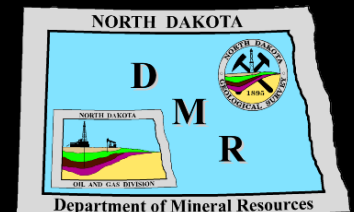


# ***OIL & GAS ACTIVITY UPDATE***

***Federation of Tax Administrators  
Annual Motor Fuel Conference***

***Fargo, ND– September 24, 2013***

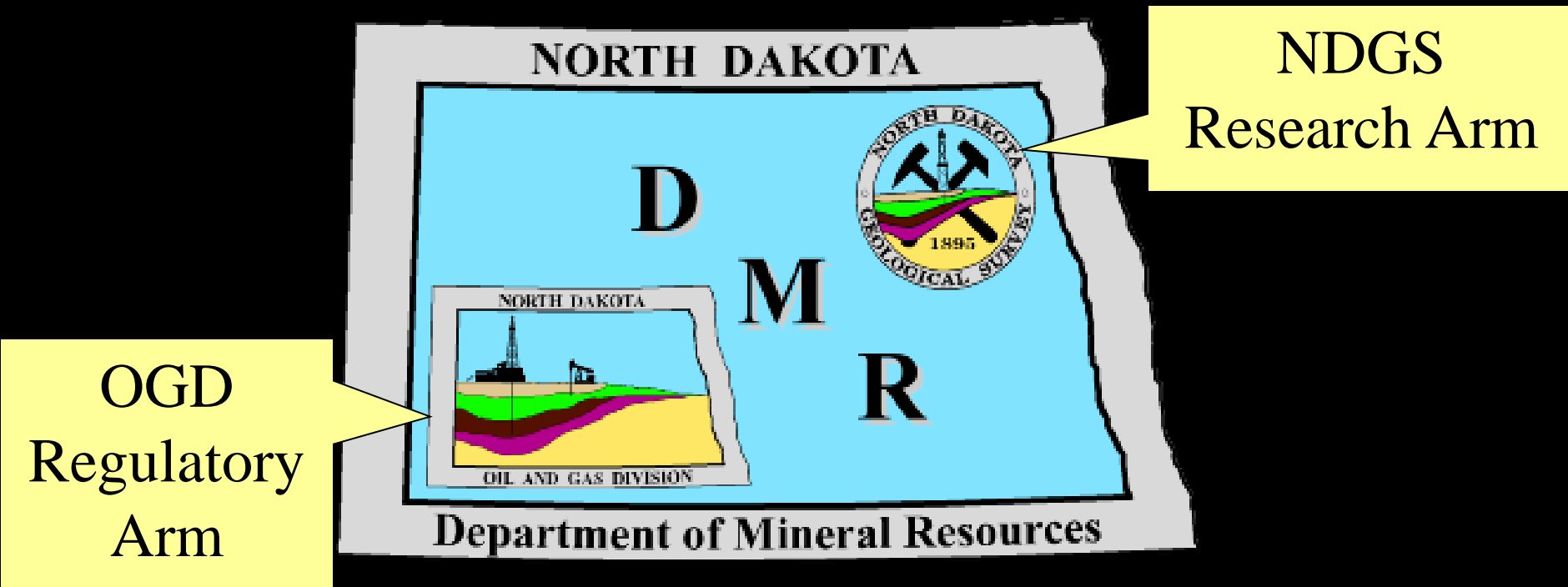


# North Dakota Development

- Regulation
- Resource Play
- Uniform Spacing—orderly development
- Multi-well locations—small footprint
- Corridors—industry and residents
- Water Needs—surface waters
- Bakken Results

*Bruce E. Hicks*  
*Assistant Director*  
*NDIC-DMR-OGD*  
*Bismarck, ND*

# North Dakota Department of Mineral Resources



<https://www.dmr.nd.gov/oilgas/>

<https://www.dmr.nd.gov/ndgs/>

***600 East Boulevard Ave. - Dept 405***

***Bismarck, ND 58505-0840***

***(701) 328-8020***

***(701) 328-8000***

NDIC DMR https://www.dmr.nd.gov/oilgas/ nd.gov nd.gov

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# North Dakota

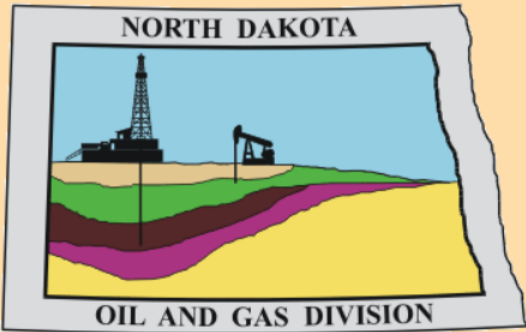
nd.gov Official Portal for North Dakota State Government

## Services

- Rules & Regulations
- Forms
- Hearing Dockets
- Active Drilling Rigs
- Daily Activity Reports
- Confidential Well List
- General Statistics
- Seismic
- Well Search
- Report a Spill/Incident
- GIS Map Server
- Publications
- Surface Mineral Owner
- Basic Services
- Premium Services
- Electronic Filing
- Related Links
- FAQ & Web Help

## Contact Us

- Employee Directory
- Email Addresses



## Welcome to the North Dakota Industrial Commission, Department Mineral Resources, Oil and Gas Division, home page.

[Director's Cut - 04/16/2013](#) and [Recent Presentations](#)

The Director's Cut is an update on current activity in the North Dakota oil patch from the Director of Department of Mineral Resources. ([View past Director's Cuts](#))

View the [latest press releases](#) from the Oil and Gas Division

### Rules approved for Geologic Storage of Carbon Dioxide.

See the [signed order](#).

### [Bakken and Three Forks Information!](#)

There are currently **2** job openings available for an [Engineering Technician IV](#) and [Engineering Technician IV](#) located in the Williston Field Office and one job opening available for an [Engineering Technician IV](#) located in the Dickinson Field Office.

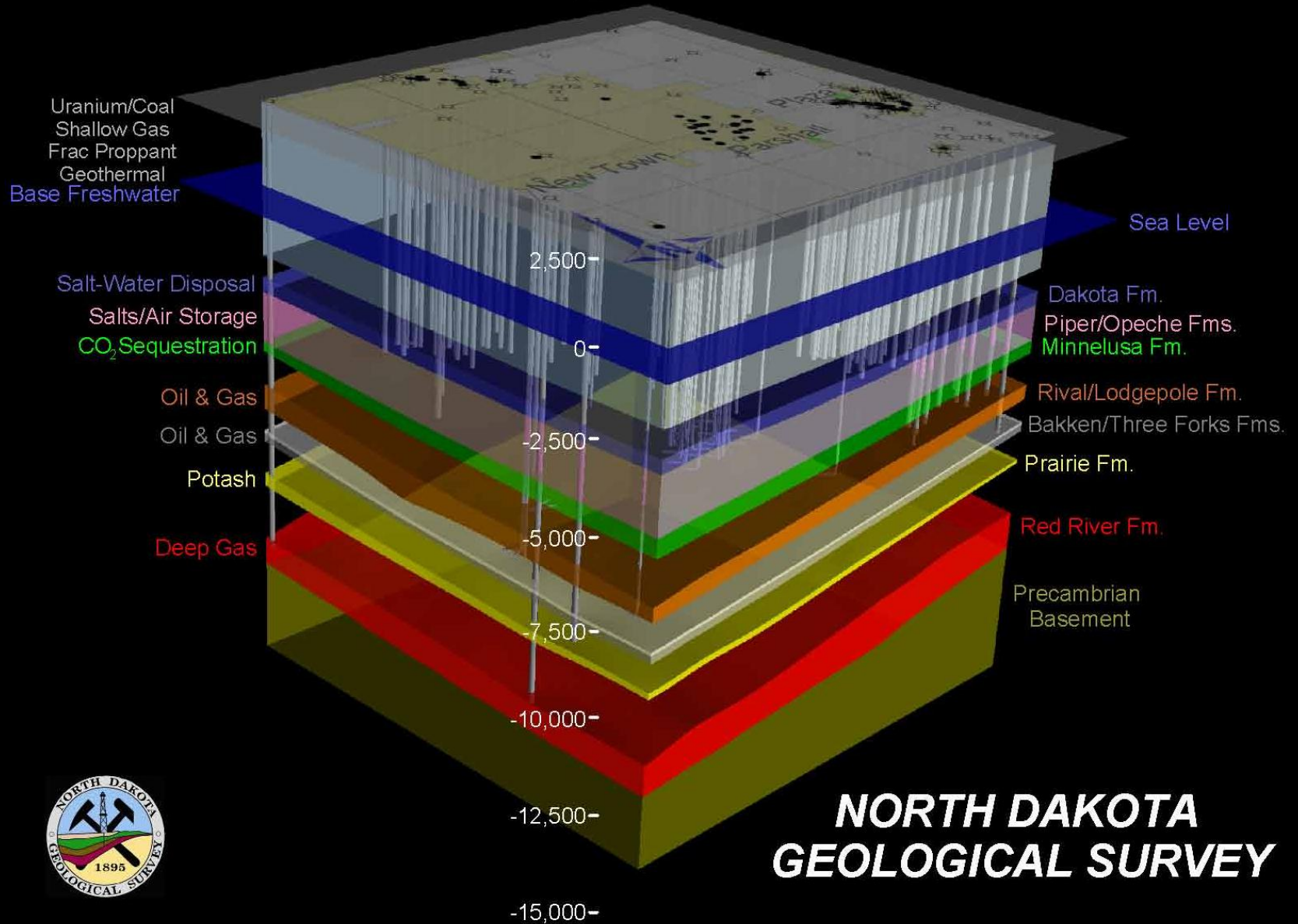
Available on the ND Petroleum Council web site are the [Surface Owner Information Center](#), the [Royalty Owner Information Center](#) and the PowerPoint presentations that were used at the [2012 Williston Basin Petroleum Conference](#).

The Oil and Gas Division regulates the drilling and production of oil and gas in North Dakota. Our mission is to encourage and promote the development

**Phone:** (701) 328-8020  
**Fax:** (701) 328-8022

Windows taskbar: 8:10 5/3/2013

# Three-Dimensional Geologic Model of the Parshall Area



# North Dakota Development

- **Regulation**
- Resource Play
- Uniform Spacing—orderly development
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- Bakken Results

# TYPICAL HORIZONTAL OIL WELL

Potable Waters



9-5/8" @ 2500'

- Drill with fresh water
- Total depth below lowest potable water
- Run in hole with surface casing
- Cement casing back to surface of ground
- 1<sup>st</sup> layer of surface water protection

# TYPICAL HORIZONTAL OIL WELL

Potable Waters

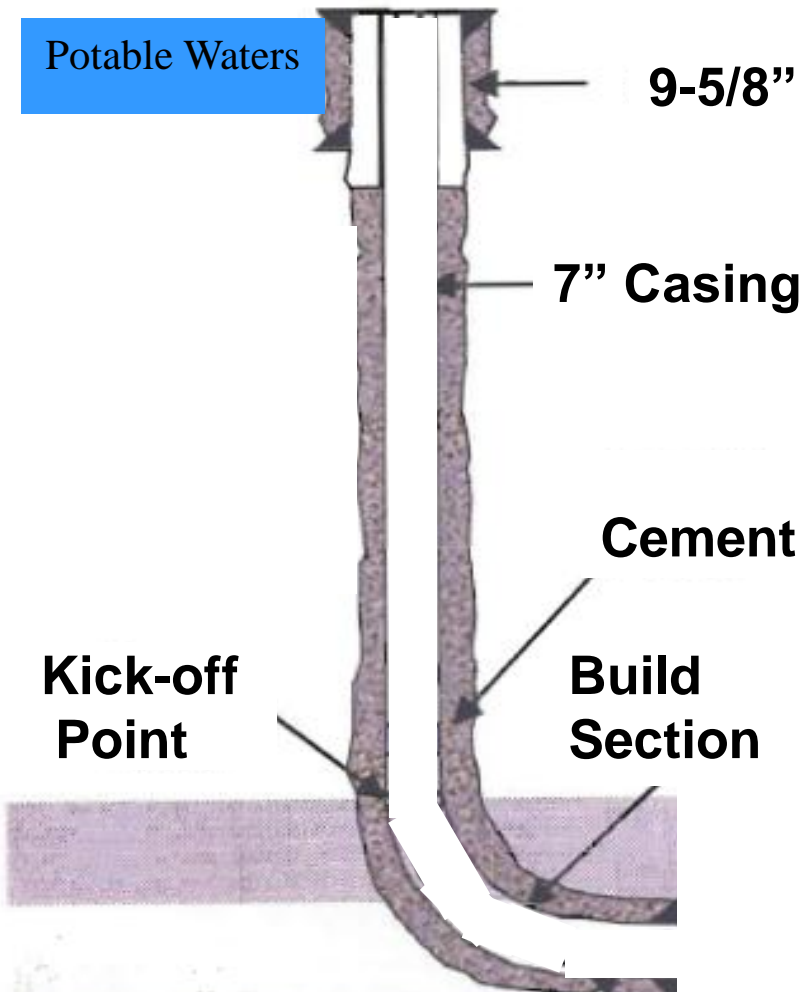
9-5/8" @ 2500'

KOP @  
10500'

- Drill vertically to kick-off point
- Run in hole with bent assembly
- Downhole mud motor

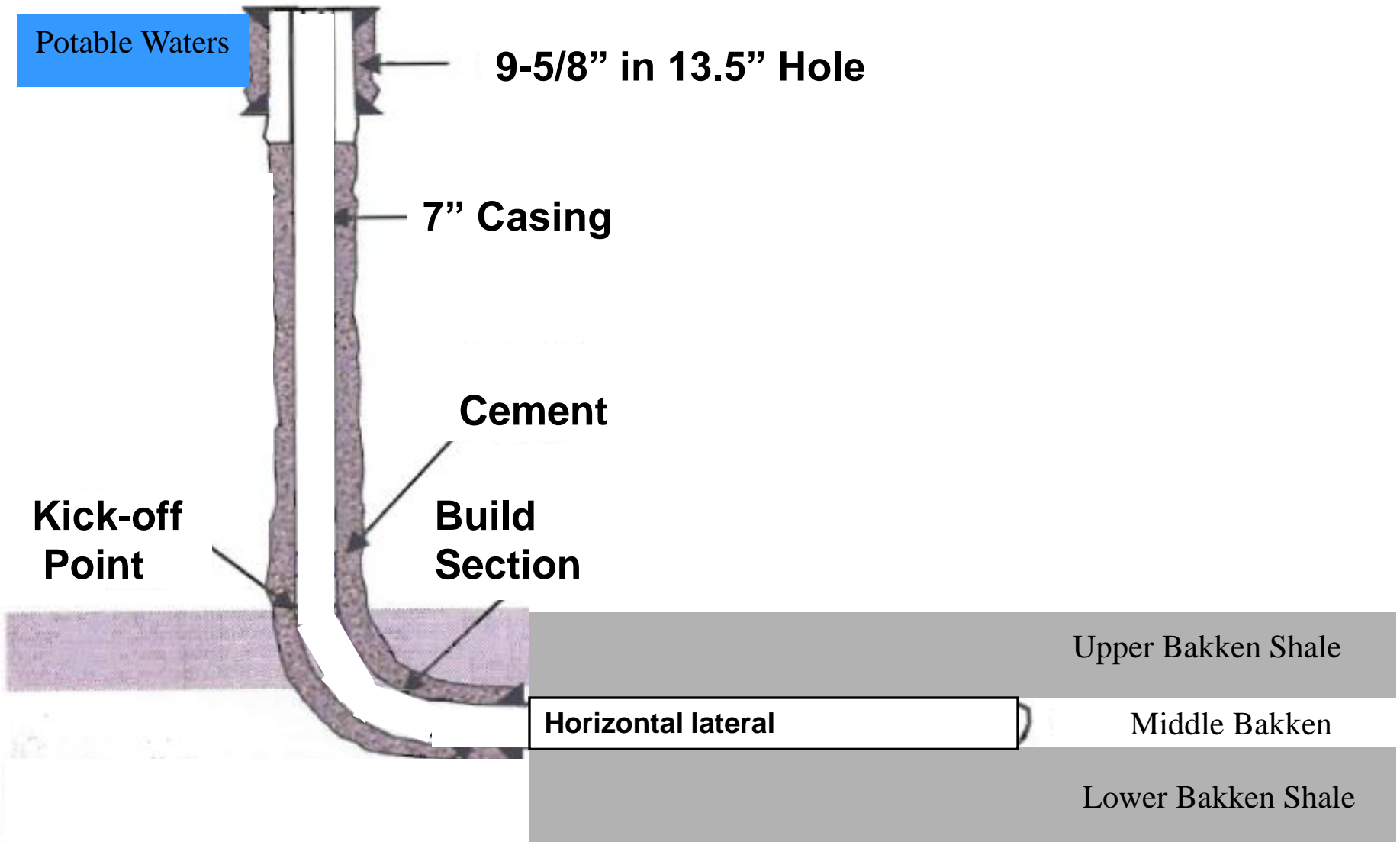


# TYPICAL HORIZONTAL OIL WELL

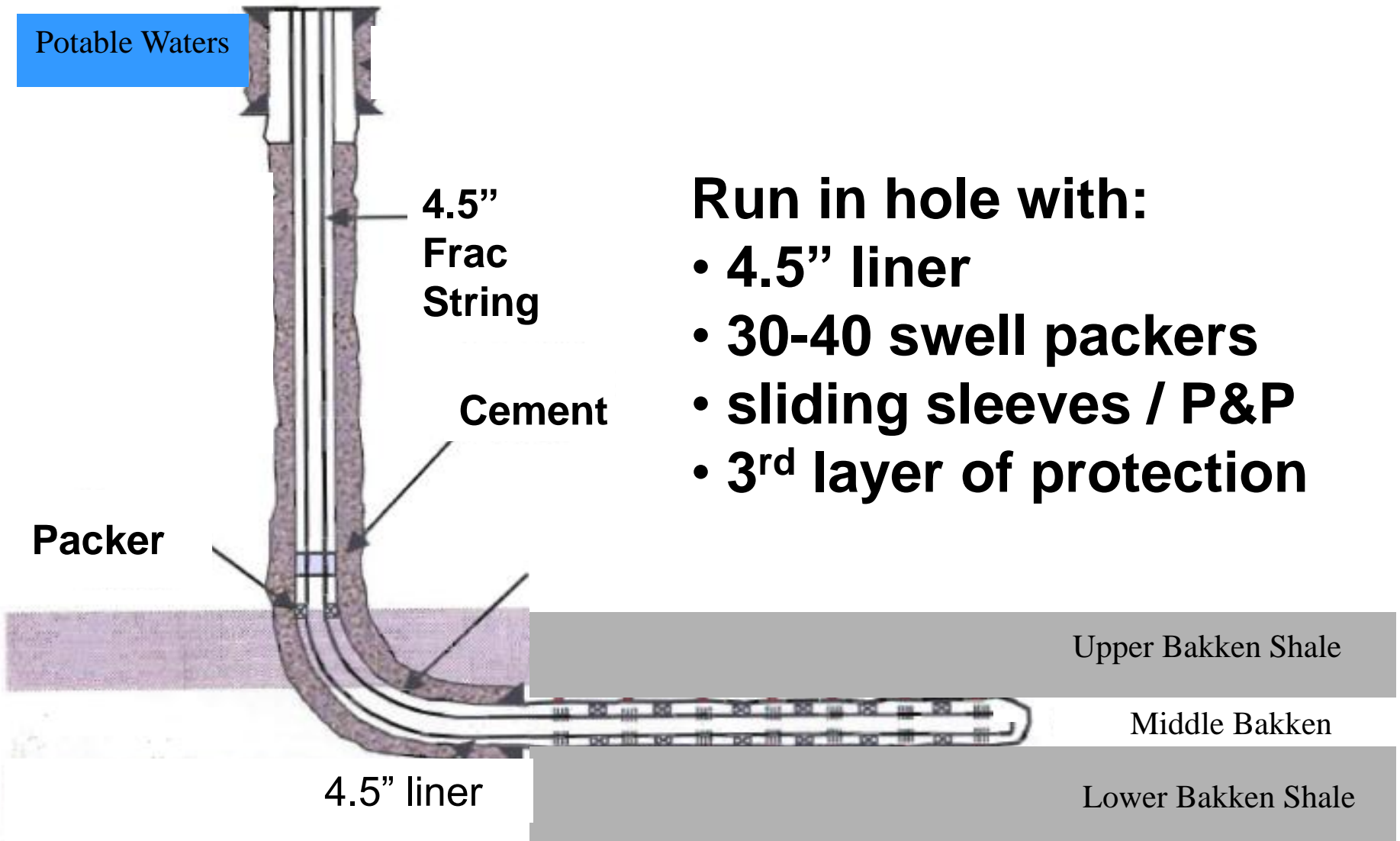


- Drill 8-3/4" hole to pay
- Run in hole with 7" casing
- Cement 7" casing
- 2<sup>nd</sup> layer of protection

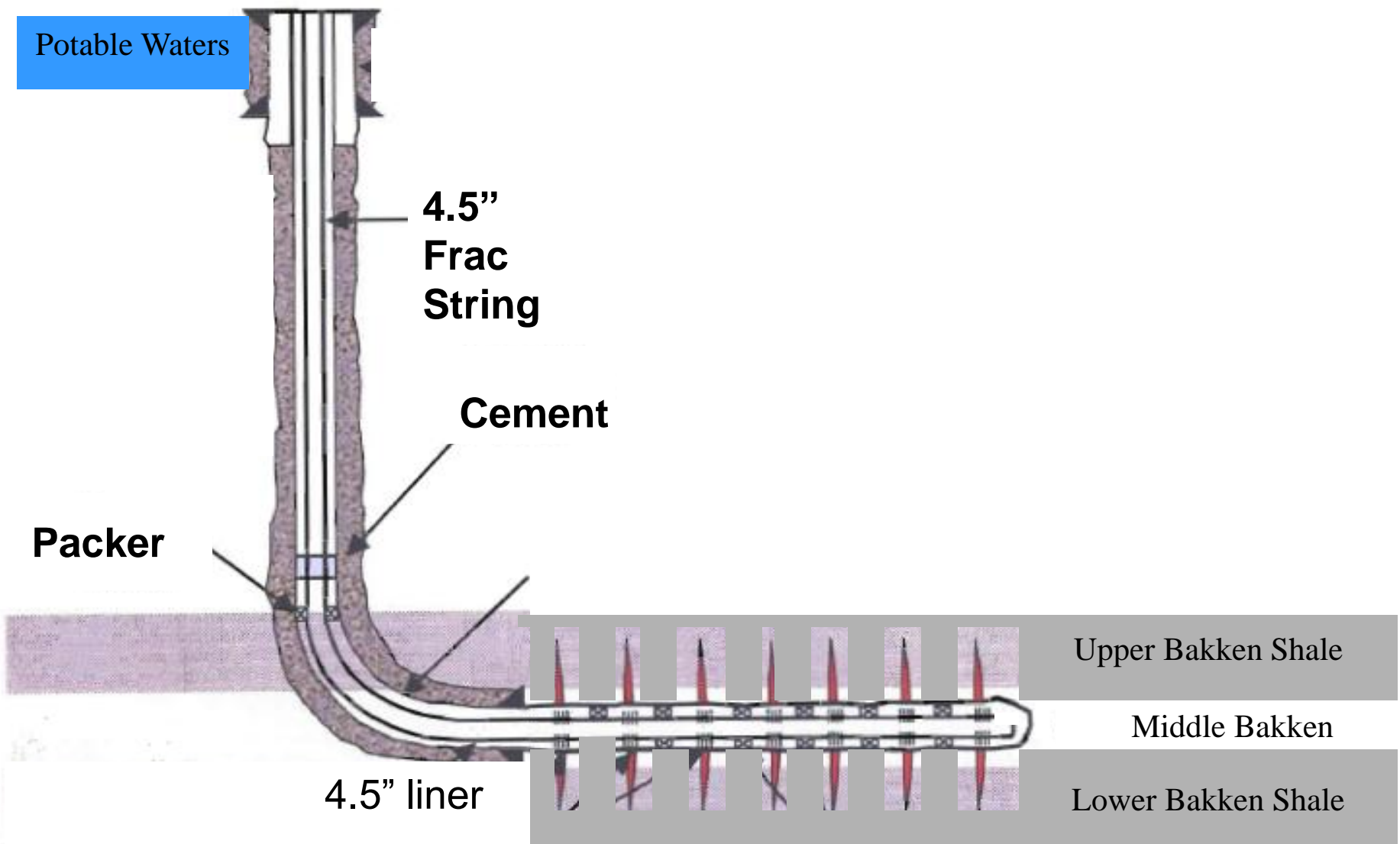
# TYPICAL HORIZONTAL OIL WELL



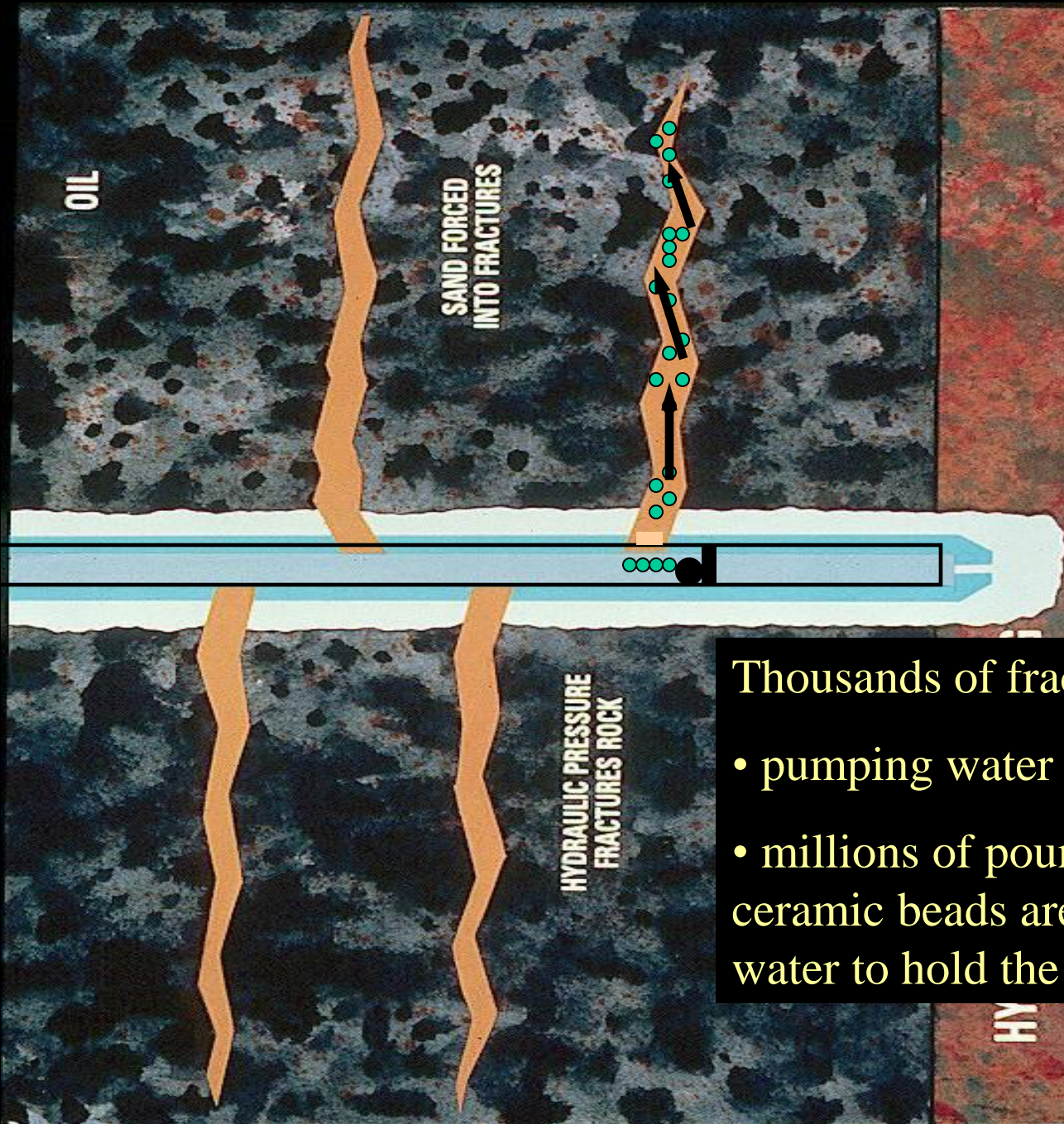
# TYPICAL HORIZONTAL OIL WELL



# TYPICAL HORIZONTAL OIL WELL

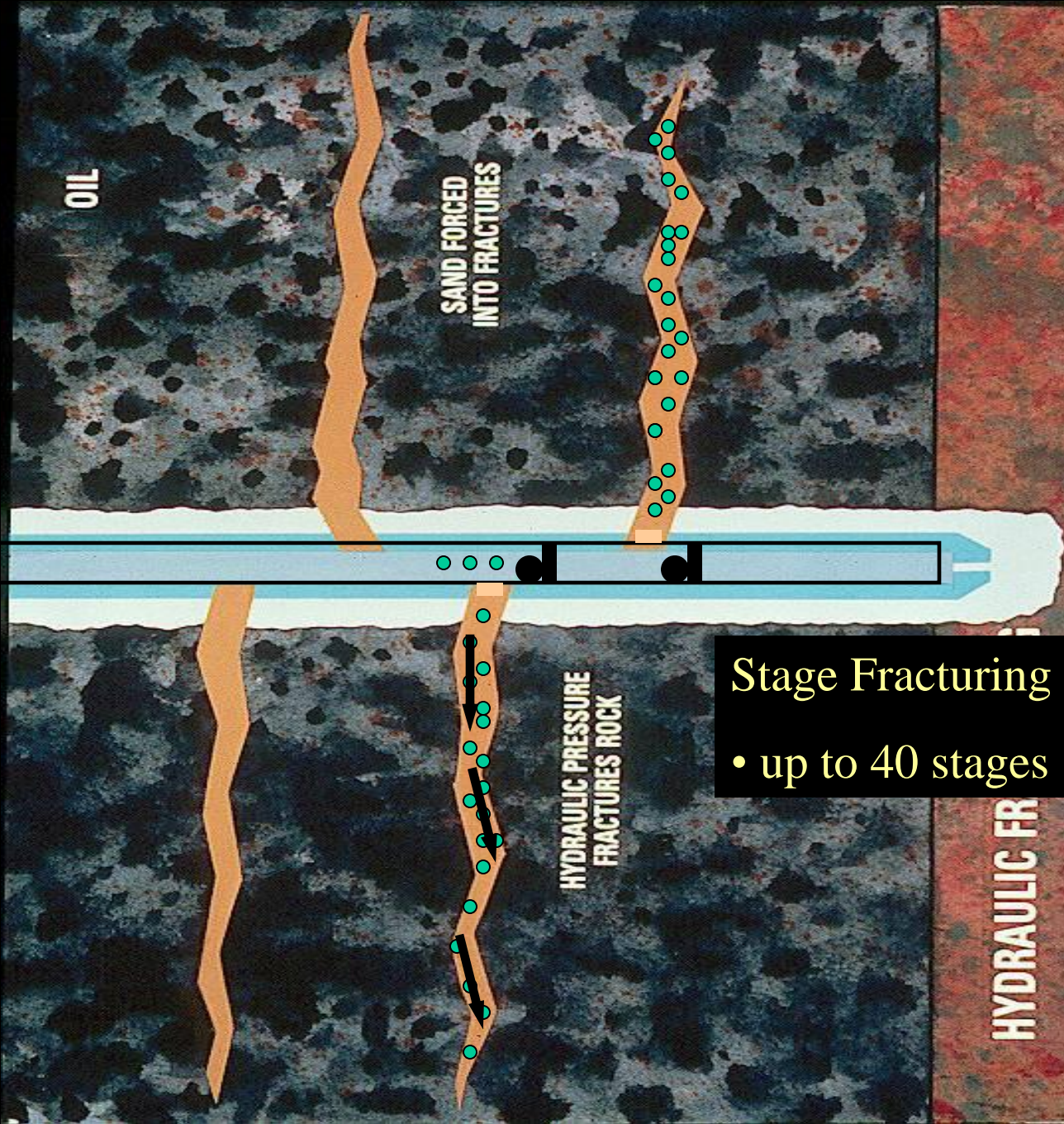






- Thousands of fractures are created
- pumping water at 6,000-9,000 psi
  - millions of pounds of sand and ceramic beads are pumped with the water to hold the fractures open.

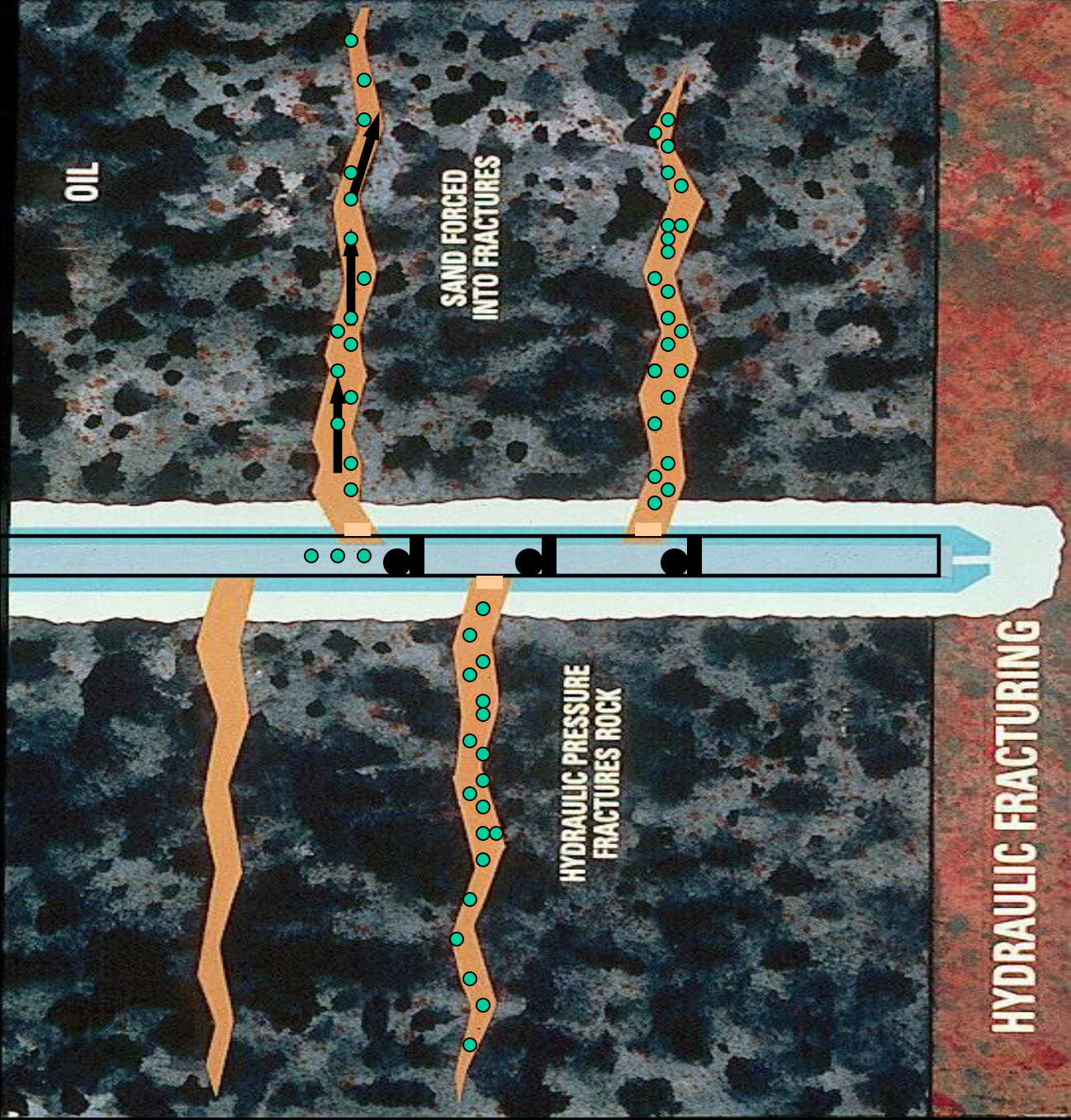




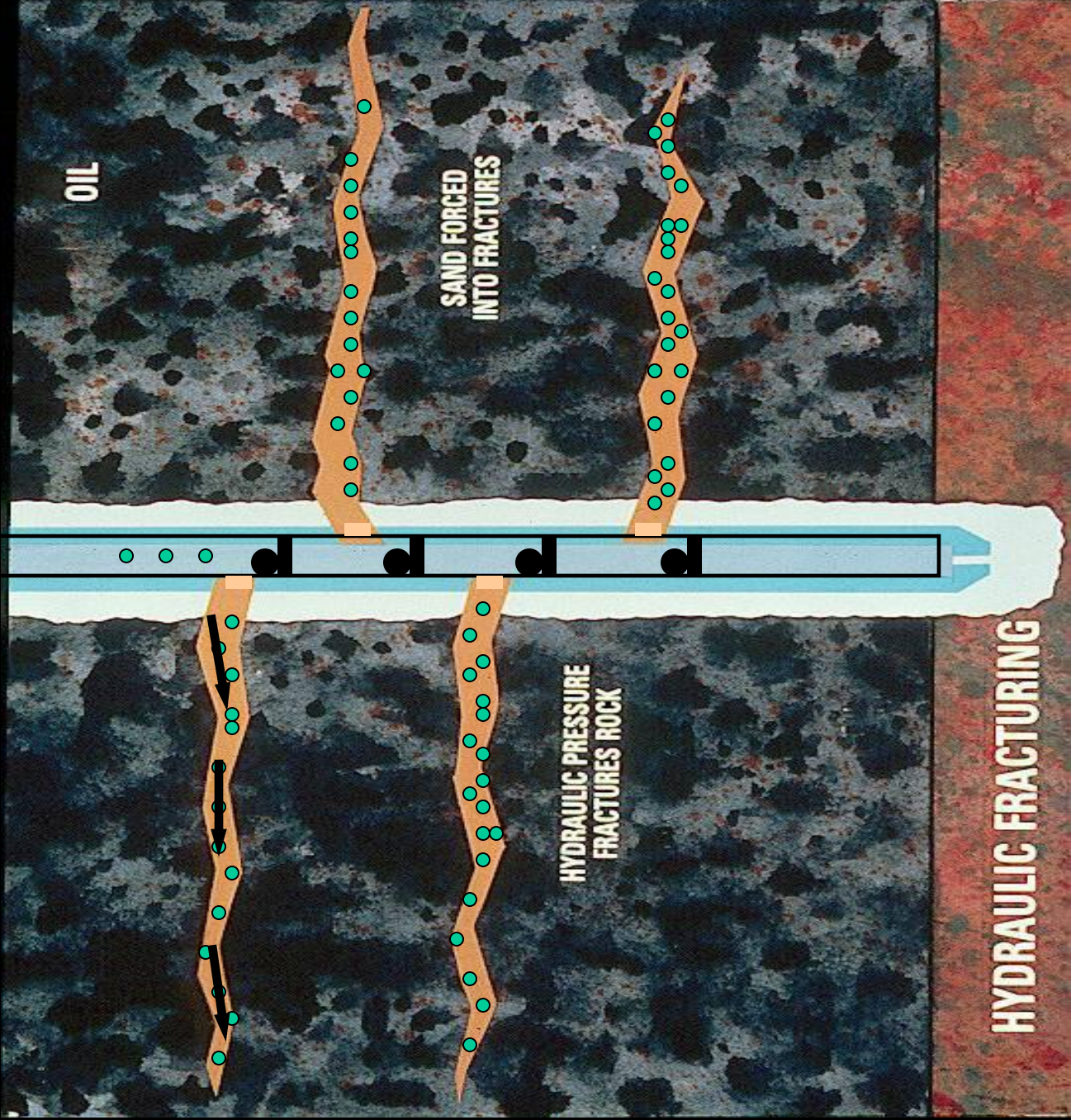
## Stage Fracturing

- up to 40 stages

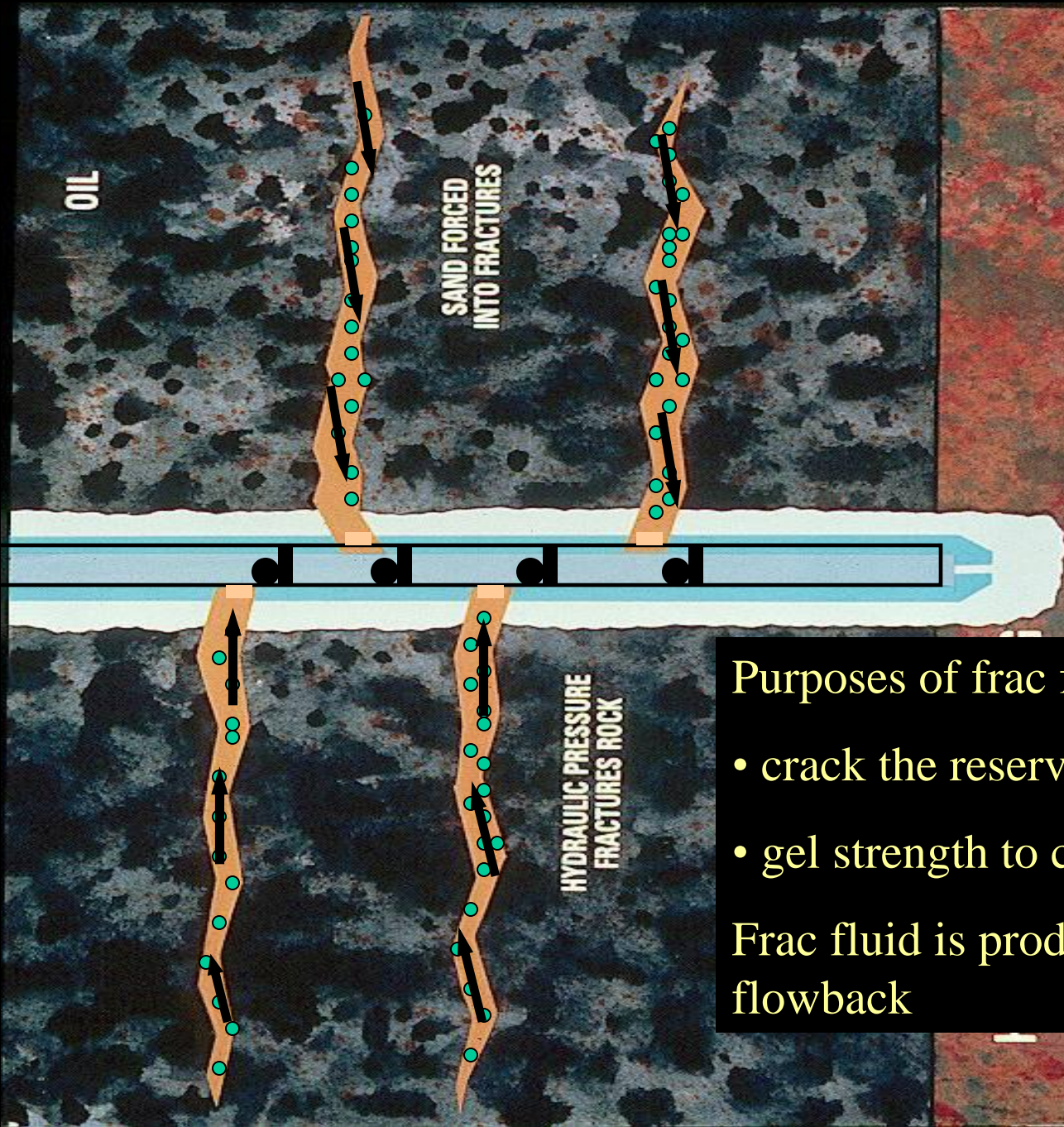










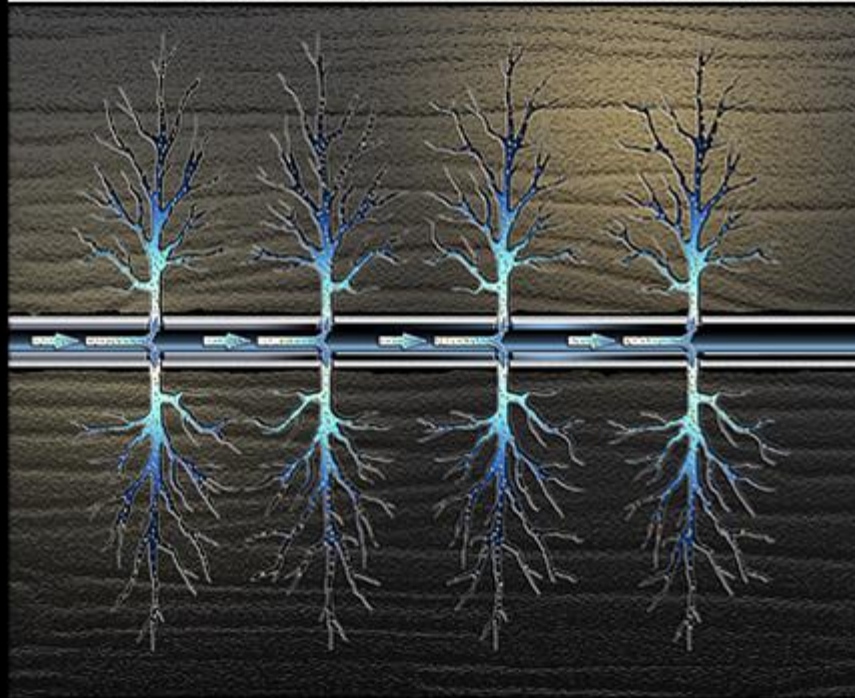


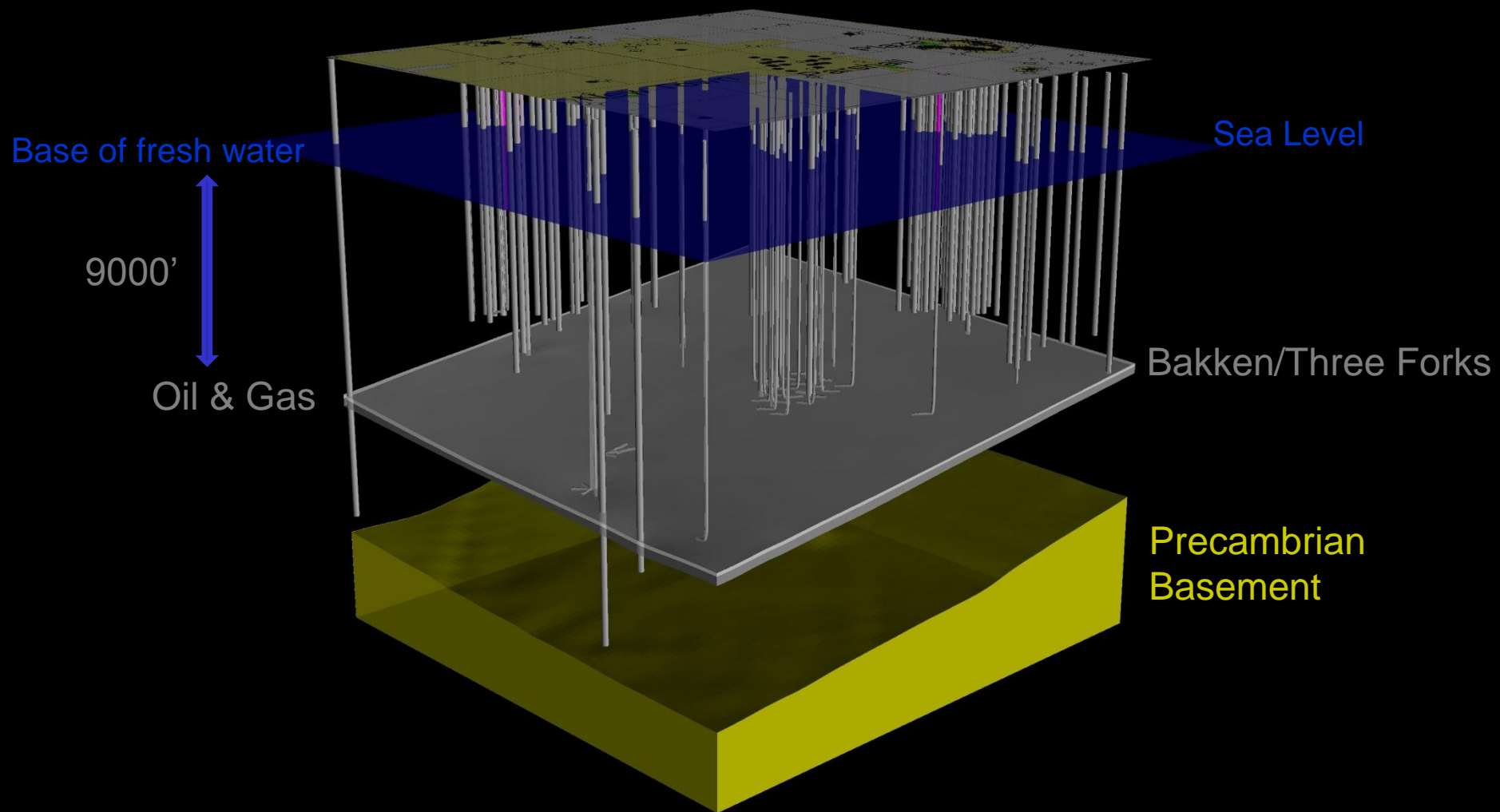
### Purposes of frac fluid

- crack the reservoir
- gel strength to carry sand

Frac fluid is produced back as flowback

**Hydraulic Fracturing:** Mixture of water, sand and chemicals pressurized and pumped into the well to form microscopic fractures in shale.









## Performing hydraulic fracture stimulation south of Tioga

- all Bakken wells must be hydraulically fractured to produce
- > 2 million gallons of water
- > 3 million pounds of sand
- cost: \$2-3 million

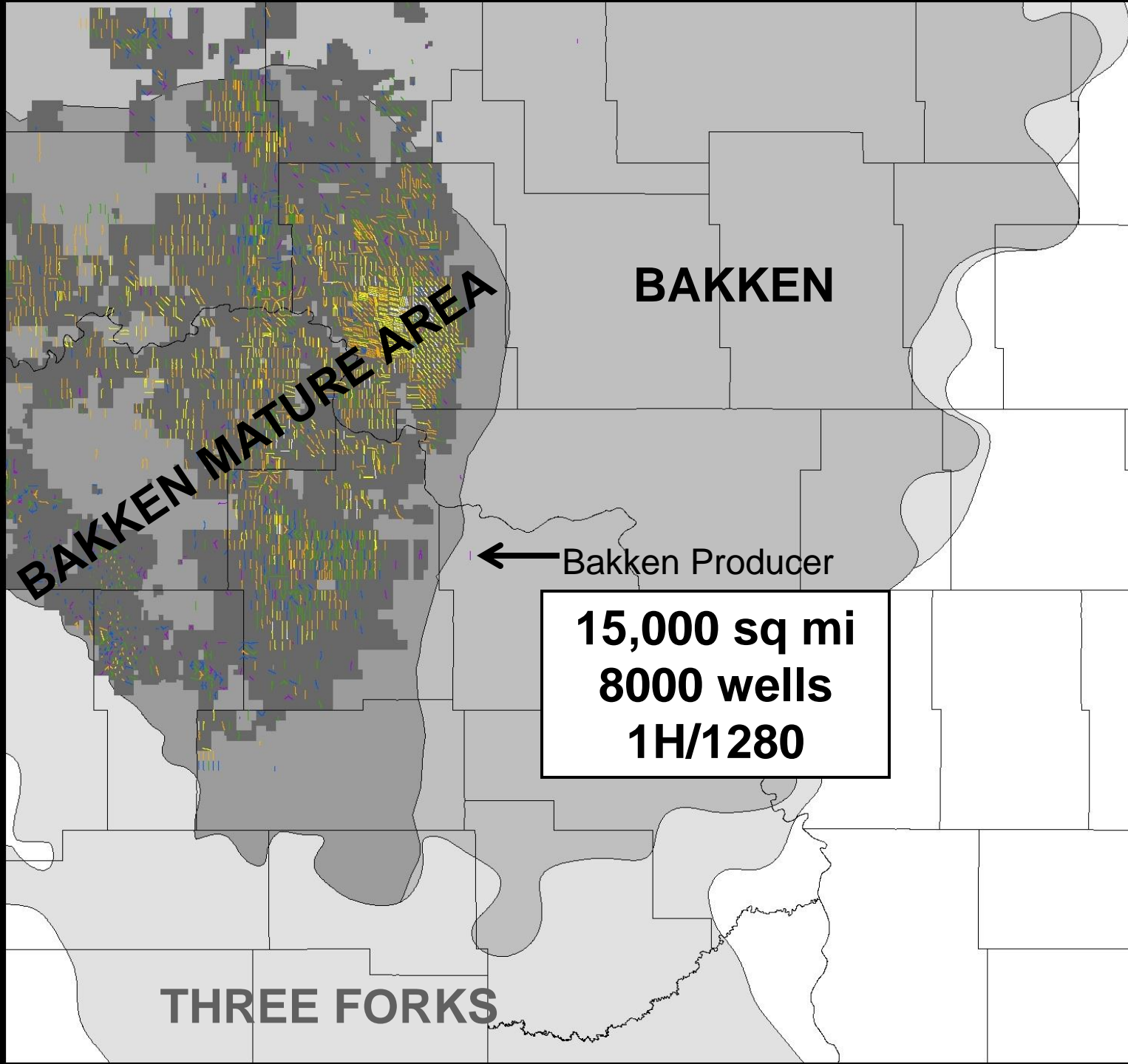
# WHY FRAC THE ROCK?

- **already developed easy oil**
  - **oil flows easily without fracking**
- **Unconventional Reserves**
  - **reservoirs are tight**
  - **look at sample**
  - **uneconomic to produce w/o fracing**
  - **must create a path for oil to flow**

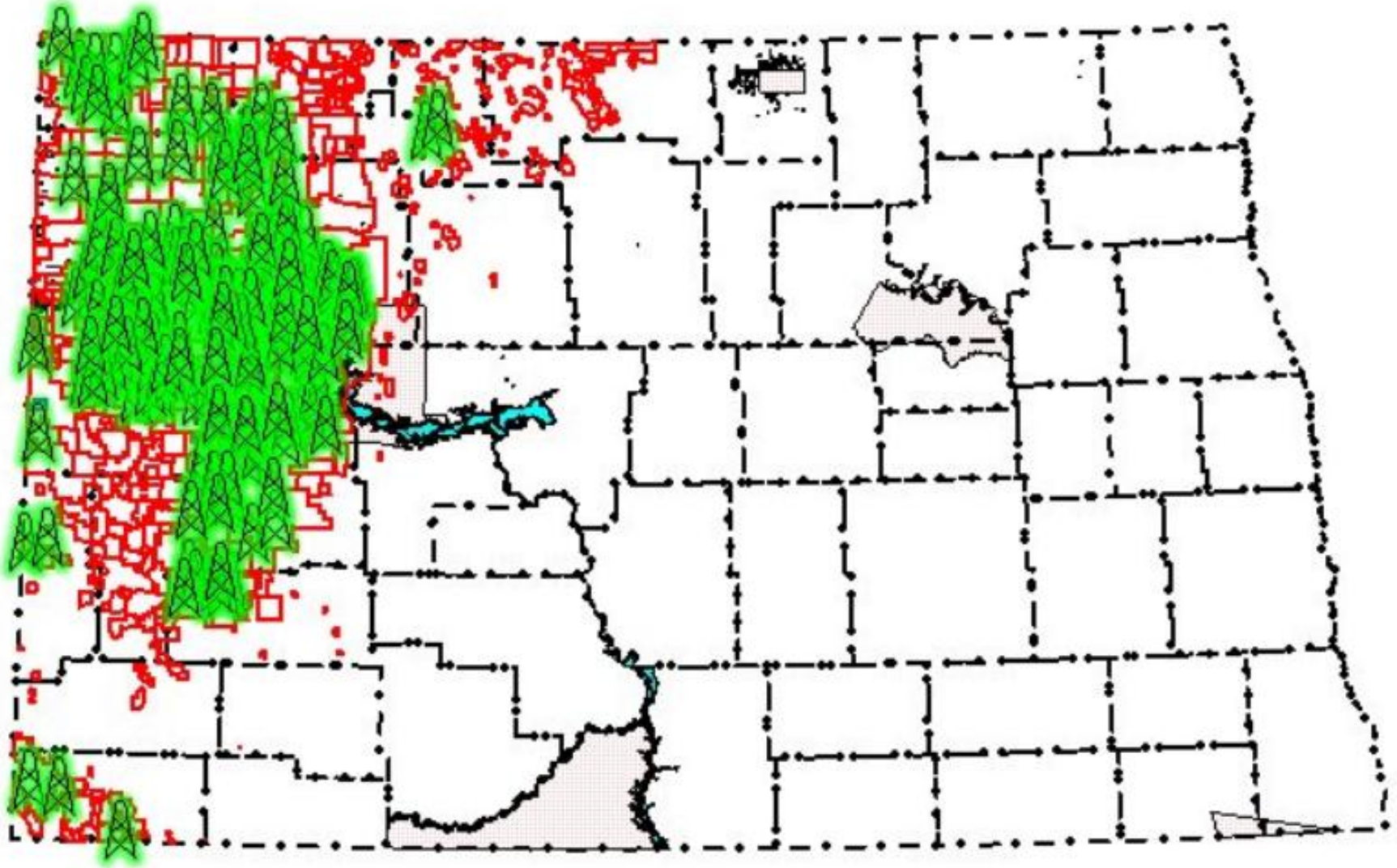
# North Dakota Development

- Regulation
- **Resource Play**
- Uniform Spacing—orderly development
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- Bakken Results





# **NORTH DAKOTA – 186 DRILLING RIGS – SEPTEMBER 2013**



**Current drilling activity is focused  
in Mountrail, Dunn, McKenzie, and Williams Counties.**

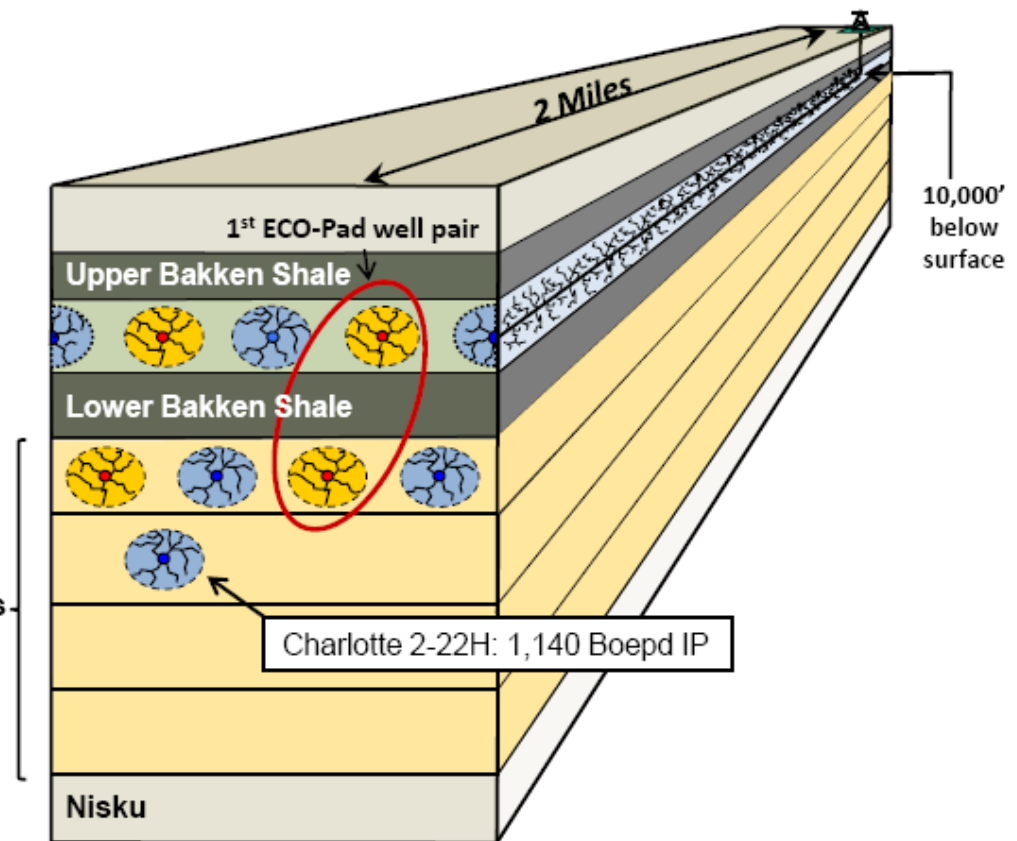


# Bakken Development Plan

## 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

## Additional Three Forks potential



11



# North Dakota Development

- Regulation
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# ArcIMS Viewer



**Townships**

Rec	Township	Tdir	Range	Rdir	TWPRNG	TWPTEXT	RNGTEXT
1	156	N	90	W	156090	T156N	R 90W

ND OI

- ☒ Oil and Gas
- ☒ Water
- ☒ Petroleum
- ☒ Right of Way
- ☒ Ditch
- ☒ Ditch
- ☒ Highway
- ☒ Highway
- ☒ Canal
- ☒ Oil
- ☒ Un
- ☒ In
- ☒ Dr
- ☒ Se
- ☒ Ga
- ☒ Other
- ☒ Re
- ☒ Co
- ☒ Riv
- ☒ La
- ☒ Imagery
- ☒ Topo
- ☒ Topo
- ☒ NAIP



1



A horizontal number line segment is shown, starting at 0 and ending at 1mi. The segment is divided into 4 equal parts by tick marks.

Information	Size	Type	Ref Code	Feature Created	Feature Updated	Case No	Order No	Map Symbol
Bakken	1280	SPC		Thu, 5 Jun 2008 00:00:00	Mon, 8 Dec 2008 00:00:00			1280SPC



### ND OIL & GAS LAYERS

- ☒ Oil and Gas
  - ☐ Wells
  - ☐ Permit Status Before Spud
  - ☐ Rig Location
  - ☐ Directional Surveys
  - ☐ Directional Legs
  - ☐ Horizontal Surveys
  - ☐ Horizontal Legs
  - ☐ Cases Docketed
  - ☒ Oil Fields
  - ☐ Unit Boundaries
  - ☐ Inspector Areas
  - ☒ Drilling / Spacing
  - ☐ Seismic
  - ☐ Gas Plants
- ☒ Other
- ☒ Imagery
  - ☐ Topo/DRG 250k
  - ☐ Topo/DRG 100k
  - ☐ NAIP 2009

Refresh Map

☒ Auto Refresh

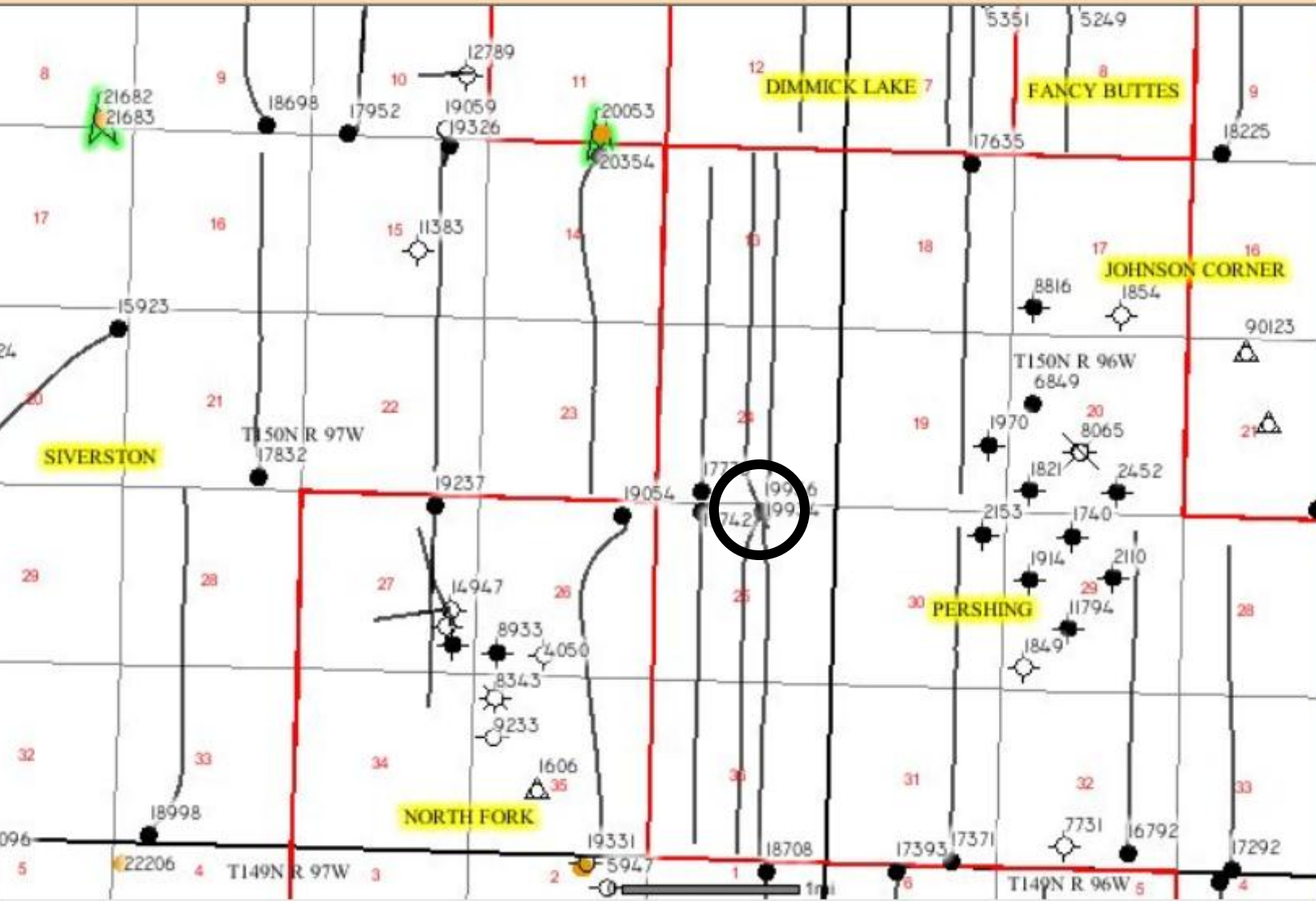
Help:

- A closed group, click to open.
- An open group, click to close.
- A map layer.

# North Dakota Development

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# ND OIL & GAS

- ☒ Oil and Gas
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- ☒ Rig Location
- ☒ Directional
- ☒ Directional
- ☒ Horizontal
- ☒ Horizontal
- ☒ Cases Do
- ☒ Oil Fields
- ☒ Unit Boun
- ☒ Inspector
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- ☒ Seismic
- ☒ Gas Plants
- ☒ Other
- ☒ Imagery
- ☒ Topo/DRG 2
- ☒ Topo/DRG 1
- ☒ NAIP 2009

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Help:

- ☒ A closed group, click to op
- ☒ An open group, click to cl
- ☒ A map layer.
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- ☒ A visible group/layer, dic
- ☒ A visible layer, but not at
- ☒ A partially visible group. c



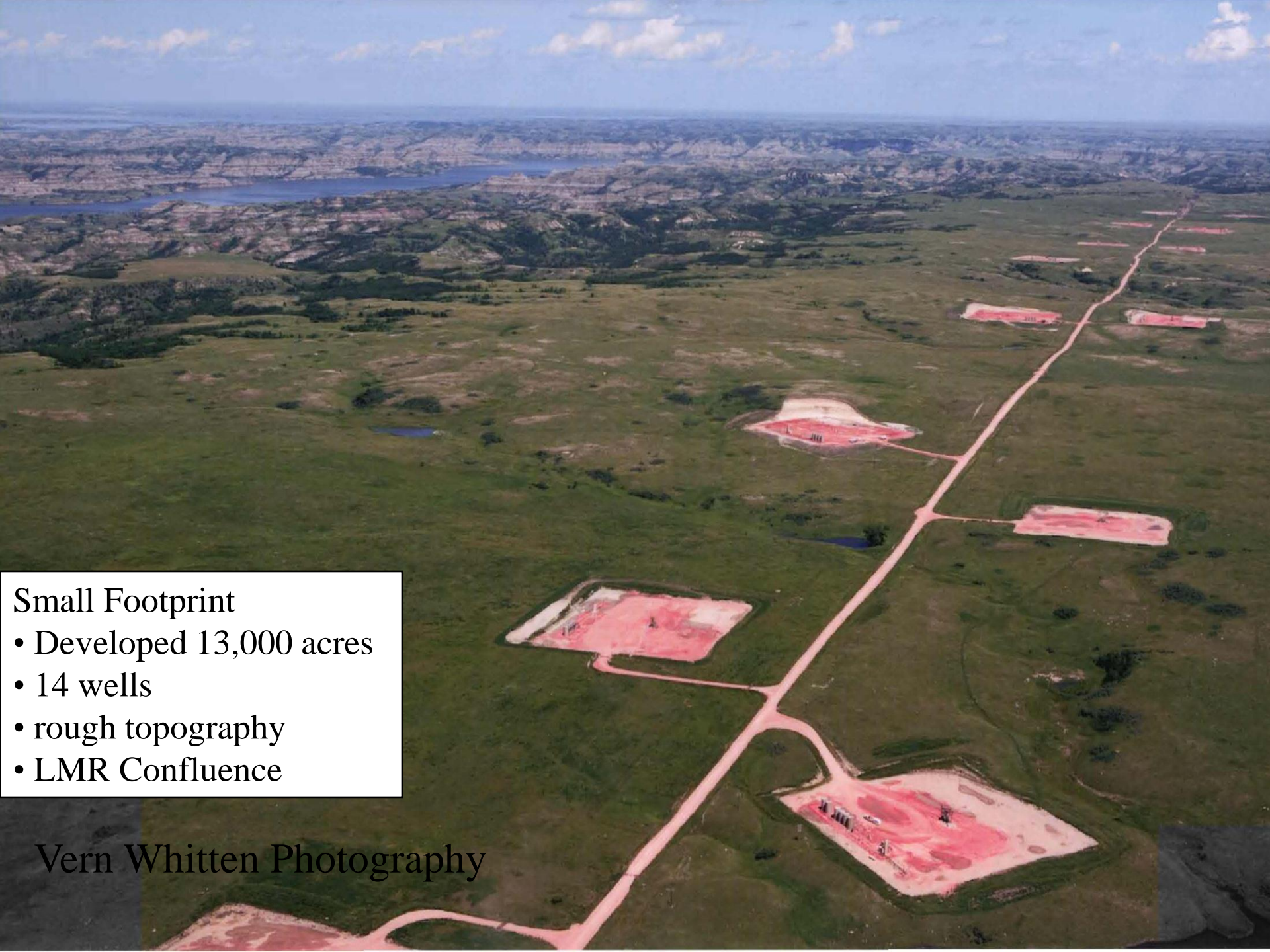


Vern Whitten Photography



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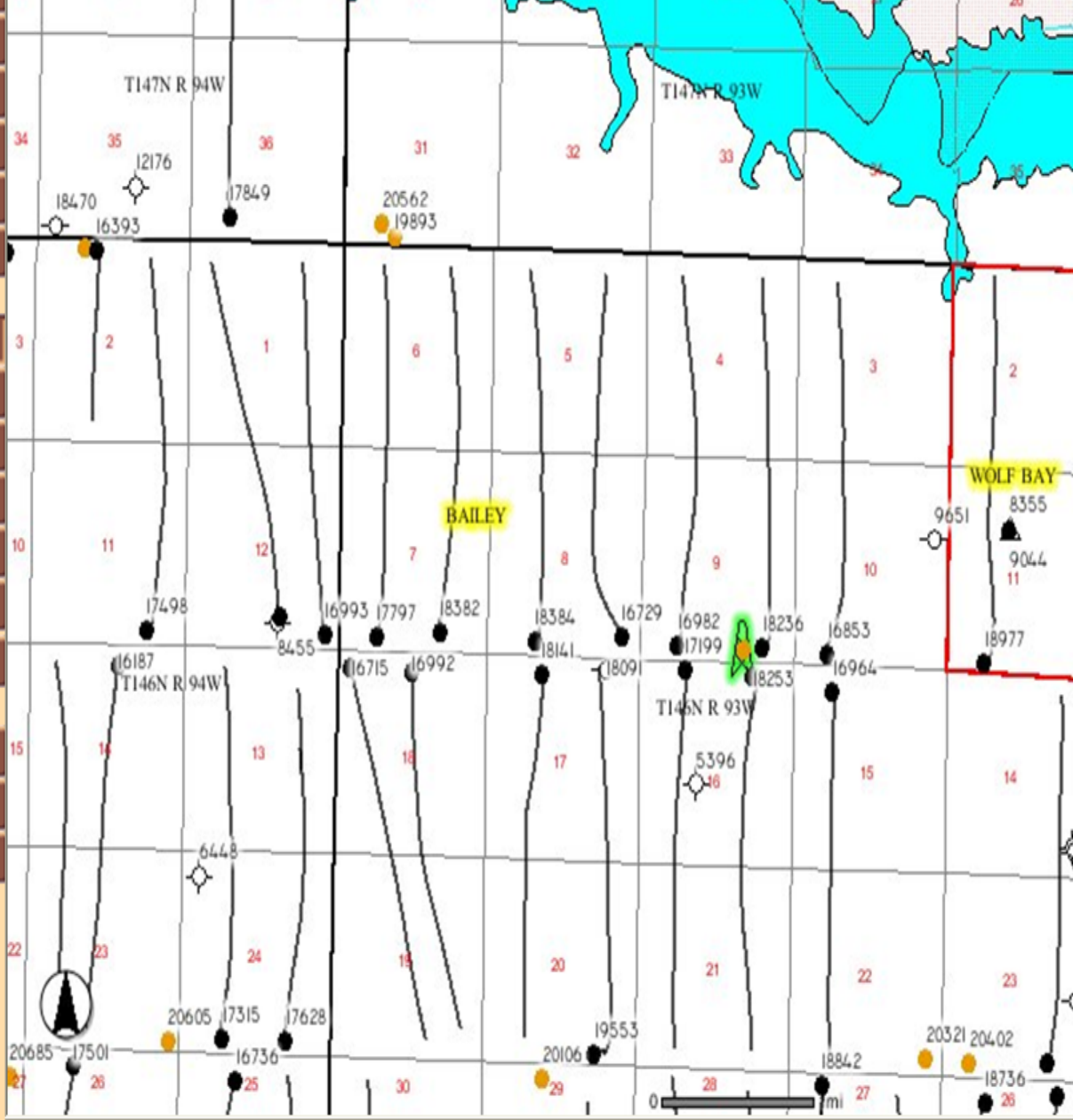
### Small Footprint

- Developed 13,000 acres
- 14 wells
- rough topography
- LMR Confluence

Vern Whitten Photography

Full Map  
Entire State  
Previous View  
Near Selection  
Search  
Generate PDF

Zoom In  
Zoom Out  
Pan  
Rect Identify  
Select Object  
Buffer  
Distance  
Find Well  
Find Field/Unit  
Find Section



- ☒ Wells
- ☒ Rig Location
- ☒ Directional Surveys
- ☒ Directional Legs
- ☒ Horizontal Surveys
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- ☒ Seismic
- ☒ Gas Plants
- ☒ Other
- ☒ Reservations
- ☒ Corporate Boundaries
- ☒ Rivers and Roads
- ☒ County Roads
- ☒ Major Roads
- ☒ Major Rivers
- ☒ Missouri River
- ☒ Land Ownership
- ☒ Imagery
  - ☒ Topo/DRG 250k
  - ☒ Topo/DRG 100k
  - ☒ NAIP 2009

Refresh Map

☒ Auto Refresh

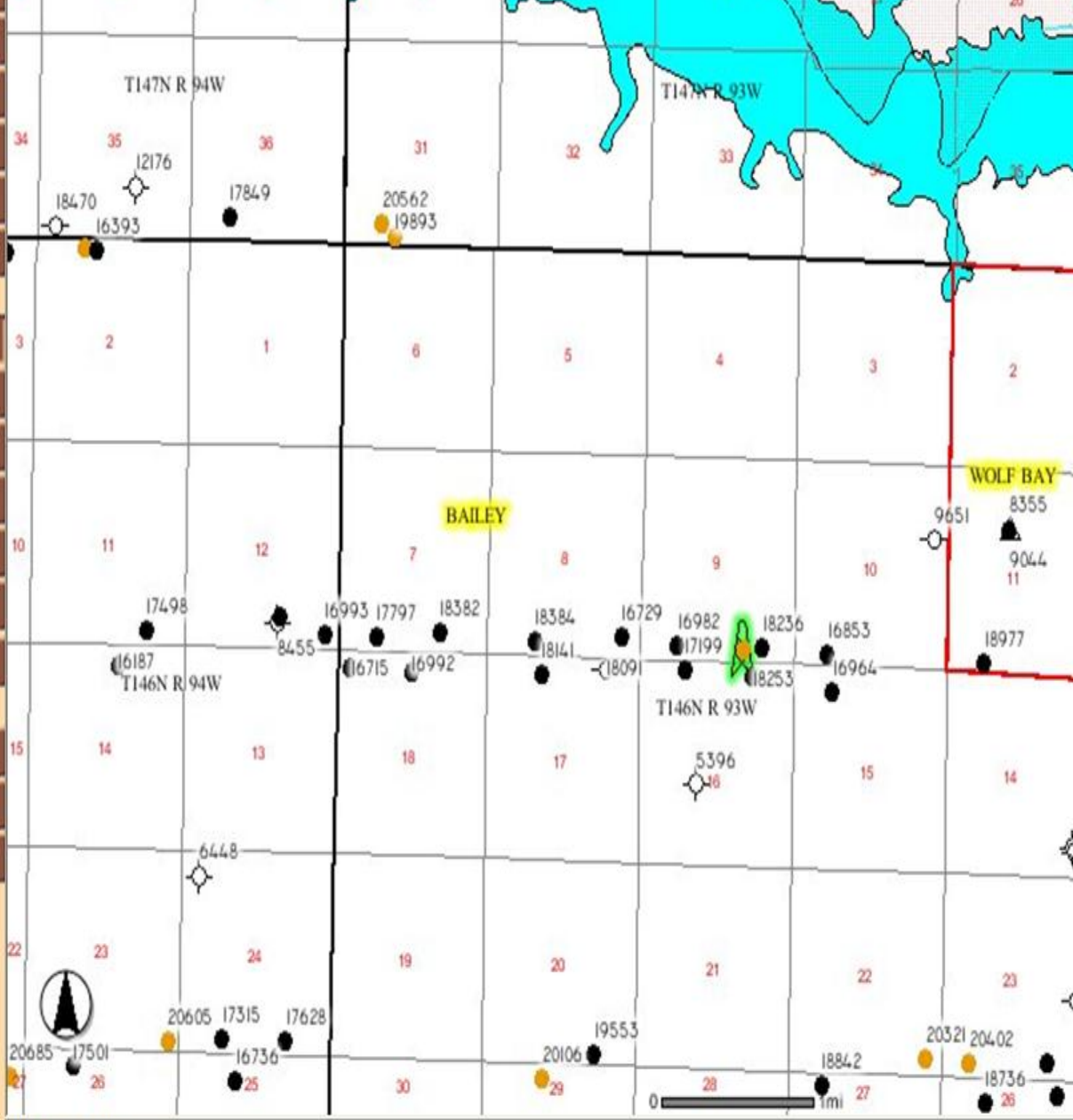
Major Rivers  
Selection cleared.

Help:  
A closed group, click to open.  
An open group, click to close.  
A map layer.  
A hidden group/layer, click to make visible.



Full Map  
Entire State  
Previous View  
Near Selection  
Search  
Generate PDF

Zoom In  
Zoom Out  
Pan  
Rect Identify  
Select Object  
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Distance  
Find Well  
Find Field/Unit  
Find Section



Major Rivers  
Selection cleared.

- ☒ Wells
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# North Dakota Development

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- **Water Needs—surface waters**
- Bakken Results

# Thirsty Horizontal Wells

- 2,000 wells / year
- 15-25 years duration
- 20 million gallons water / day

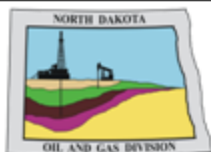
## **Commission supports surface water use**

- **Lake Sakakawea best water resource**
  - **one inch contains 10 billion gal water**
    - **5000 wells @ 2mil gal wtr/well**
    - **2-year supply**

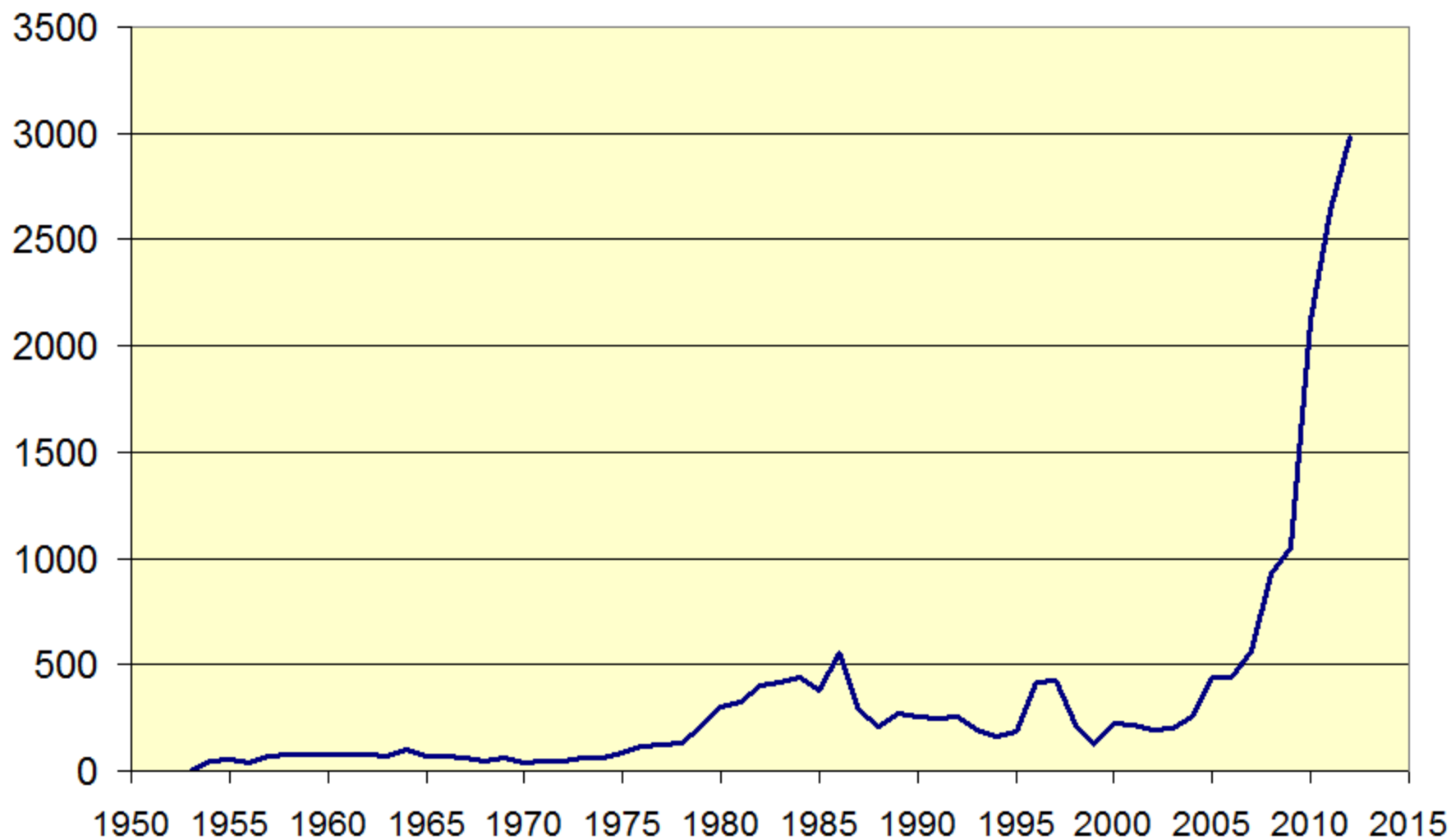
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- **Bakken Results**



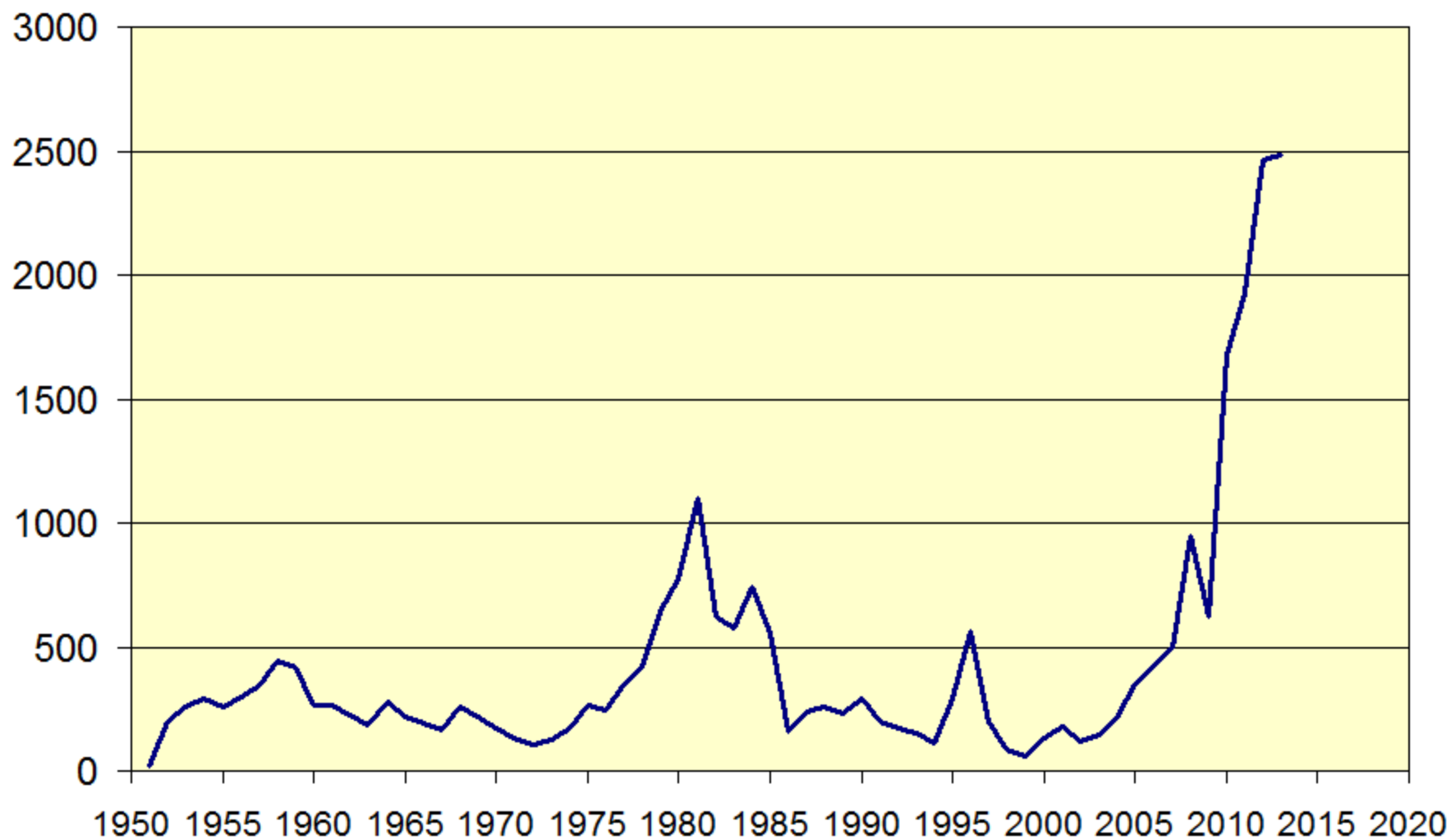


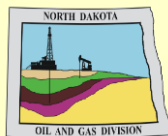
## North Dakota Industrial Commission Cases Heard



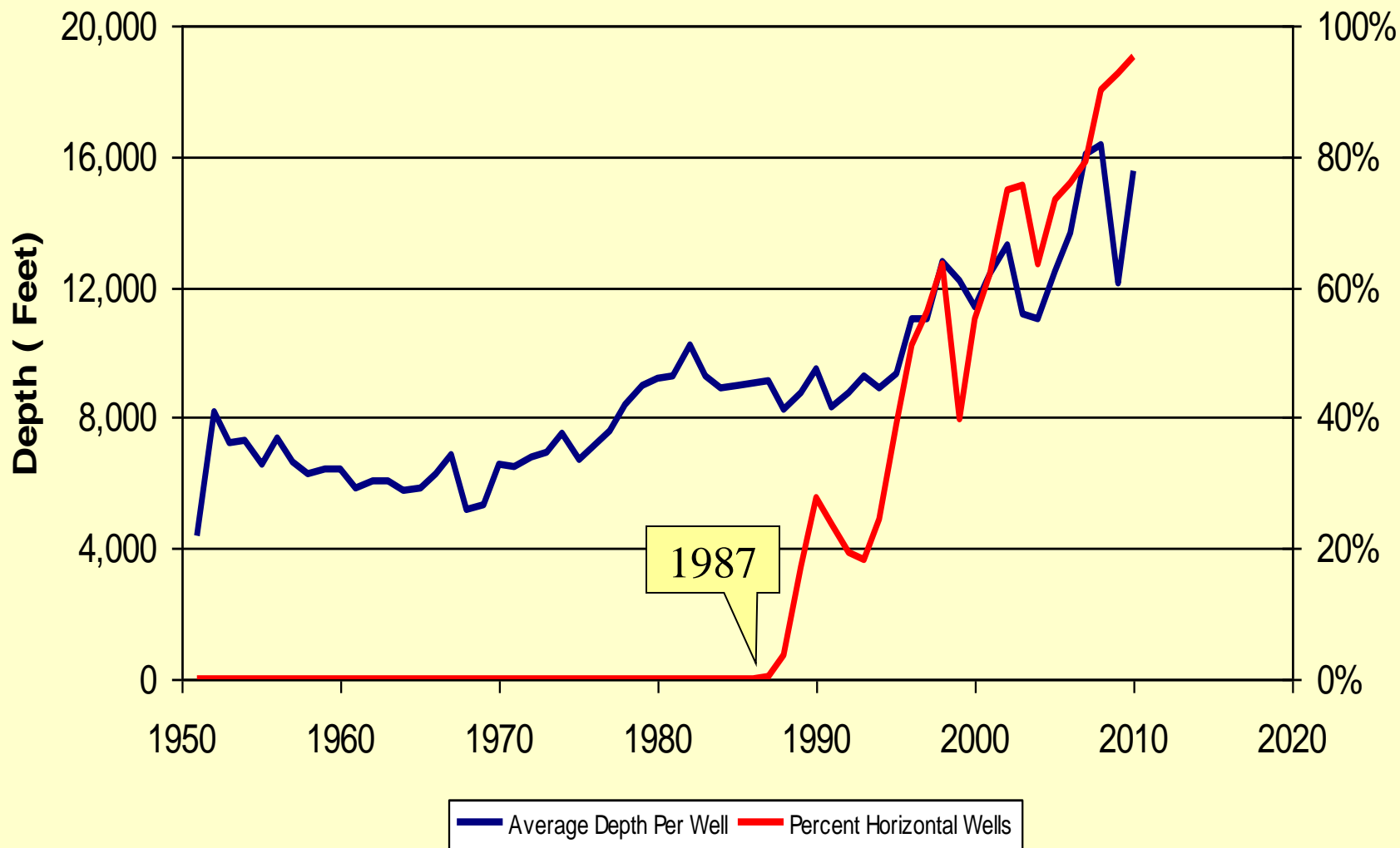


## North Dakota New Well Permits Issued

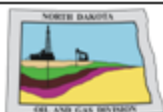




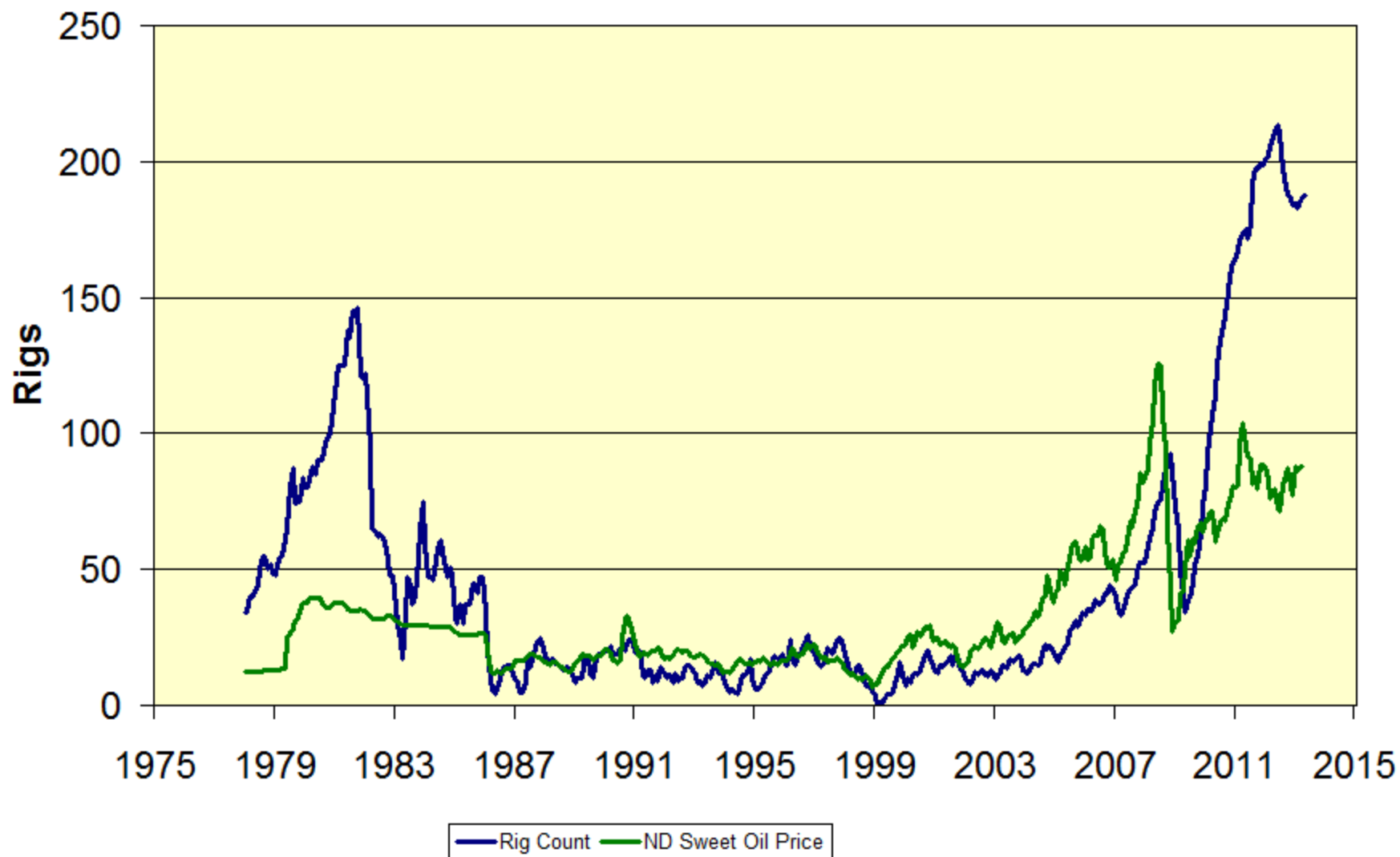
## North Dakota Well Depth and % Horizontal







## North Dakota Average Monthly Rig Count



# RIGS

- 186 rigs currently
- 225 rigs - 2 years to secure leases
- 225 rigs – another 16 years f/5H/SU
- Declining rig count?
  - walking rigs replace inefficiencies
  - drilling more wells w/less rigs

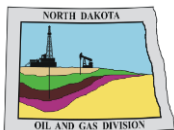
# WELLS

- **9,322 wells currently producing**
  - **5,897 Bakken**
  - **3,000 more to secure leases**
- **40,000 additional development wells**
  - **225 rigs – another 16 years**
  - **100 rigs – another 30 years**
- **Bakken Pool – 4 targets**

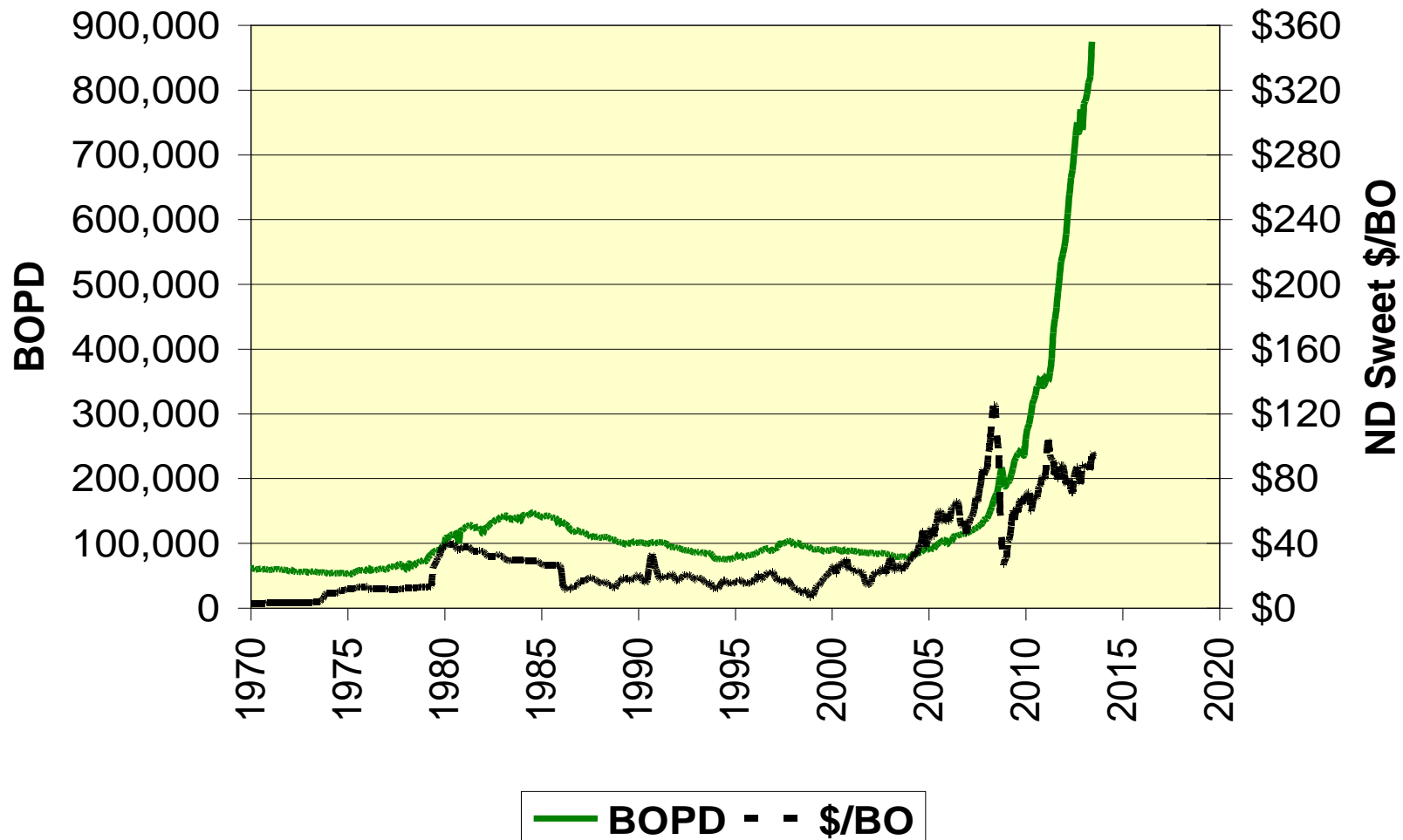


## **Typical 2012 Bakken well**

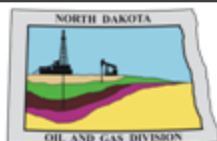
- 45-year well life**
- 615,000 barrels of oil**
- \$9 million to drill and complete**
- \$20 million net profit**
- \$4 million in taxes**
- \$7 million in royalties**
- \$2 million in wages**
- \$2 million in operating expenses**



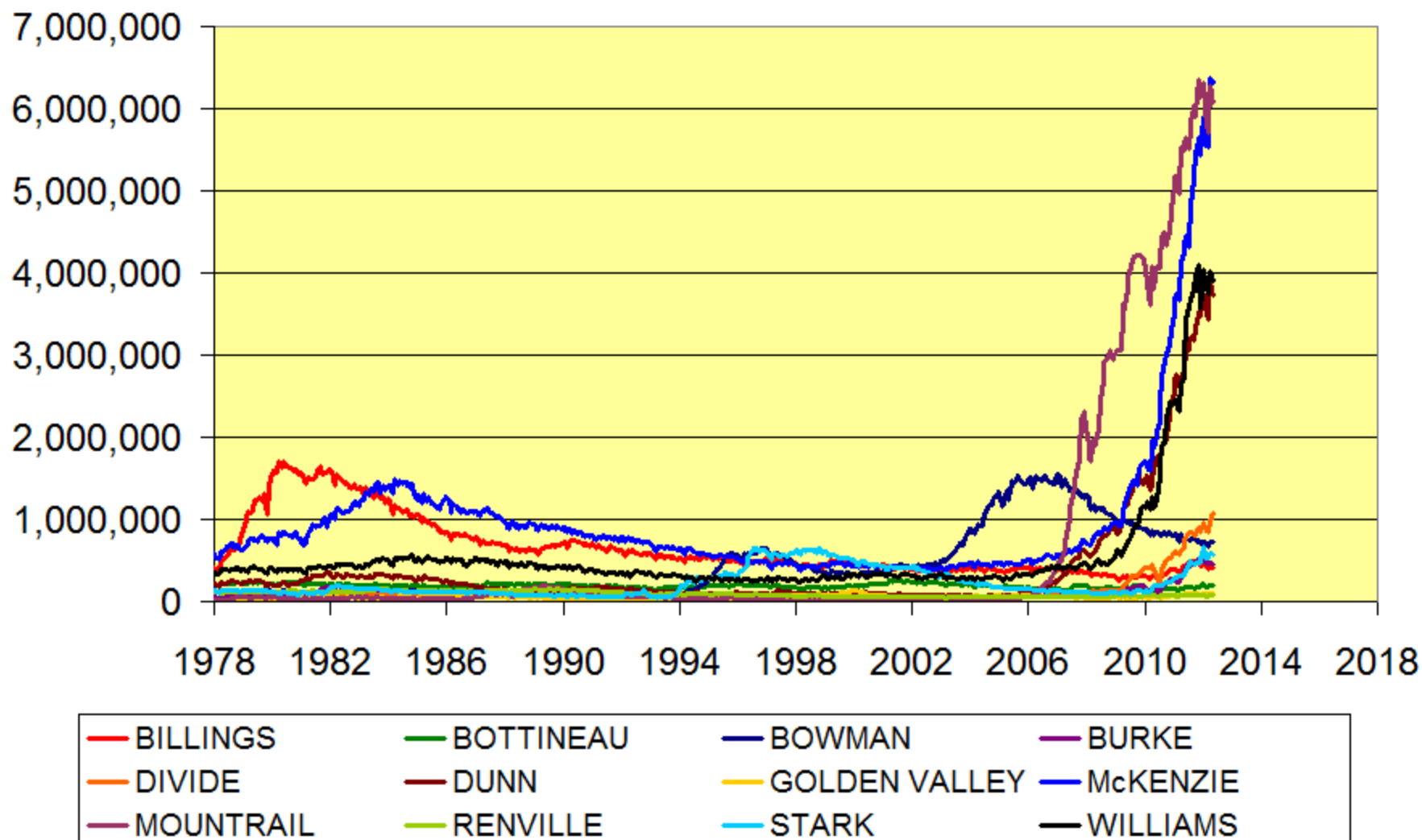
## North Dakota Daily Oil Produced and Price



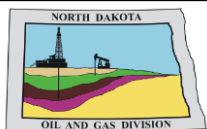
**Production 874,460 bopd (appr 795,064 from Bakken—91%)**



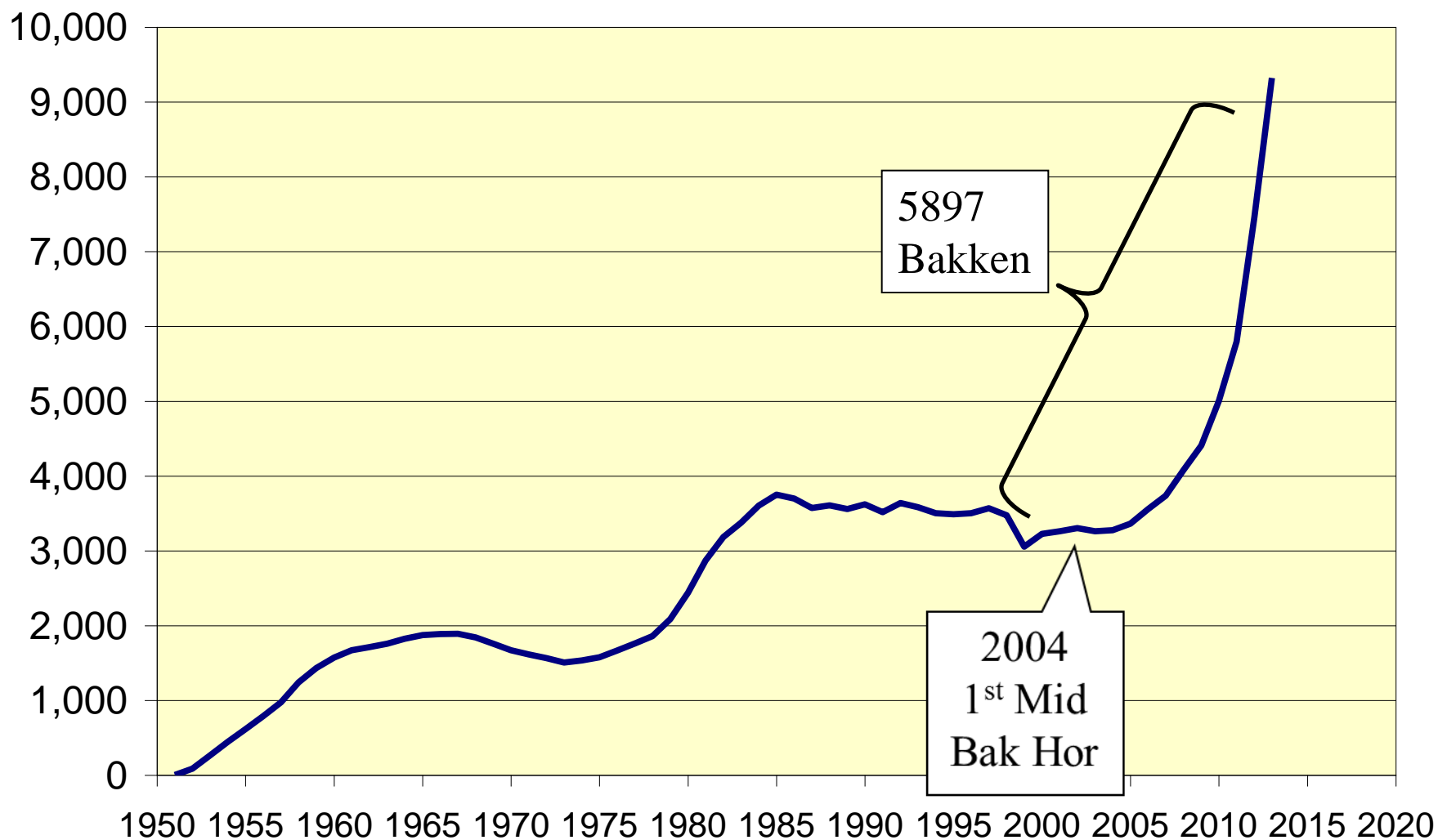
## North Dakota Monthly Production Top 12 Counties





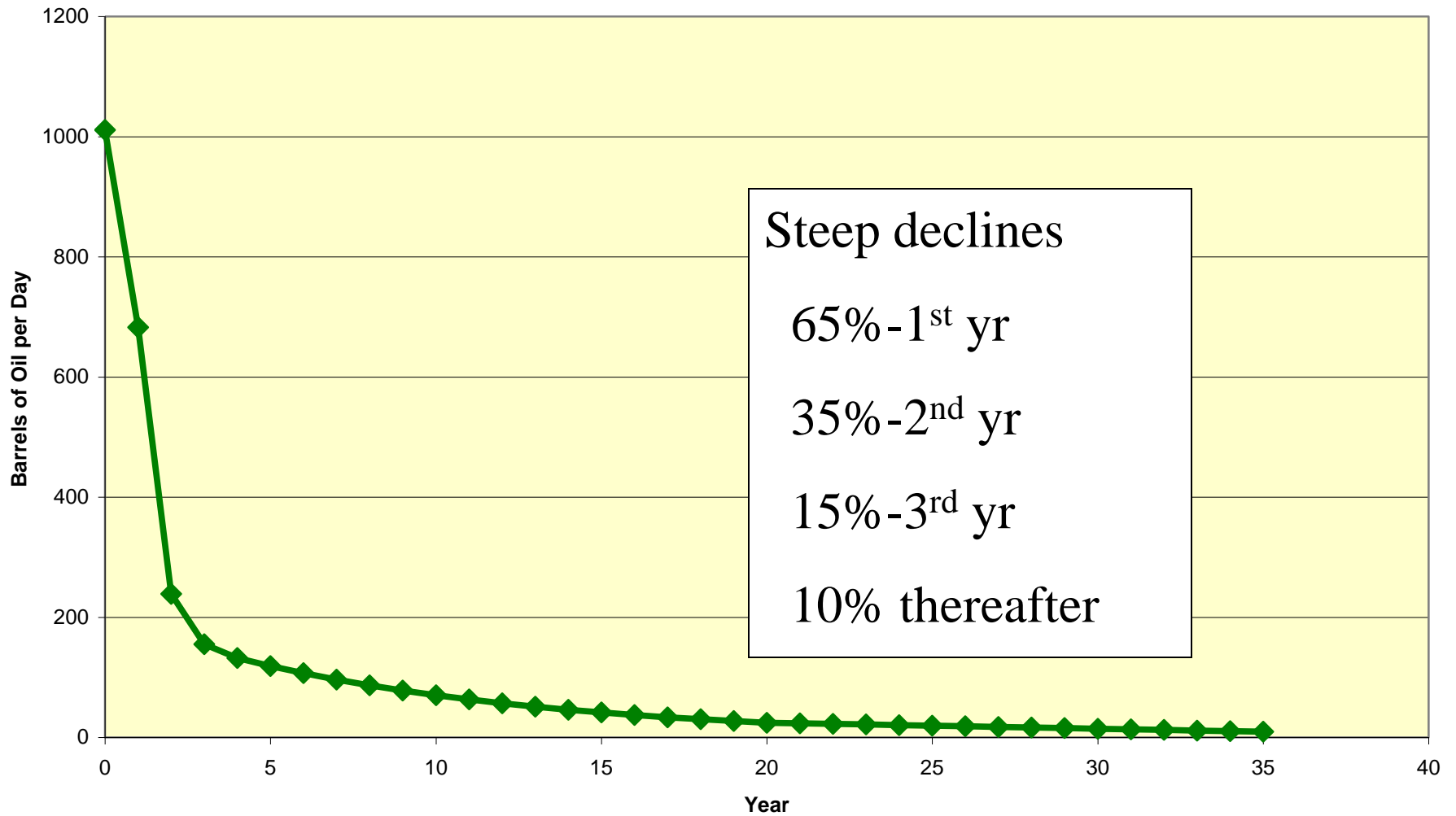


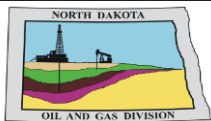
## North Dakota Wells Producing



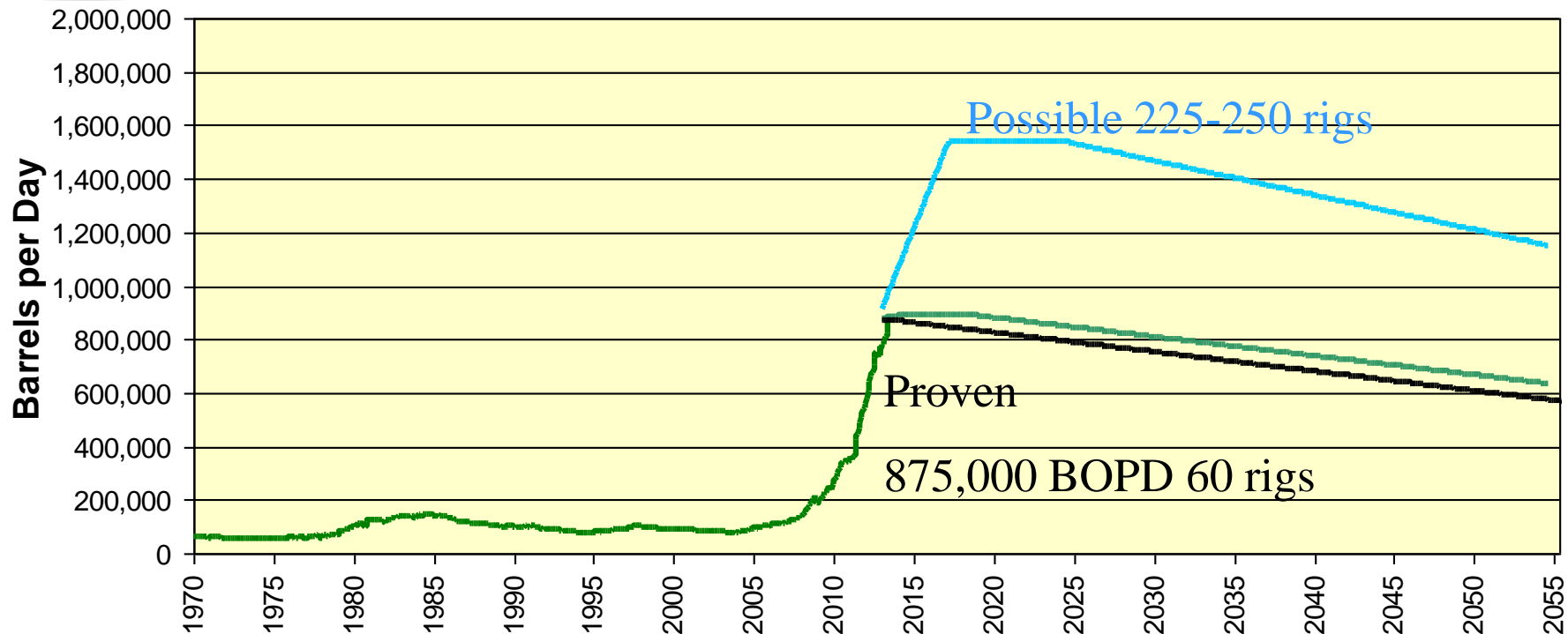
**9322 total wells – 5462 Bakken horizontal (63.3%)**

## Typical Bakken Well Production





## North Dakota Oil Production



**5,897** Bakken and Three Forks wells drilled and completed

**35,000 - 40,000** more new wells possible in thermal mature area

History

Bakken - Three Forks P10

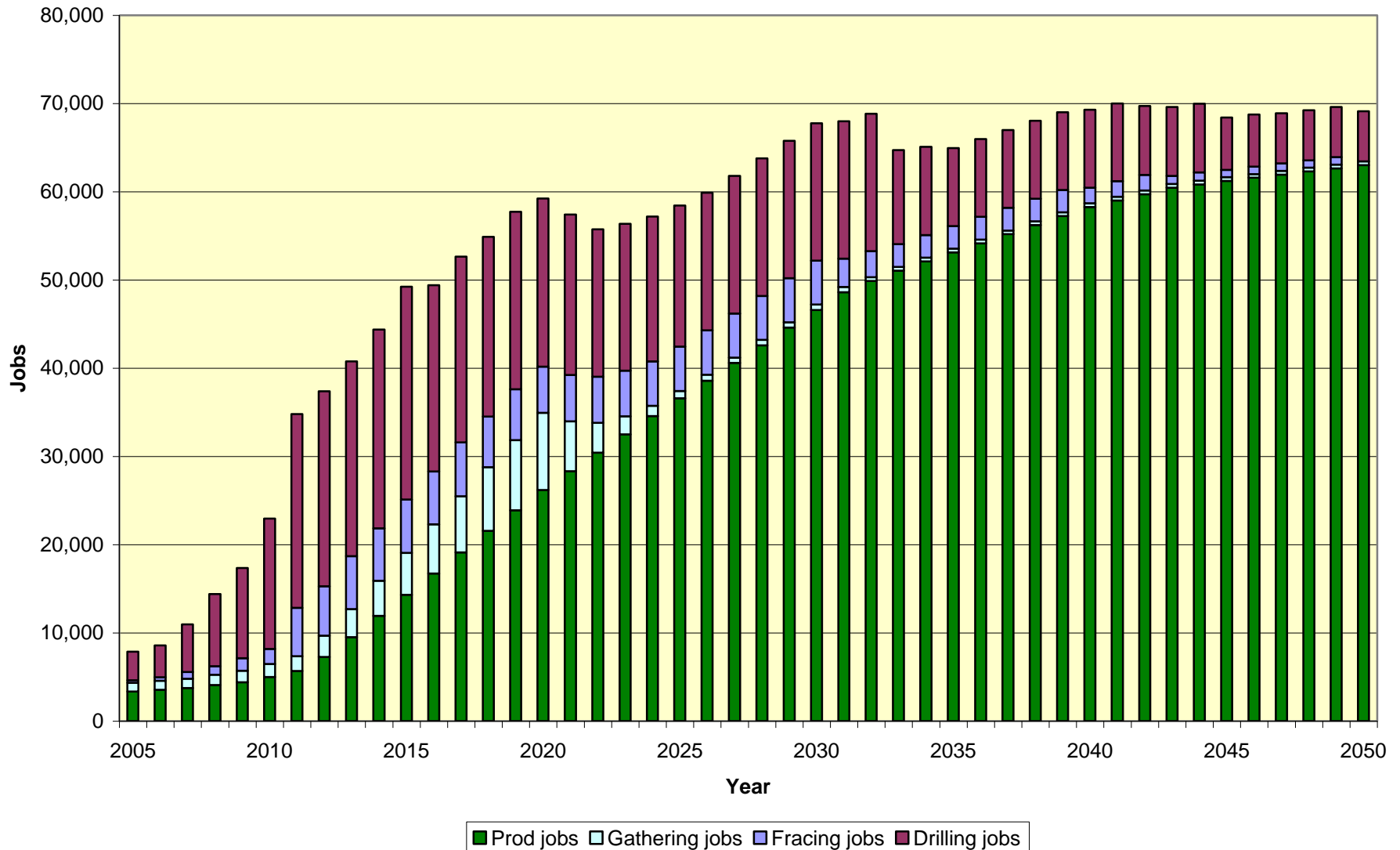
Bakken - Three Forks P50

Bakken - Three Forks P90



# Expected Case

## North Dakota Oil Industry Jobs



# Western North Dakota Water

- 1,100 to 2,700 wells/year = 2,000 expected
  - 185 rigs will complete the first phase of drilling in 6-12 months
  - 185 rigs will require about 20 years to complete phase 2 drilling
  - 2,000 new wells per year requires 11-22 million gallons of frac water per day
  - 40,000-45,000 new wells = 17-28 million gallons per day maintenance water



## Reclaimed Location

File No. 15092  
Armstrong #1-5 Hanson  
Sec 5-T155N-R102W  
Williams County, ND