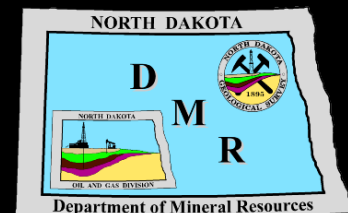
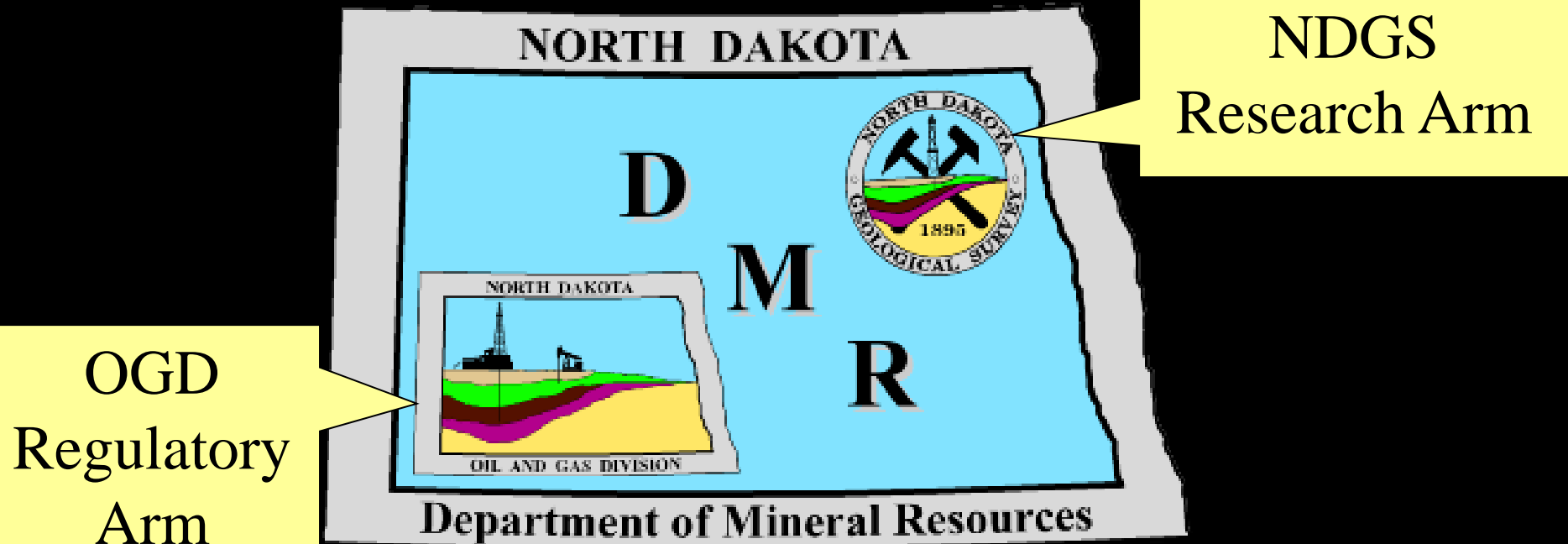


OIL & GAS ACTIVITY UPDATE

***American Legislative Exchange Council
Spring Task Force Summit
Oklahoma City, OK – May 3, 2013***



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

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

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

File Edit View Favorites Tools Help

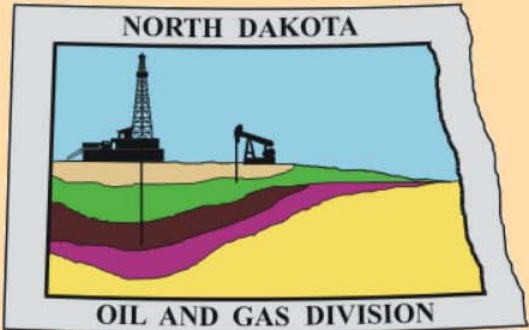
Convert Select

Boys Hockey Overall Stan... Oracle PeopleSoft Enterpr... BT The Bismarck Tribune nd.gov 63rd Assembly Regular N... NDIC Oil & Gas Division H... Suggested Sites Bismarck News, Weather, ... Bismarck, ND - Official W... NDIC Commission Order Search...

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



NORTH DAKOTA

OIL AND GAS DIVISION

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](#).

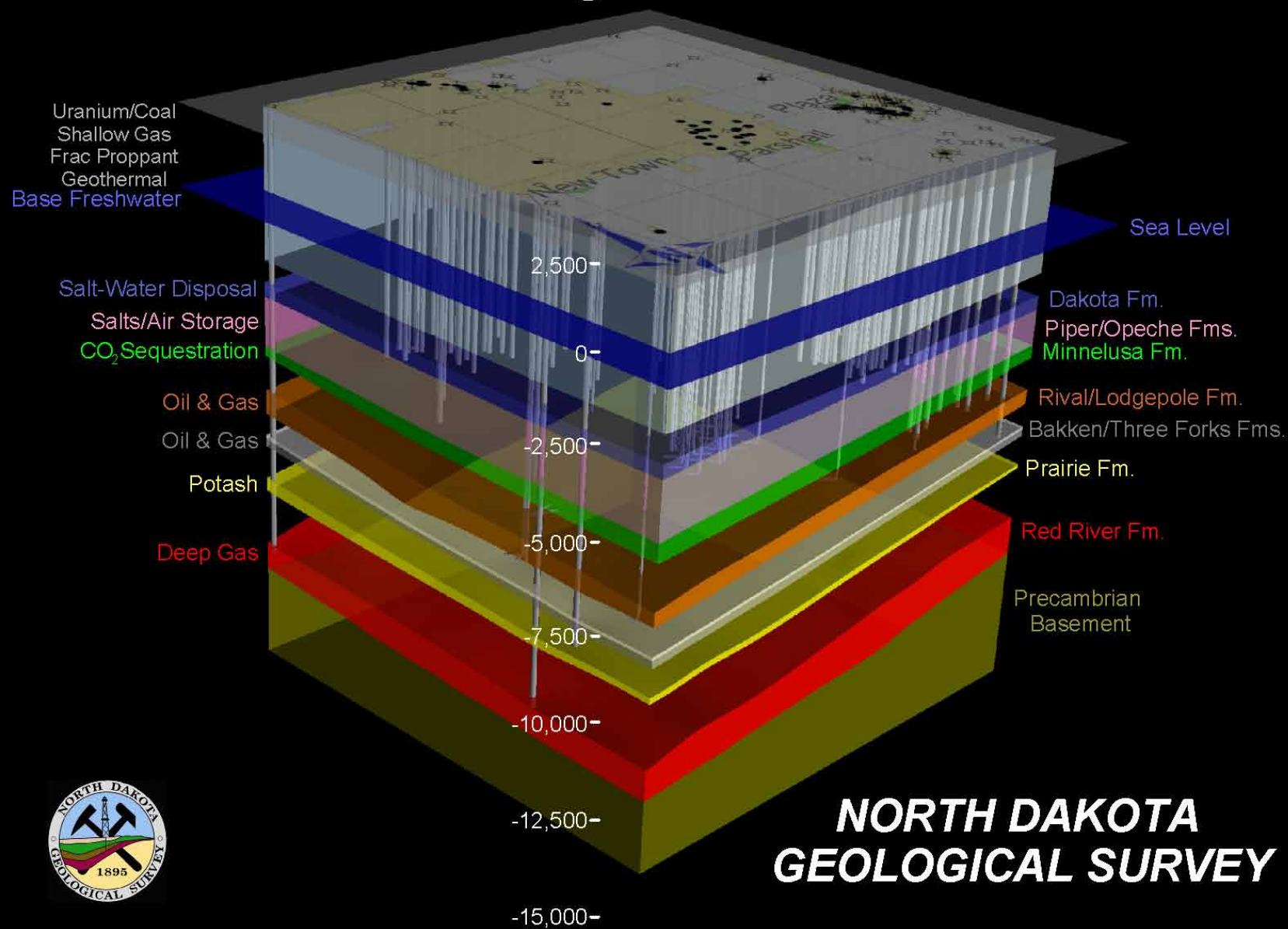
The Oil and Gas Division regulates the drilling and production of oil and gas in North Dakota. Our mission is to encourage and promote the development

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

https://www.dmr...

8:10 5/3

Three-Dimensional Geologic Model of the Parshall Area



North Dakota Development

- **Regulation**
- Resource Play
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TYPICAL HORIZONTAL OIL WELL



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

TYPICAL HORIZONTAL OIL WELL

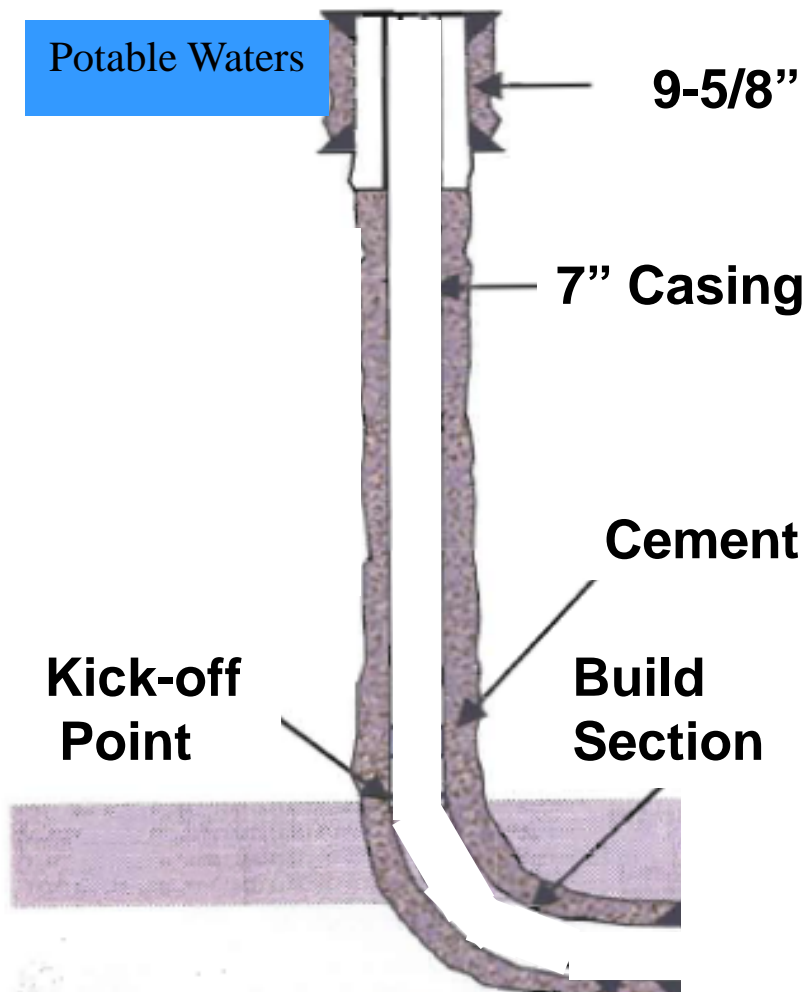
Potable Waters

9-5/8" @ 2500'

KOP @
10500'

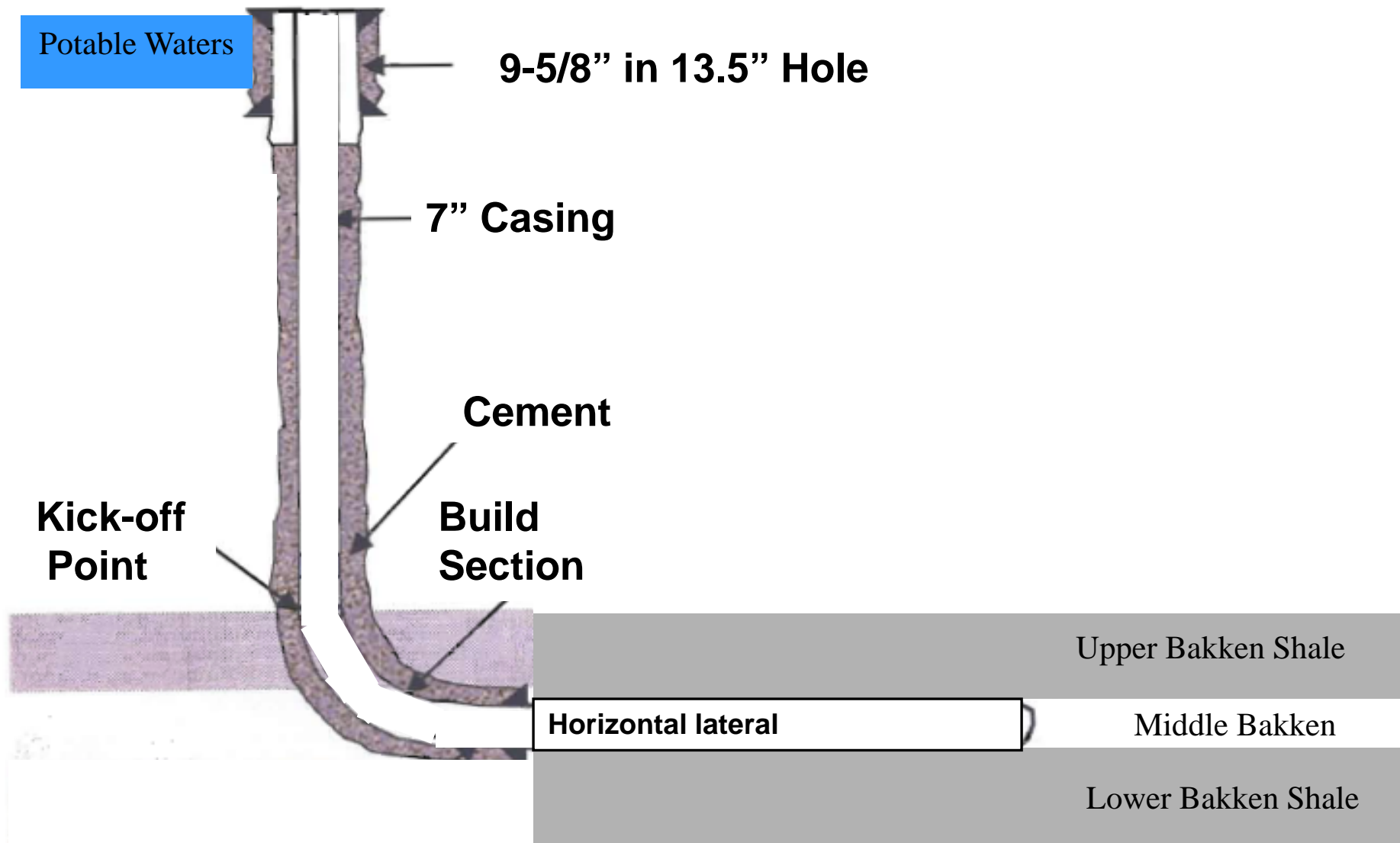
- Drill vertically to kick-off point
- Run in hole with bent assembly
- Downhole mud motor

TYPICAL HORIZONTAL OIL WELL

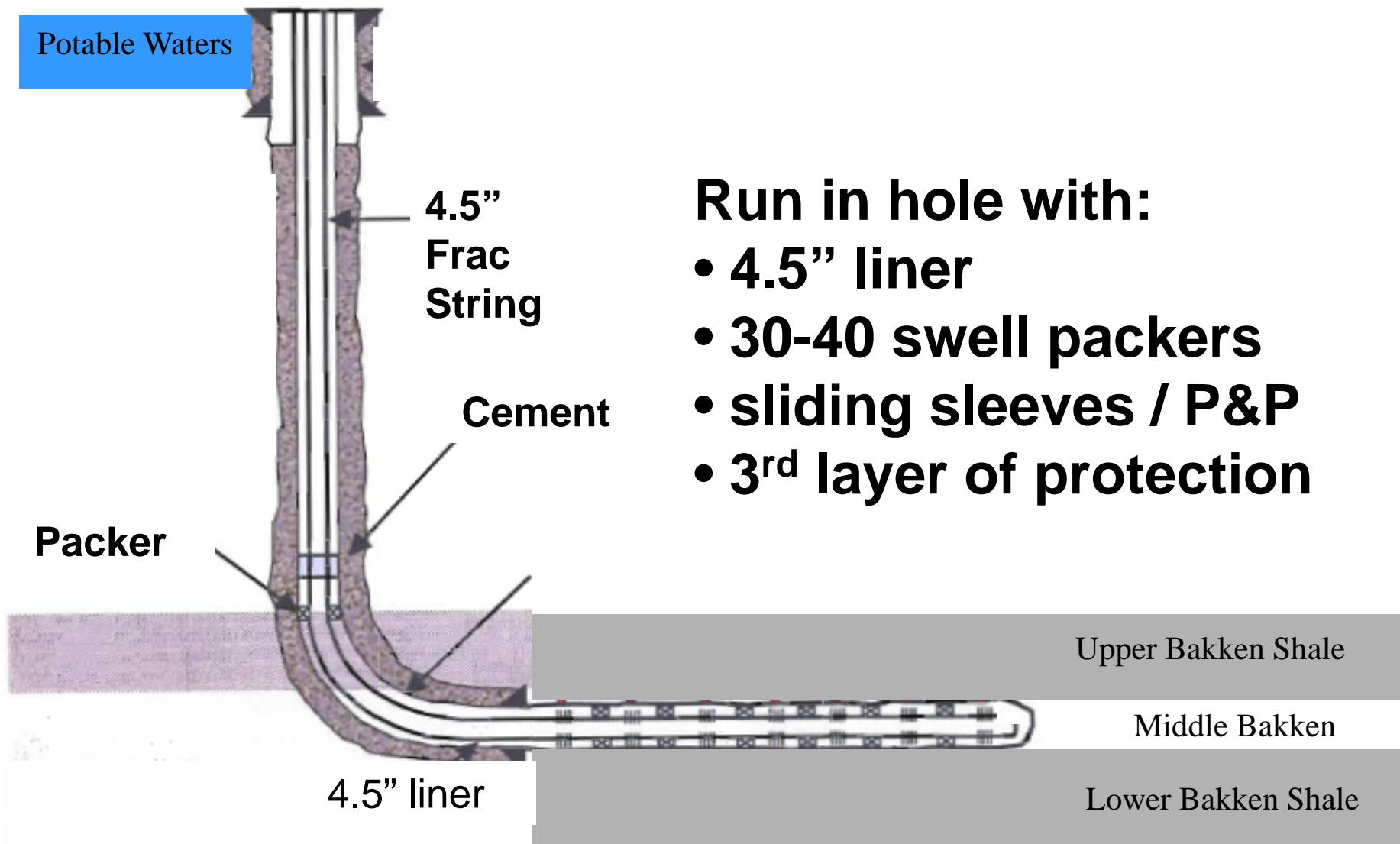


- Drill 8-3/4" hole to pay
- Run in hole with 7" casing
- Cement 7" casing
- 2nd layer of protection

TYPICAL HORIZONTAL OIL WELL



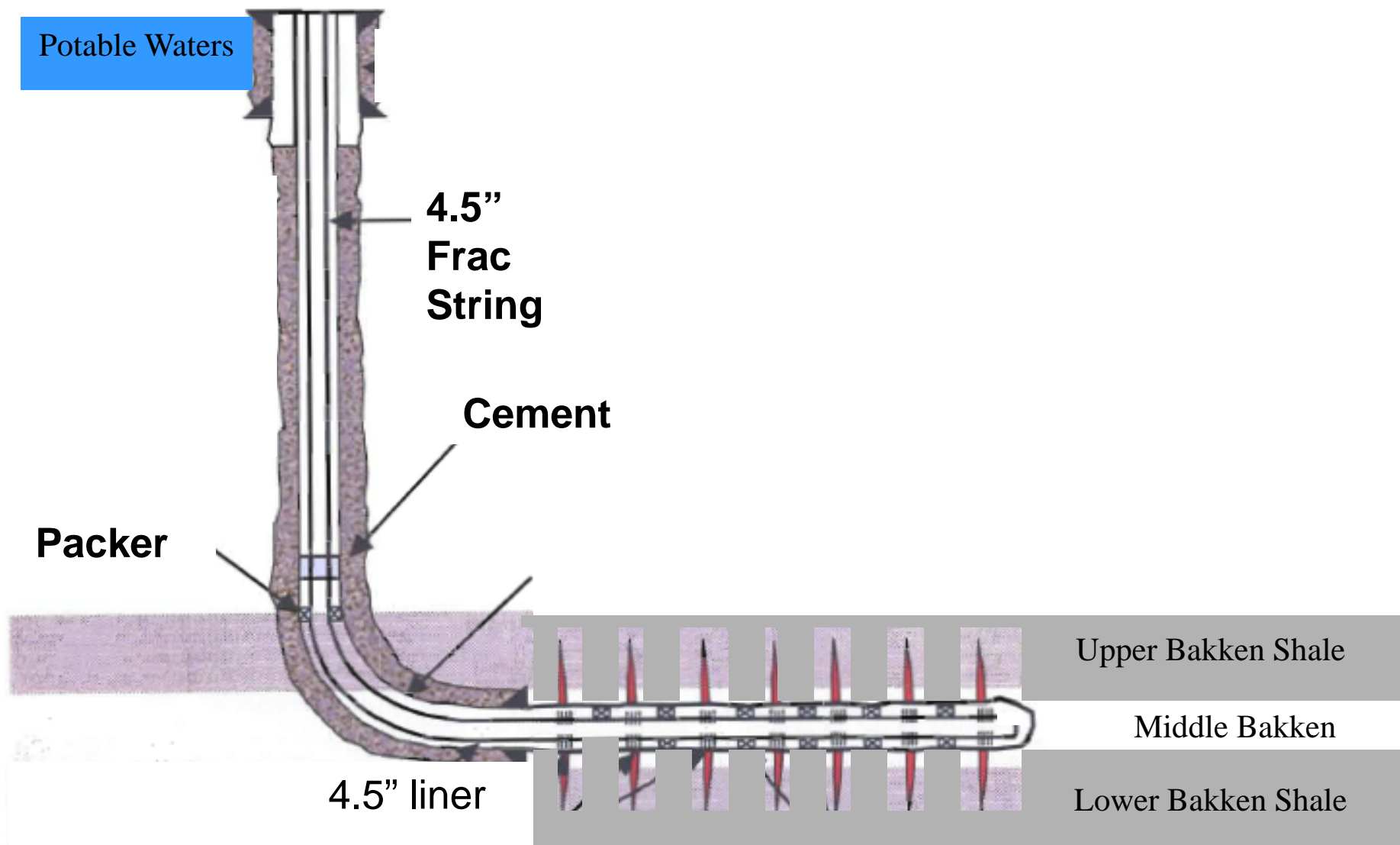
TYPICAL HORIZONTAL OIL WELL

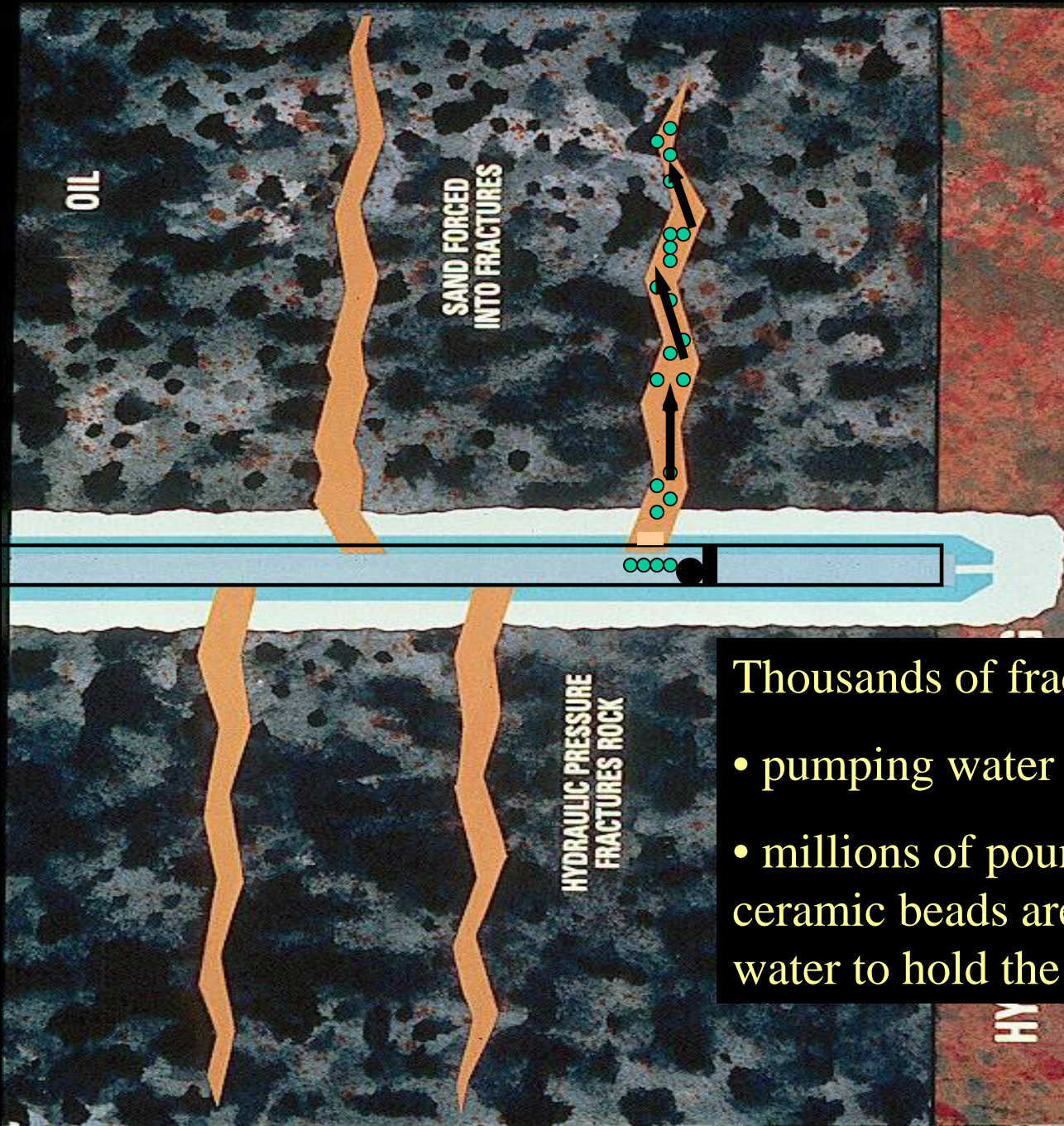


Run in hole with:

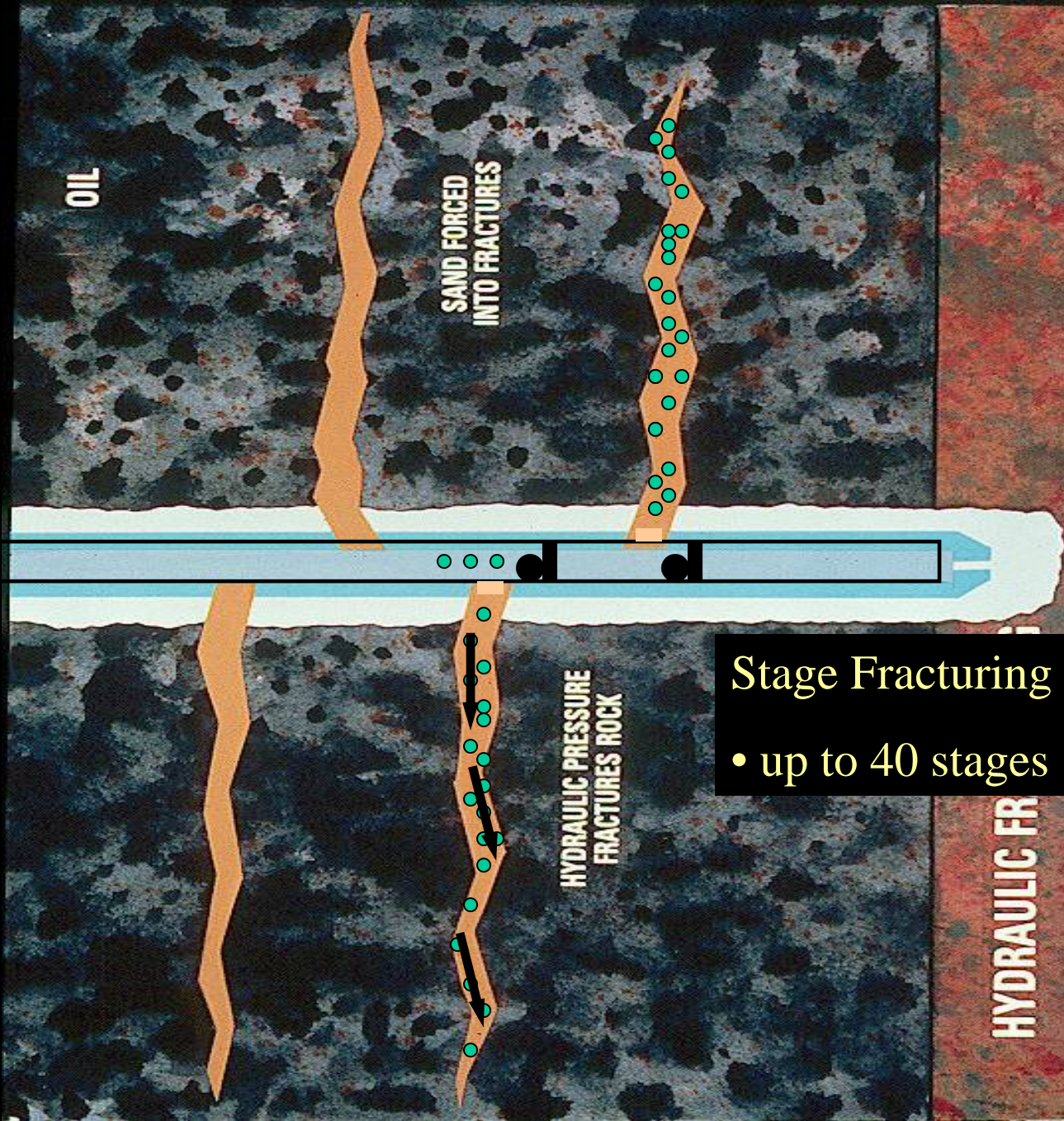
- 4.5\" liner
- 30-40 swell packers
- sliding sleeves / P&P
- 3rd layer of protection

TYPICAL HORIZONTAL OIL WELL



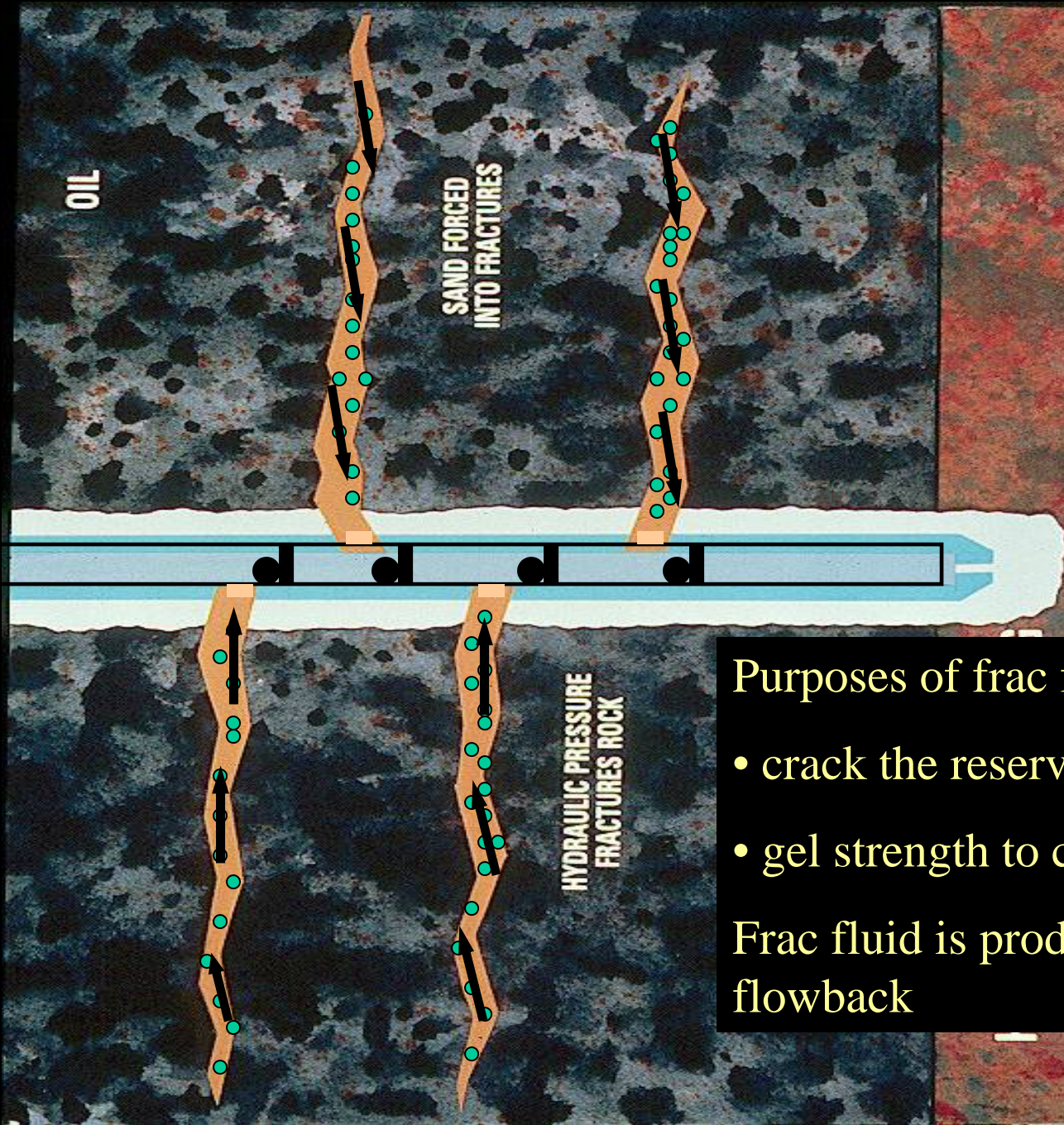


- Thousands of fractures are created
- pumping water at 6,000-9,000 psi
 - millions of pounds of sand and ceramic beads are pumped with the water to hold the fractures open.



Stage Fracturing

- up to 40 stages

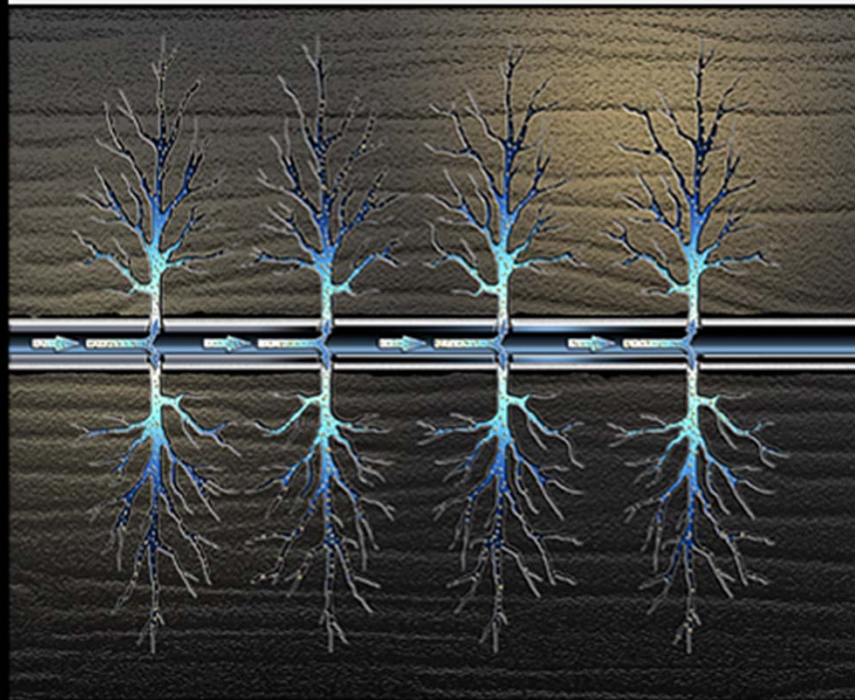


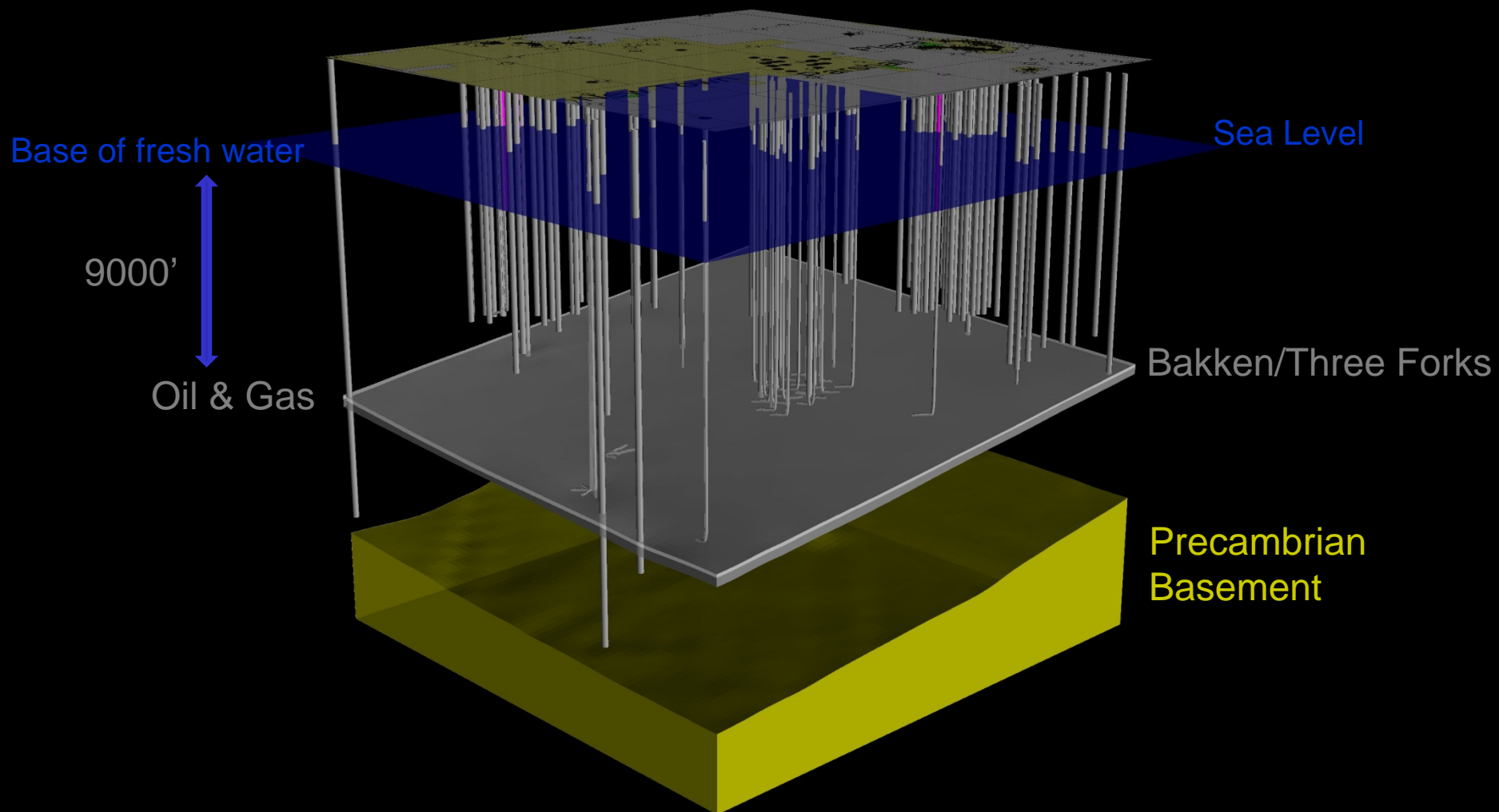
Purposes of frac fluid

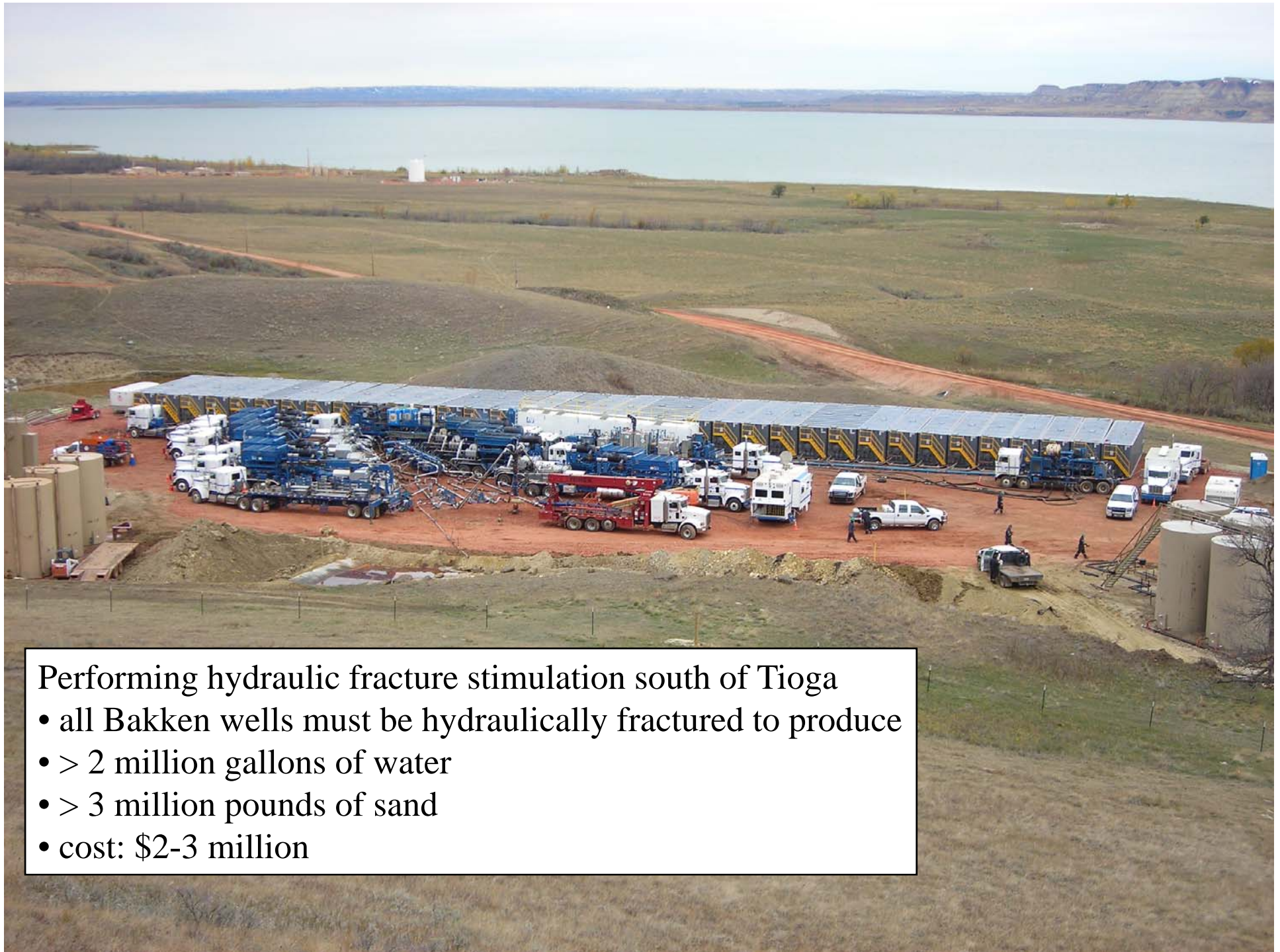
- crack the reservoir
- gel strength to carry sand

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**

Industrial Commission Regulation

- Hydraulic fracturing regulation
 - NDAC Section 43-02-03-27.1
 - <https://www.dmr.nd.gov/oilgas/>
 - sur csg open + diversion line to pit/vessel
 - relief valve on treating lines w/ck valves
 - remote operated frac valve on treat lines
 - if sur csg press > 350 psi notify NDIC
 - 60 days post FracFocus chem registry

- **Frac down 4-1/2'' frac string**
 - **sting into liner or set pkr below Kd**
 - **press and monitor 4-1/2'' X 7'' ann**
 - **press relief valve on treating lines**
 - **set $\leq 85\%$ of yield press**
 - **press relief valve on 4-1/2'' X 7'' ann**
 - **set $\leq 85\%$ of weakest 7'' yield**
 - **diversion line run to pit or vessel**

- **Frac down 7'' csg string**
 - **max treating press 85% of csg rating**
 - **csg eval tool to verify wall thickness**
 - **inspect + photo of top 7'' csg jt**
 - **reduce treating press if warranted**
 - **cmt eval tool to confirm cmt**
 - **run frac string if defective cmt**
 - **press test 7'' and wellhead**
 - **if wellhead press rating < frac design**
 - **use wellhead protection system**

States have been regulating the full life cycle of hydraulic fracturing for decades

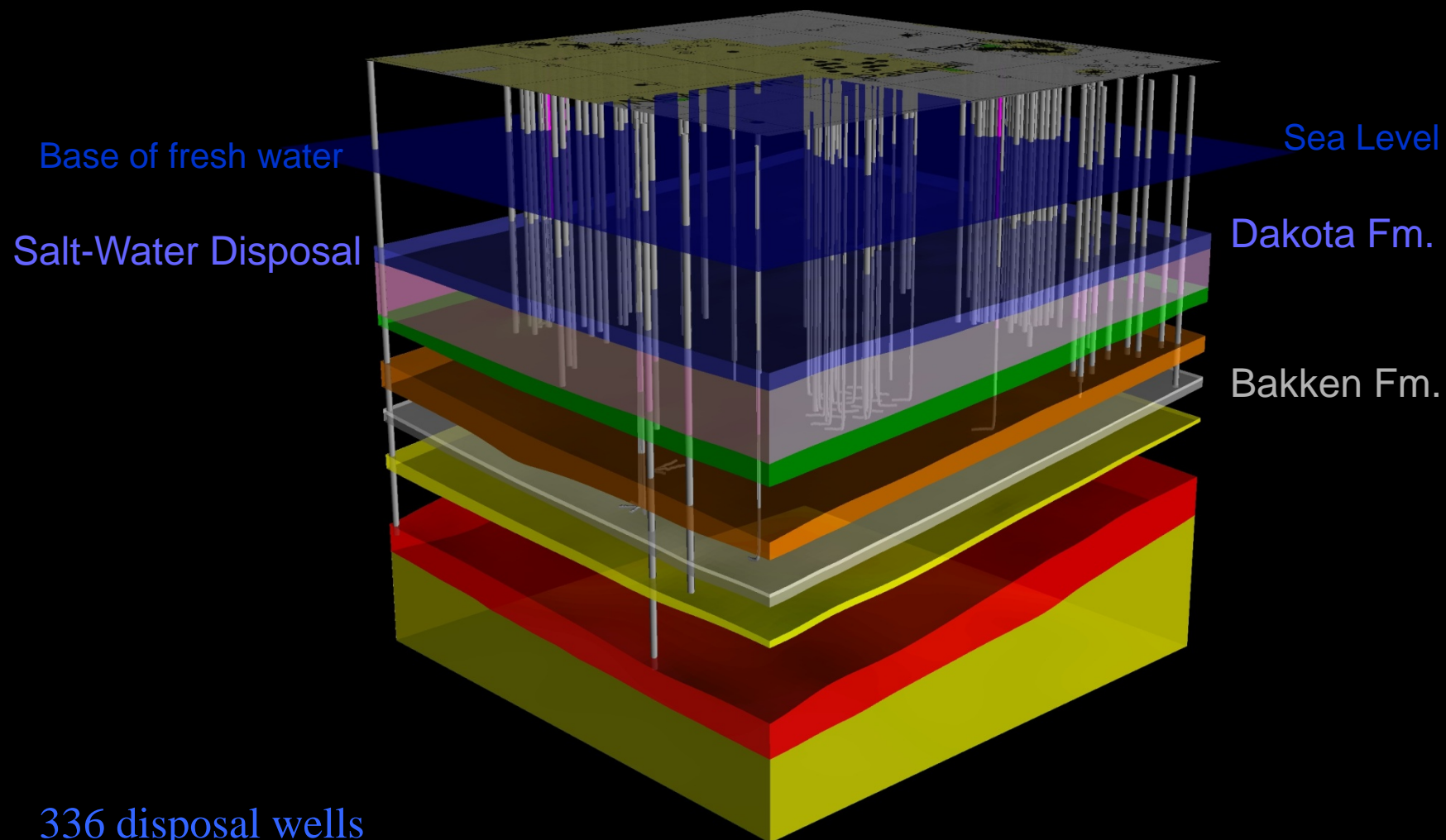
- Water Appropriation Regulation**
- Oil & Gas Regulation**
- Health Department Regulation**
- Geologic setting in each basin different**

Hydraulic Fracturing Stimulation is Safe

- **IOGCC survey—no contamination**
- **GWPC study verifies State's regs**
- **GWPC National Registry f/chemicals**

Industrial Commission Regulation

- **Water flowback after frac**
 - **Storage in open pits prohibited**
 - **Disposal wells permitted through Underground Injection Program**
 - **Disposal zone is 2,500 feet below potable waters**



336 disposal wells

720,000 barrels per day

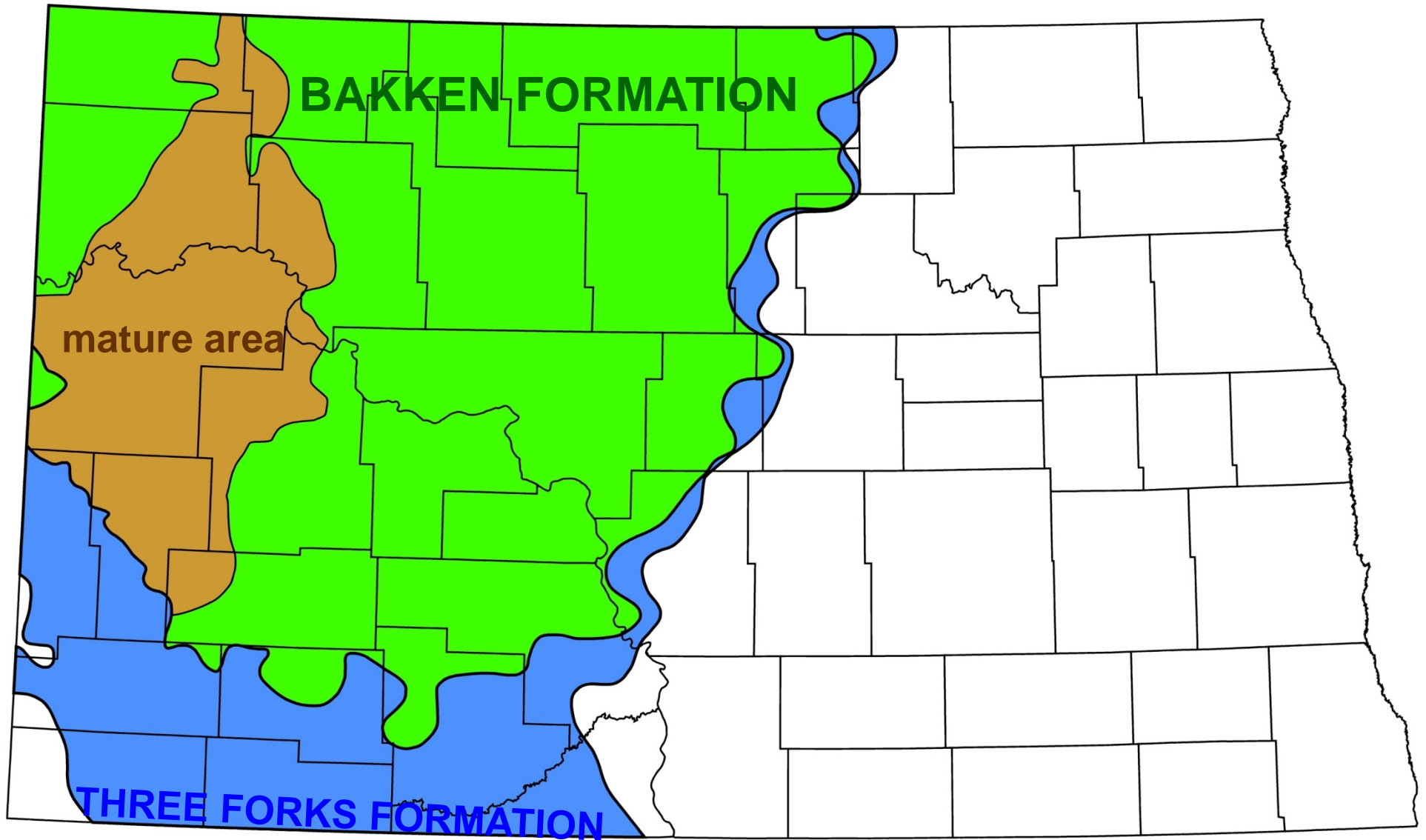
Rules and Legislation

- **prohibit reserve pits**
 - **allow cuttings pit only**
 - **implement strong HF rules**
- **63rd Legislative Session—ends today ☺**
 - **HB 1333—GIS pipelines**
 - **HB 1234—reduce O&G taxes—failed?**

North Dakota Development

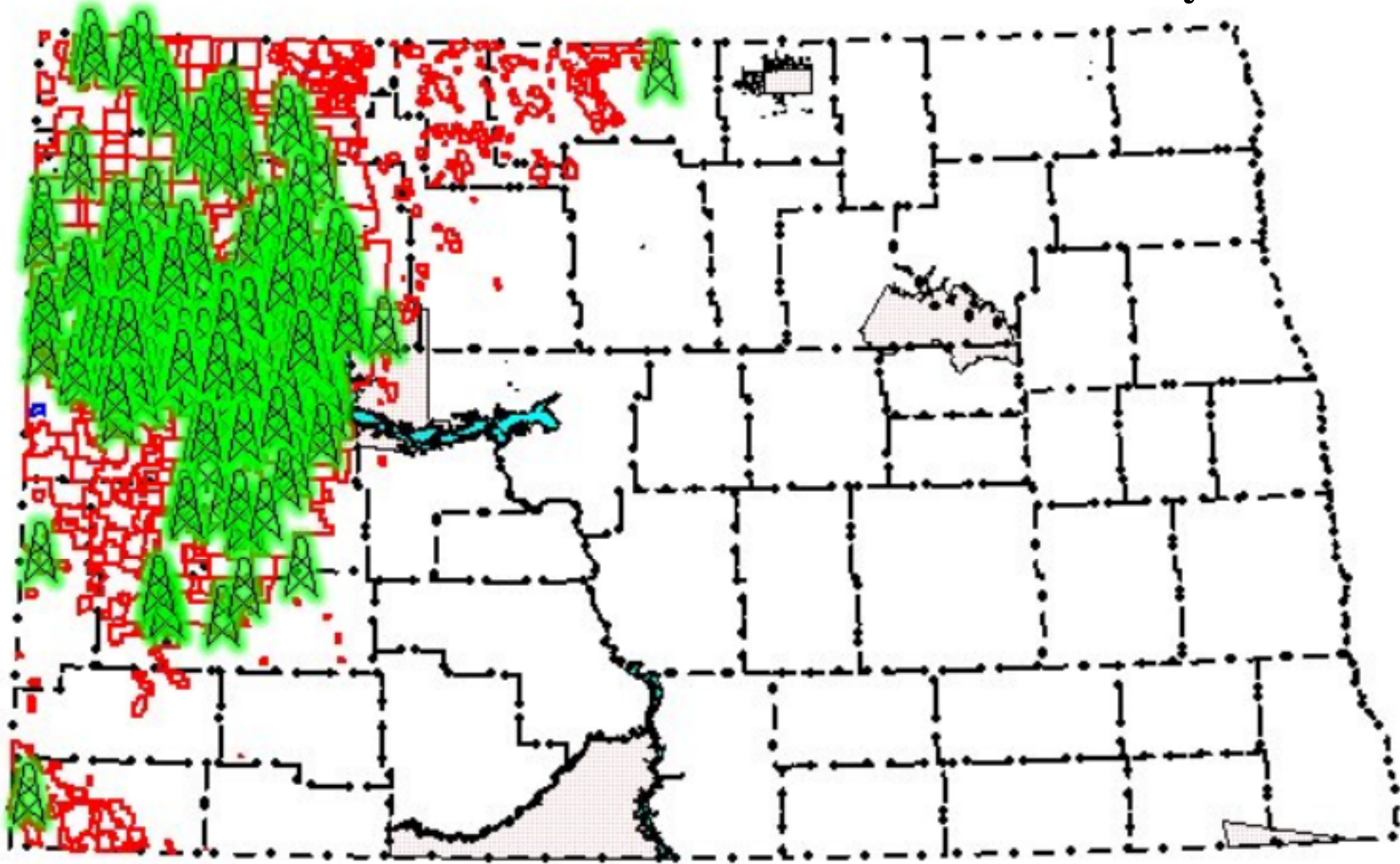
- Regulation
- **Resource Play**
- Uniform Spacing—orderly development
- Multi-well locations—small footprint
- Corridors—industry and residents
- Water Needs—surface waters
- Bakken Results

ESTIMATED MATURE AREA OF THE BAKKEN FORMATION



(Nordeng, 2010)

NORTH DAKOTA – 187 DRILLING RIGS – May 2013



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

Click the button below to create a PDF version of the above map or to view the legend.

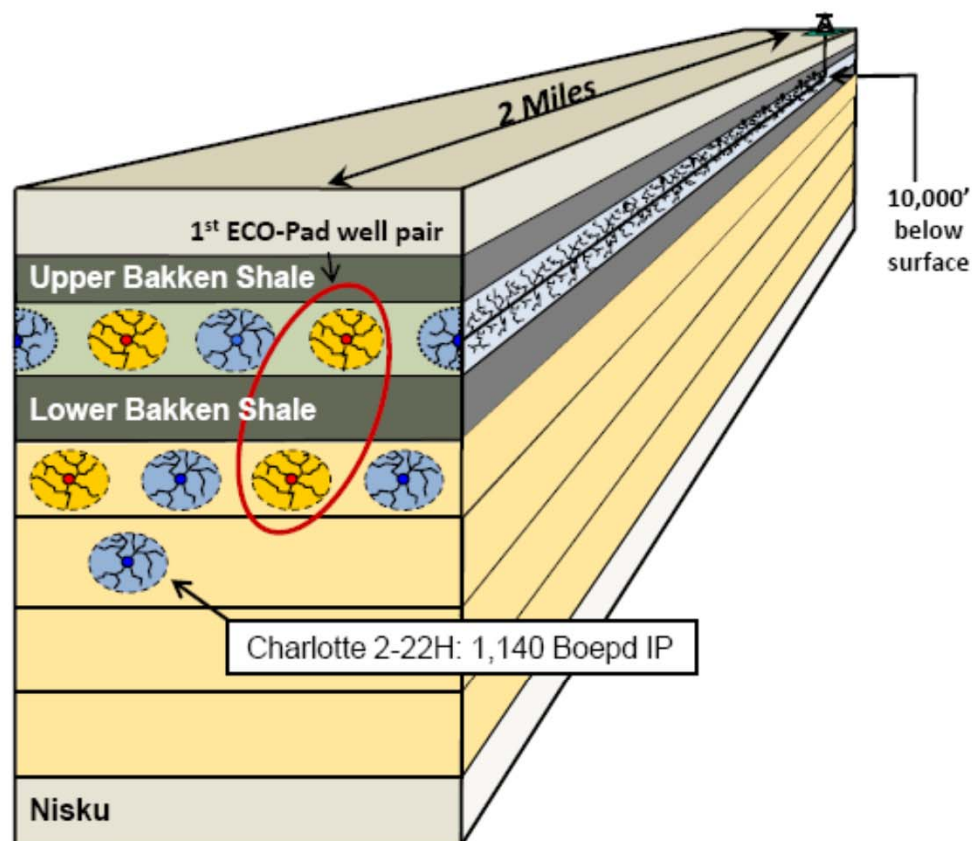
Bakken Development Plan

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

Three Forks



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

: ArcIMS Viewer



1280 Acre

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

Power

Download Shape Files



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

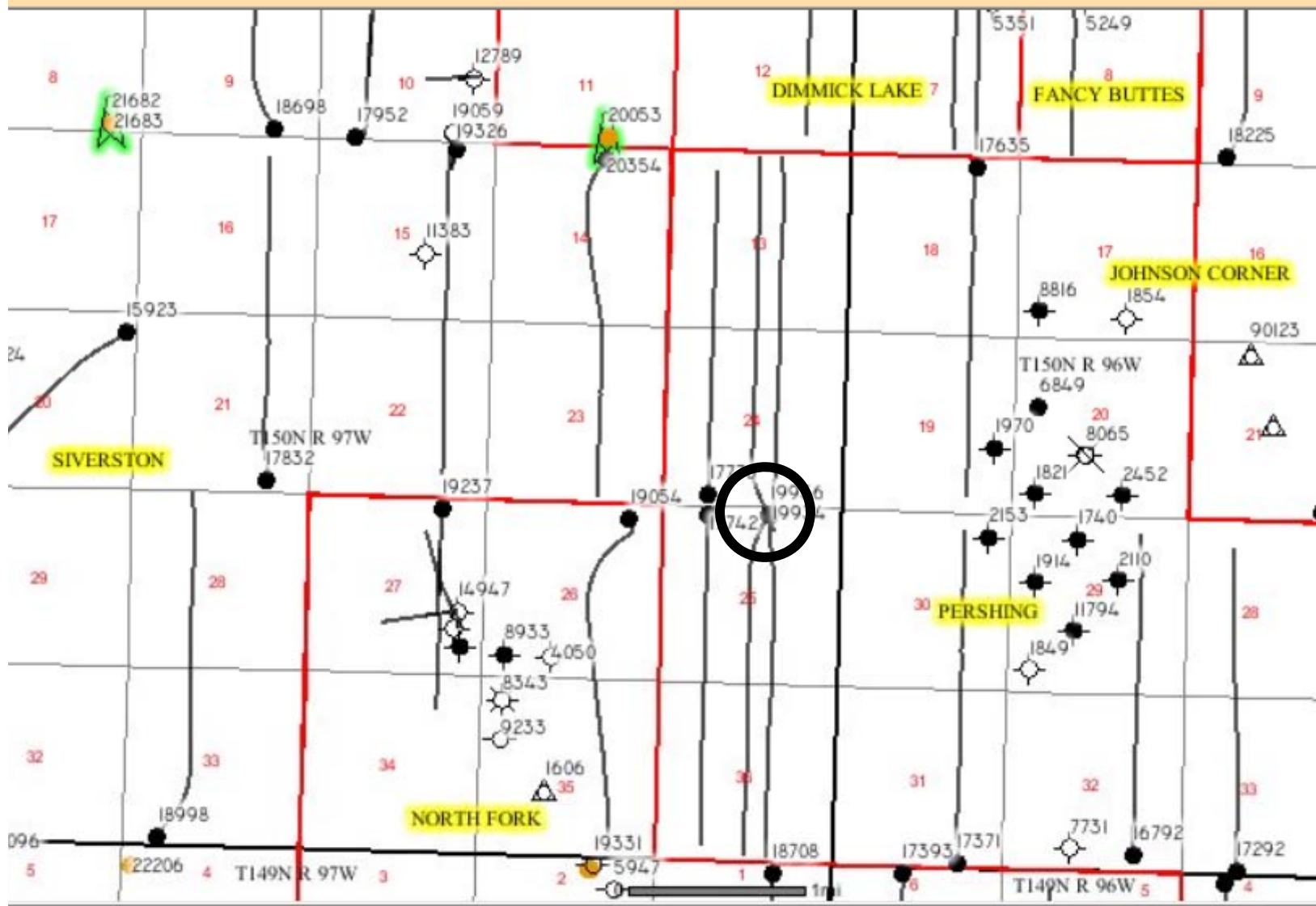
☒ Auto Refresh

Help:

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

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ND OIL & GAS

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

Refresh

☒ Auto Refresh

Help:

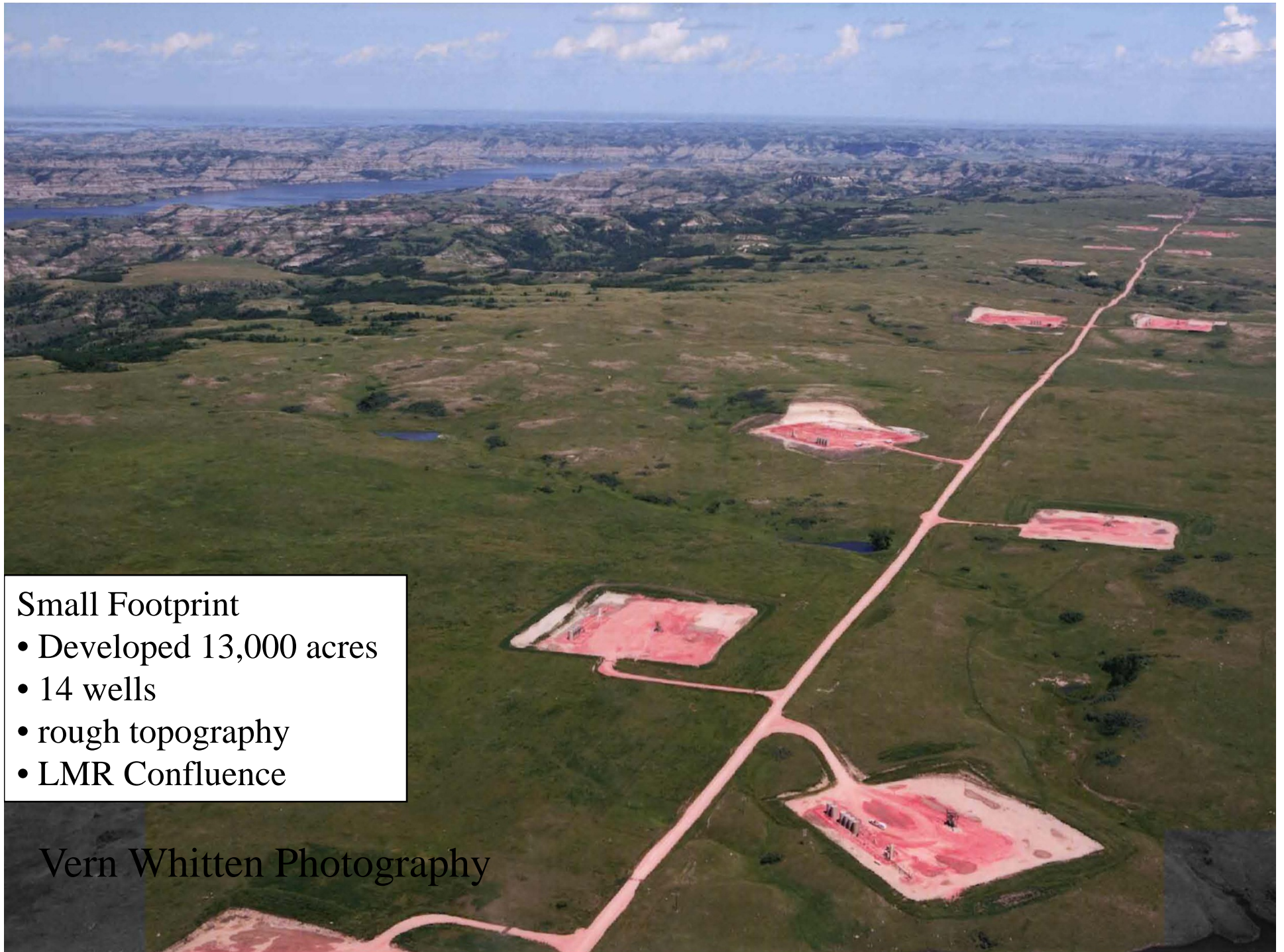
- ☒ A closed group, click to open
- ☒ An open group, click to close
- ☒ A map layer.
- ☒ A hidden group/layer, click to show
- ☒ A visible group/layer, click to hide
- ☒ A visible layer, but not at the top
- ☒ A partially visible group/layer



Vern Whitten Photography

North Dakota Development

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Small Footprint

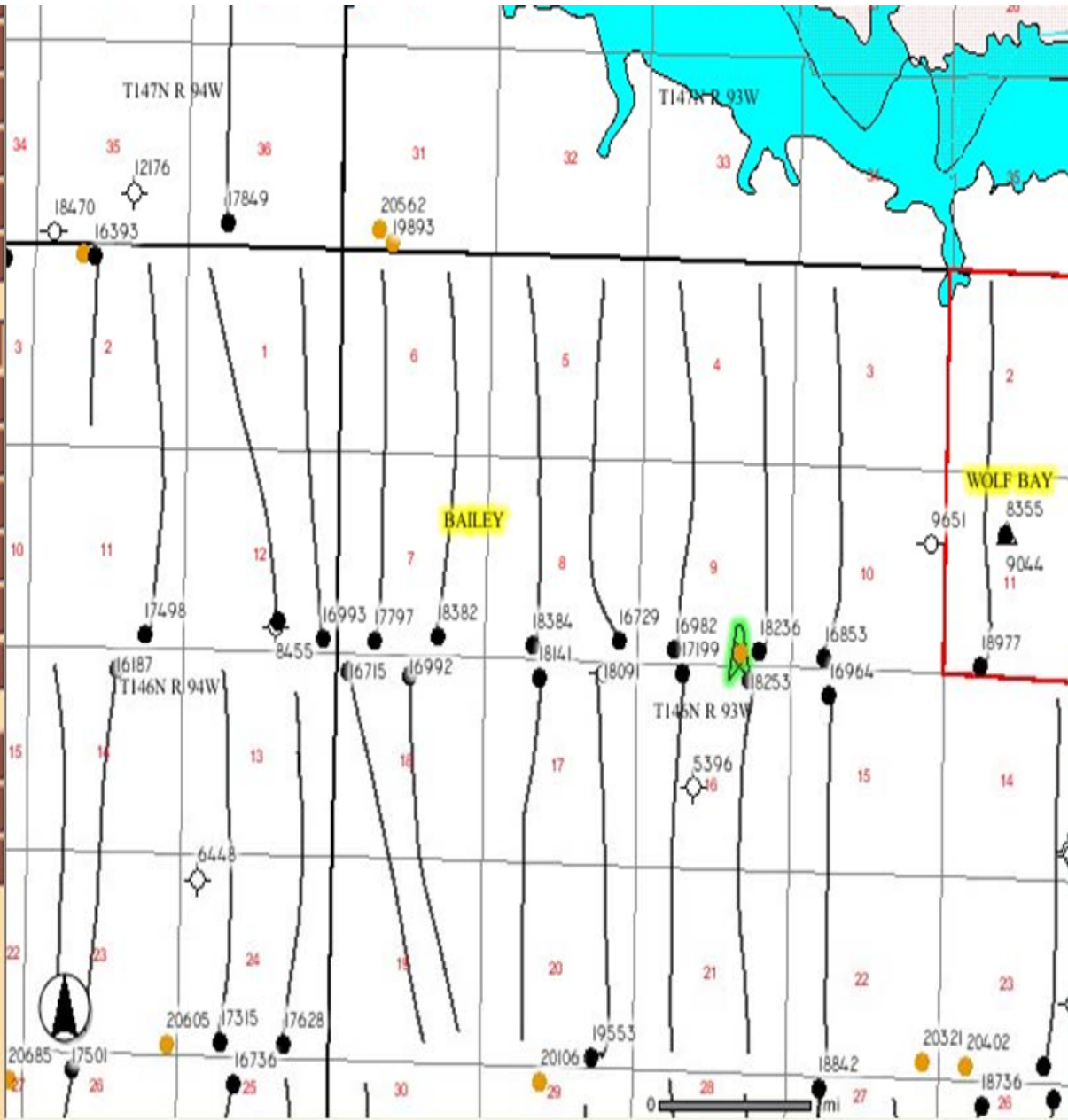
- Developed 13,000 acres
- 14 wells
- rough topography
- LMR Confluence

Vern Whitten Photography

View 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



Major Rivers
Selection cleared.

- ☒ Rig Location
- ☒ Directional Surveys
- ☒ Directional Legs
- ☒ Horizontal Surveys
- ☒ Horizontal Legs
- ☒ Cases Docketed
- ☒ Oil Fields
- ☒ Unit Boundaries
- ☒ Inspector Areas
- ☒ Drilling / Spacing
- ☒ 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

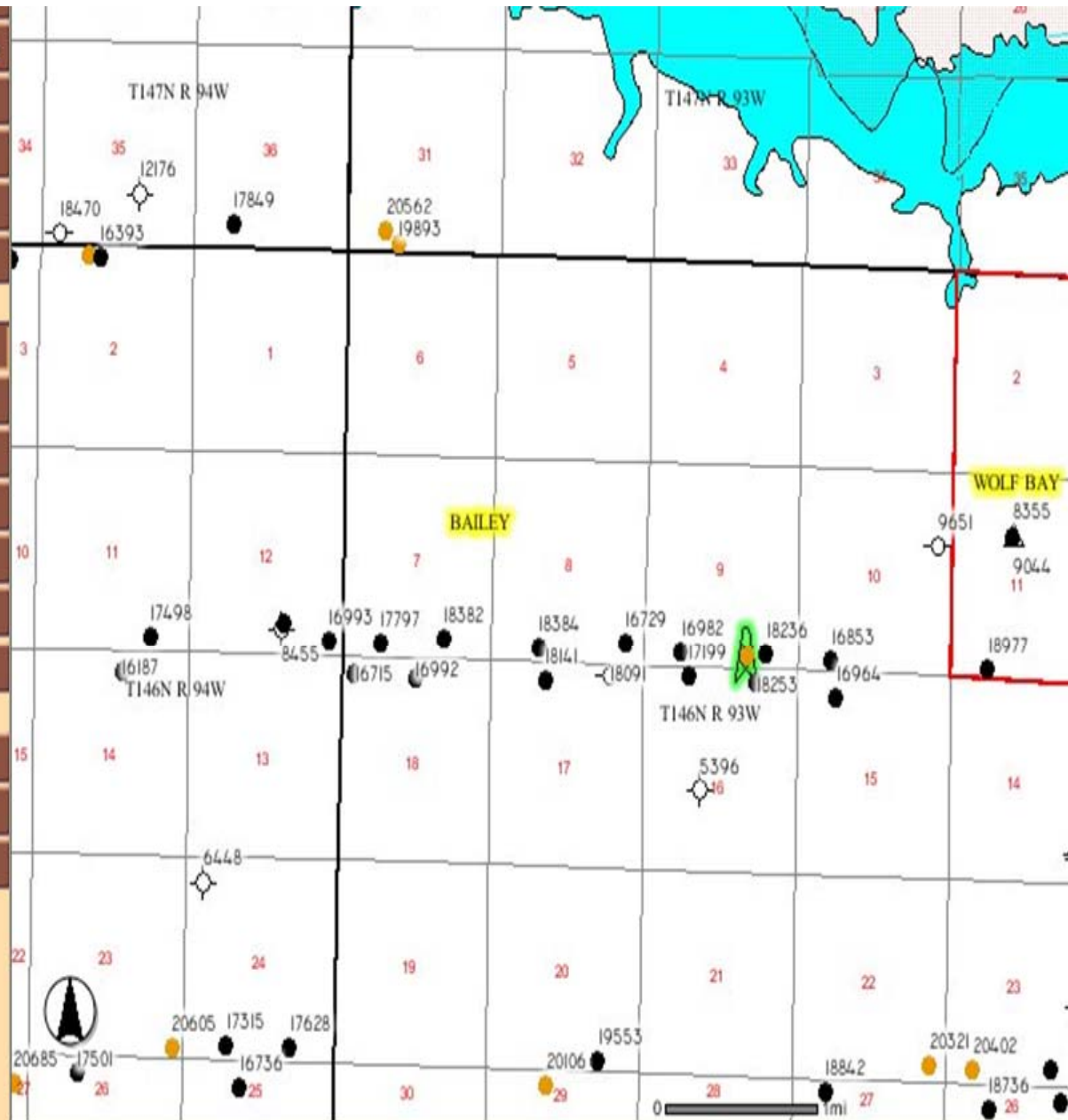
Refresh Map

☒ Auto Refresh

Help:

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- An open group, click to close.
- A map layer.
- A hidden group/layer, click to make visible.

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







Major Rivers
Selection cleared.

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 - Topo/DRG 100k
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Refresh Map

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Thirsty Horizontal Wells

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

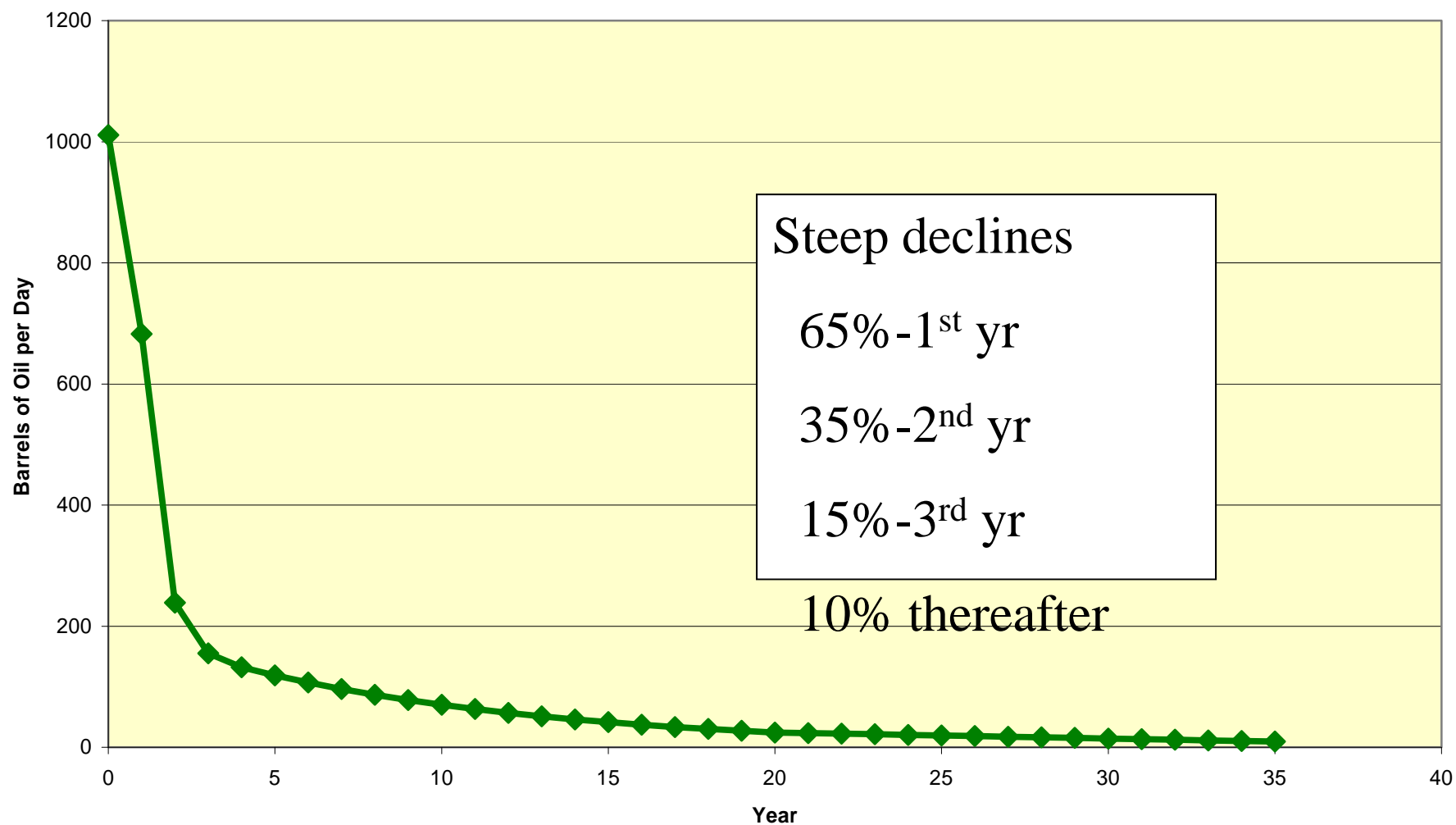
Commission supports surface water use

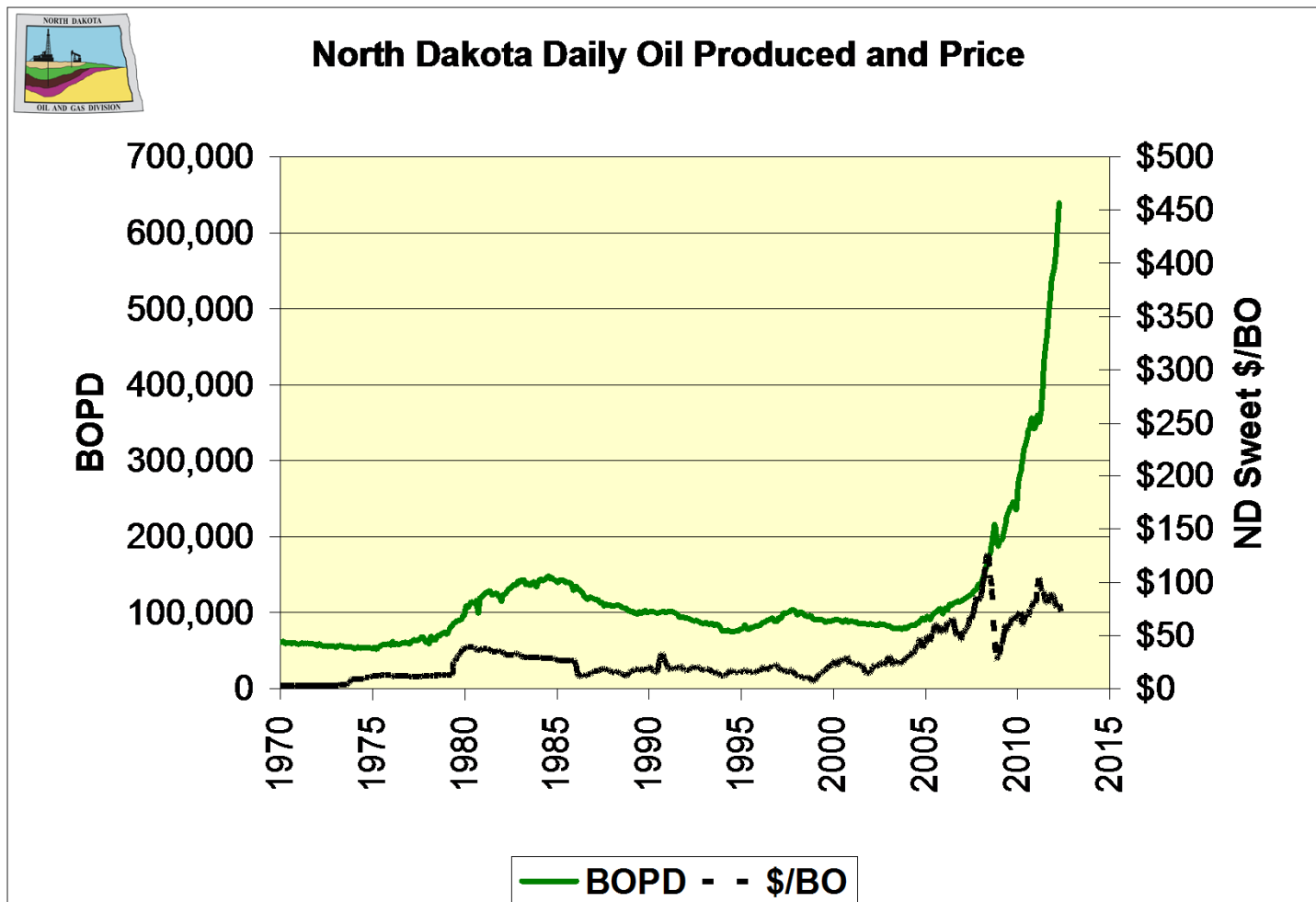
- **Lake Sakakawea best water resource**
 - **one inch contains 10 billion gal water**
 - **5000 wells @ 2mil gal wtr/well**
 - **2-year supply**

North Dakota Development

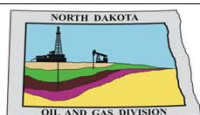
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- **Bakken Results**

Typical Bakken Well Production

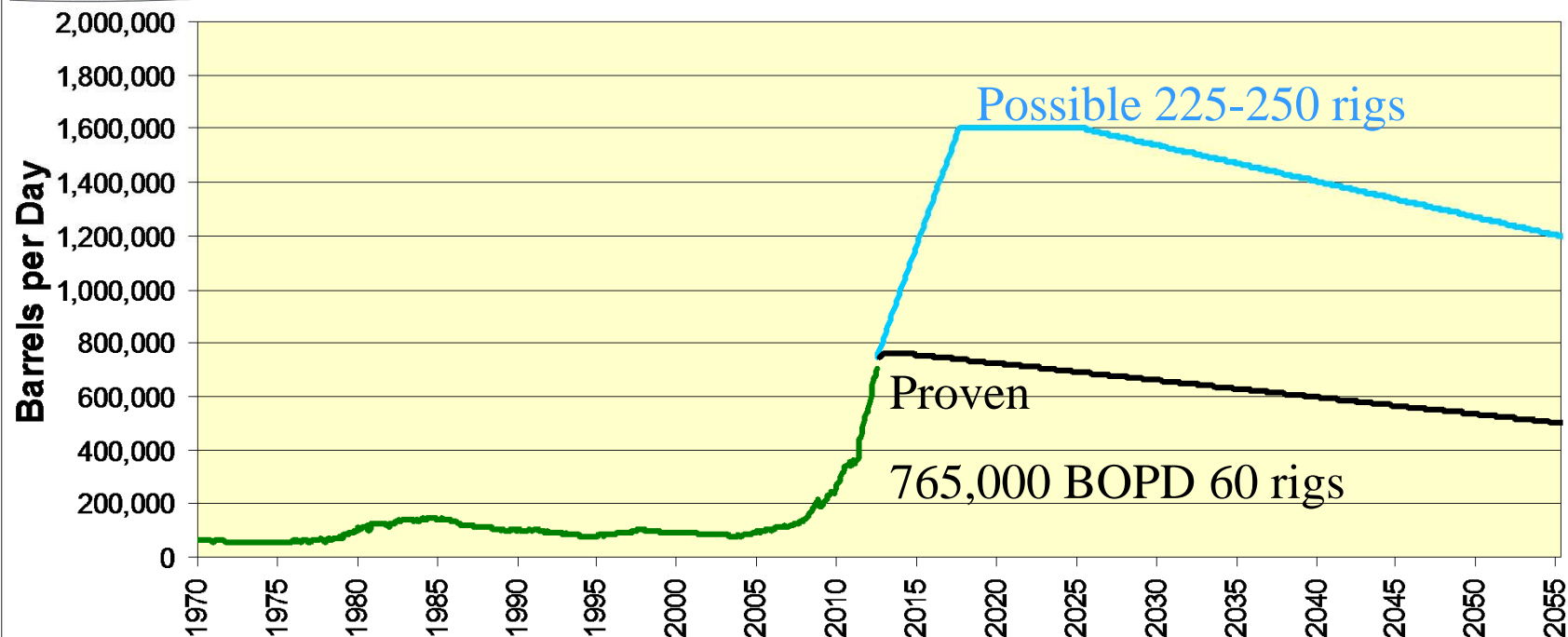




Production 780,000 bopd (appr 716,971 from Bakken—92%)



North Dakota Oil Production



5,200 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 P90

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**



Reclaimed Location

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