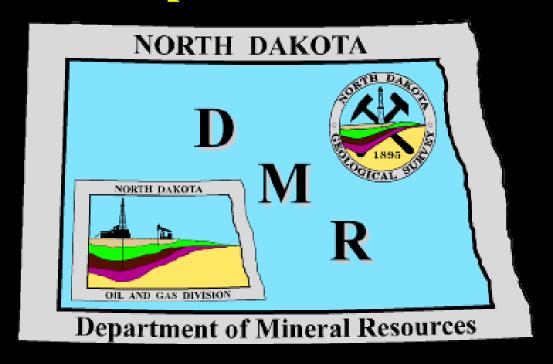
North Dakota Department of Mineral Resources



http://www.oilgas.nd.gov

http://www.state.nd.us/ndgs

600 East Boulevard Ave. - Dept 405 Bismarck, ND 58505-0840 (701) 328-8020 (701) 328-8000



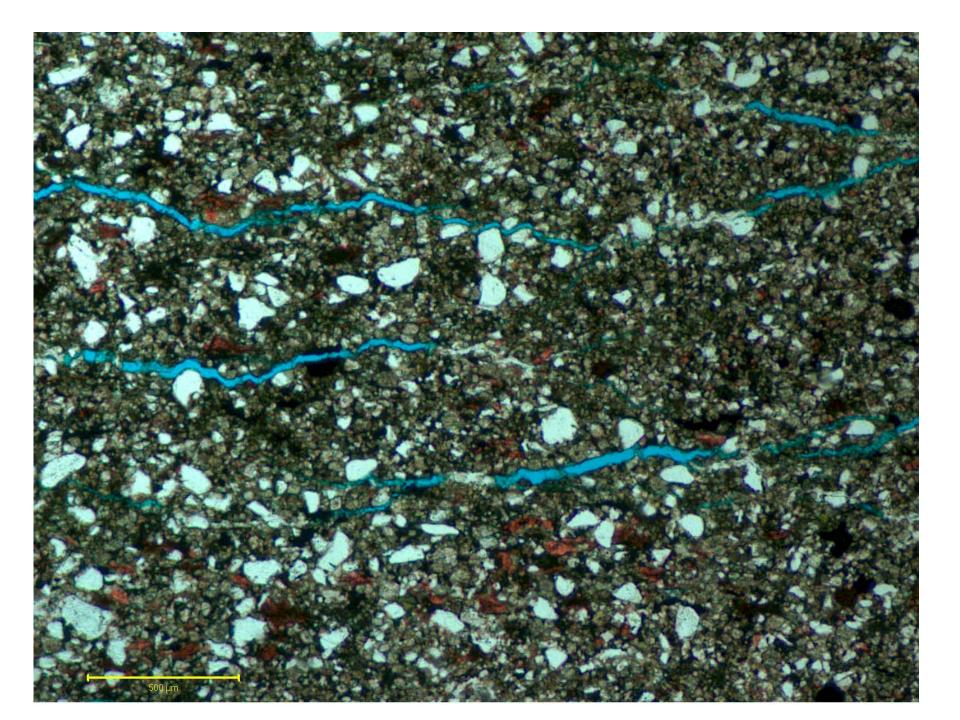
Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI. Updated: May 9, 2011

Bakken Formation

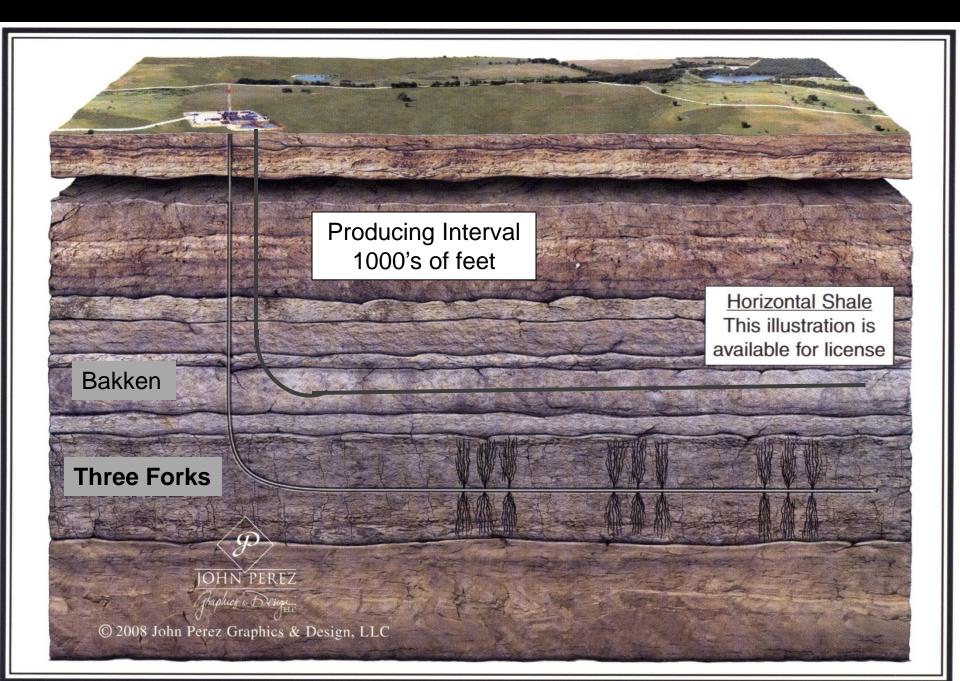
Three Forks Formation

upper shale middle member lower shale

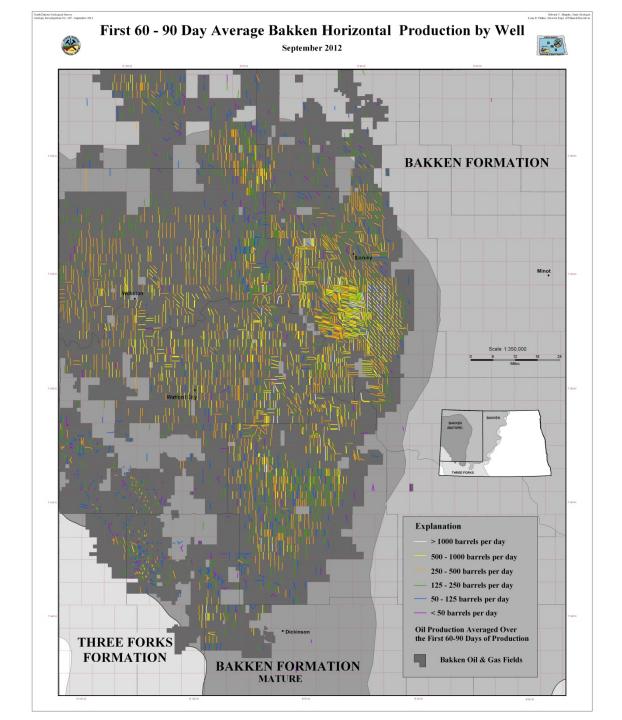


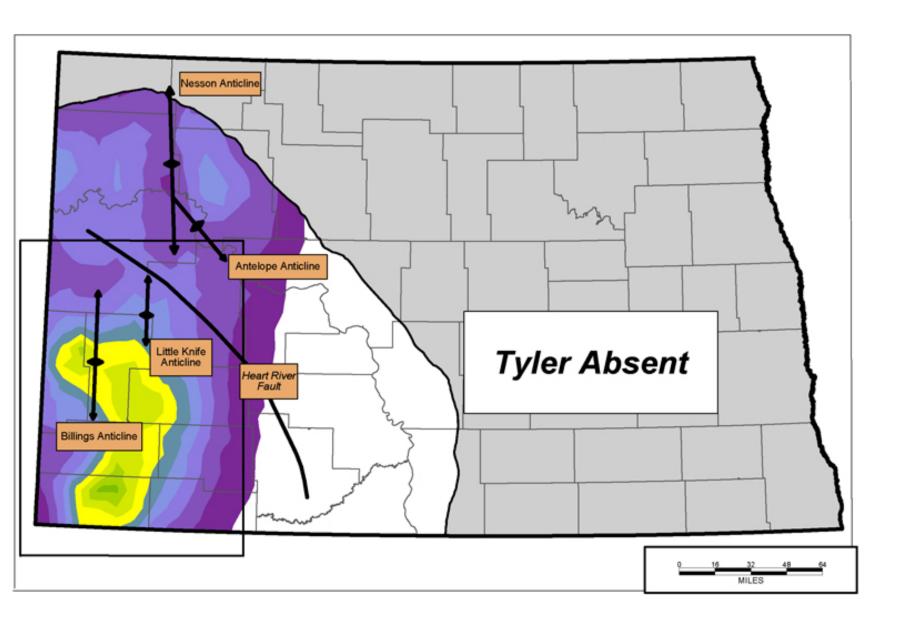


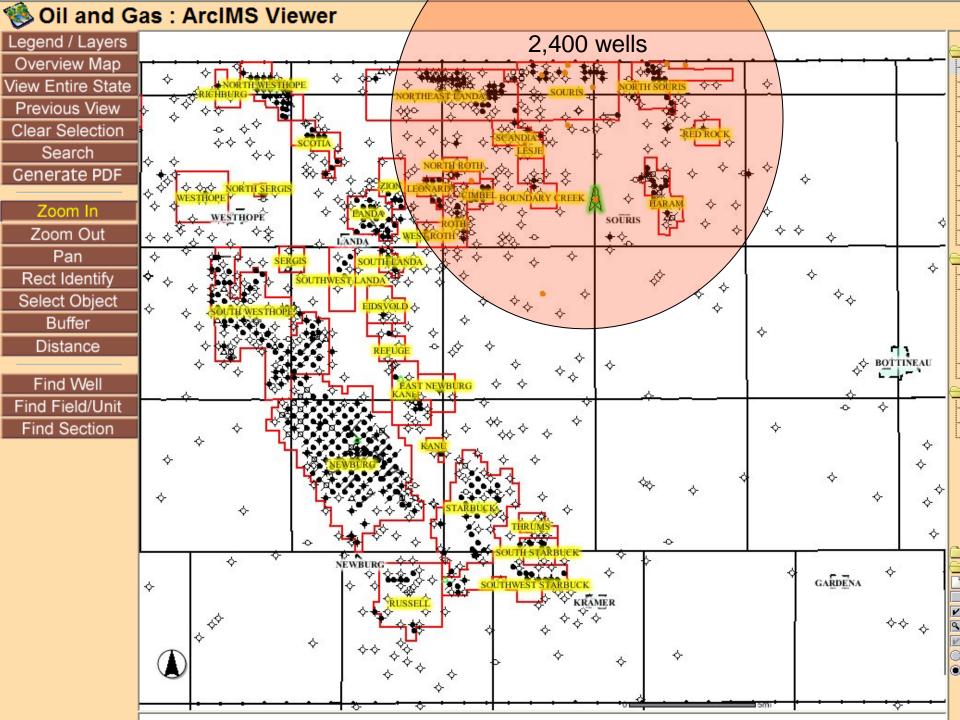
5) Technology = horizontal well / multi stage hydraulic fractured



Development area > 15,000 sq mi
Size of West Virginia

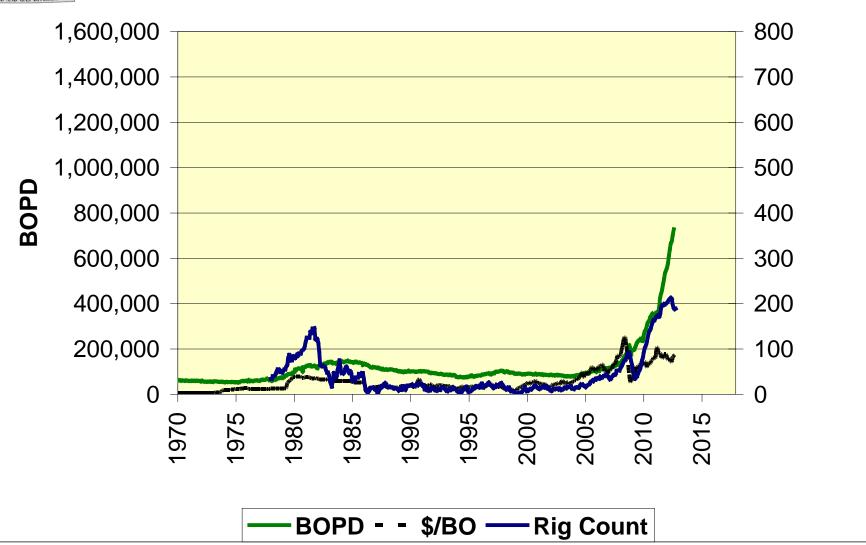








North Dakota Daily Oil Produced and Price

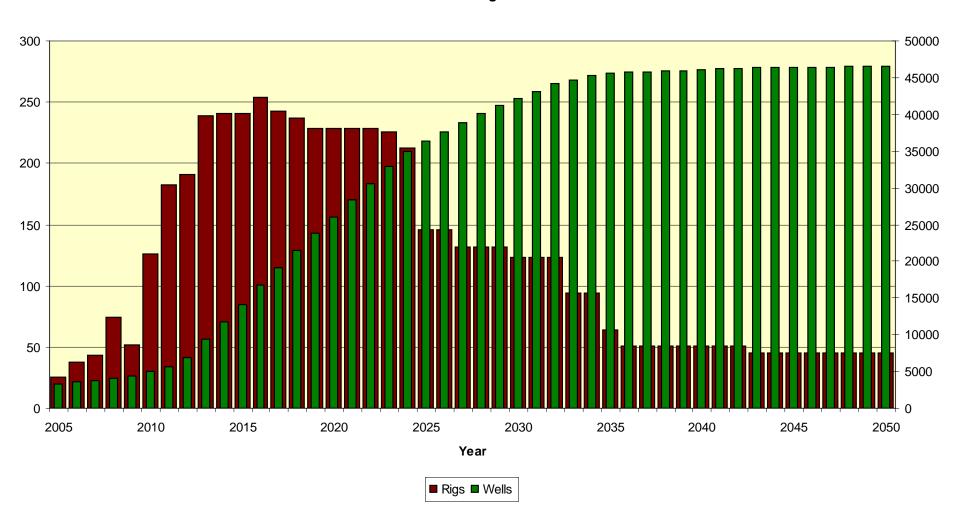


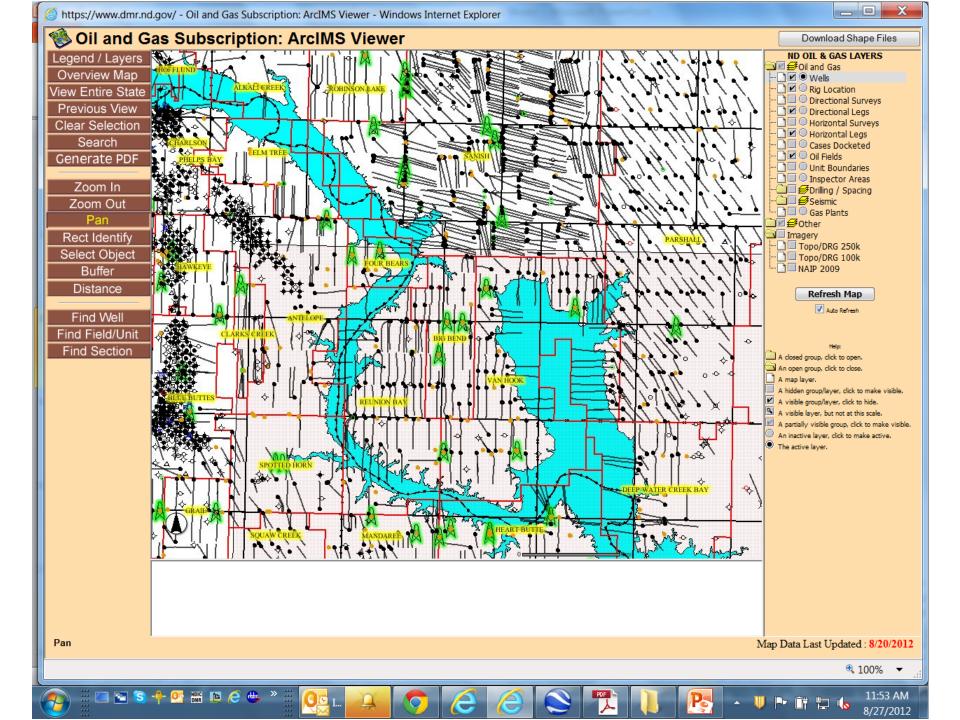
Western North Dakota

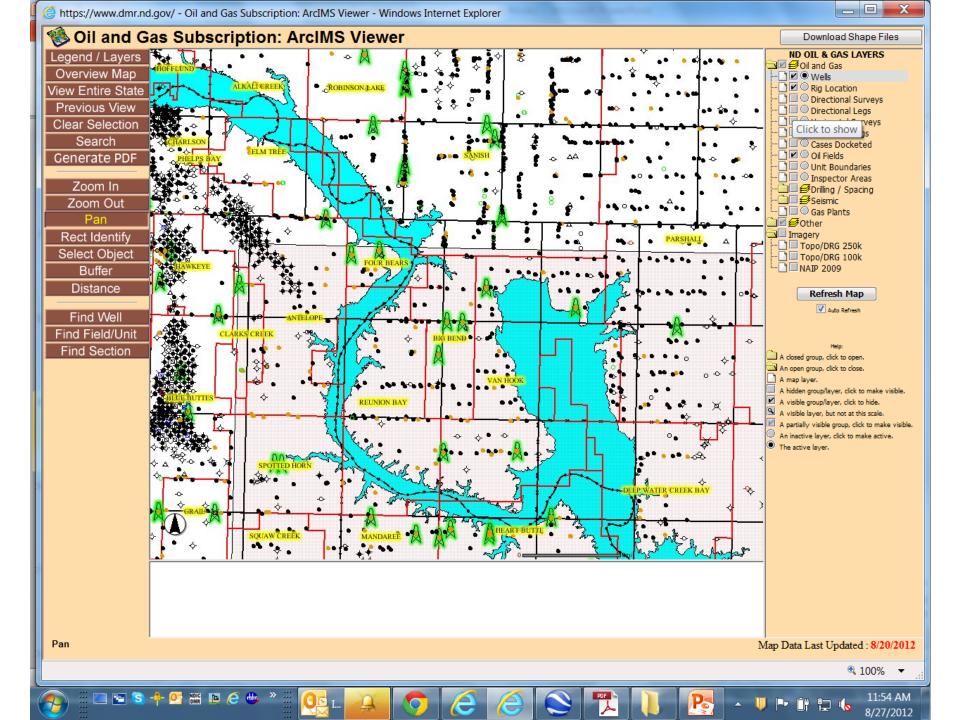
- 1,500 to 3,000 wells/year = 2,400 expected
 - 125-250 rigs
 - 200 rigs can drill the wells needed to secure leases in 1 year
 - 200 rigs can drill the wells needed to develop spacing units in 18 years
 - 40,000-50,000 wells = 40,000-75,000 long term jobs

Expected Case

North Dakota Rigs and Wells

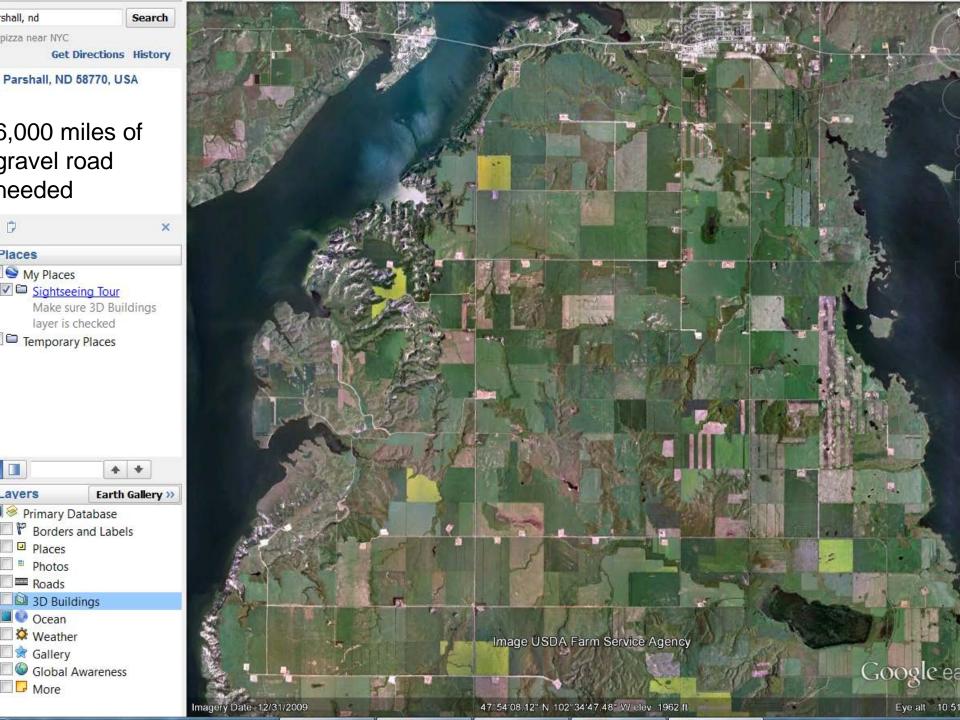




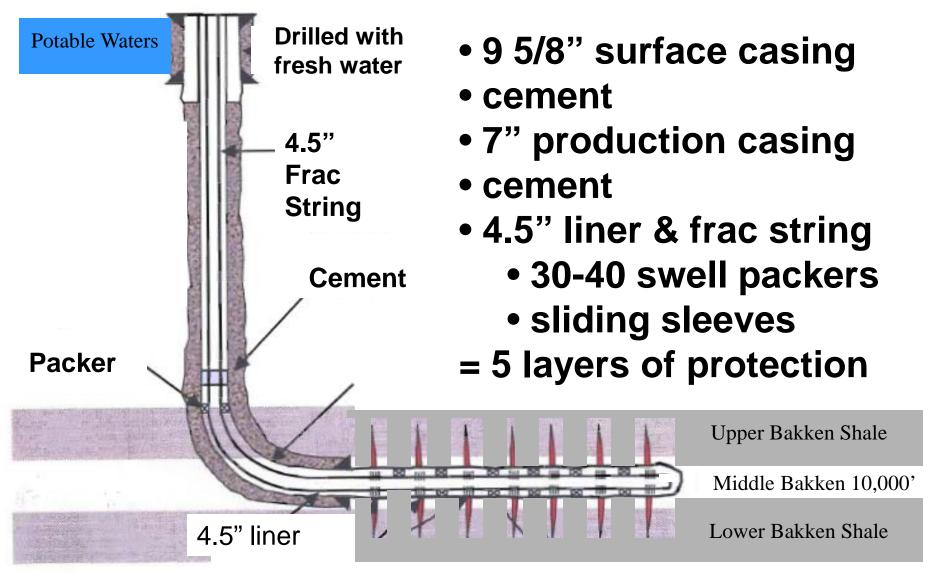




Vern Whitten Photography



TYPICAL HORIZONTAL OIL WELL



7 miles of pipe per well X 40,000 more wells is enough to reach past the moon



PROPPANT PROJECT

2 millions tons/year



Photomicrograph of sand grains collected in McHenry County.

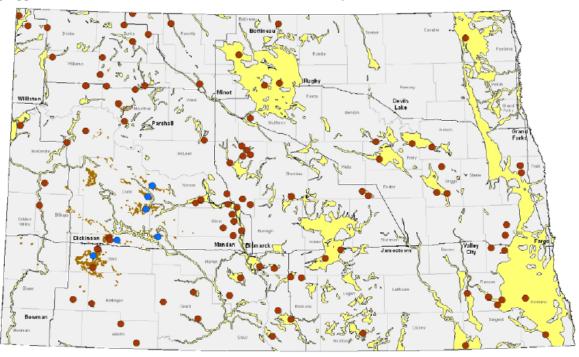
2 millions tons/year



Photomicrograph of ceramic proppant from a batch that was used in a Bakken well in North Dakota. This proppant was manufactured in China.

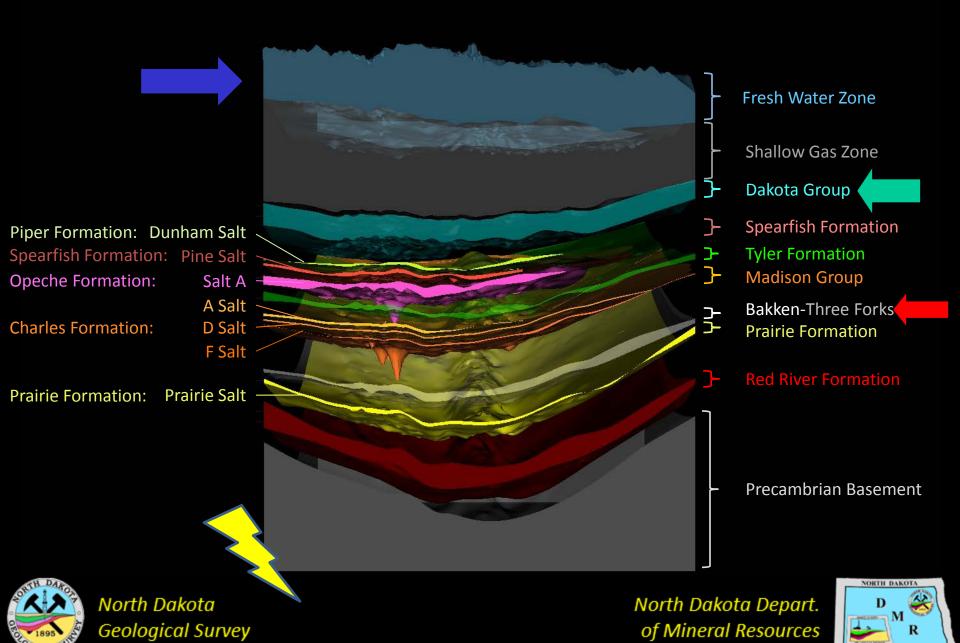
Millions of tons of sand and ceramic proppants are used every year in the Williston Basin, part of a multi-billion dollar industry. The Geological Survey has collected 125 sand samples throughout the state in our search for deposits that could be utilized for oil and gas proppants in the well fracing process. We are in the process of performing preliminary analysis on those samples to determine if any would fit the proppant criteria. We have also collected clay samples and will be testing those samples for their kaolin content to determine their suitability in the manufacturing of ceramic proppants.

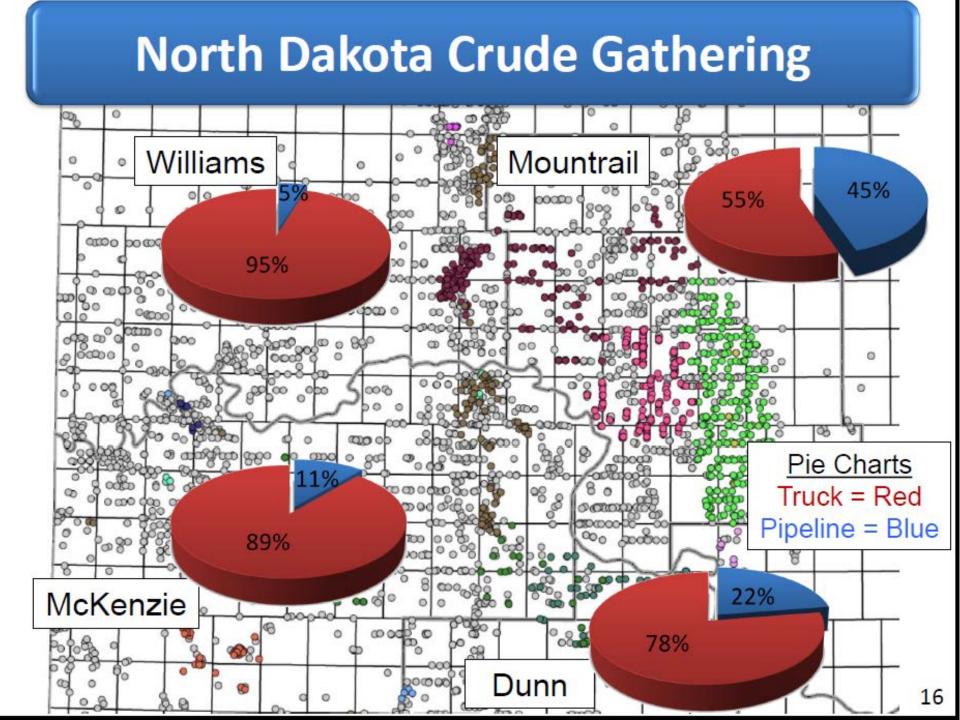
Under the second phase of this project, the ten most promising sand samples will undergo full ISO analysis (including bulk density, specific gravity, crush resistance, etc), mineralogy (XRD), and stack conductivity analysis to determine which are the most suitable proppant candidates and we will continue to evaluate the clay beds.



Locations of sand samples (red dots) and clay samples (blue dots) collected during this study. The areas in yellow are known sand deposits and the areas in brown are kaolinitic claystones within the Golden Valley Formation.

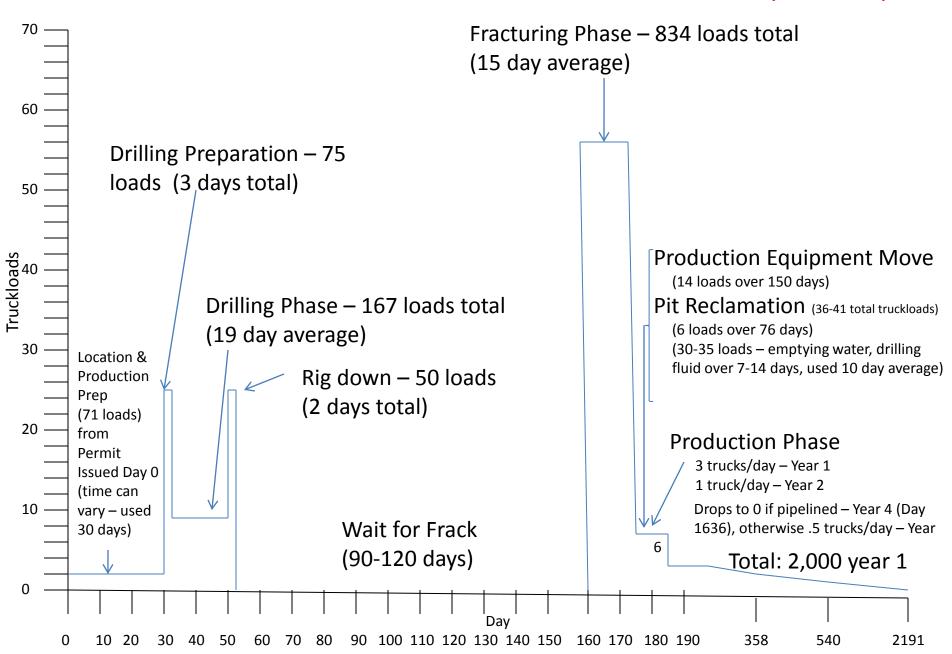
Significant Salt Intervals of Northwestern North Dakota





New Bakken Well – Truckload Timeline

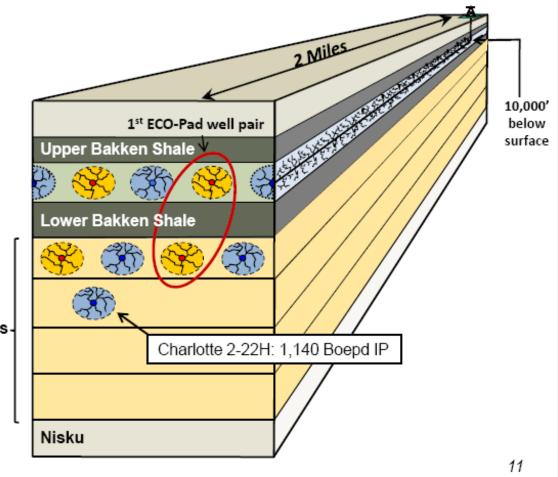




Bakken Development Plan

- Original dual-zone development plan
 - 8 wells per 1,280 acres – 4 MB, 4TF
 - 603,000 Boe EUR per well (avg. 24.5 stages/completion)
 - ECO-Pad® design:
 2 wells south, 2
 wells north

 Three Forks-
- Additional Three Forks potential



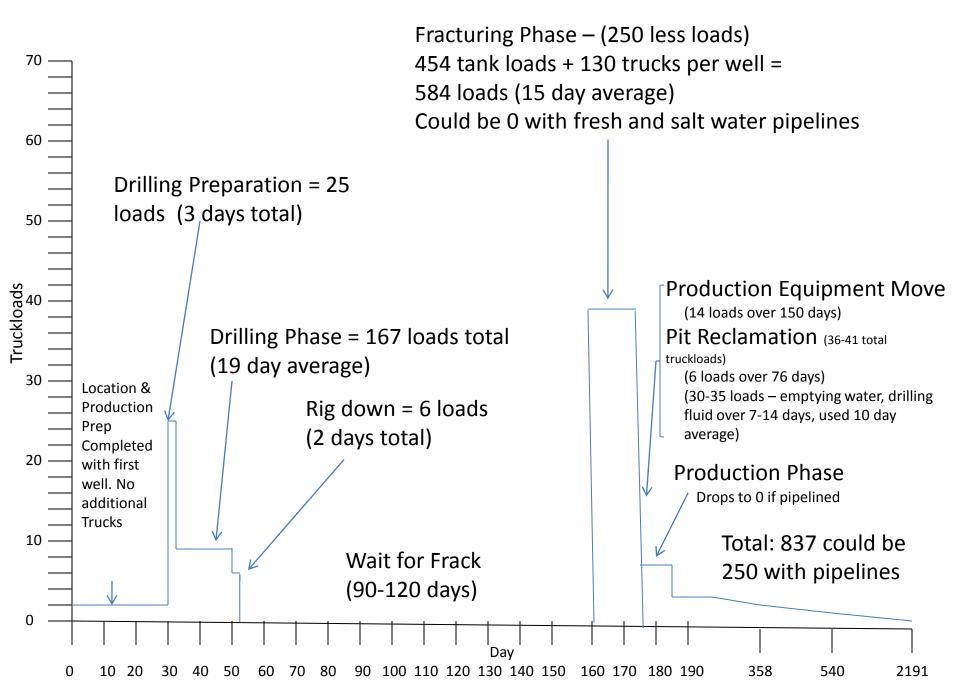


Six Wells on a Single Pad



Vern Whitten Photography

Bakken Wells 2-4 – Truckload Timeline

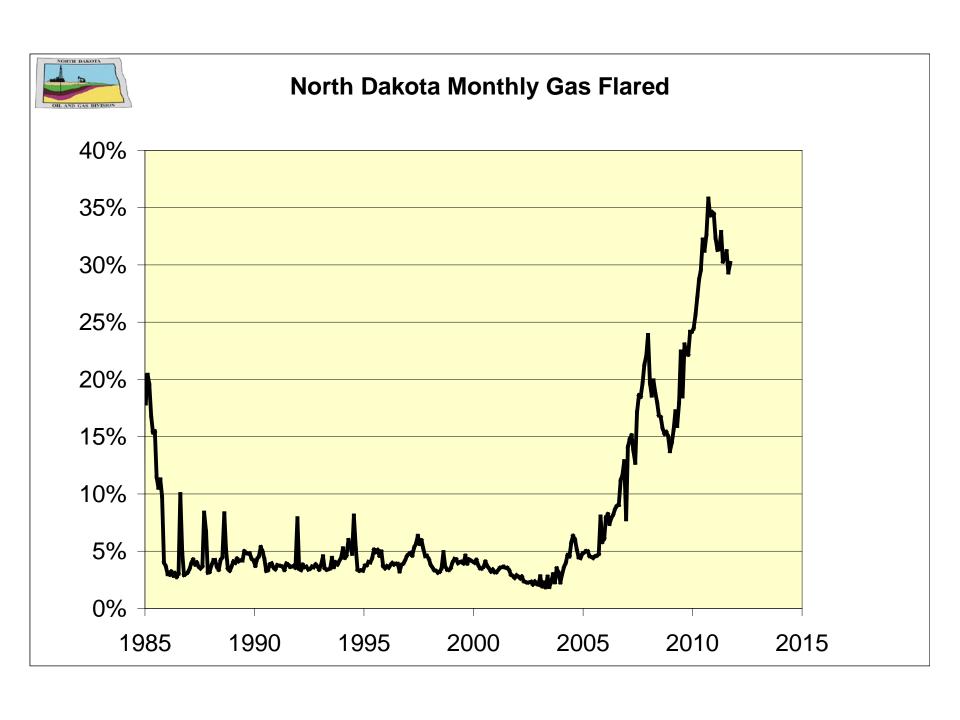




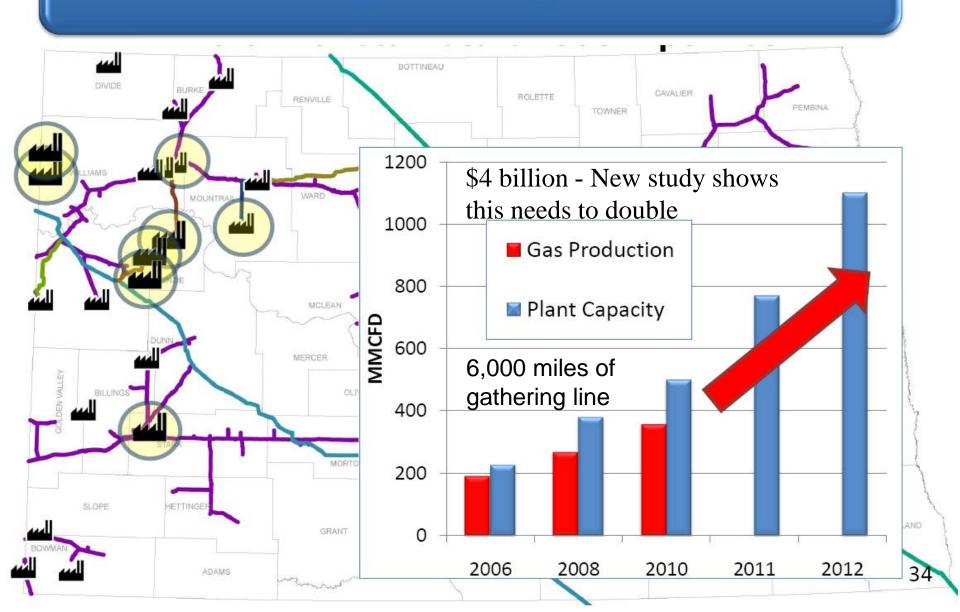


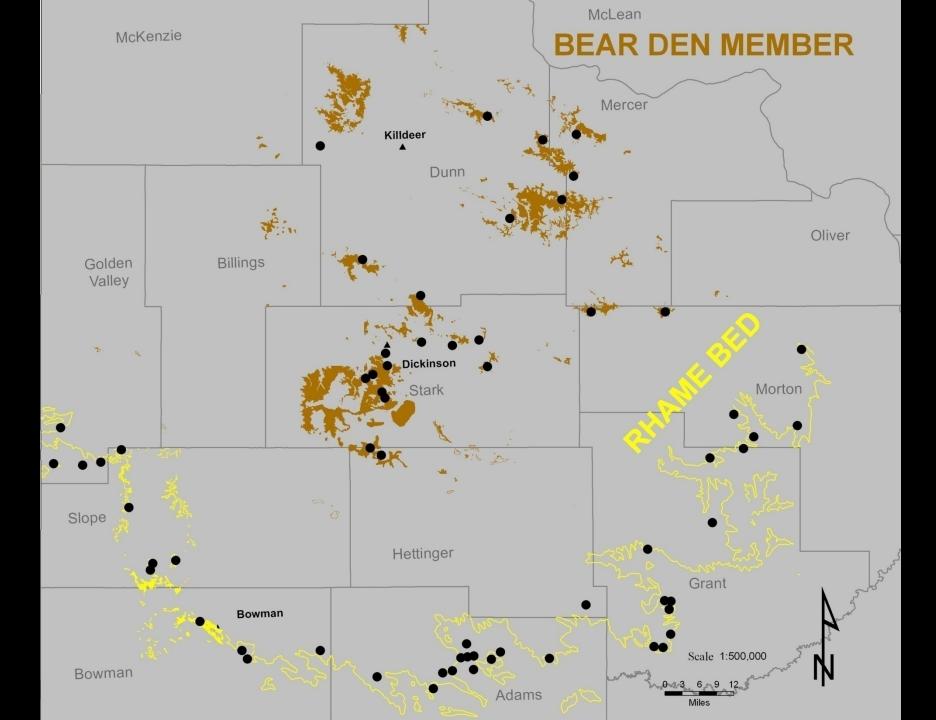






New or Expanding Gas Plants







Draft BLM Hydraulic Fracturing rule could double federal drilling permit approval time.



The future looks promising for sustained Bakken/Three Forks development



Draft EPA guidance on diesel fuel in hydraulic fracturing could triple drilling permit approval time. 90,000 comments



World and U.S. economies continue to struggle. If China joins the downward spiral oil price could fall enough to make some areas uneconomic

Current administration budget contains tax changes that could reduce drilling capital

35-50%