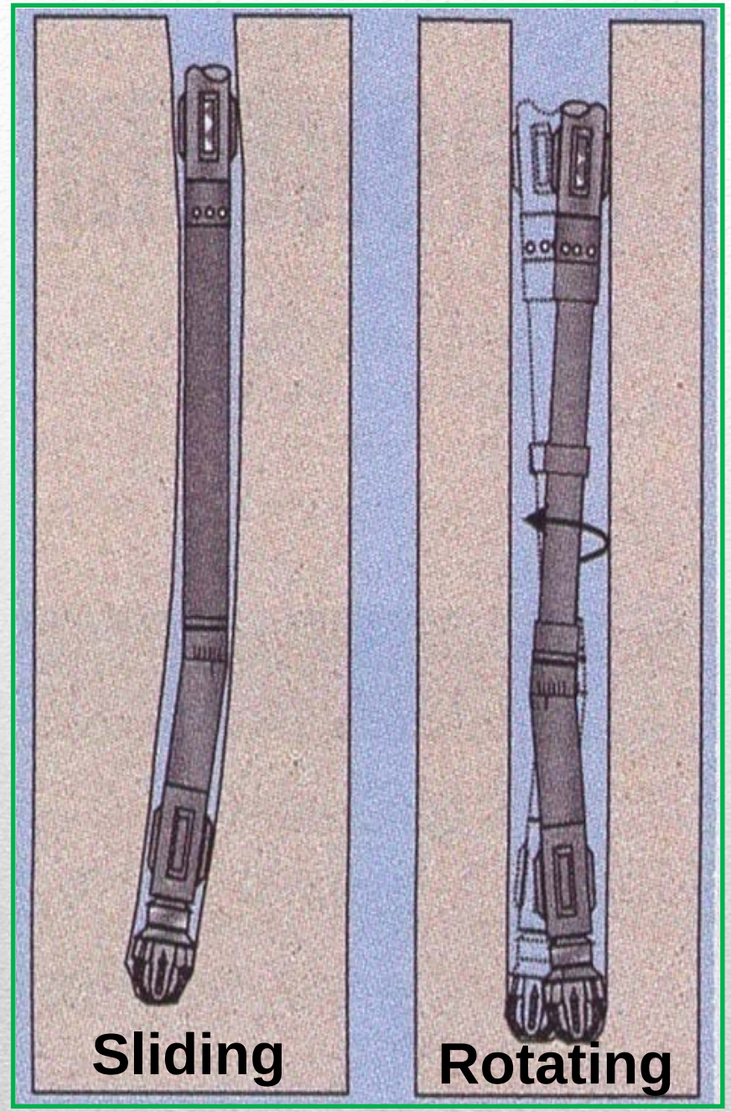
Directional (Horizontal) Drilling

- Steering the bit
- Deflection equipment
- Sliding?



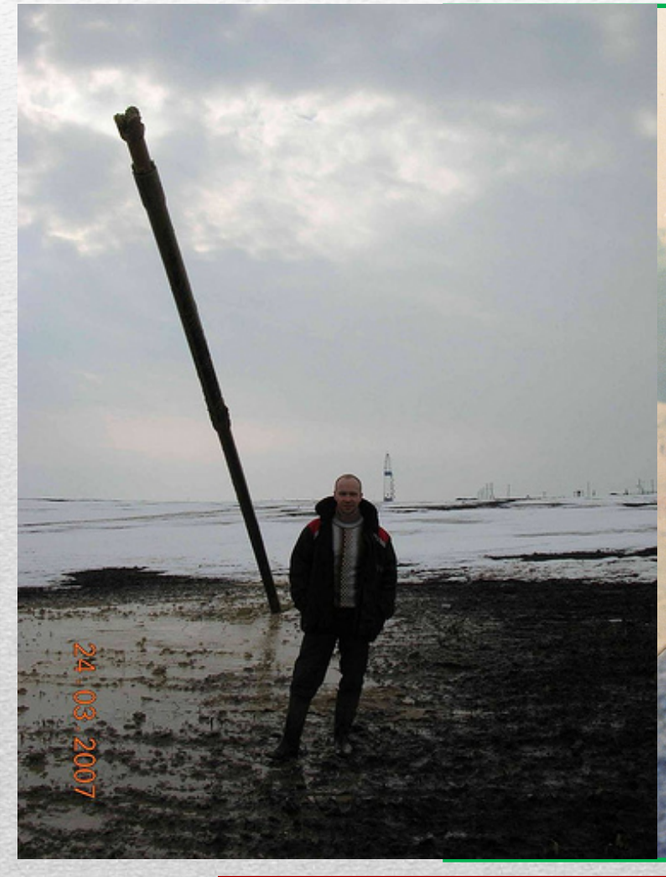




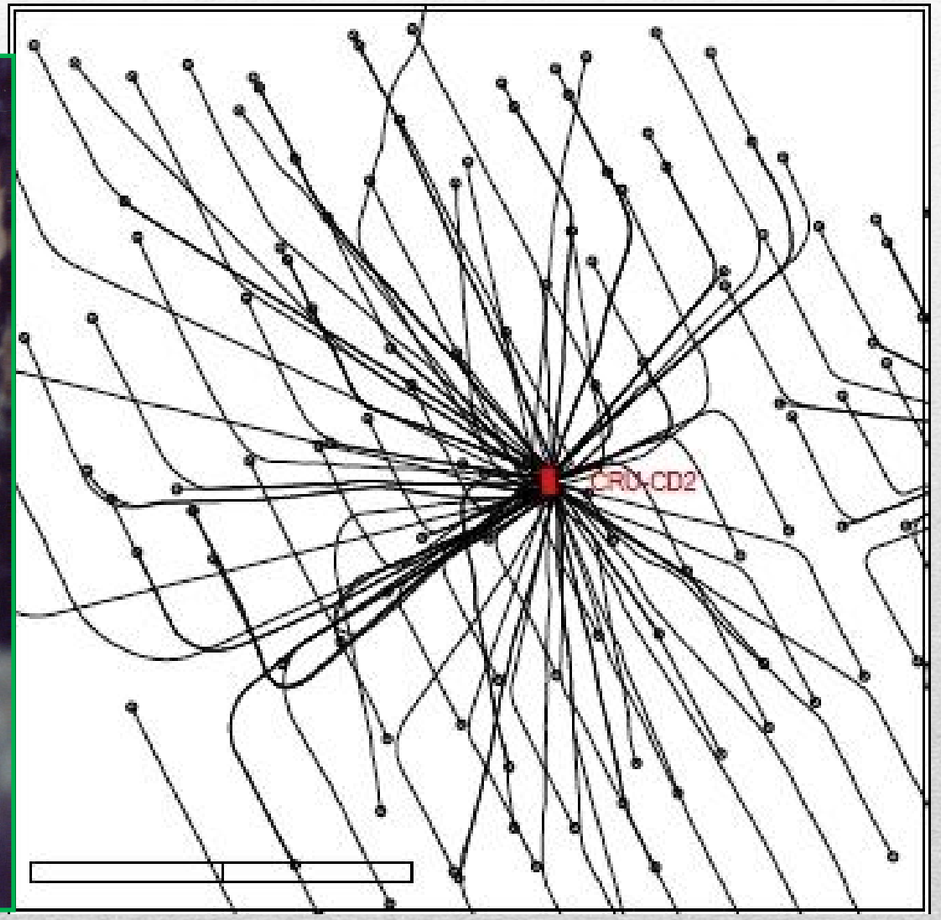


Directional Drilling

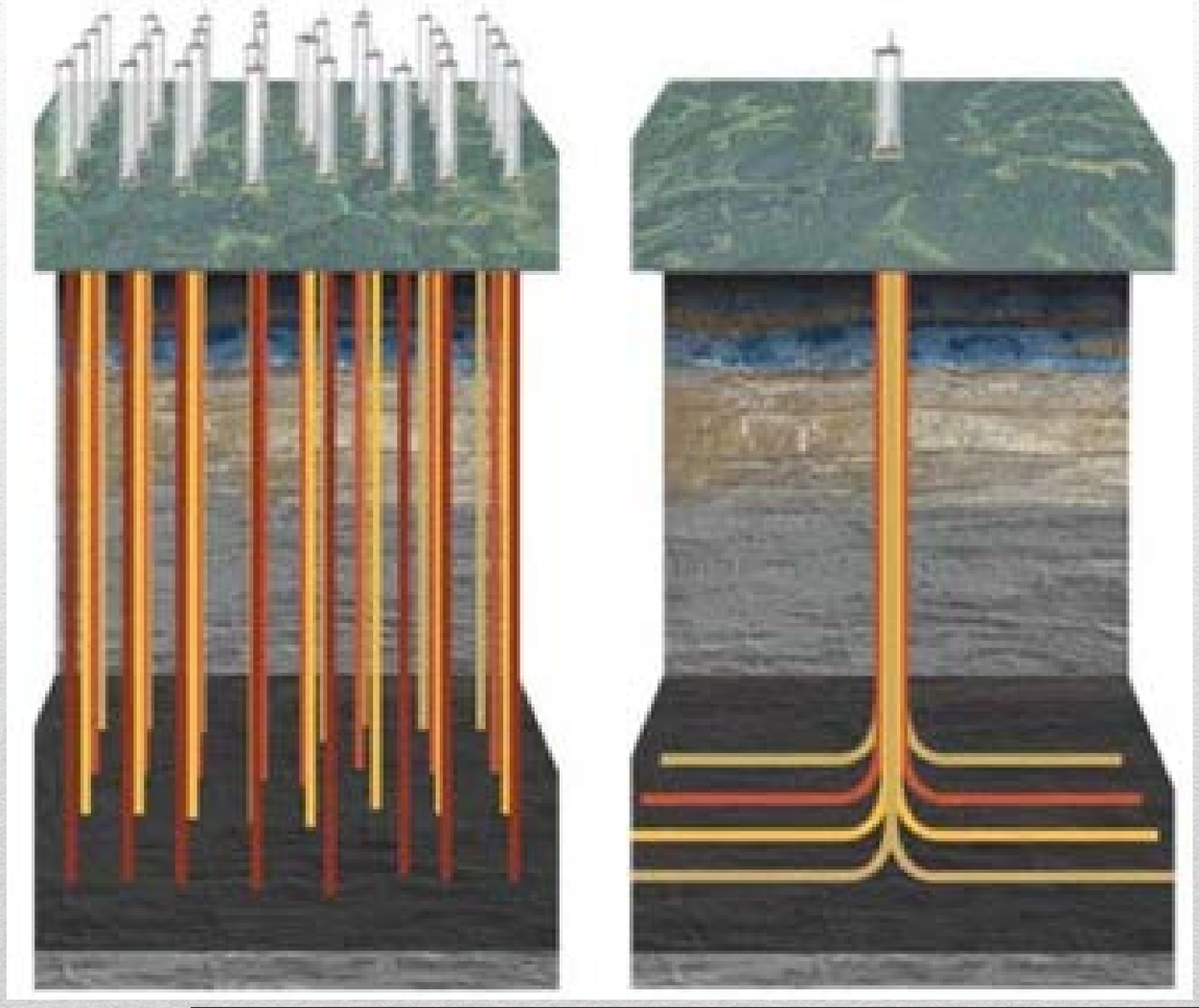
- Survey instruments (azimuth & inclination)
- Measurement equipment (MWD/LWD)

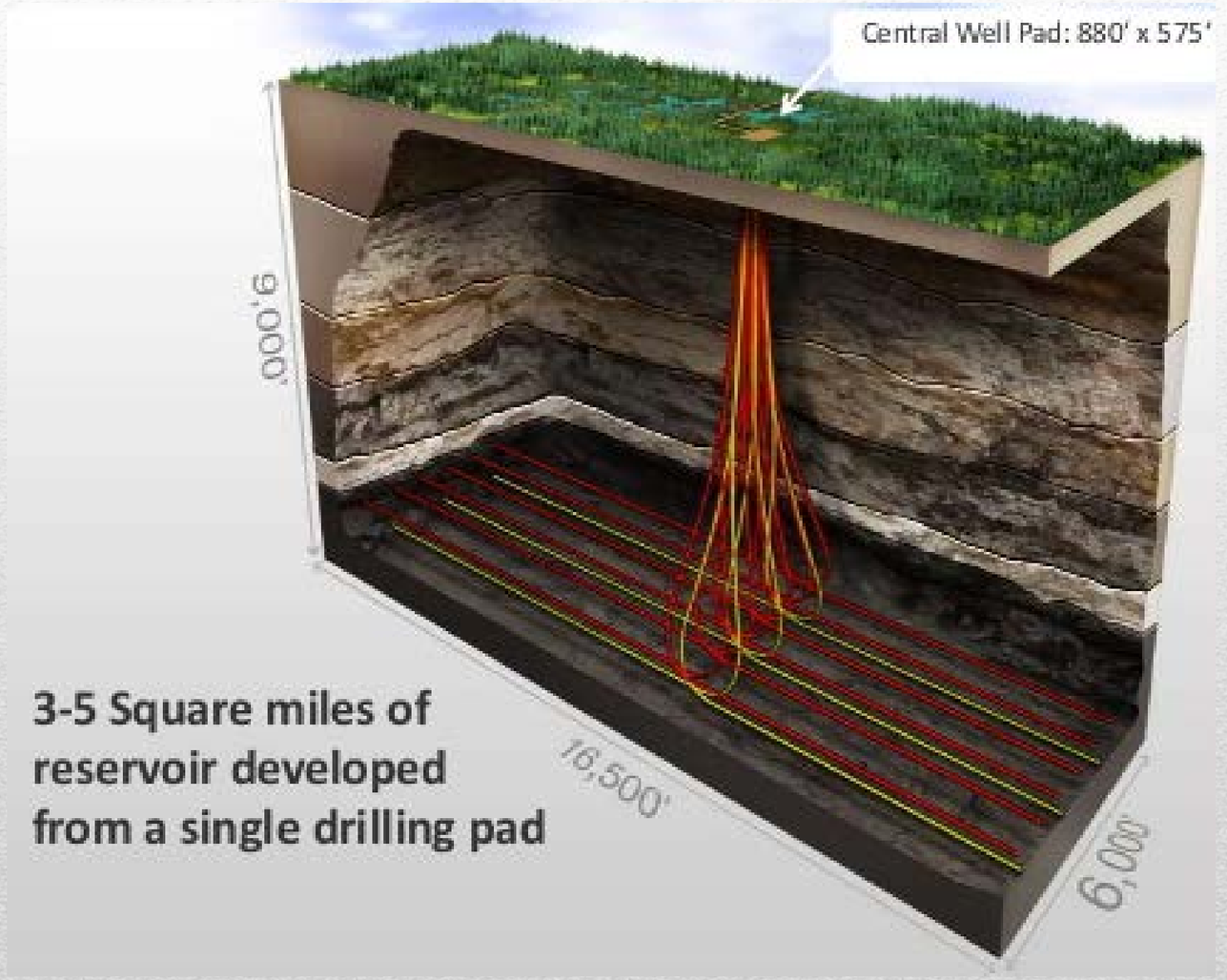


Anti-collision



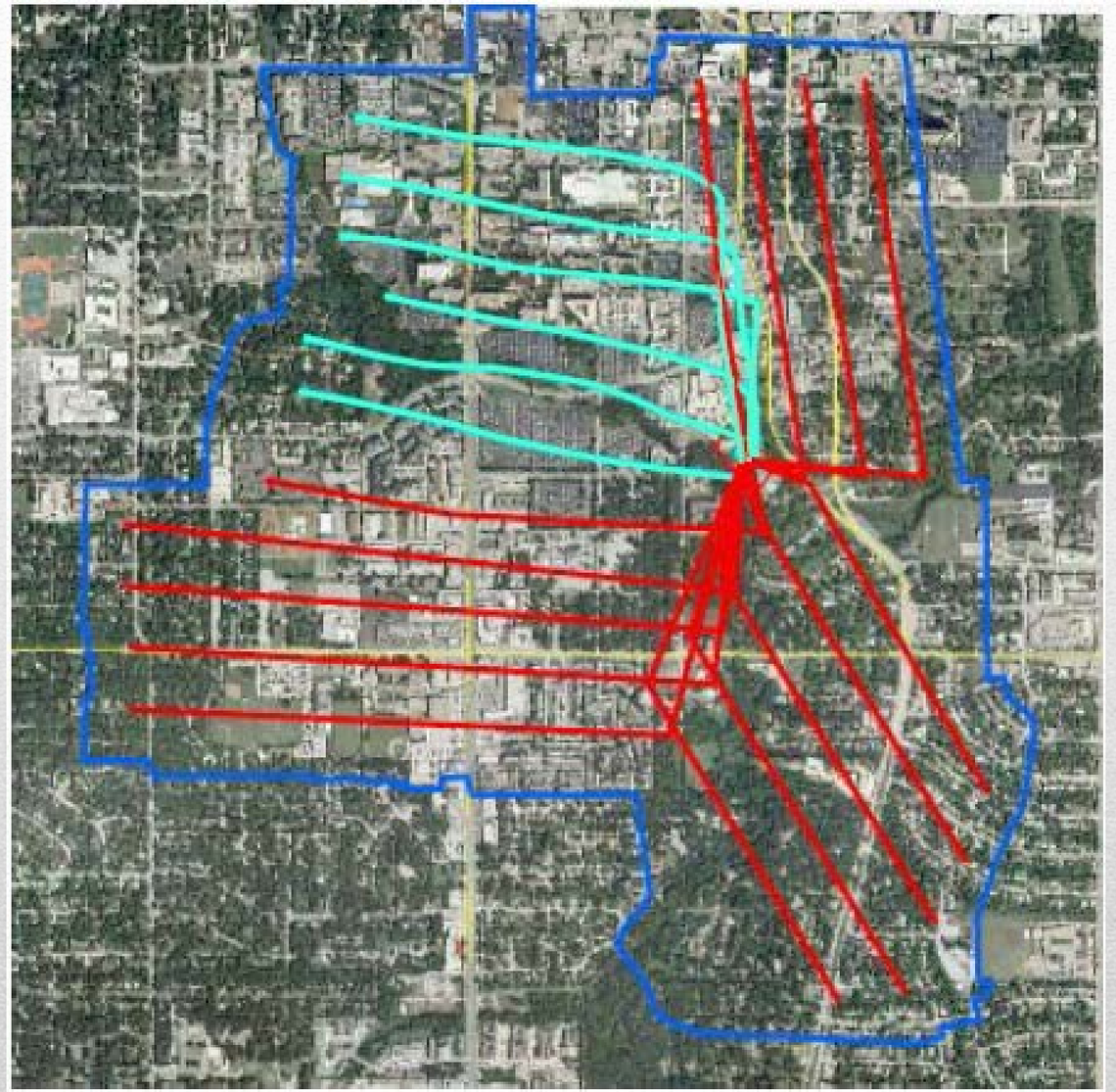
Pad/Batch Drilling



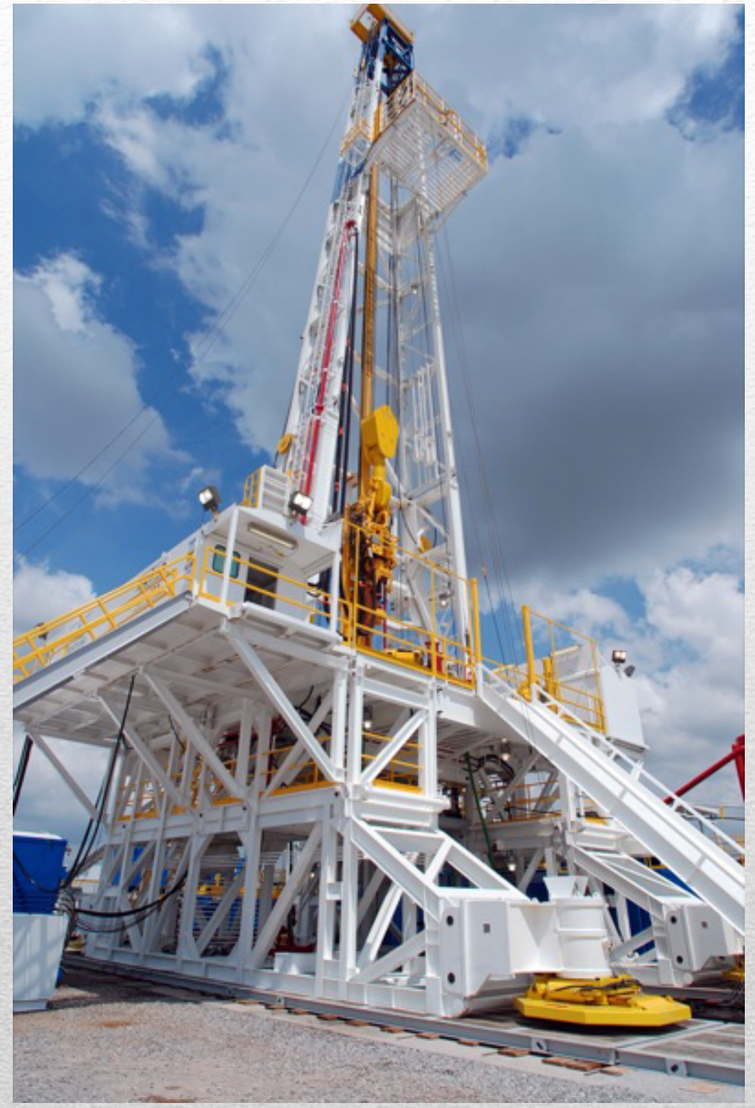


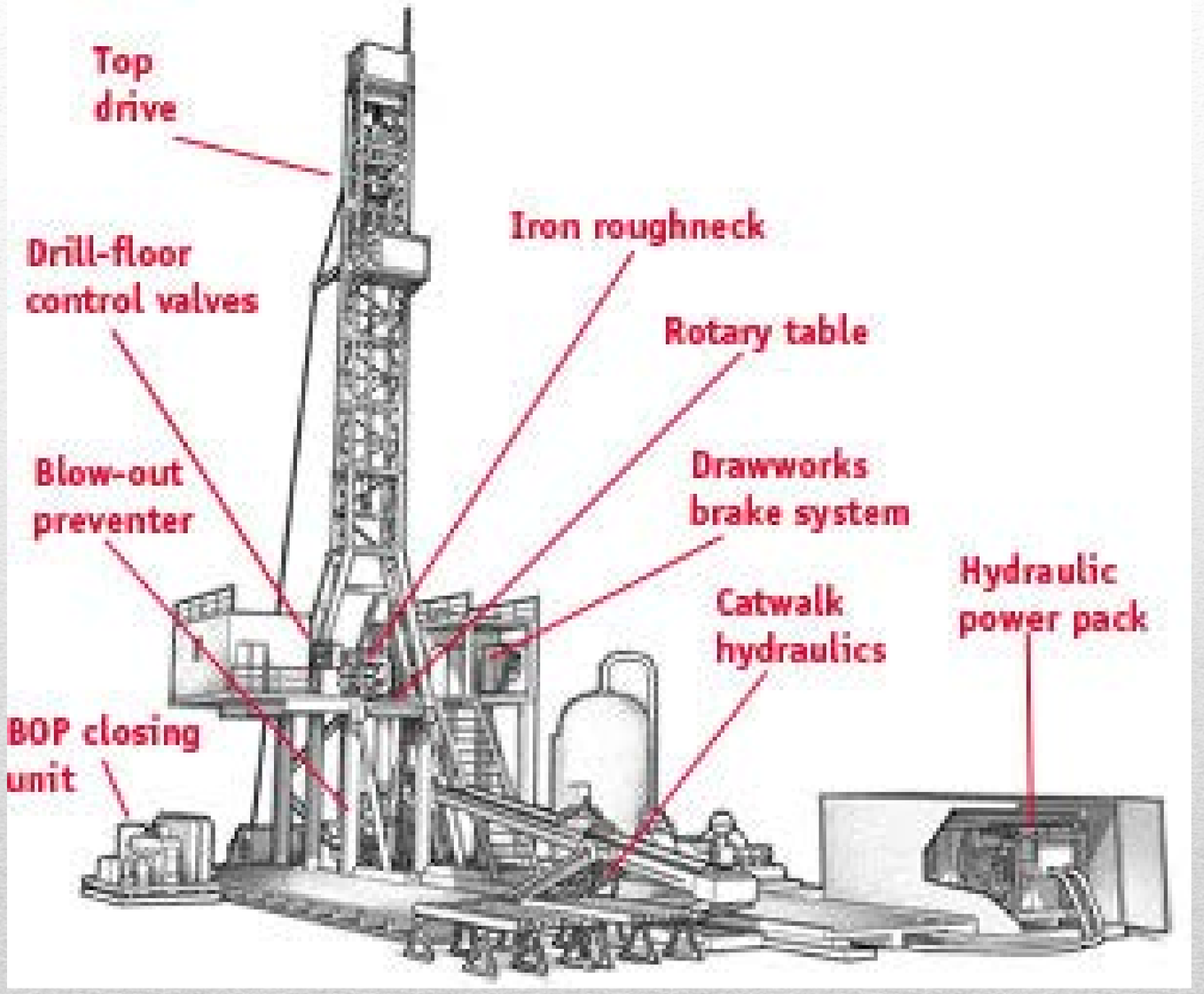
Minimize Footprint

- ~2 square miles developed from 4.5 acre pad with 20 horizontal wells
- Where is this? UT Arlington

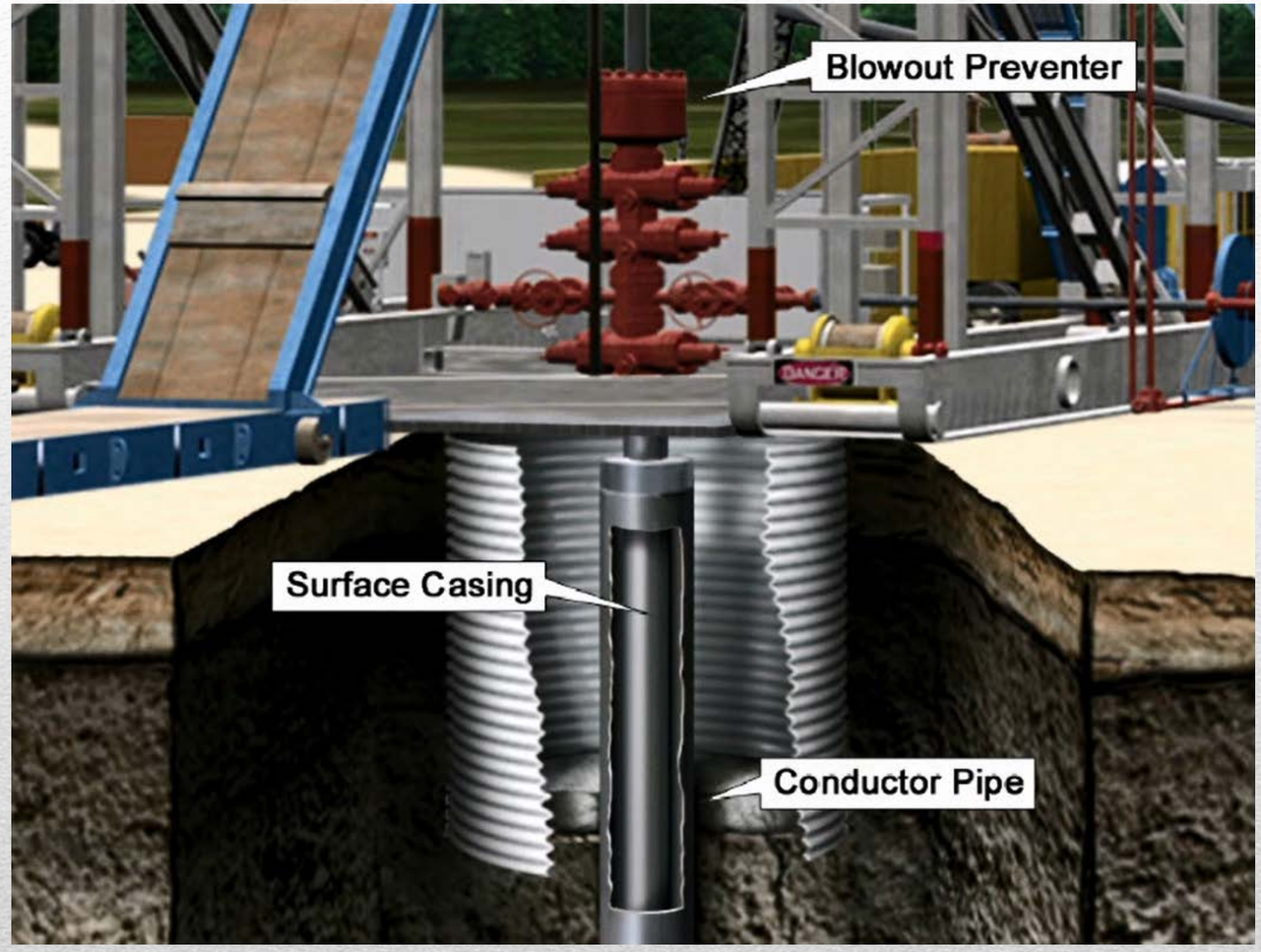


Slide/Skid/Walking Rig

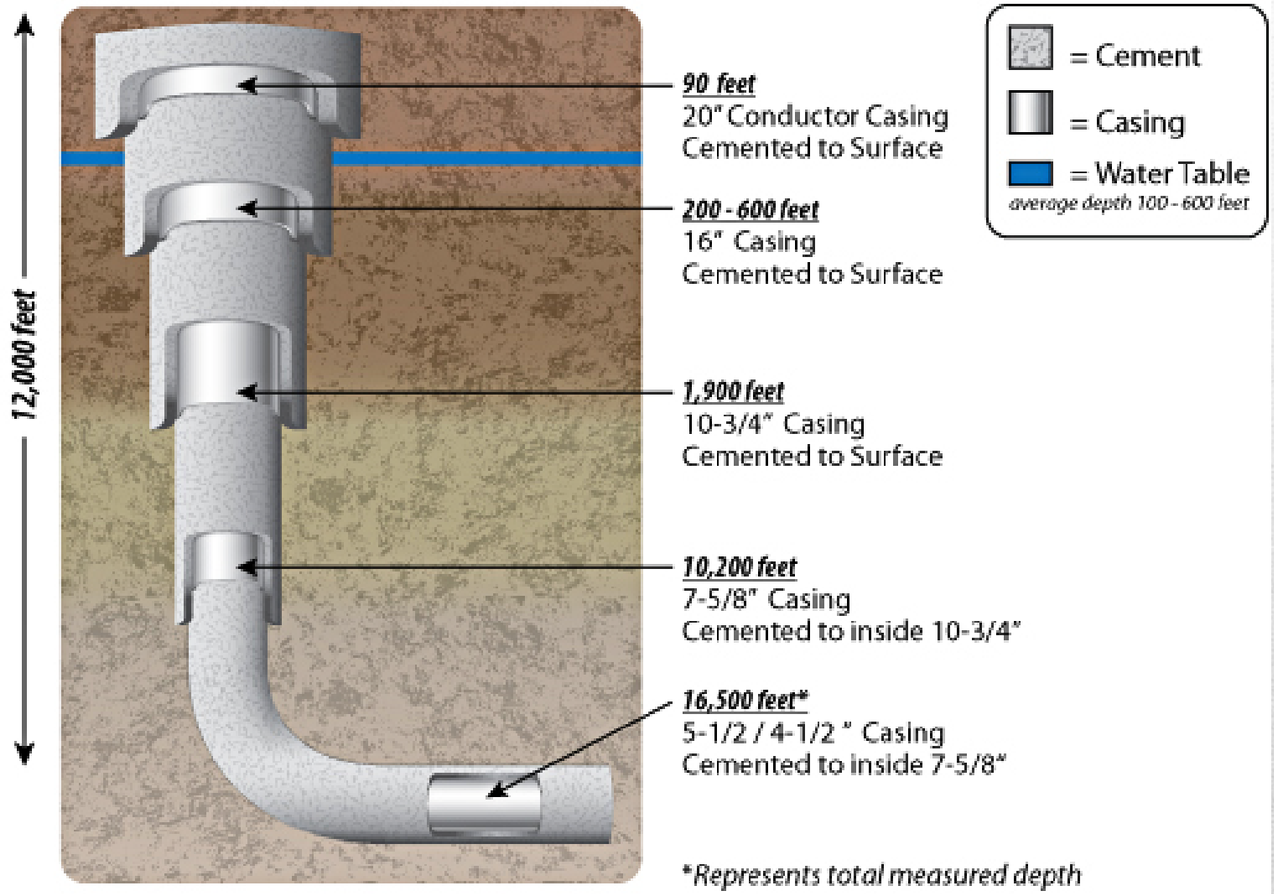




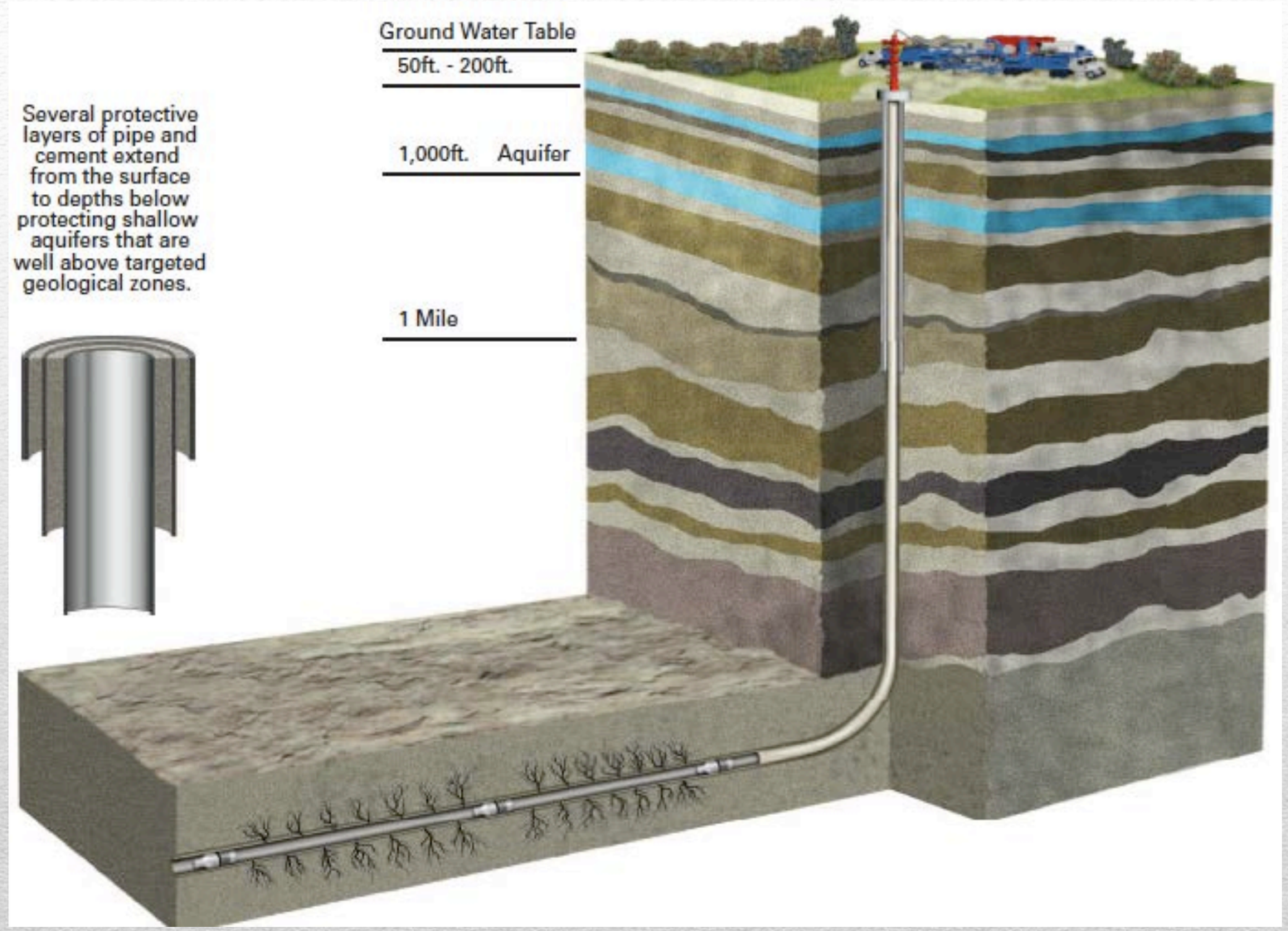
Wellbore Design – Protect Water



Casing Design for Typical DeSoto Parish, Louisiana, Haynesville Shale Well

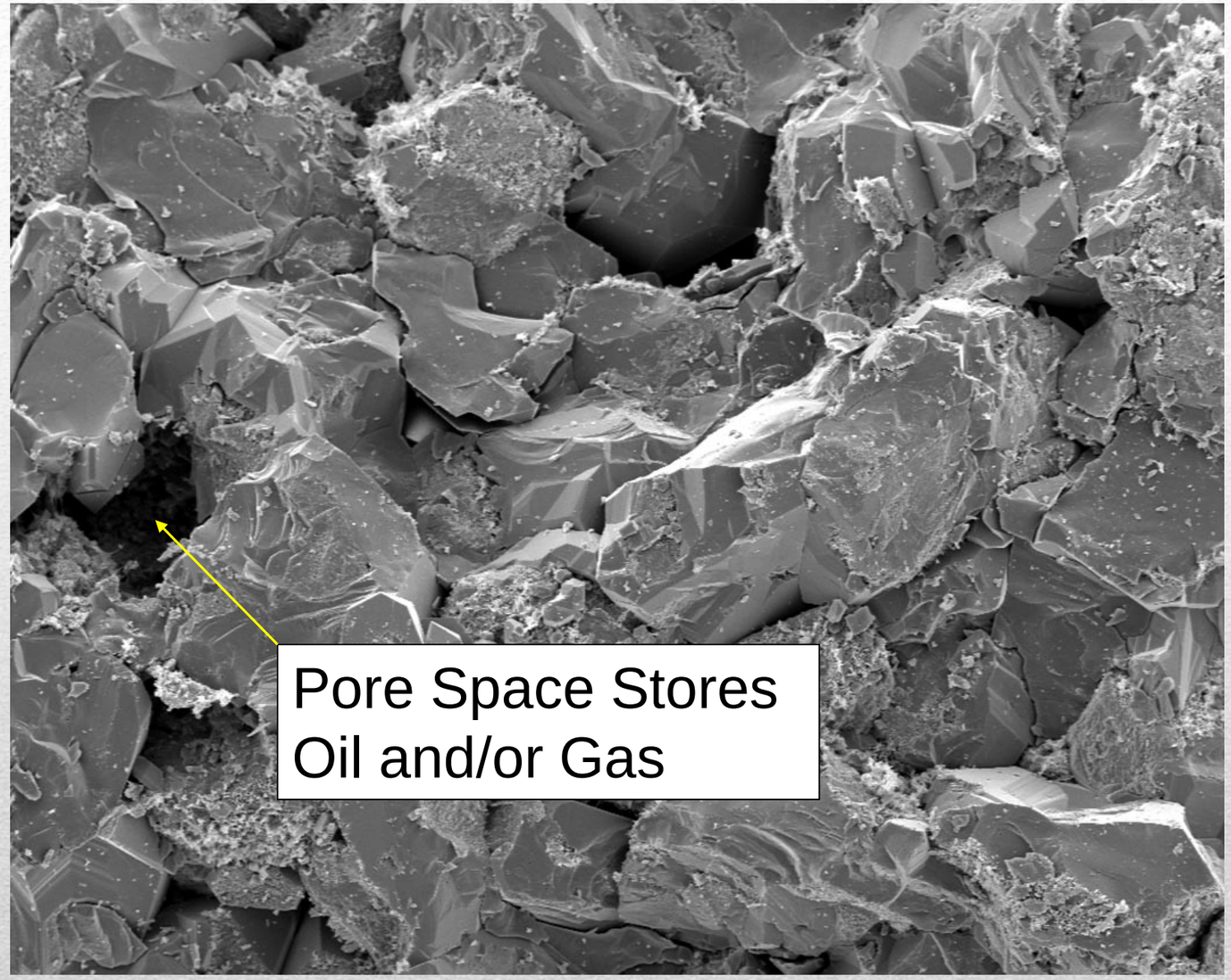


Casing the Well – Think Long Term!



Cement Casing

Why does a well require hydraulic fracturing?



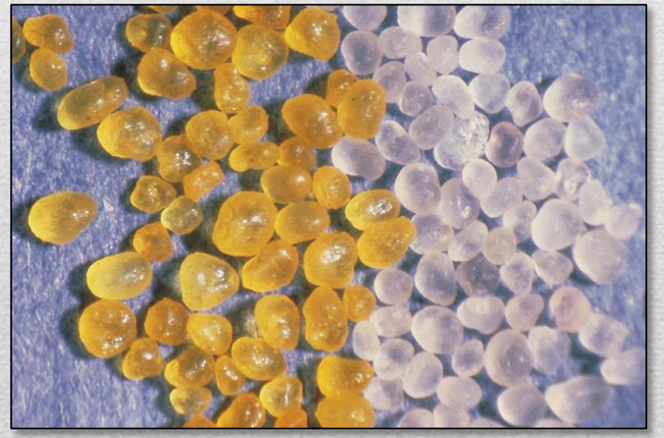
- Porosity – pore space between rock grains
- Permeability – how well the pore spaces are connected
- Fracturing creates more wellbore surface area and connects the small pores

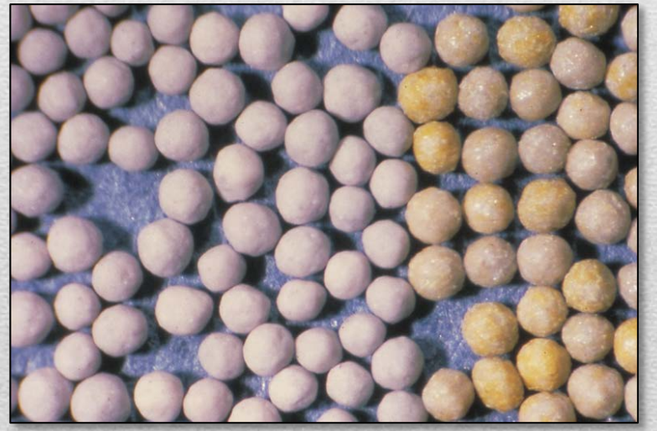
Fracture & Proppant

Open Fracture During Pumping

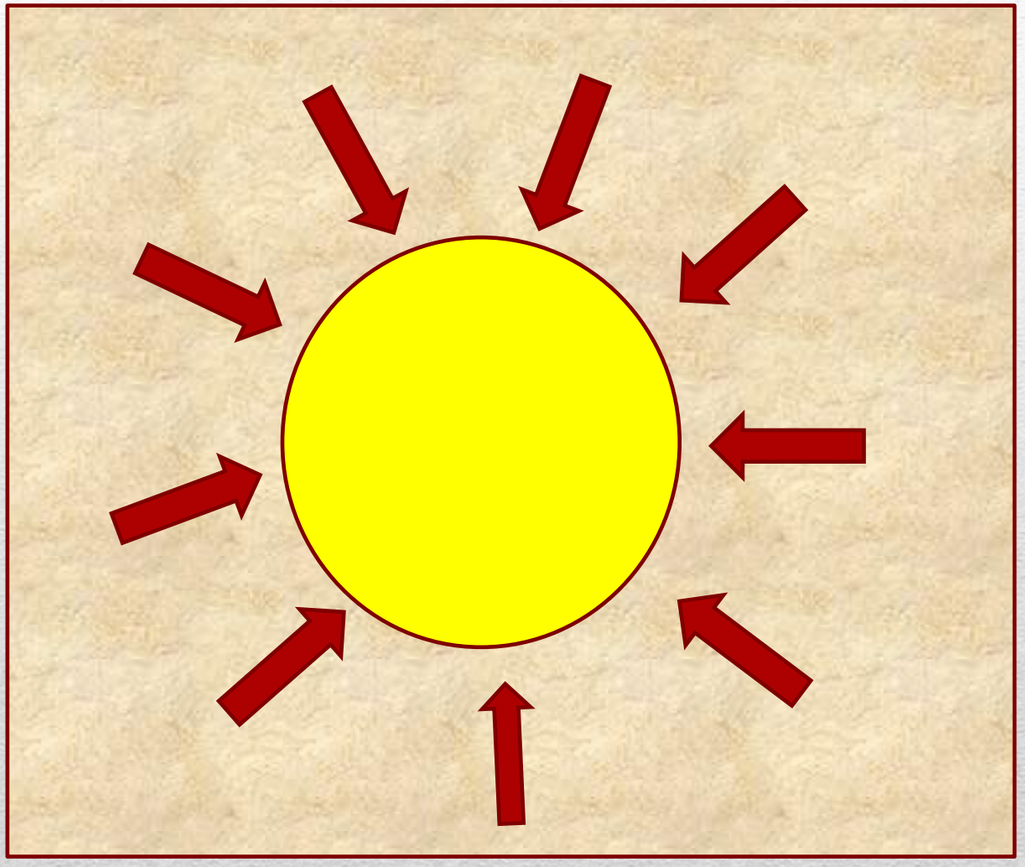
Closed Fracture Without Proppant

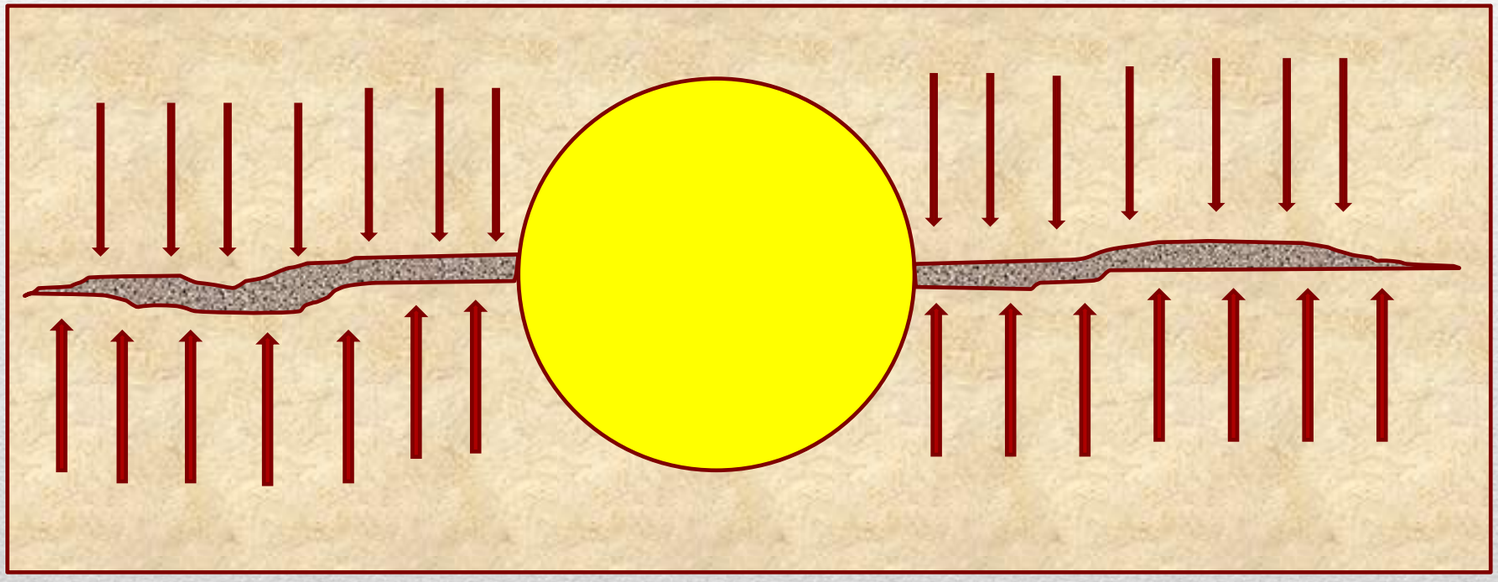
Closed Fracture With Proppant



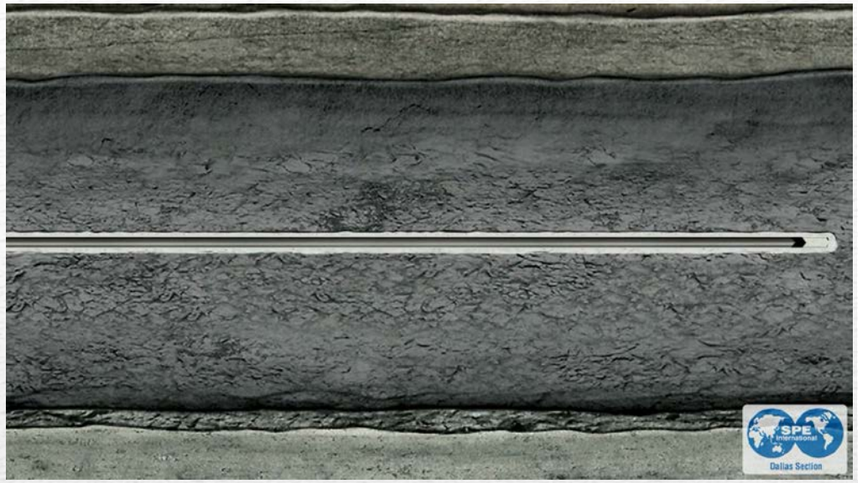


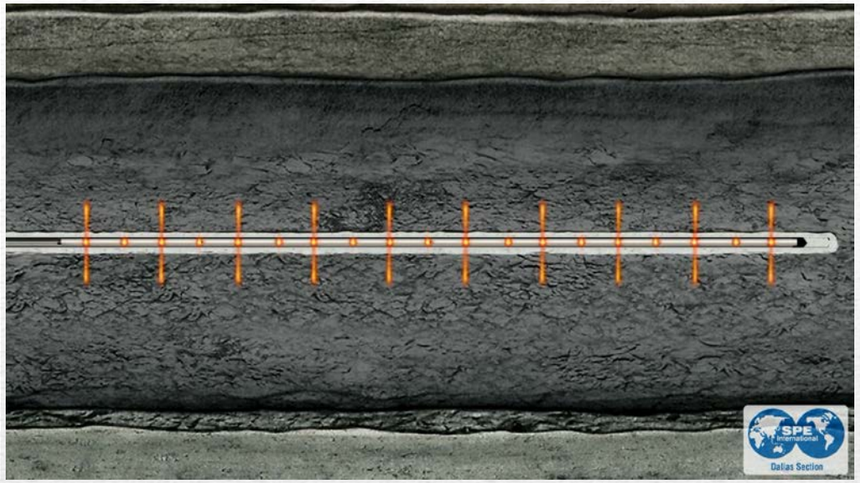
Increased Reservoir Contact

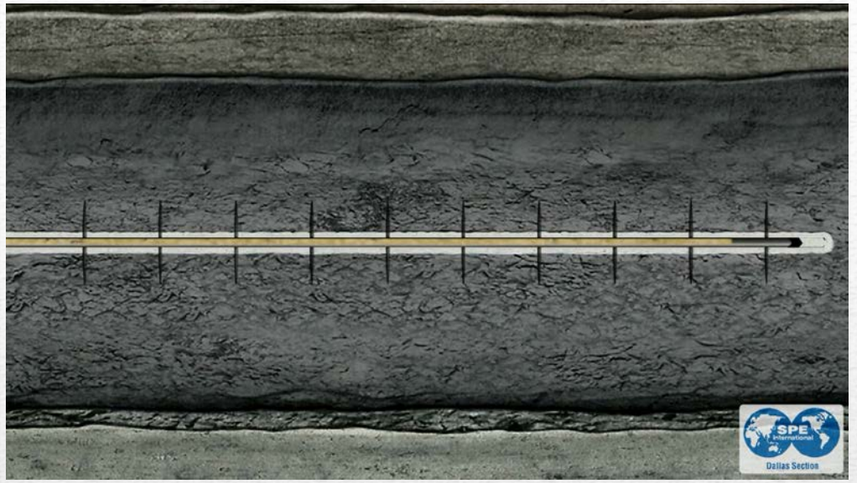


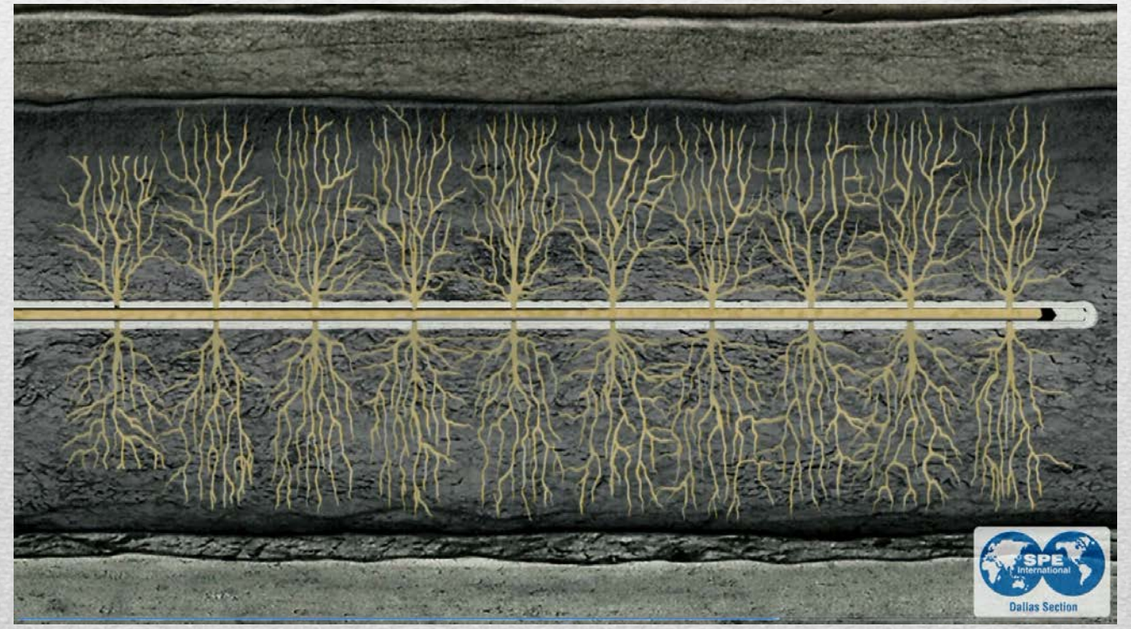


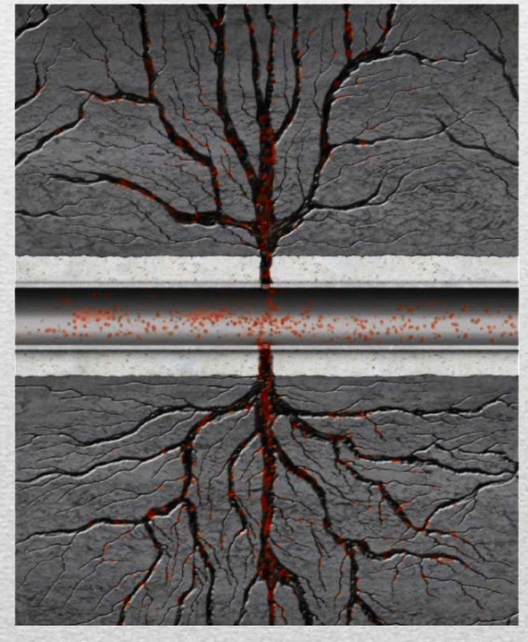
Perf & Frac





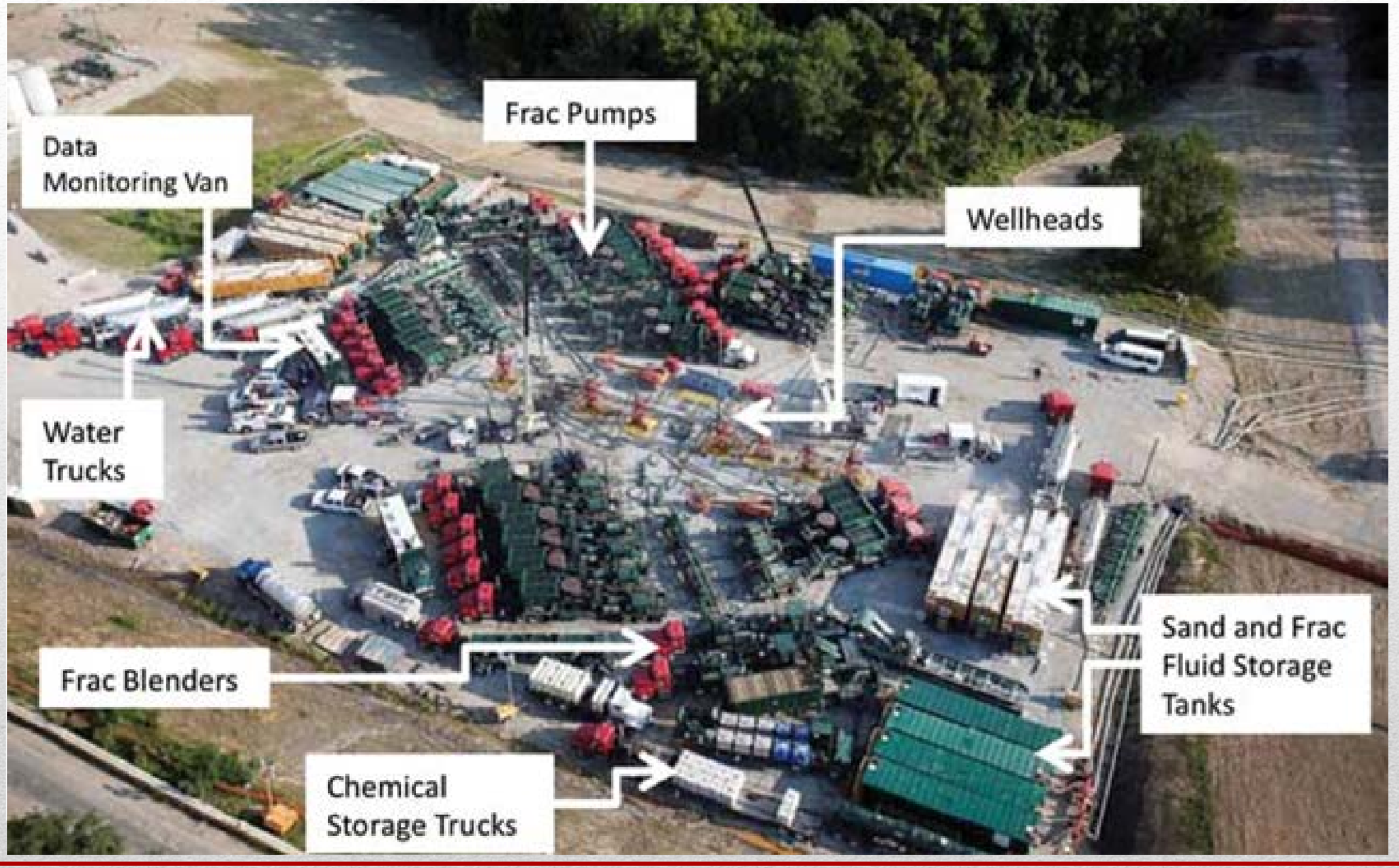






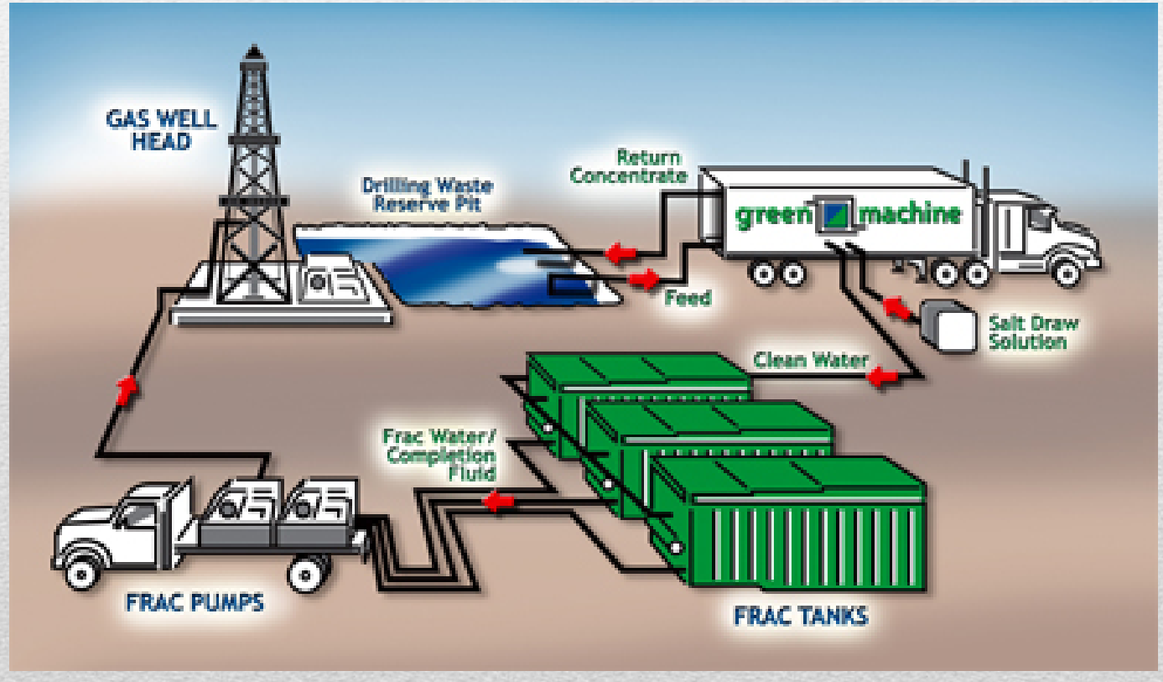
UT Arlington Barnett Shale Frac Job

Frac Location Components



Operational Improvements

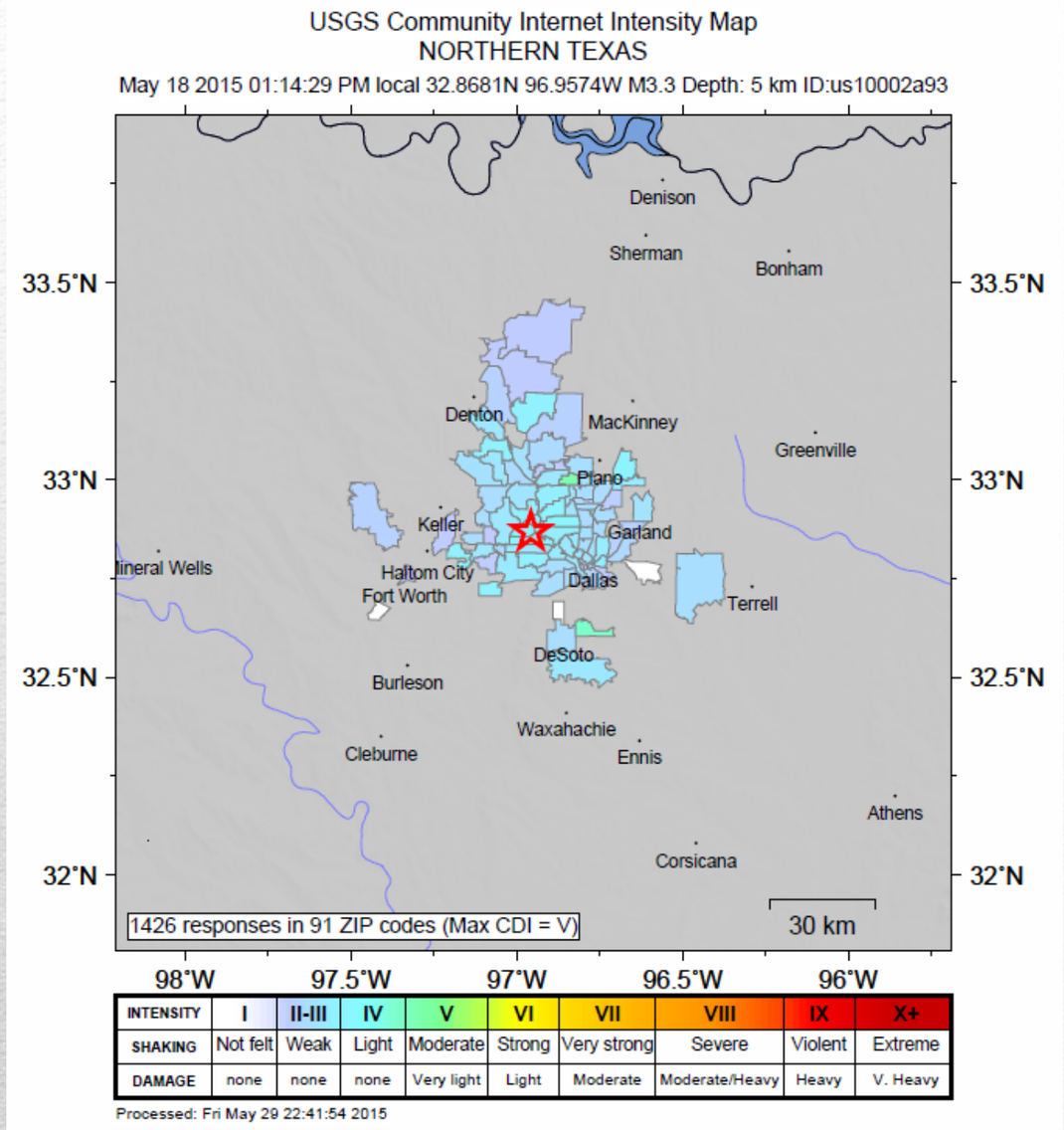
- Non-toxic chemicals – nearly all found in household items
- Fracfocus.org - frac fluid disclosure
- Improved water disposal management
- Water purification & recycling
- Produced natural gas used to power equipment
- Eliminating/Capturing emissions
- Improving urban operations (traffic, road damage, noise abatement)
- Proper regulation and enforcement



Recent Well Control Incident

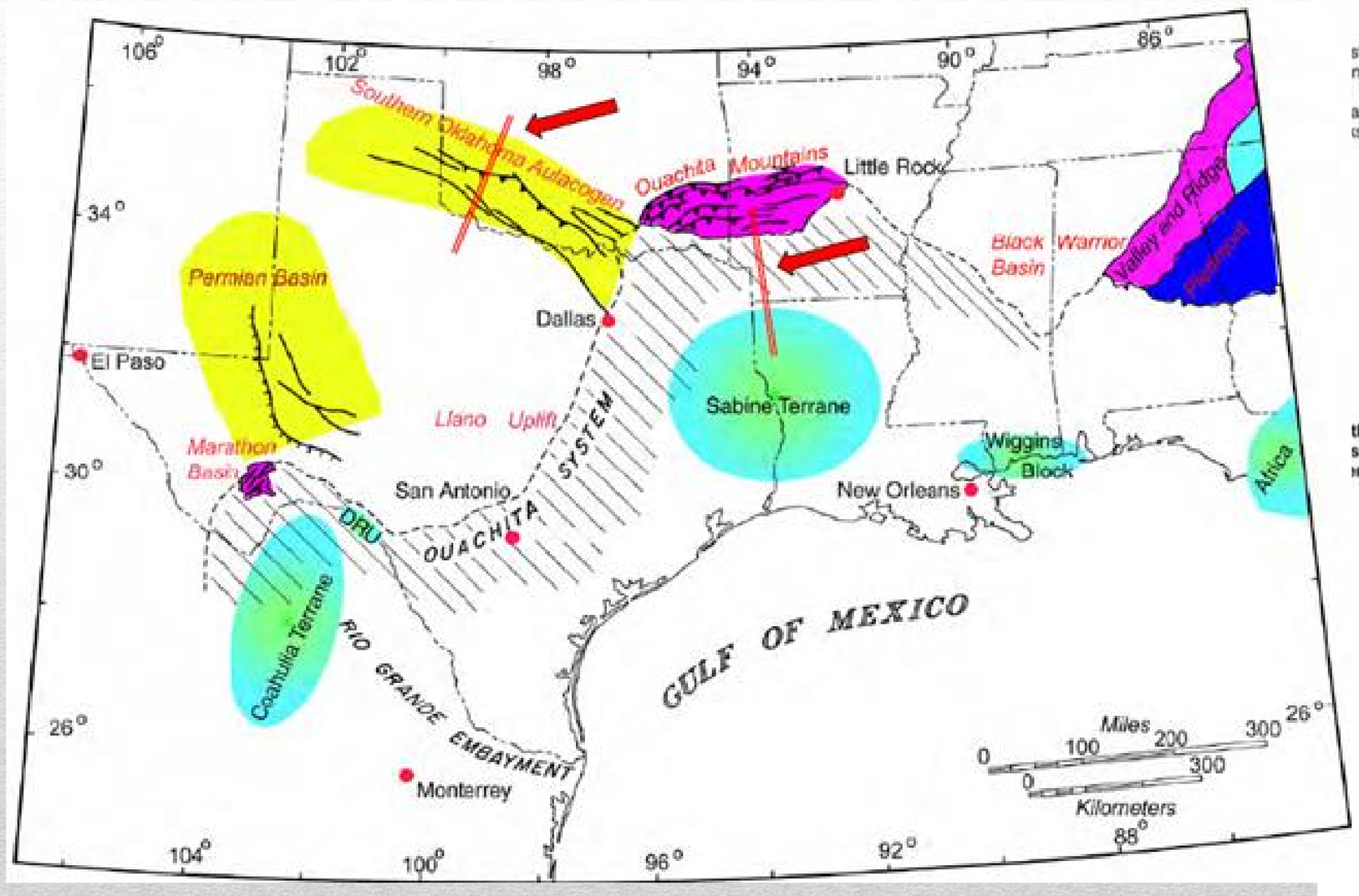
Officials: Arlington gas well sealed after “very serious” mishap
Star Telegram, April 12, 2015

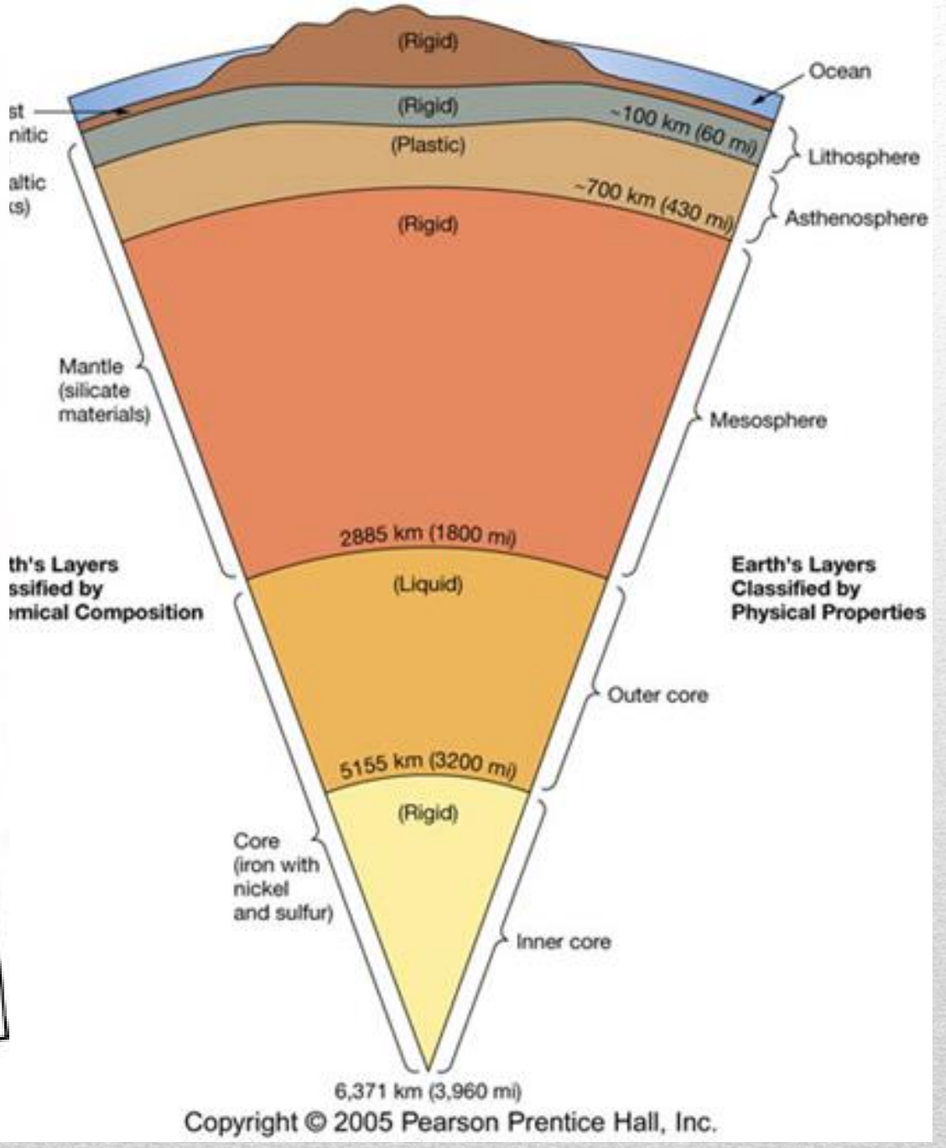
Does fracing cause earthquakes?



- http://earthquake.usgs.gov/earthquakes (not an O&G sponsored agency)
- Quakes centered around old Cowboy Stadium around 16,000’ below surface
- OK says high volume disposal near faults and/or basement rock is cause
- Unable to inject/dispose into the shale reservoirs being produced
- Ellenberger sandstone is massive, 1,000’s of feet above quakes, not continuous, hasn’t increased significantly in pressure and usually accepts water on vacuum

Ouachita Mountain Range & Plate Movement





Recent News

- Denton Frac Ban approved by voters November 4, 2014

- Texas House Bill 40 signed into law May 18, 2015

Methane in Freshwater Aquifers?

- Naturally occurring
- Biogenic (bacterial) gas (not thermogenic)
- Faulting
- Well integrity failure – good cement is vital!
- Drilling or Fracing? NO
- Parker County
- Gasland

Parker County homeowner Steve Lipsky demonstrates methane contamination in his well water by lighting it on fire. A new academic study links the contamination to faulty cement or production casing on gas wells. Star-Telegram/Khampha Bouaphanh

Parr vs. Aruba Petroleum

LAW360 Adva

Fracking Case That Wasn't: Parr V. Aruba Petroleum Inc.

Joshua L. Fuchs

Law360, New York (June 13, 2014, 10:59 AM ET) -- On April 22, 2014, in Parr v. Aruba Petroleum Inc., an alleged hydraulic fracturing case, a Dallas jury awarded almost $3 million to a Texas family, finding that an energy company's drilling activity in the Barnett Shale constituted a private nuisance. The verdict garnered widespread media attention and was covered by national media outlets such as CNN and NPR.

The media characterization of the trial as a "fracking case," however, is misleading. The plaintiffs' claims did not focus on "typical" fracking-related concerns, such as seismic activity, water use, contamination of water supplies or appropriate disposal of flowback/produced water. Instead, the plaintiffs complained about activities that are commonly required to drill almost any oil or gas well, such as flaring, construction activity, trucking traffic and the emission of gas and chemicals into the air. These types of activities occur even if a well is not hydraulically fractured. Nevertheless, it is likely that the verdict and its attendant media coverage may embolden plaintiffs' lawyers, resulting in an increase in the number of claims against oil and gas exploration companies engaged in fracking activity.

We Must Good Stewards

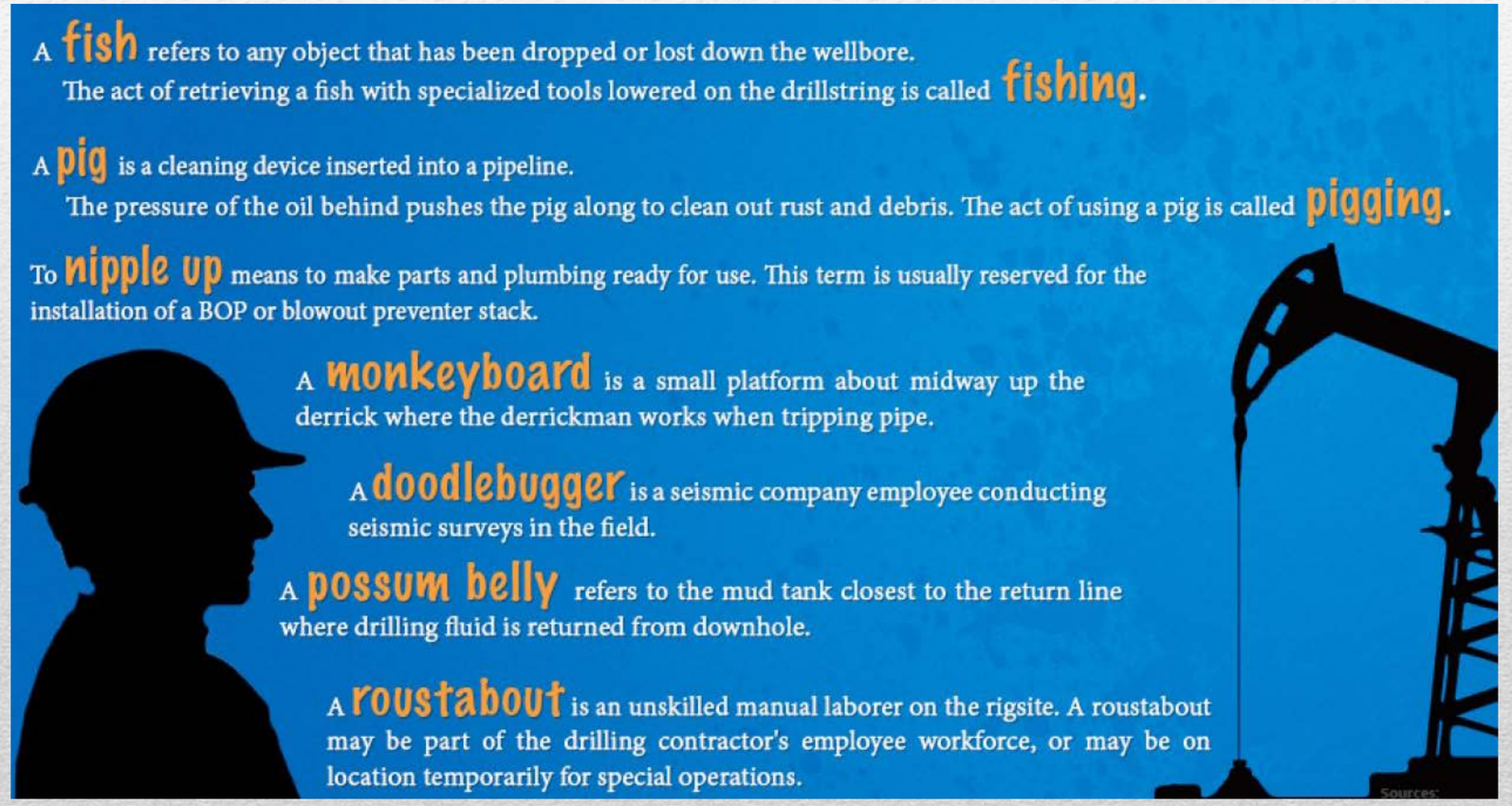
- Design, construct and execute optimally
- Operate safely in all aspects; it is our ethical responsibility
- Would I let my son or daughter do this?
- Educate!
- http://energy4me.org/

energy4me®
Essential Energy Education

Perot Museum
Tom Hunt Energy Hall

When discussing O&G to non-O&G people

- Avoid jargon, acronyms and technical terms
- Analogies can help people understand technical subjects
- Use stories or experiences to educate when sensible
- Know the facts
- Honesty
- Transparency
- Be humble



“Frack” – Misspelled and Misused

Thank You!

Questions?