



**North Dakota Pipeline Authority**  
**North Dakota Petroleum Council Annual Meeting**  
**September 20, 2012 – Medora, ND**

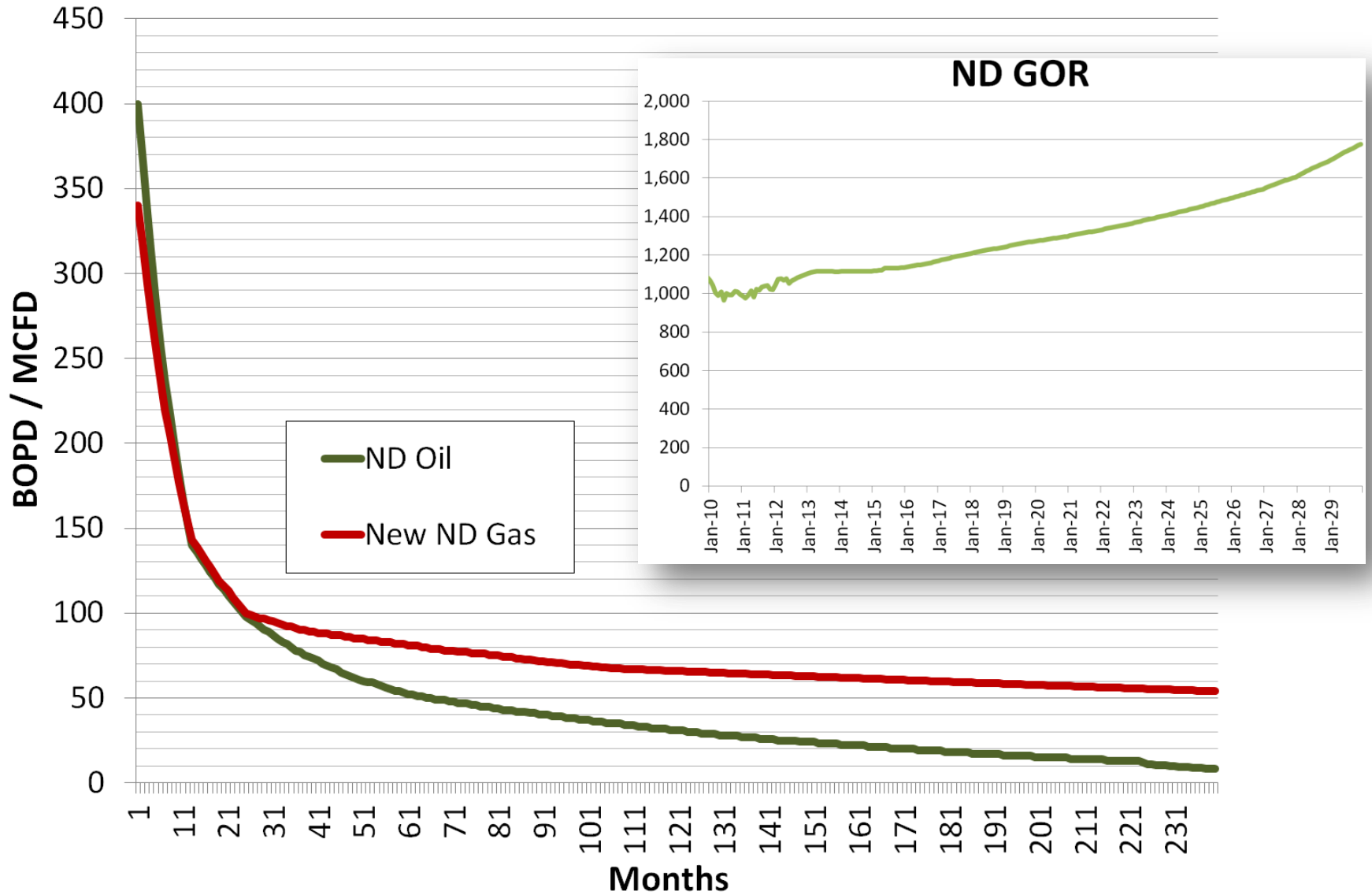
# Natural Gas Study

**WILLISTON BASIN**

**The Williston Basin:**  
Greasing the Gears for Growth in North Dakota

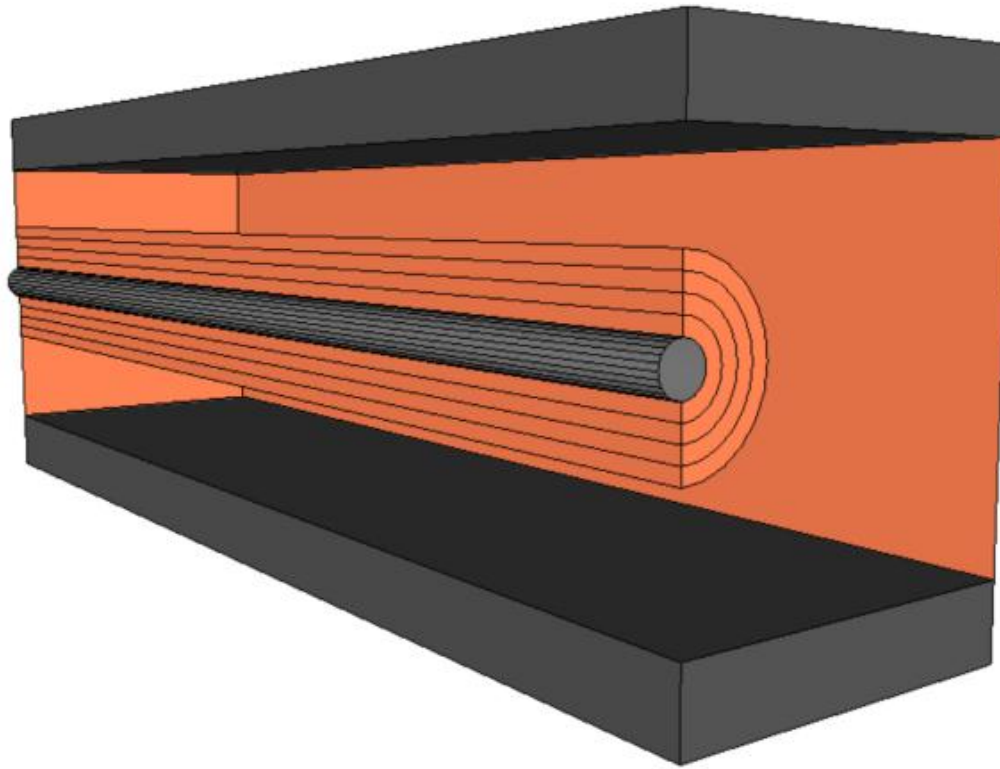
**BENTEK**  
Energy

# North Dakota Type Curves\*

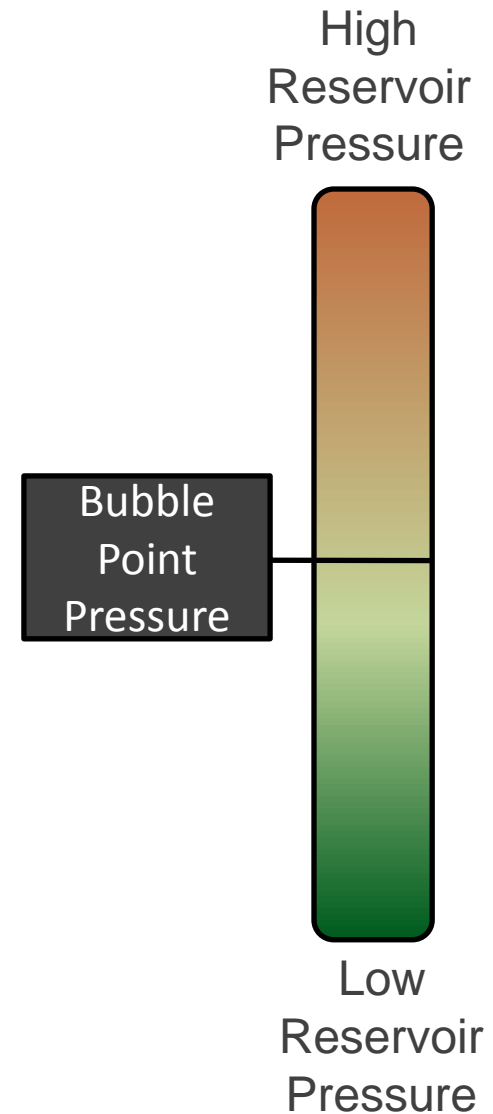


\*Based on the July 2012 BENTEK Natural Gas Study

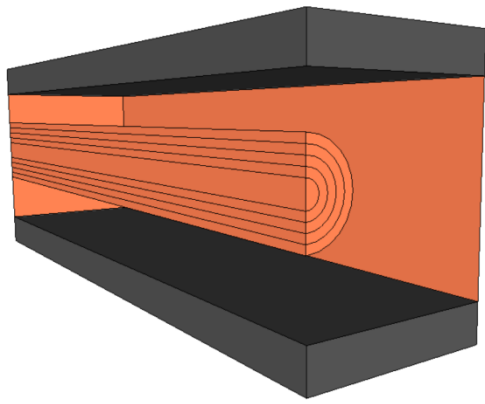
# Gas – Oil Ratio (GOR) Increasing Over Time



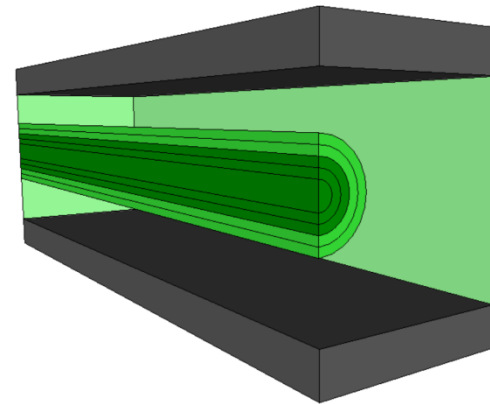
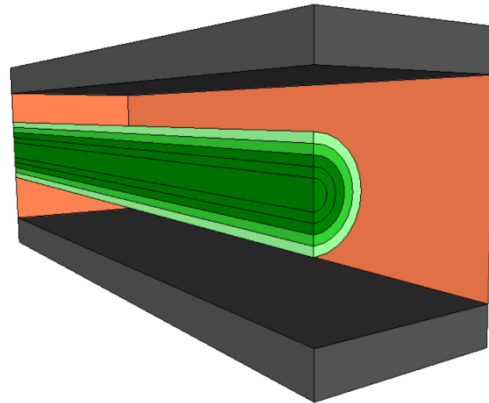
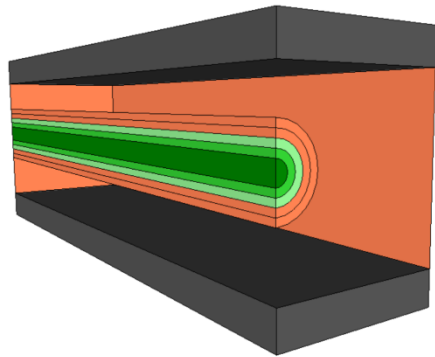
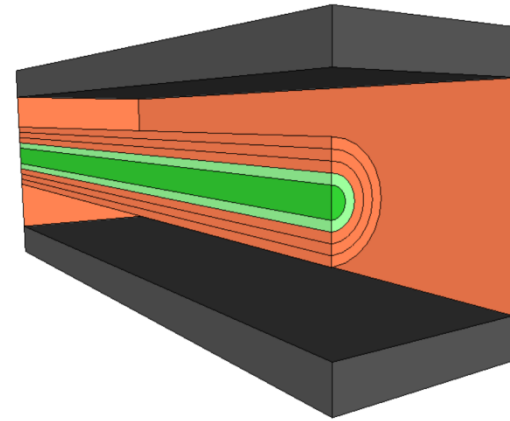
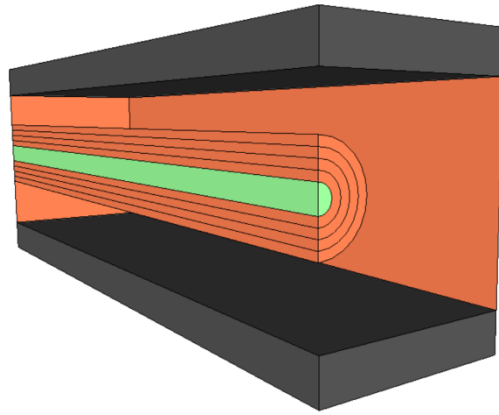
Horizontal Well Completed  
in Target Reservoir



# Gas – Oil Ratio (GOR) Increasing Over Time



Youngest - Original Reservoir Pressure



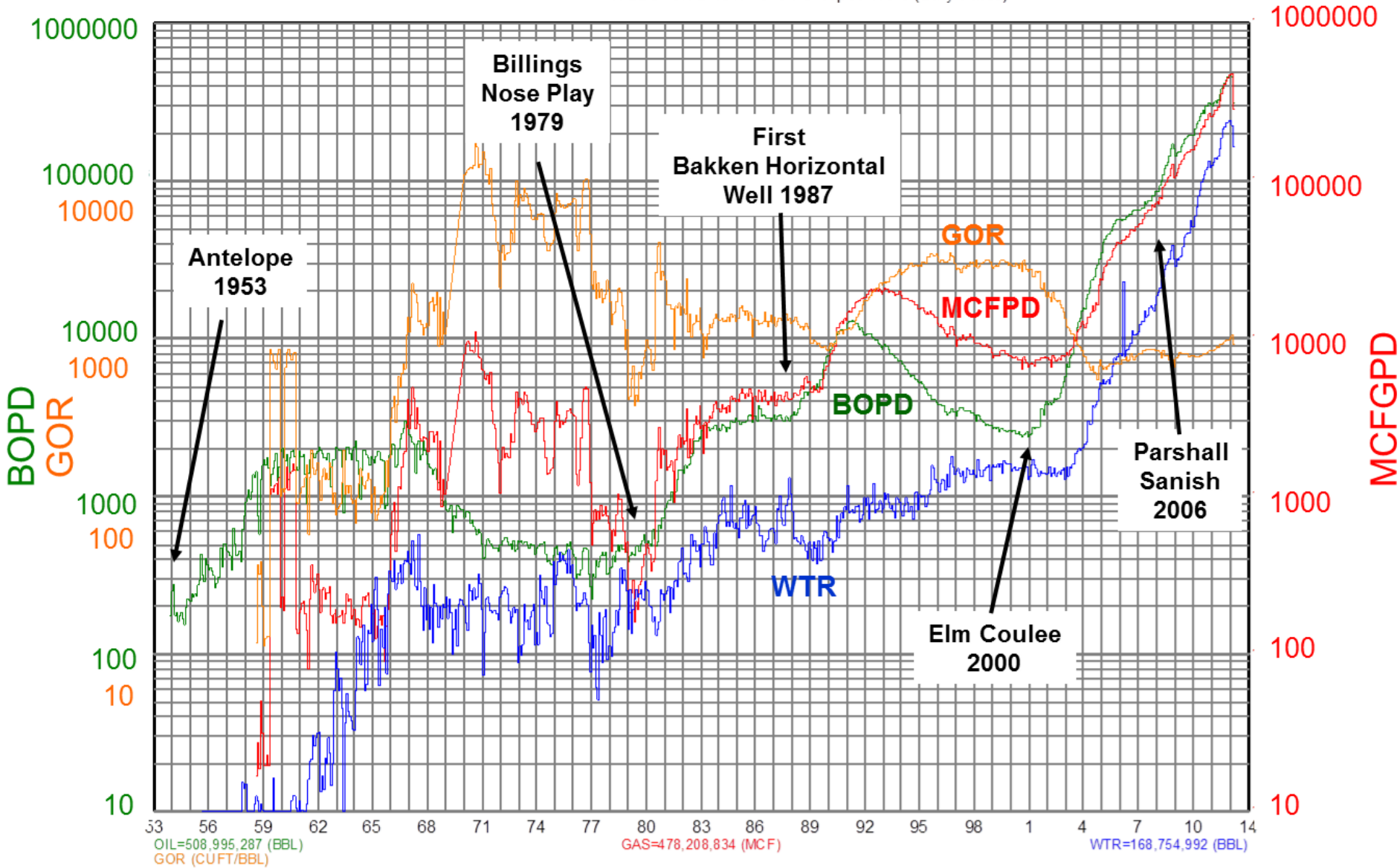
Oldest – Entire Reservoir Below Bubble Point

High Reservoir Pressure



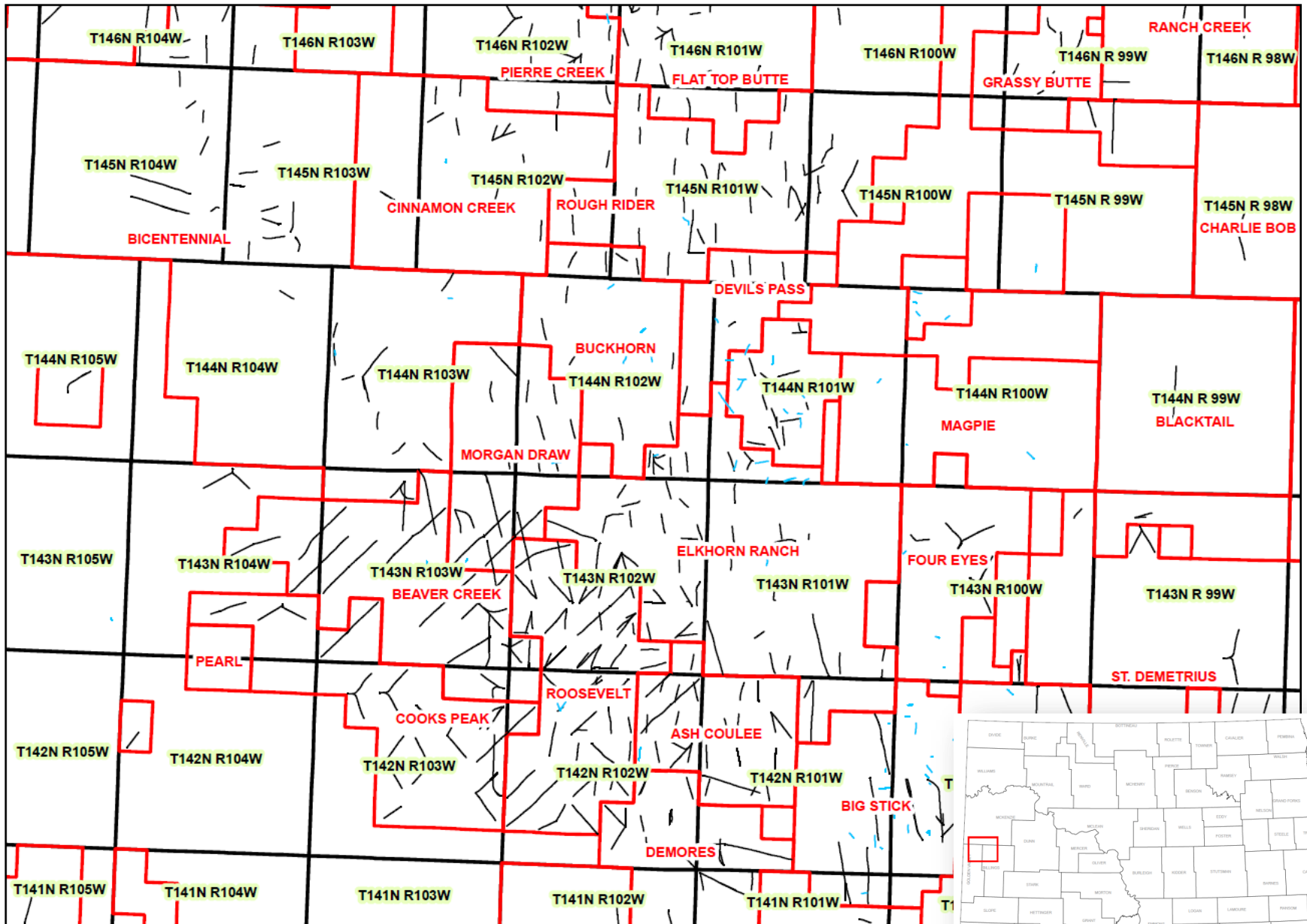
Bubble Point Pressure

Low Reservoir Pressure



*Production curve for the Bakken and Three Forks, US Williston Basin.*

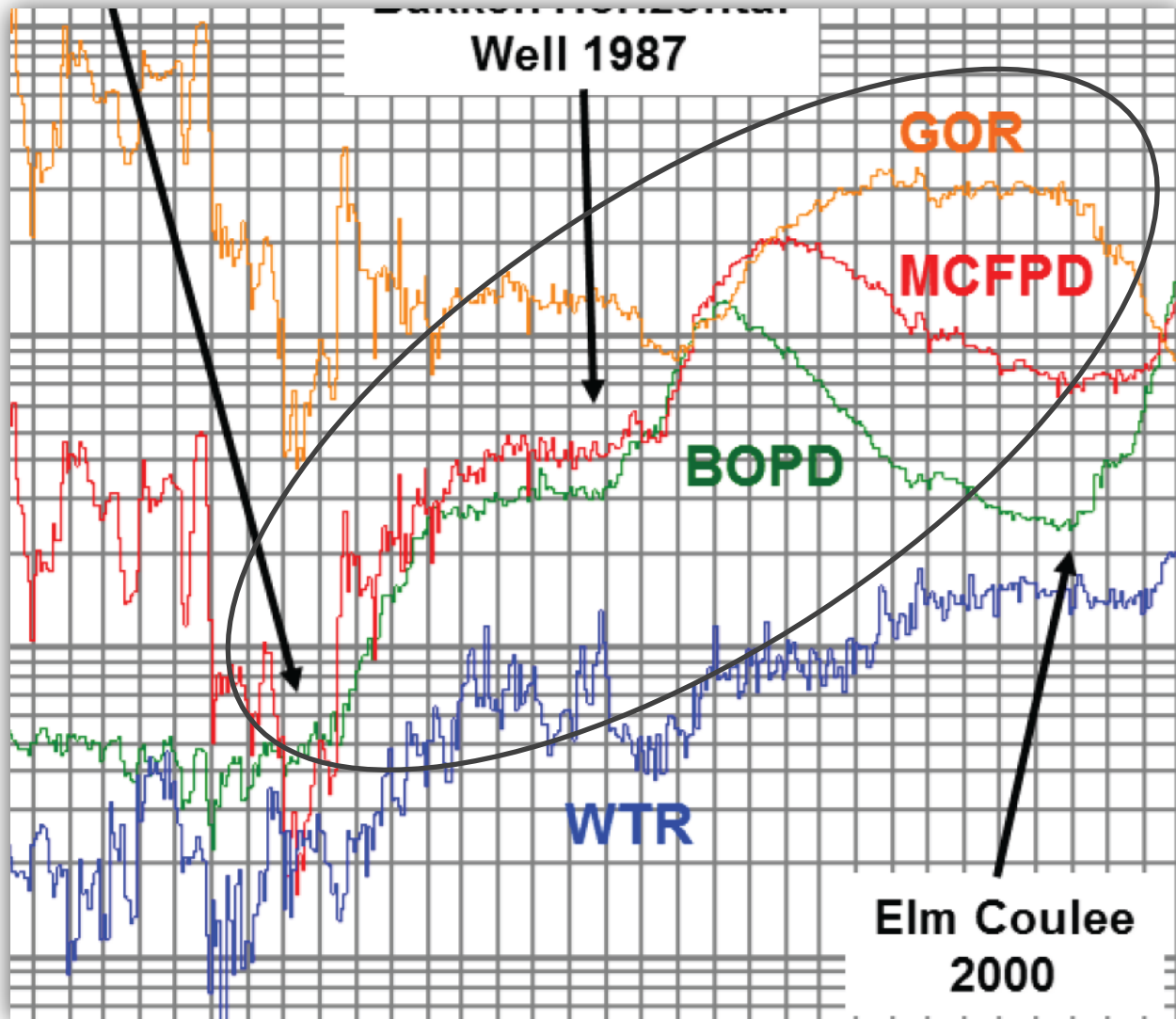
*Source: BENTEK Energy July 2012 Report*



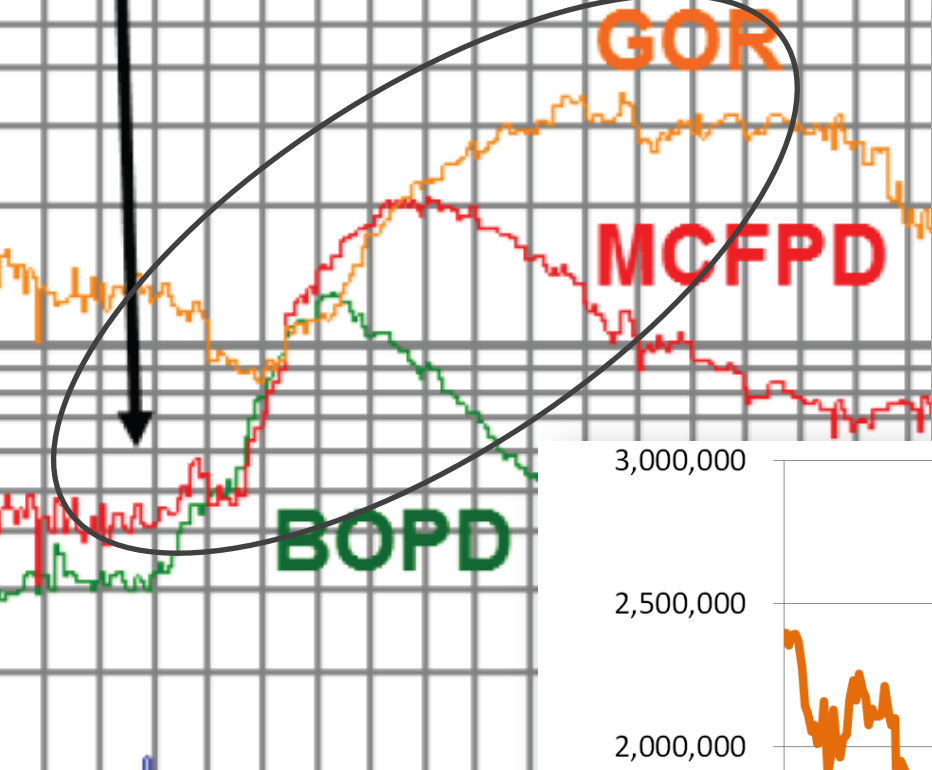
*Only horizontal wells shown on map*



# 1980's-90's Bakken Development

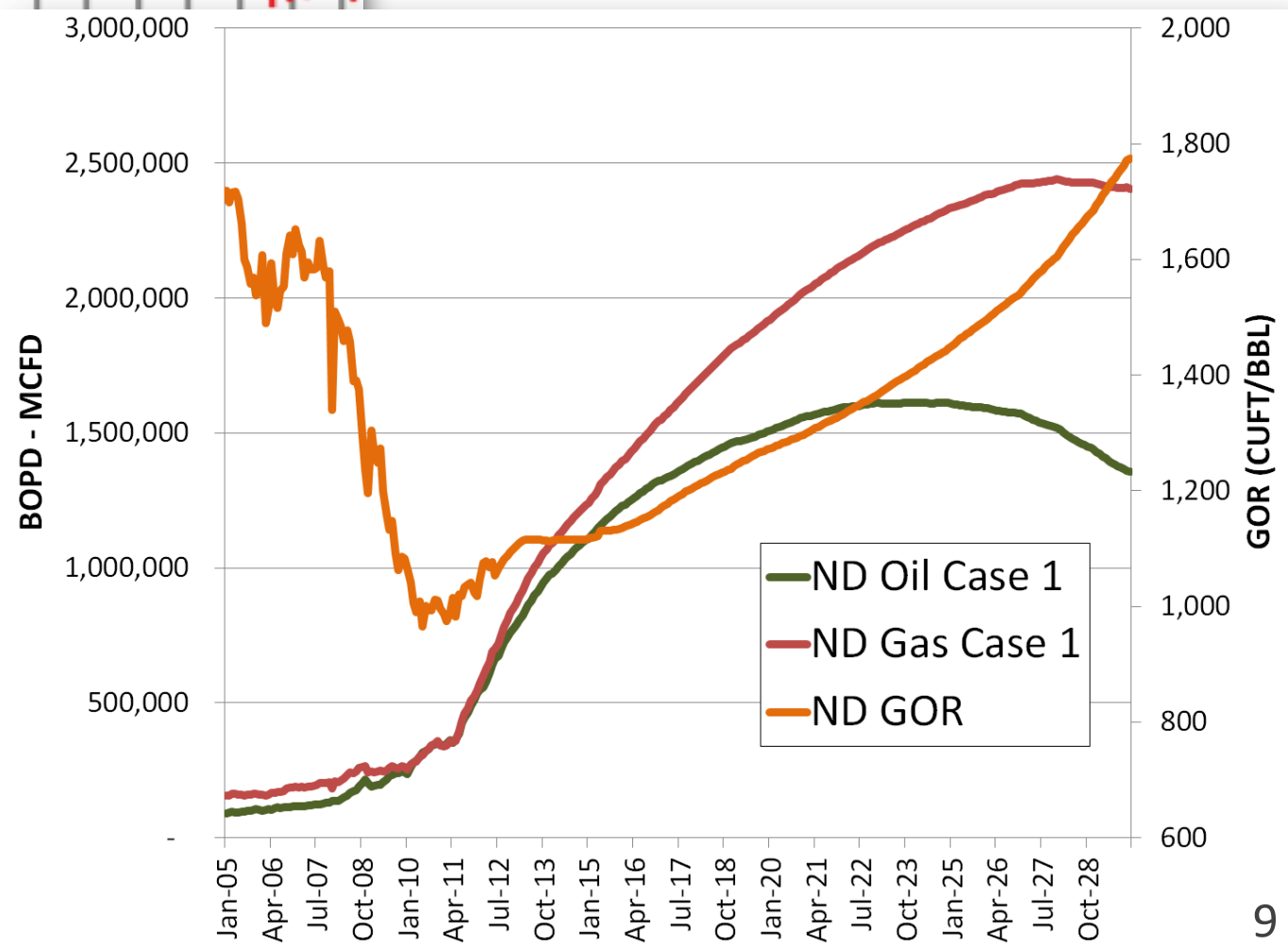




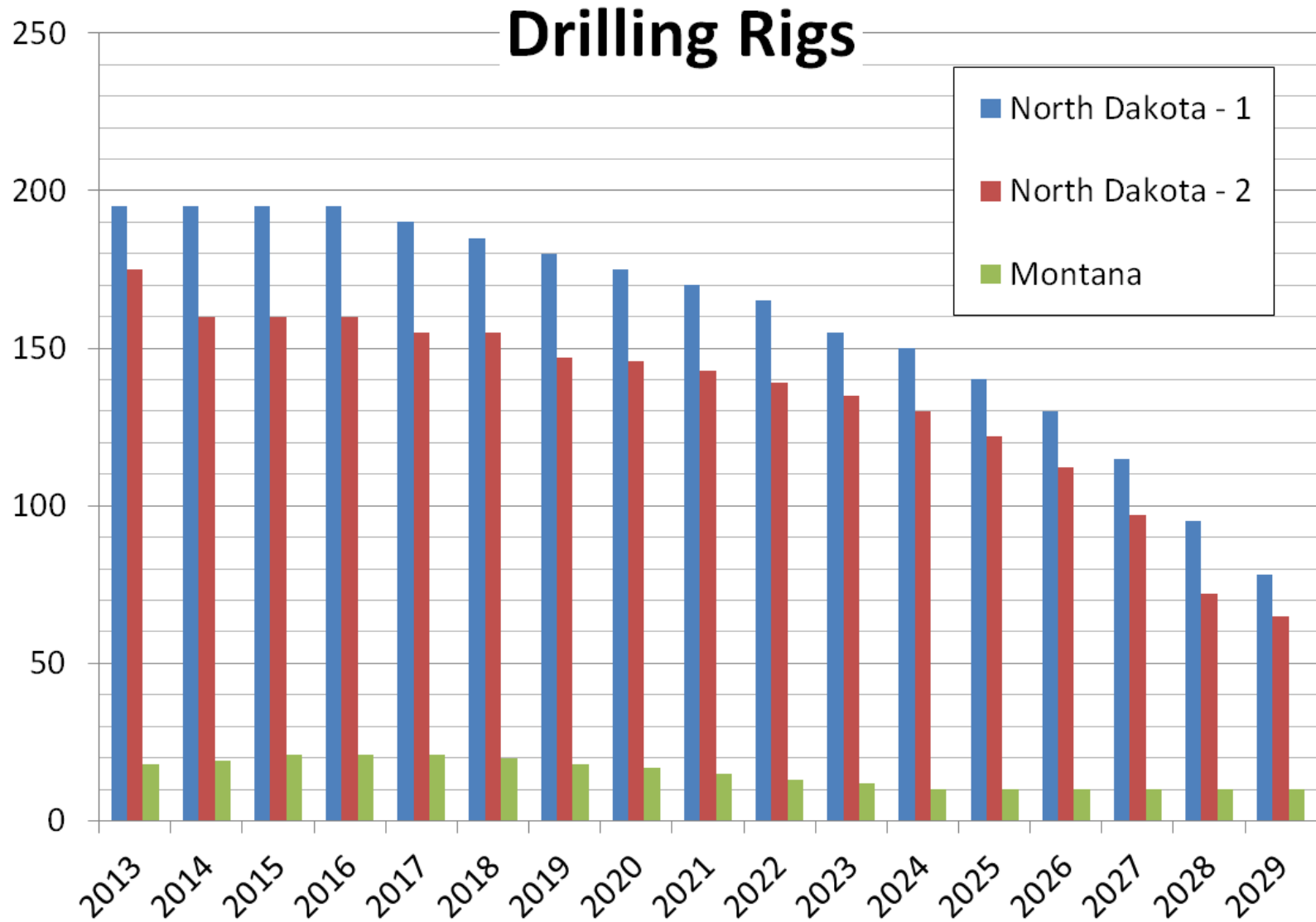


← GOR 3,000 CUFT/BBL

← GOR 1,000 CUFT/BBL

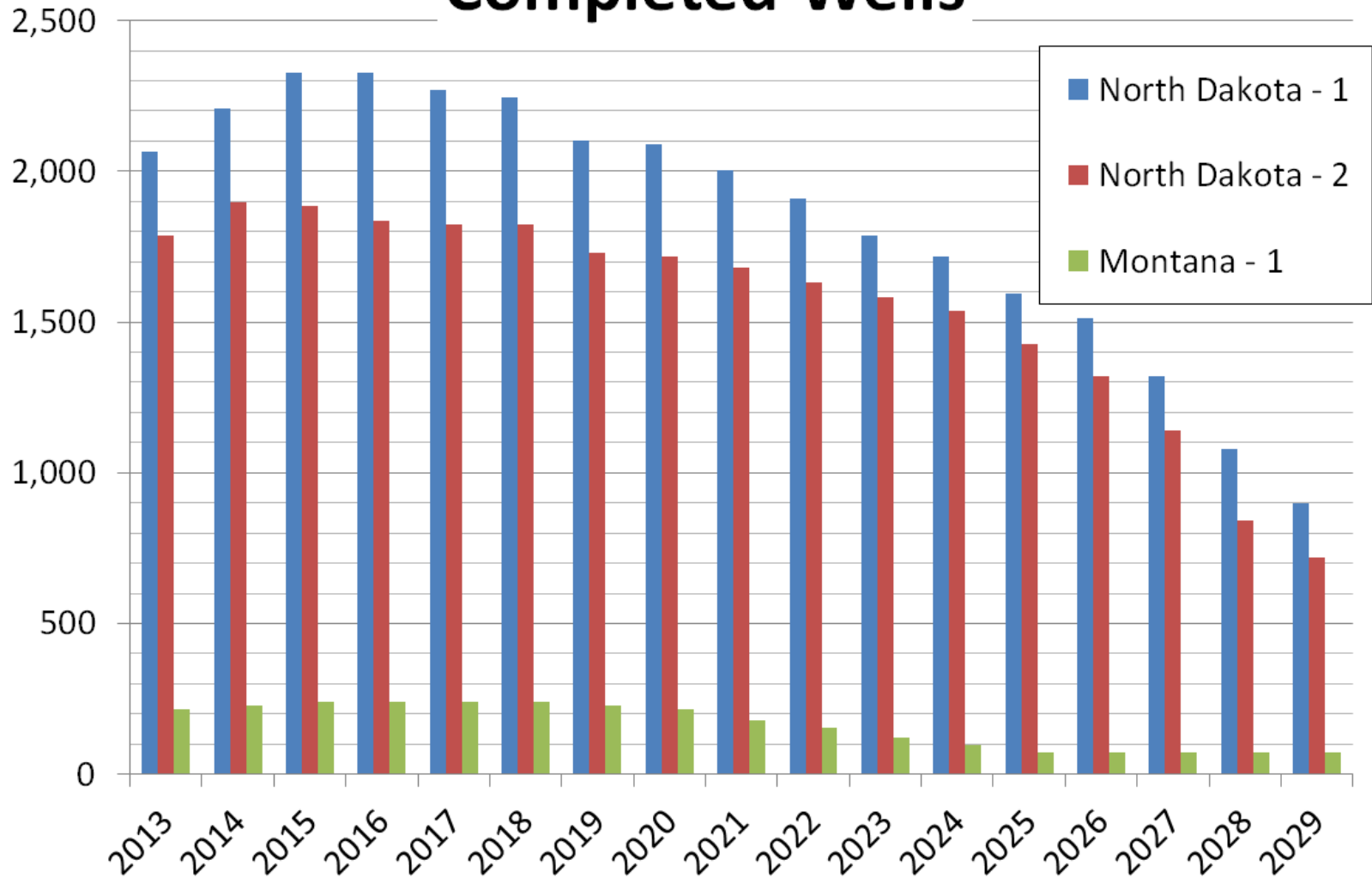


# September 2012 Forecast Assumptions

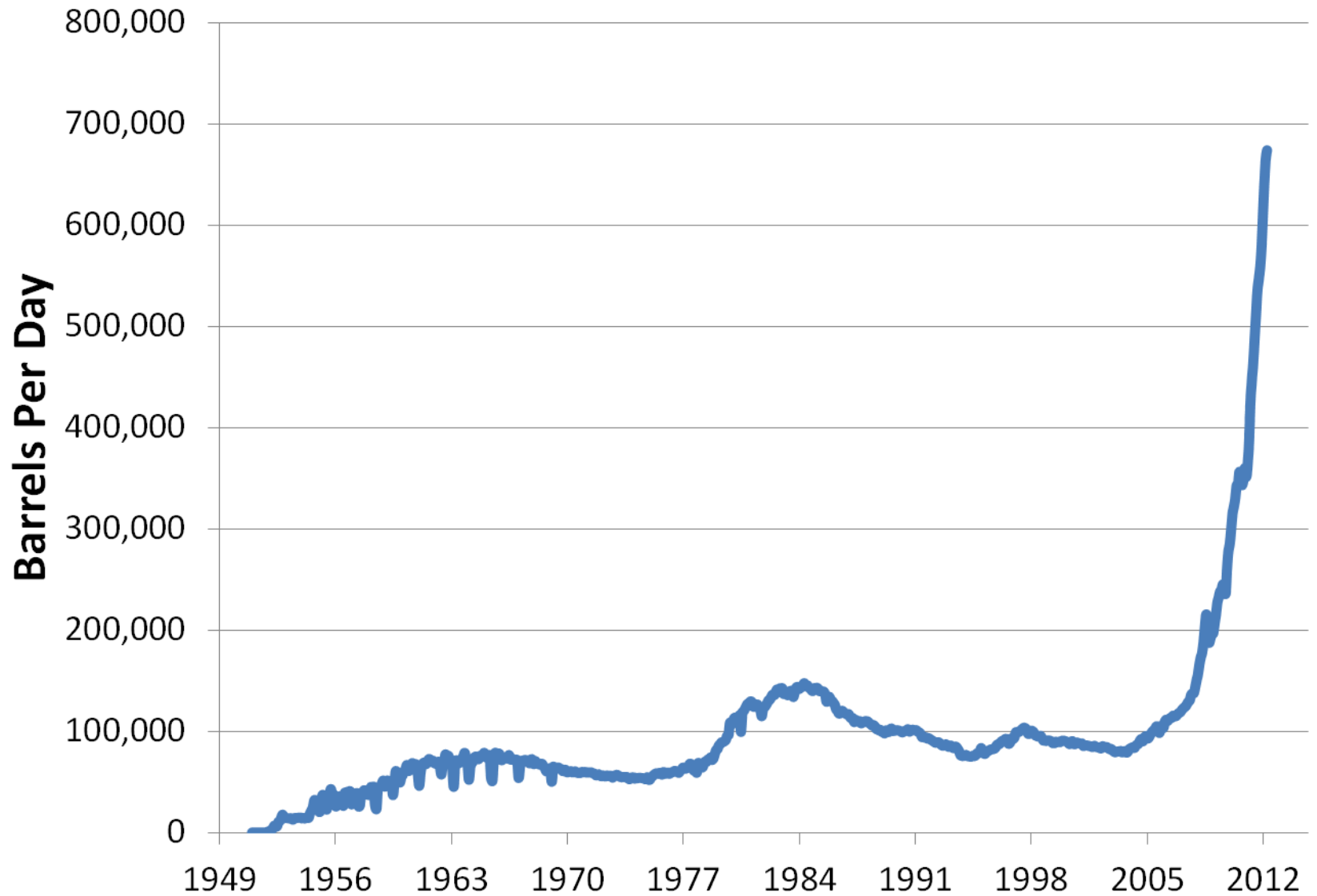


# September 2012 Forecast Assumptions

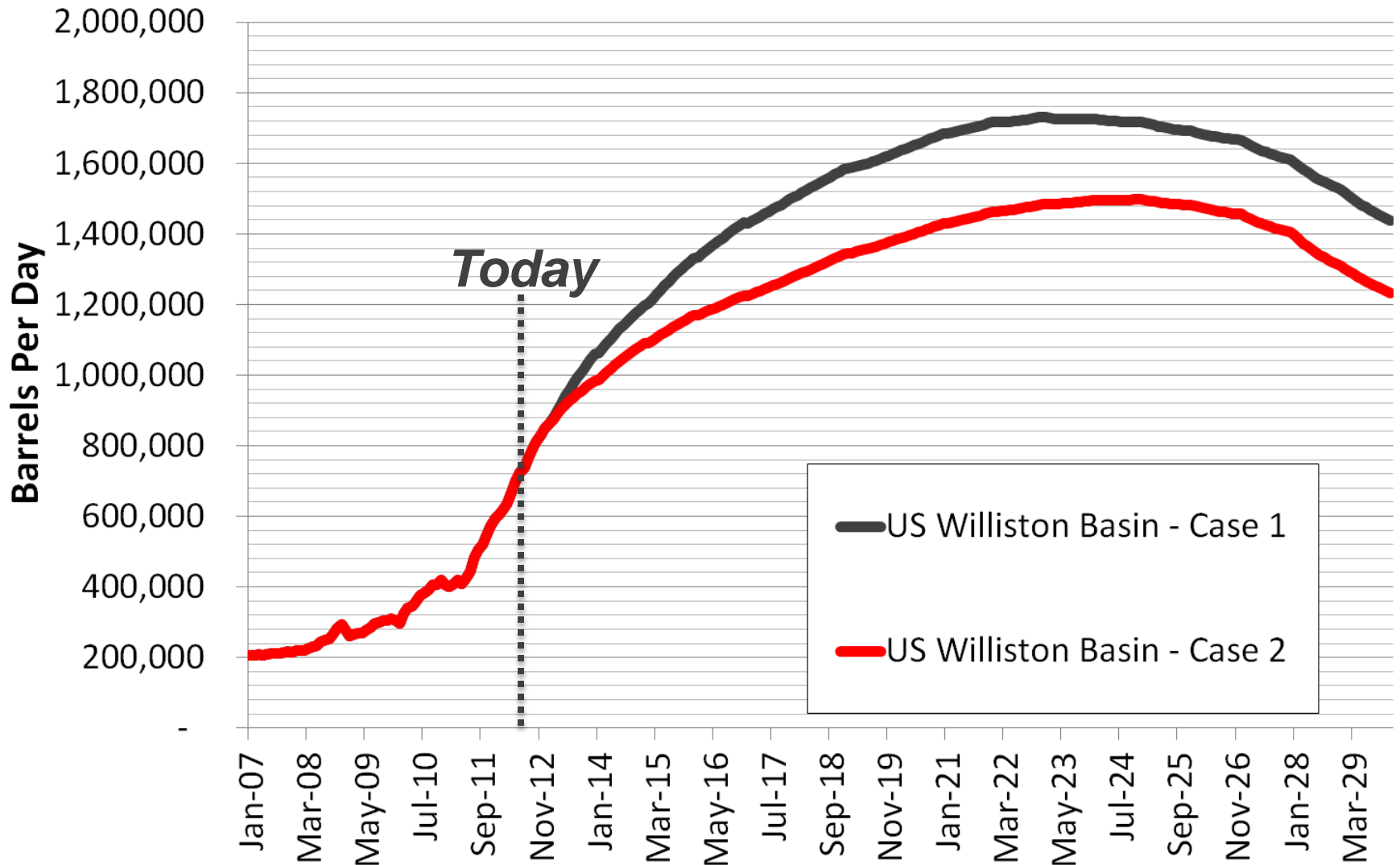
## Completed Wells



# North Dakota Crude Oil

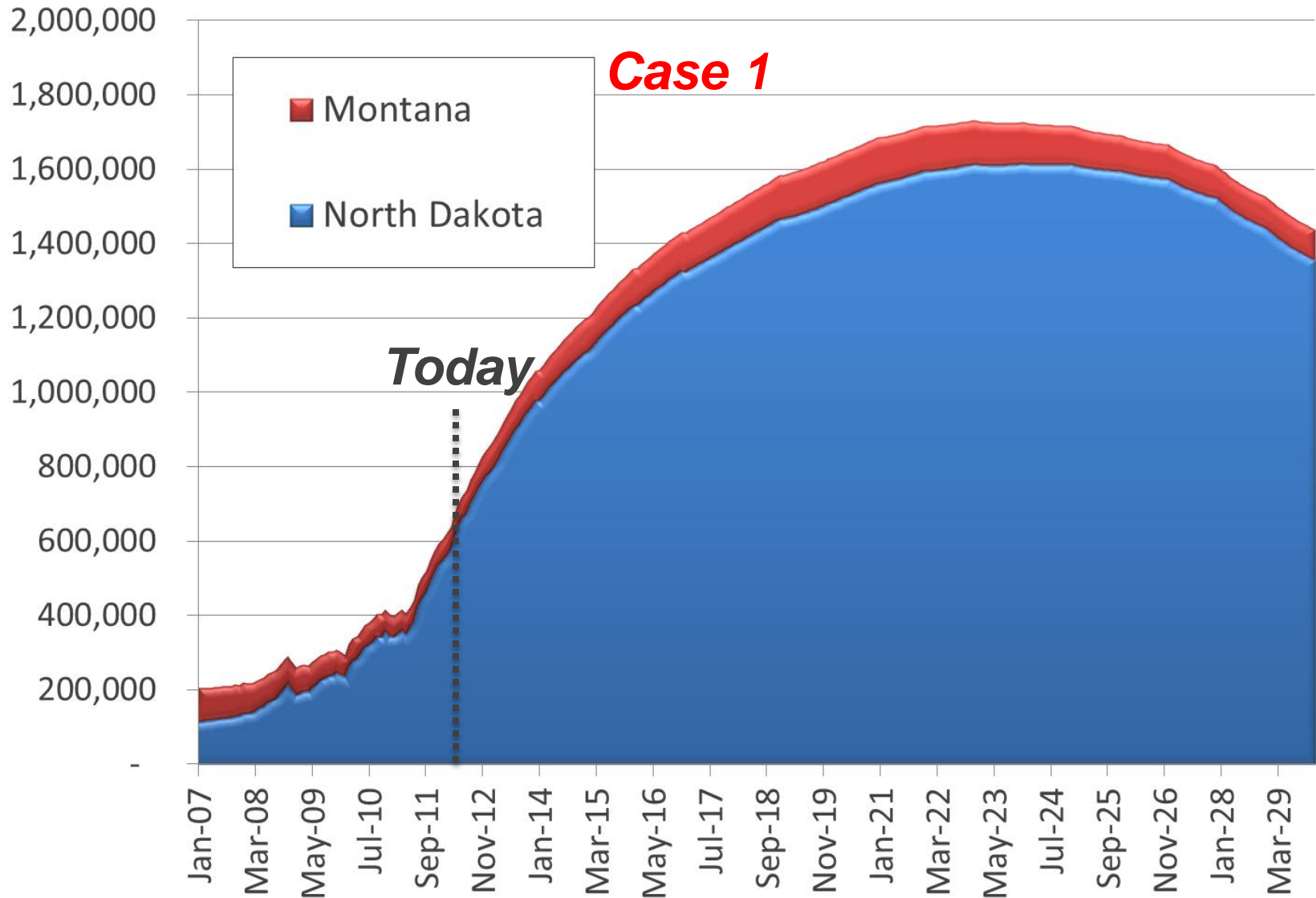


# Forecasting Williston Basin Oil Production, BOPD



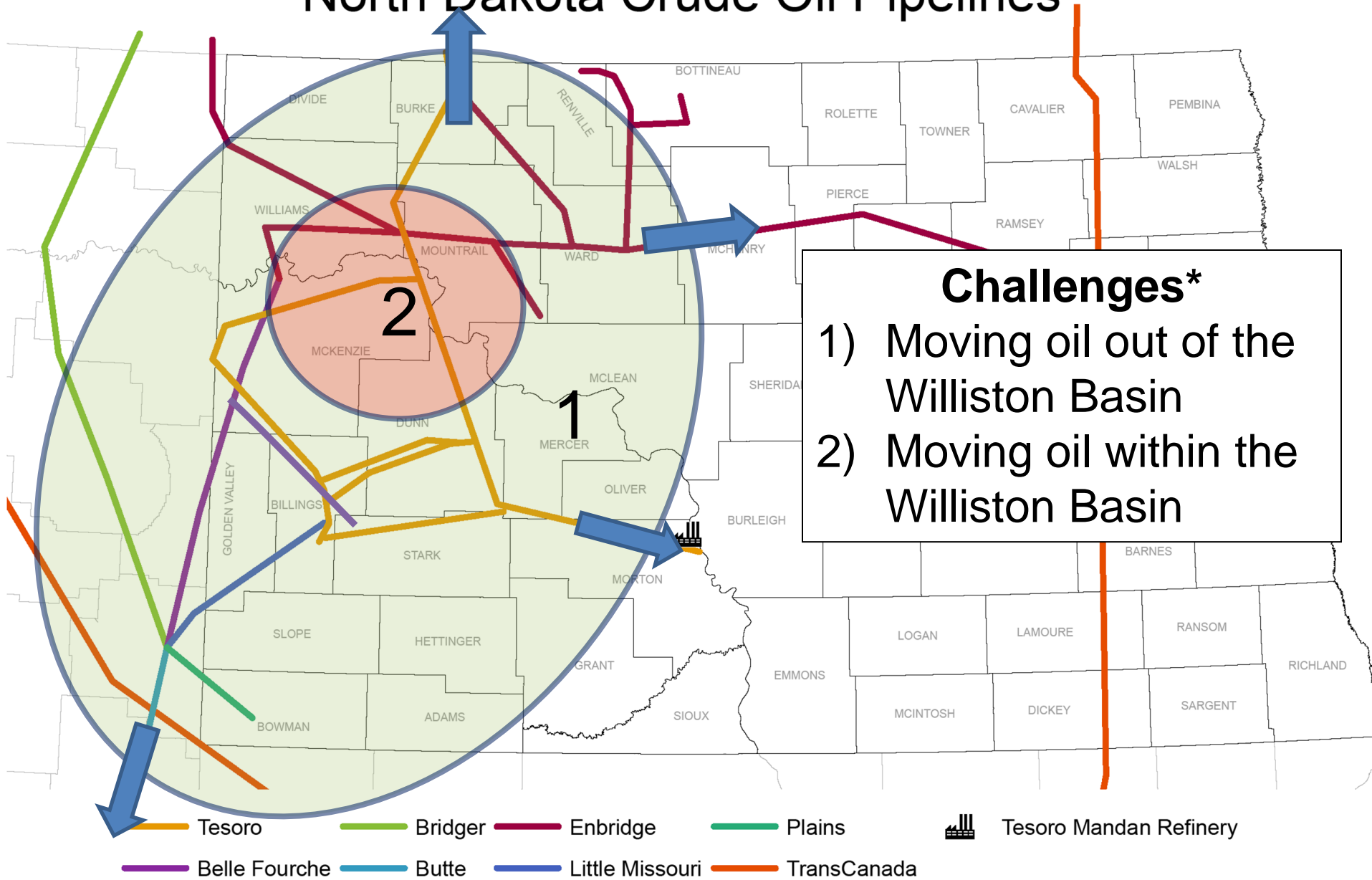
*Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.*

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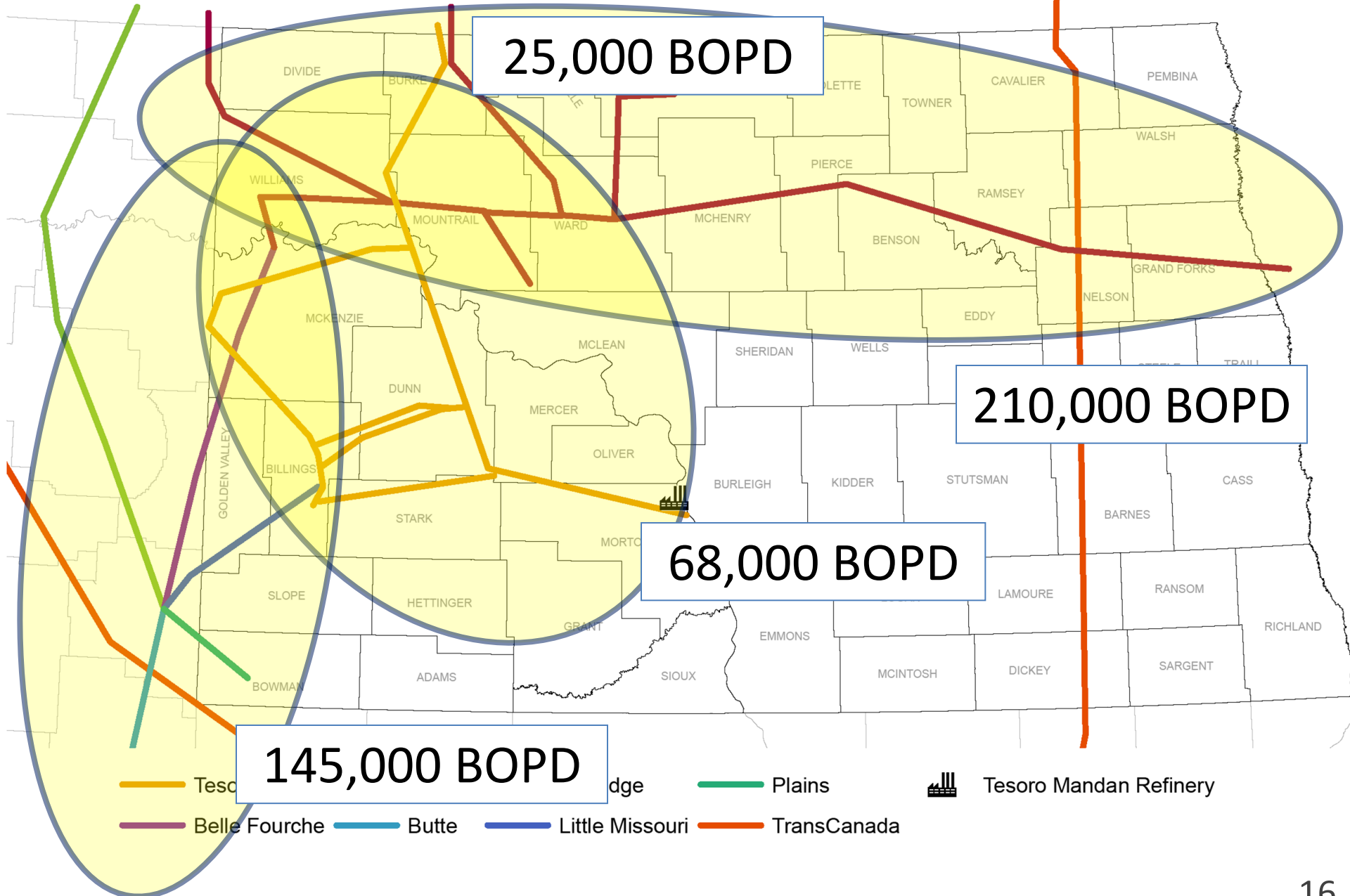
# North Dakota Crude Oil Pipelines



\*Modified from Bridger and Belle Fourche Pipelines

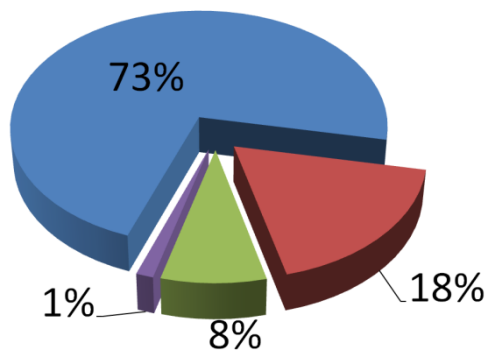


# North Dakota Crude Oil Pipelines

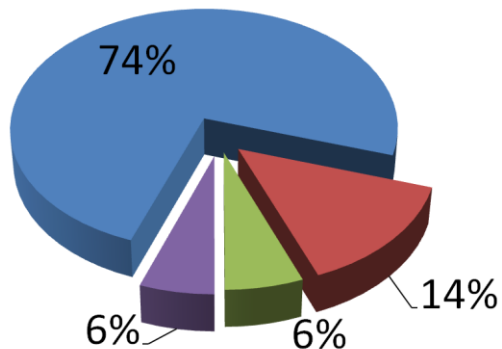


# Williston Basin Oil Transportation

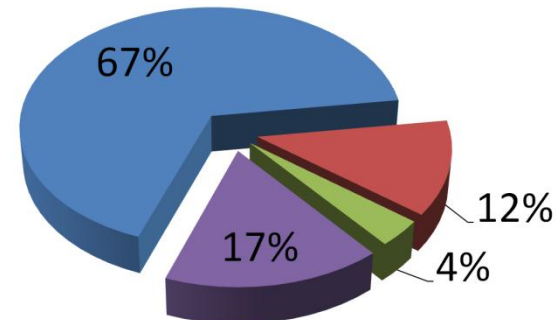
July 2009



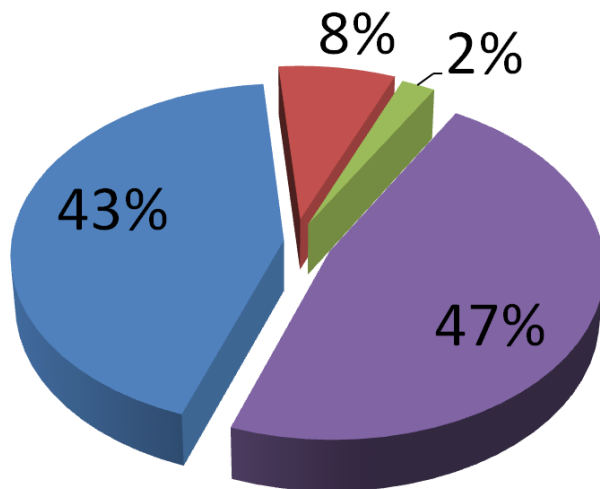
July 2010



July 2011



July 2012



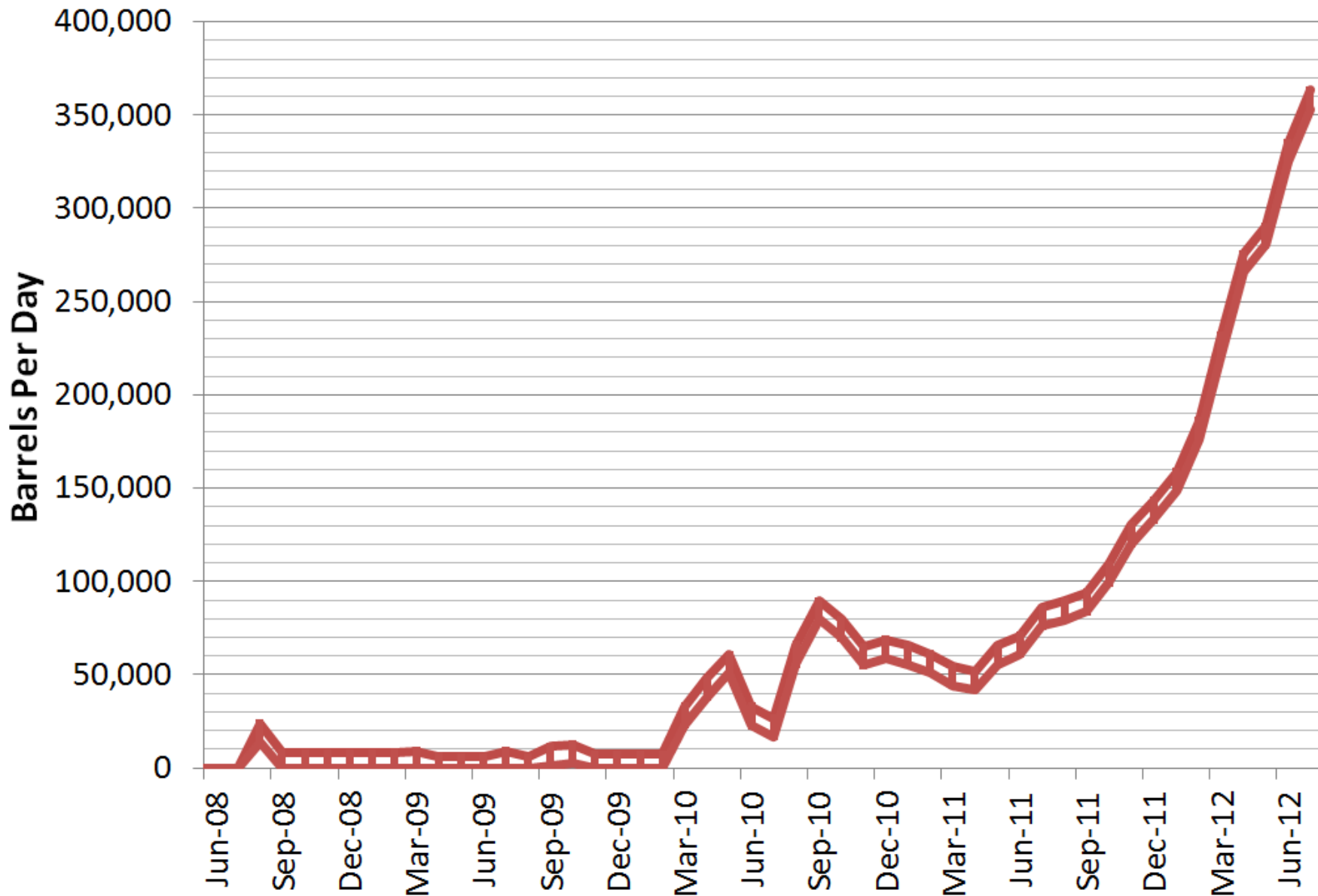
■ Pipeline Export

■ Tesoro Refinery

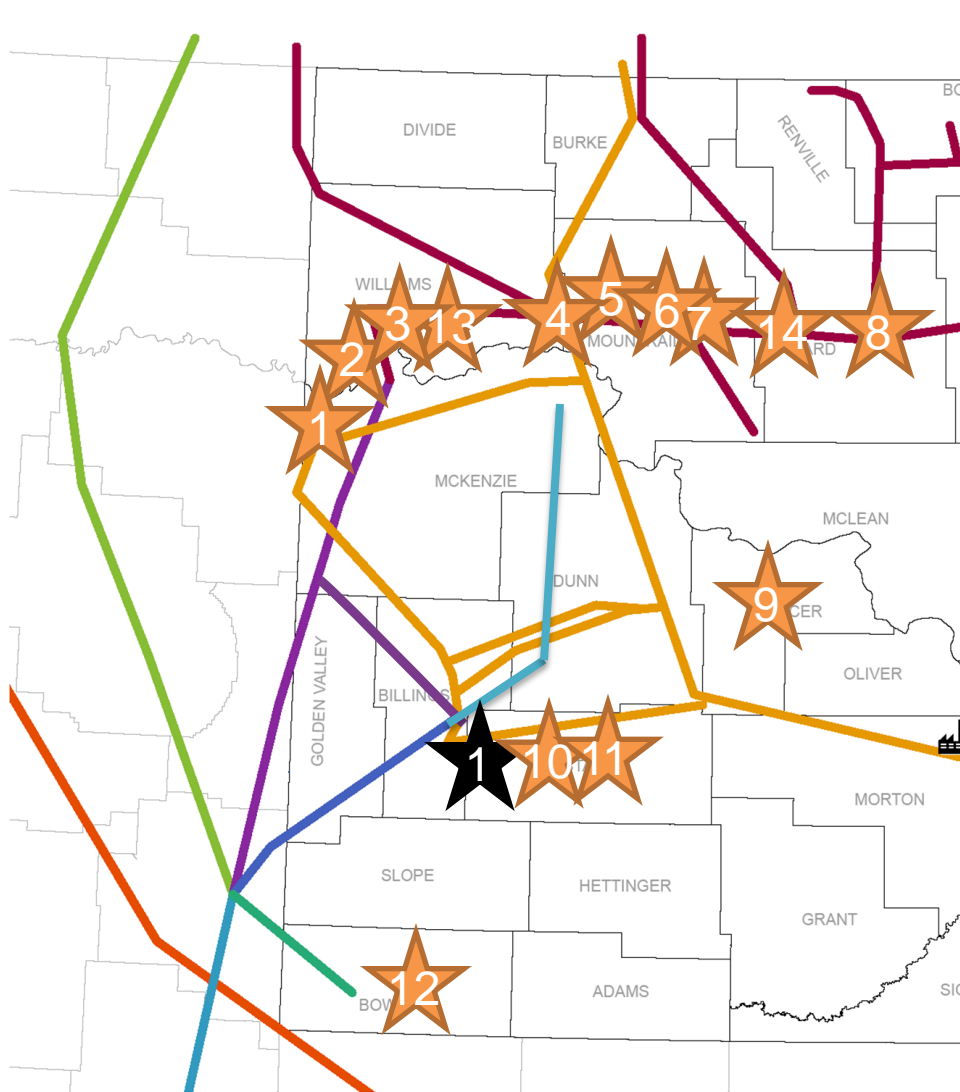
■ Truck to Canadian Pipelines

■ Estimated Rail

# Estimated ND Rail Export Volumes



# BNSF Crude Rail Locations



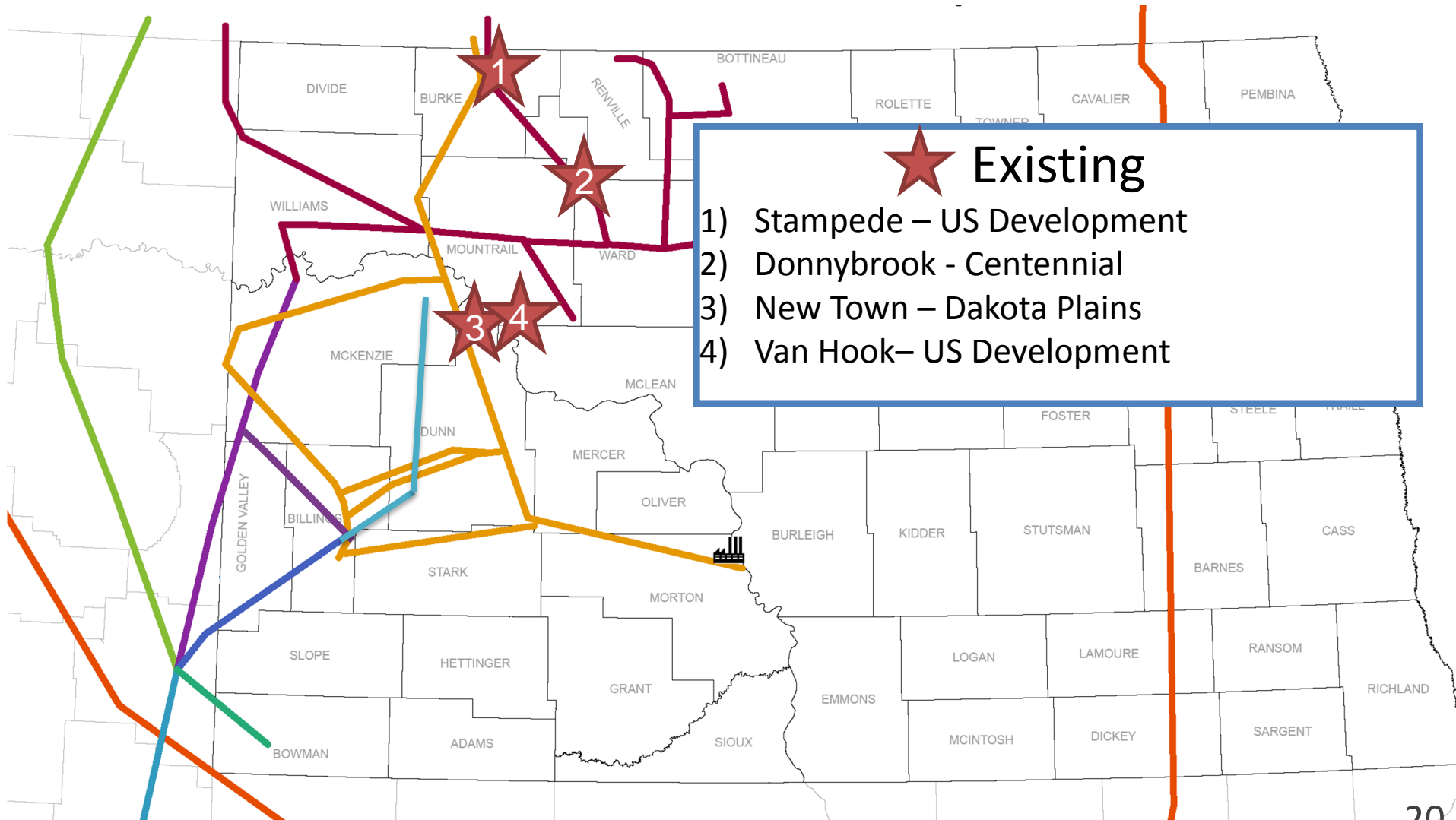
 Existing

- 1) Dore – Musket - Unit
- 2) Trenton – Savage – Manifest/Unit
- 3) Williston – Red River Supply - Manifest
- 4) Tioga – Hess - Unit
- 5) Manitou – Plains - Unit
- 6) Ross – Bakken Transload - Manifest
- 7) Stanley – EOG - Unit
- 8) Minot – ND Port Services- Manifest
- 9) Zap/Republic – Basin Transload - Unit
- 10) Eland – BOE - Unit
- 11) Dickinson – Centennial - Manifest
- 12) Gascoyne – Enserco – Manifest/Unit
- 13) Epping – Rangeland – Unit
- 14) Berthold – Enbridge – Unit (Full Serv Q1/13)

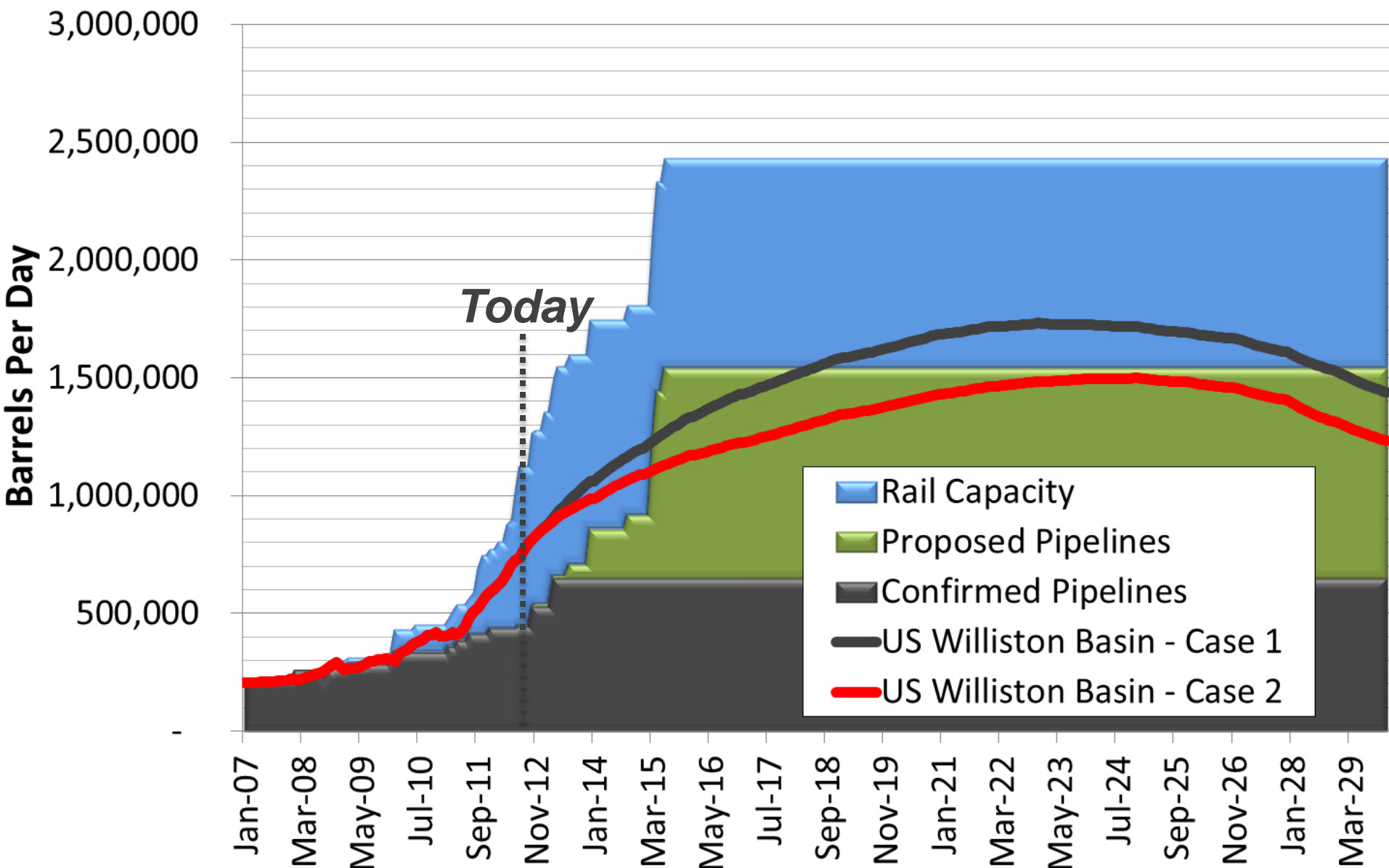
 Planned

- 1) Fryburg – Great Northern - Unit

# CP Crude Rail Locations

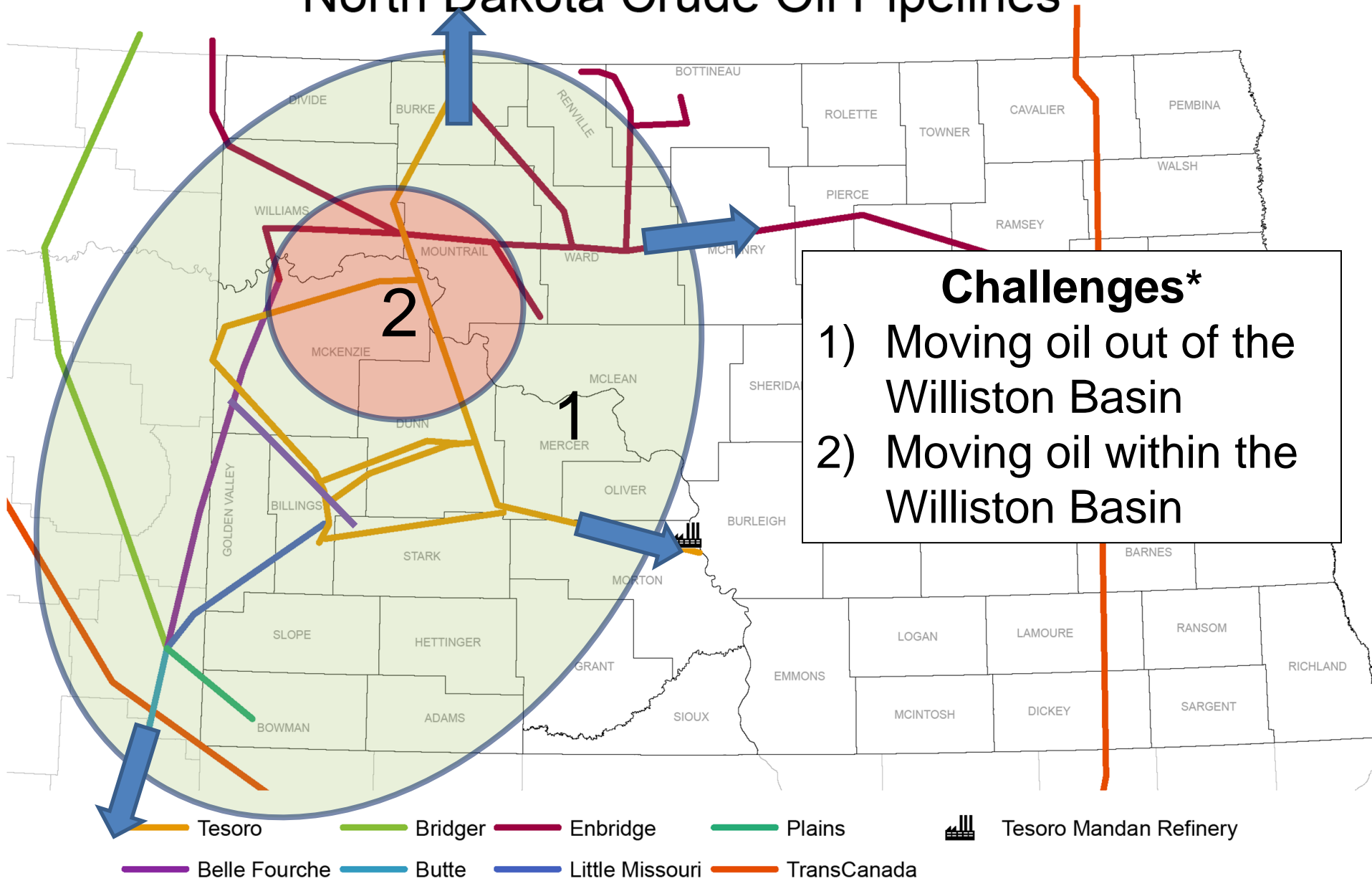


# Williston Basin Oil Production & Export Capacity, BOPD



Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.

# North Dakota Crude Oil Pipelines



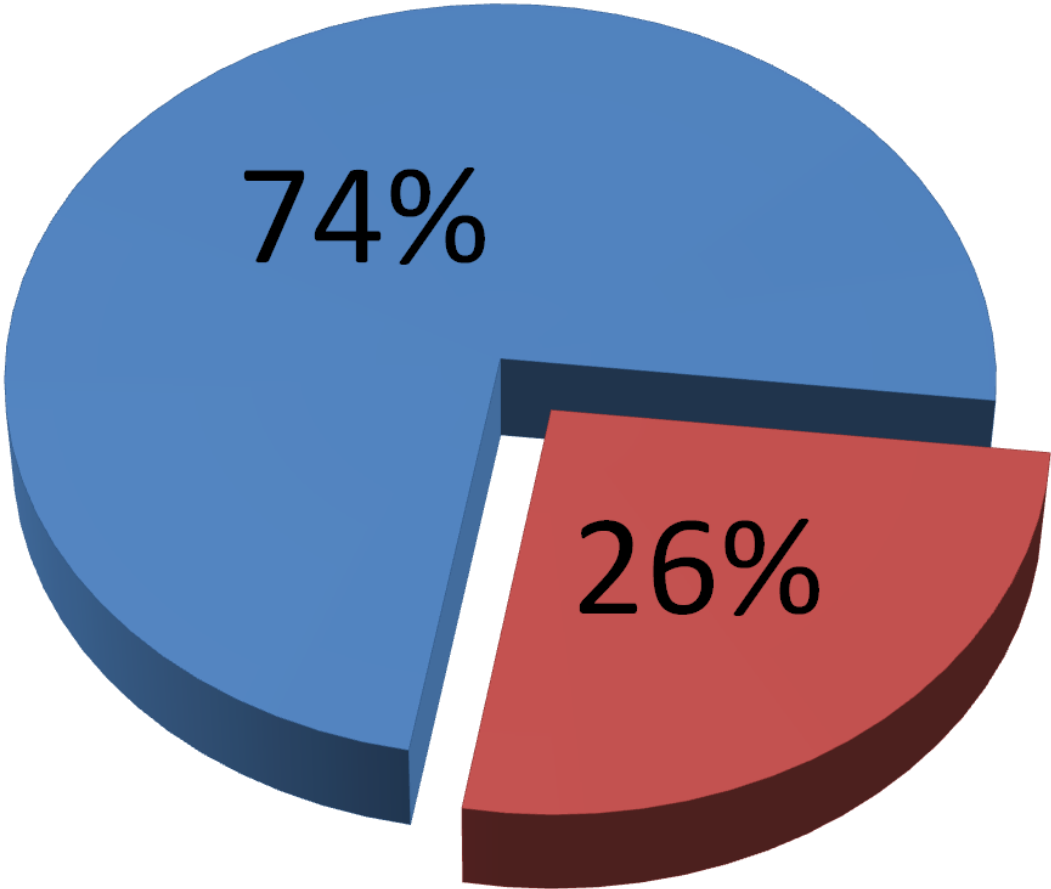
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# Crude Oil Gathering

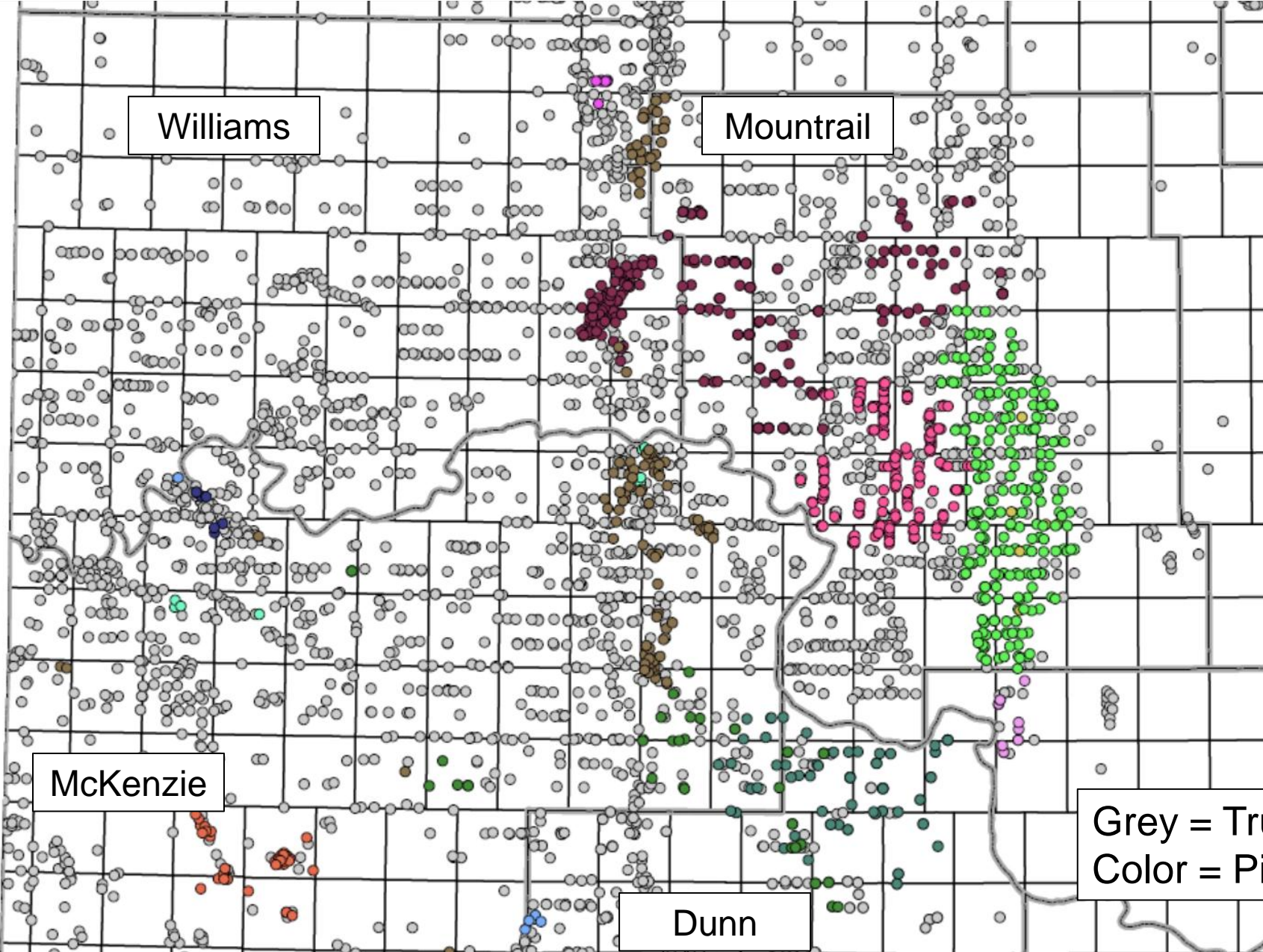


# North Dakota Crude Gathering



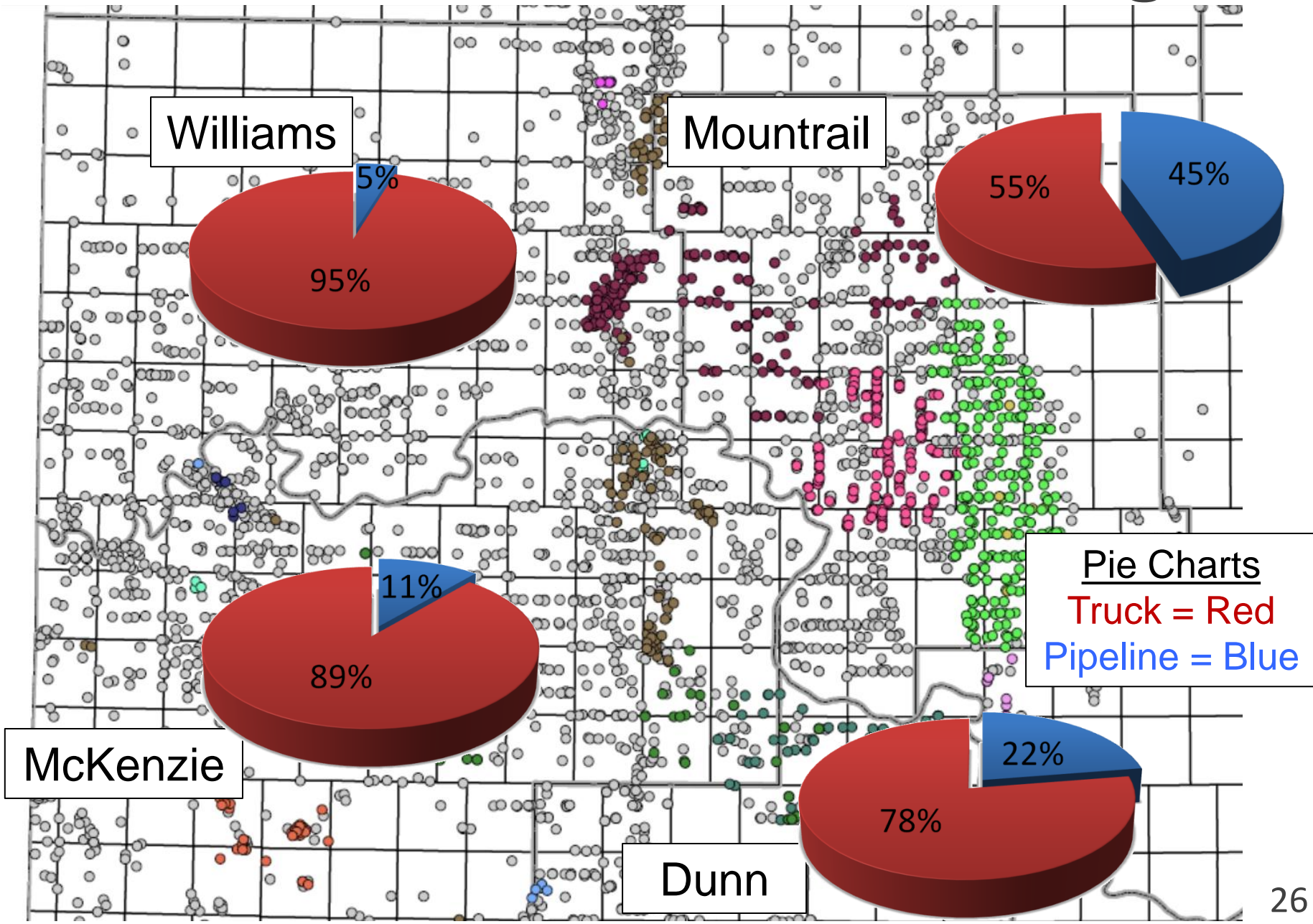
■ Truck    ■ Pipeline

# North Dakota Crude Gathering





# North Dakota Crude Gathering

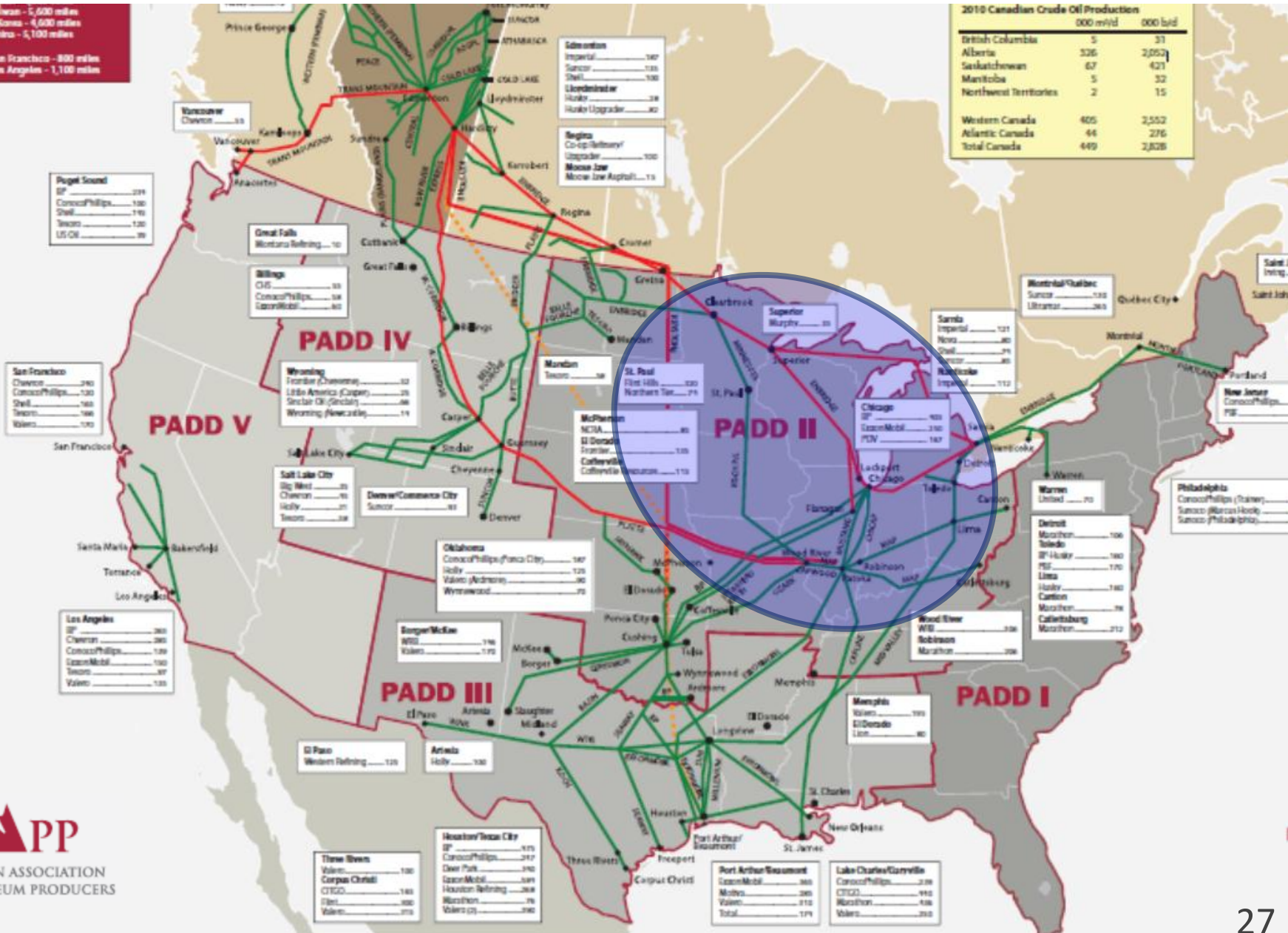


# Pipeline Challenges Outside ND

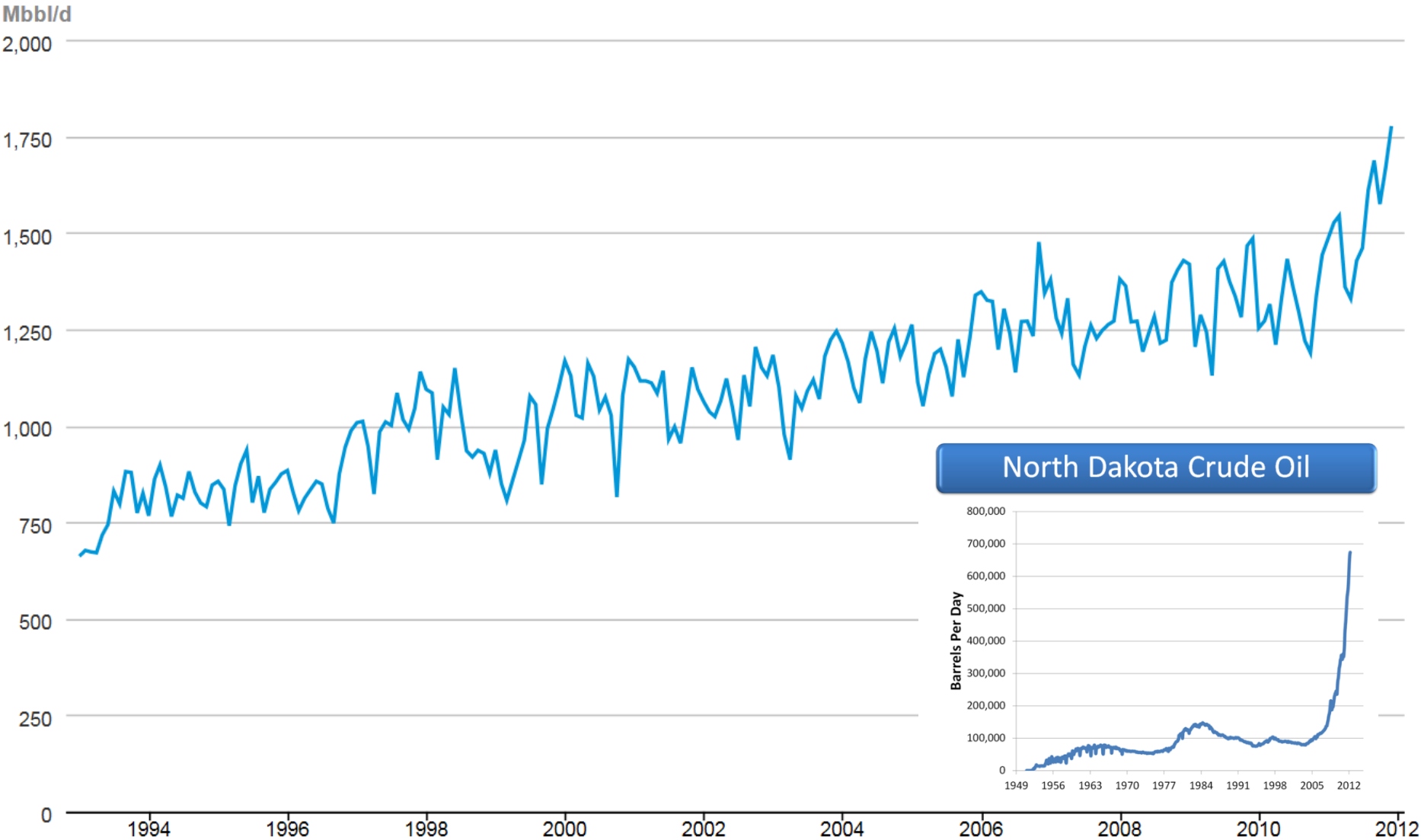
Talwan - 5,600 miles  
 S. Korea - 4,600 miles  
 China - 5,100 miles

San Francisco - 800 miles  
 Los Angeles - 1,100 miles

2010 Canadian Crude Oil Production		
	000 m/b/d	000 b/d
British Columbia	5	31
Alberta	326	2,052
Saskatchewan	67	421
Manitoba	5	32
Northwest Territories	2	15
Western Canada	405	2,552
Atlantic Canada	44	276
<b>Total Canada</b>	<b>449</b>	<b>2,828</b>



# PAD District Imports by Country of Origin



— Midwest (PADD 2) Imports by PADD of Processing from Canada of Crude Oil and Petroleum Products



# Snapshot for Bloomberg Bakken (Clearbrook MN) Crude Oil Differential

Open: **5.50000**

High:

## Rate Chart for USCSUHC1 >>

• USCSUHC1:IND 5.50000

Compare

1M

1Y



<http://www.bloomberg.com/quote/USCSUHC1:IND>

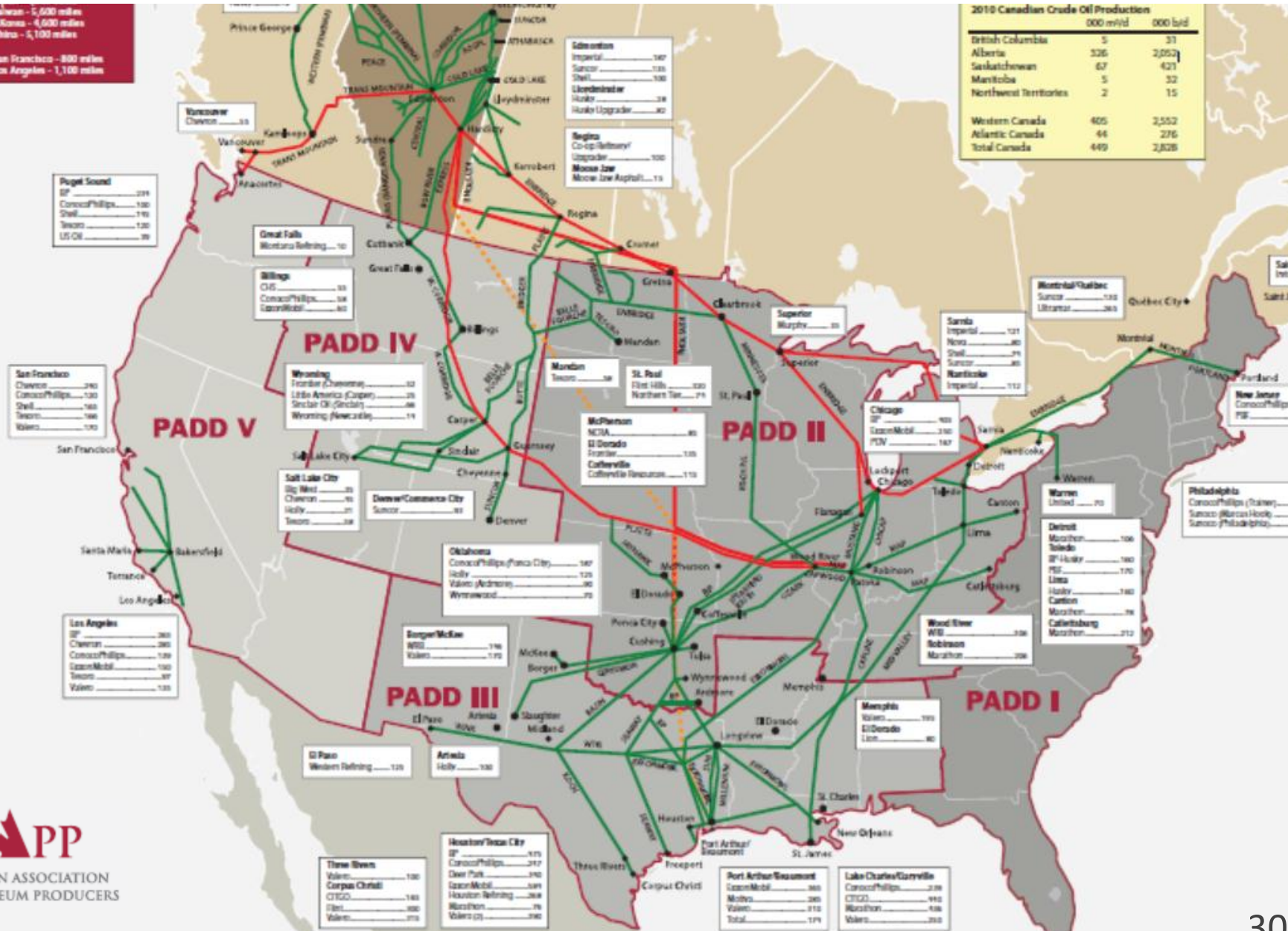


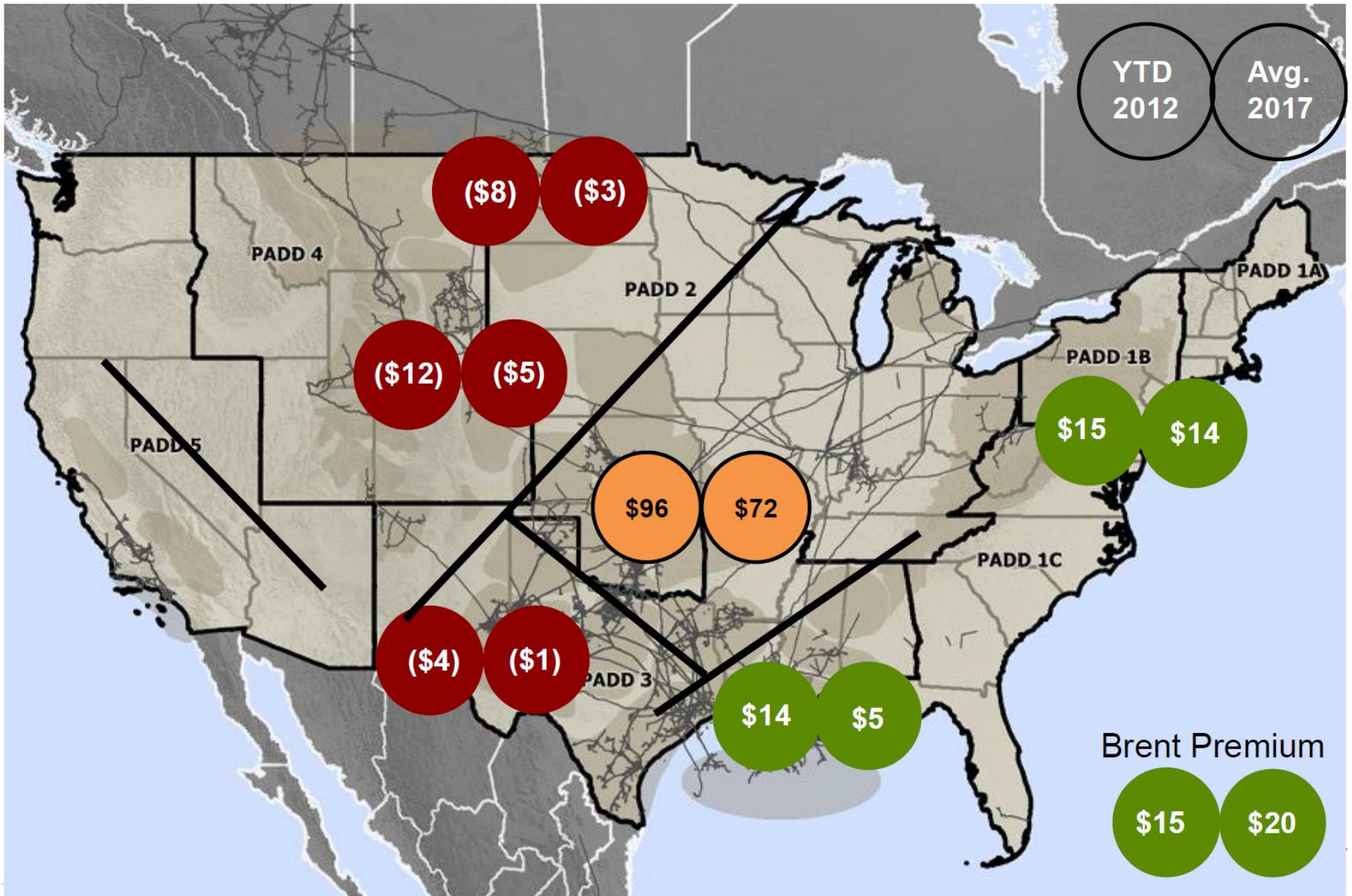
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Source: Jodi Quinnell, BENTEK Energy - Sept 12, 2012 "Crude Awakening"



# Strengthening Landowner Relations

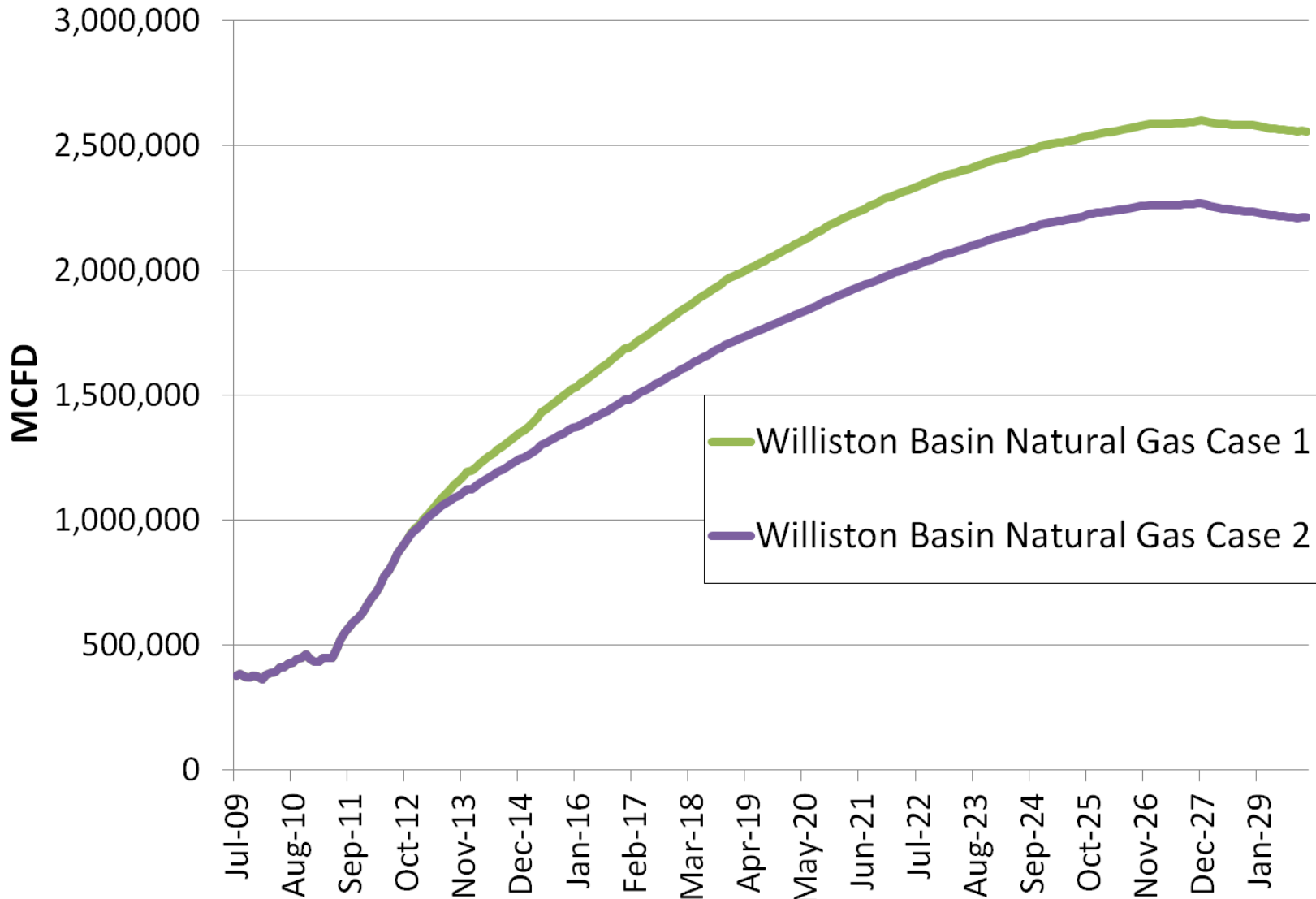




# Natural Gas



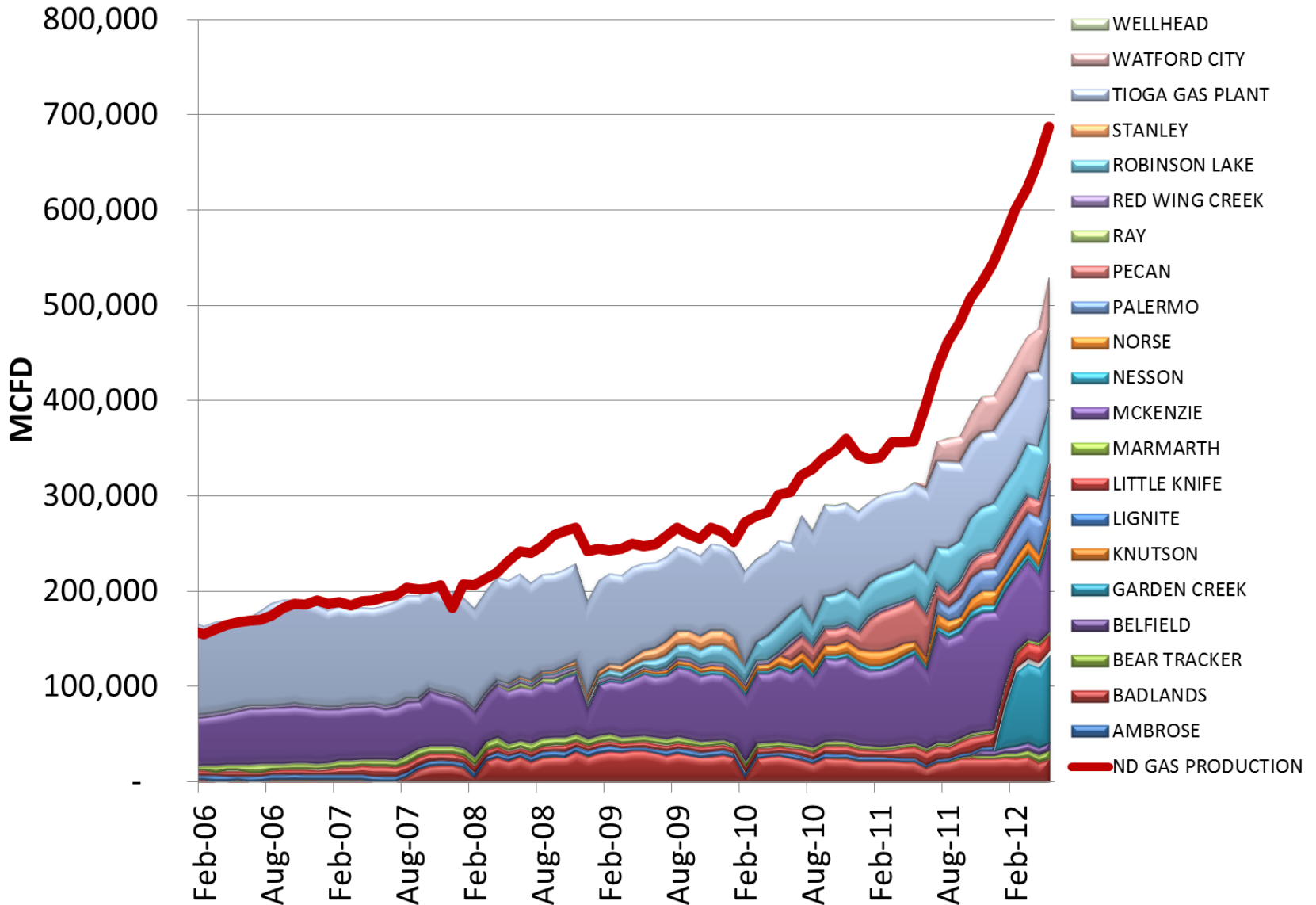
# Williston Basin Gas Production



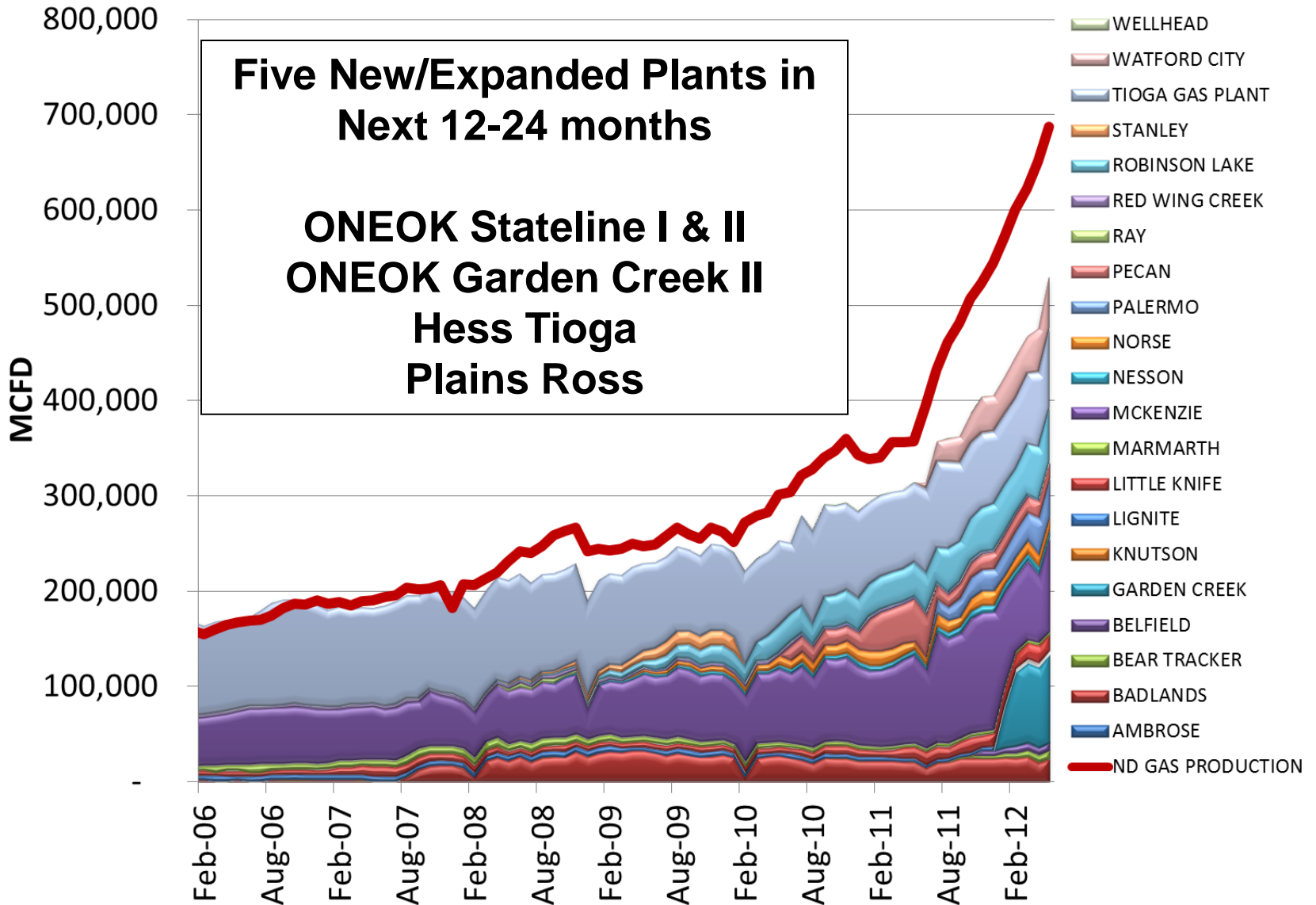
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# ND Gas Facility/System Intake

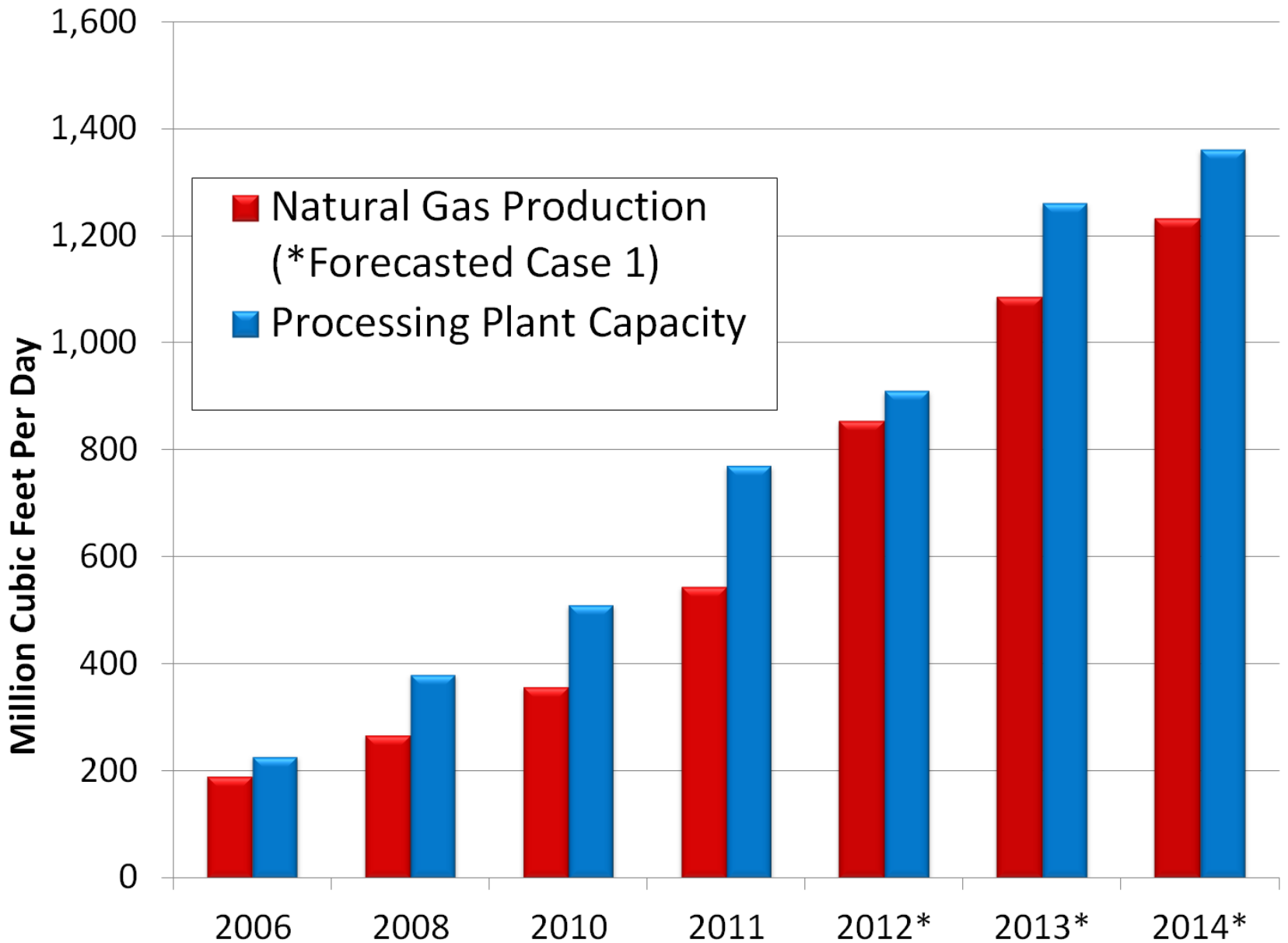


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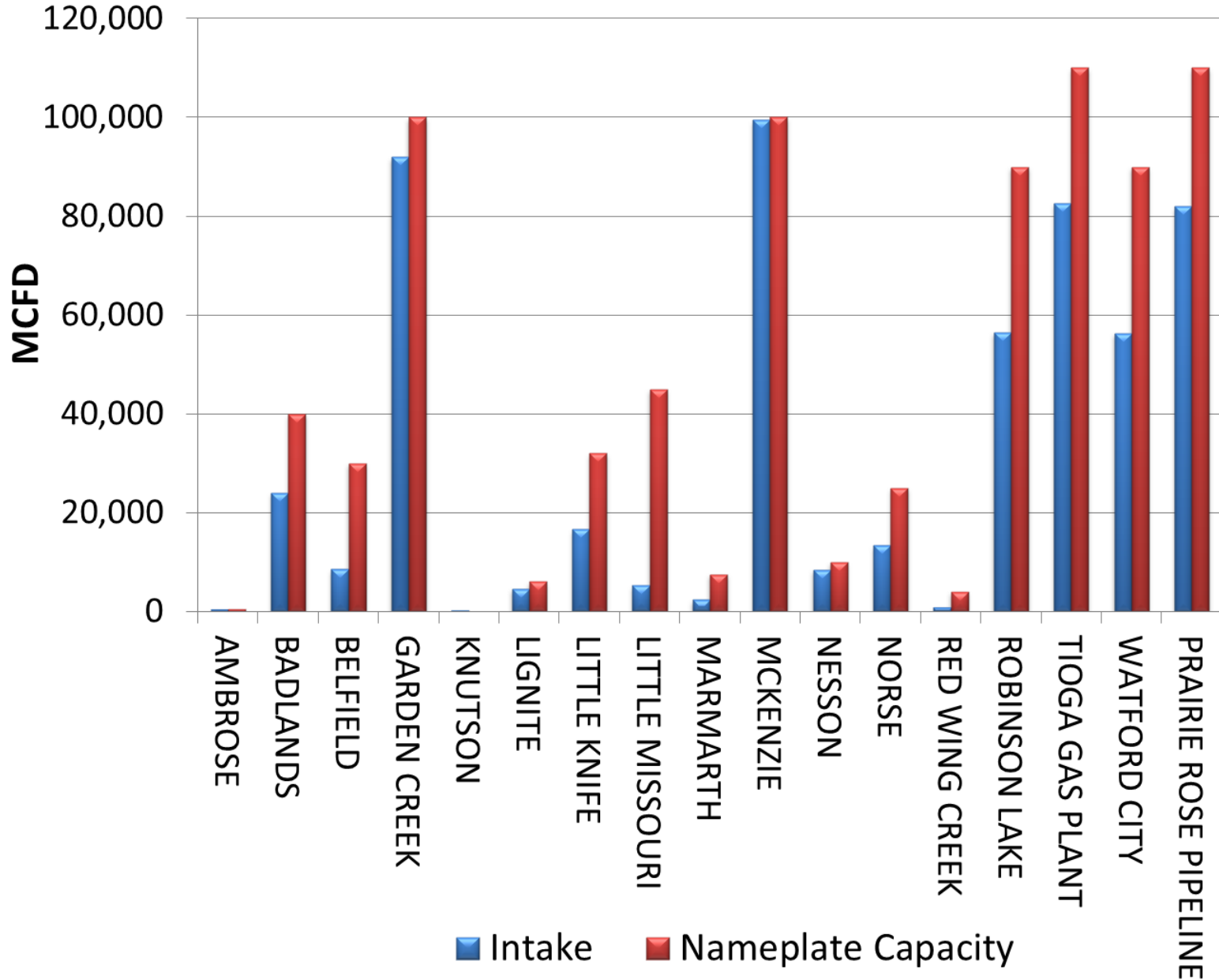




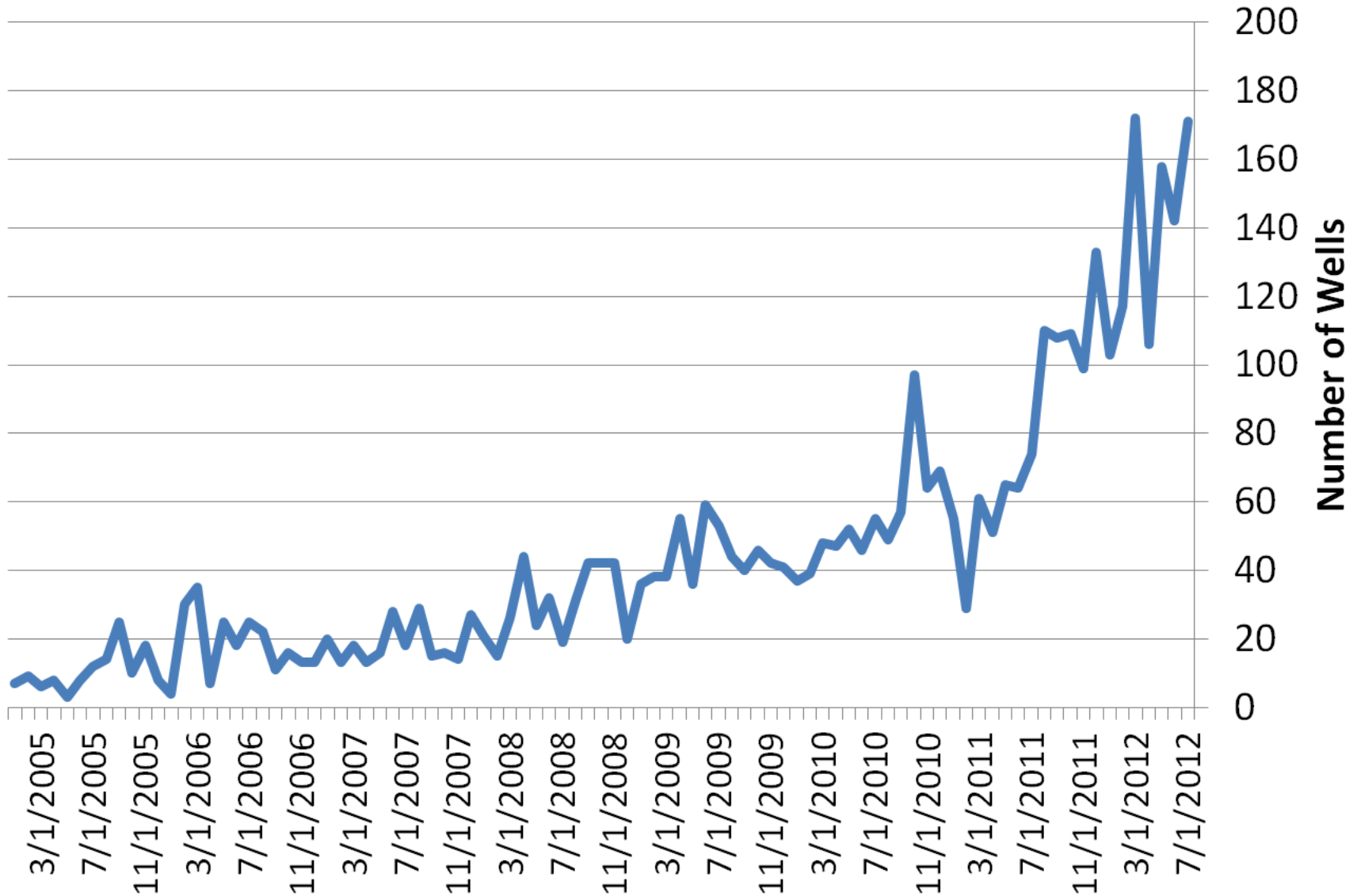
# ND Gas Plant Capacity



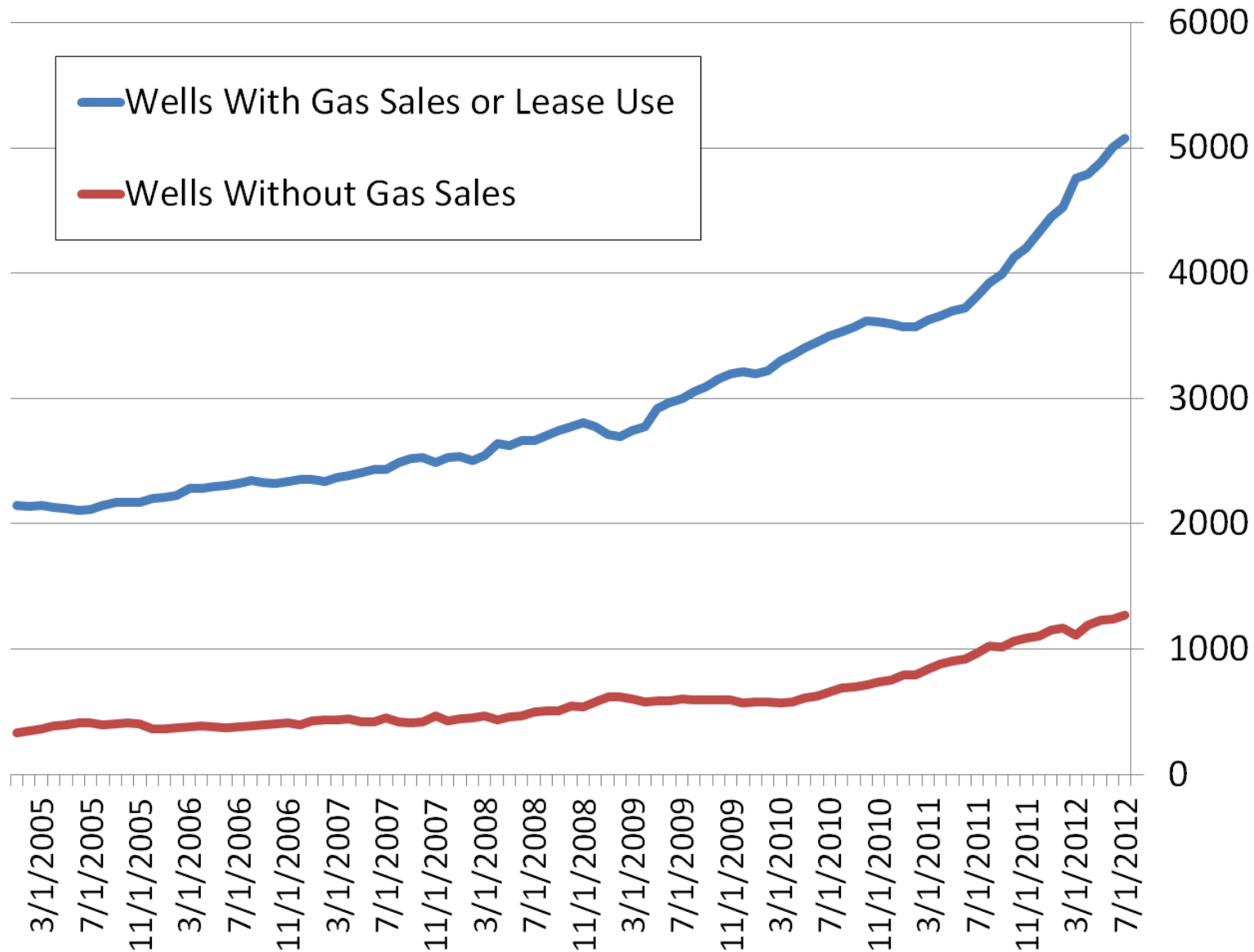
# May 2012 Gas Plant Volumes



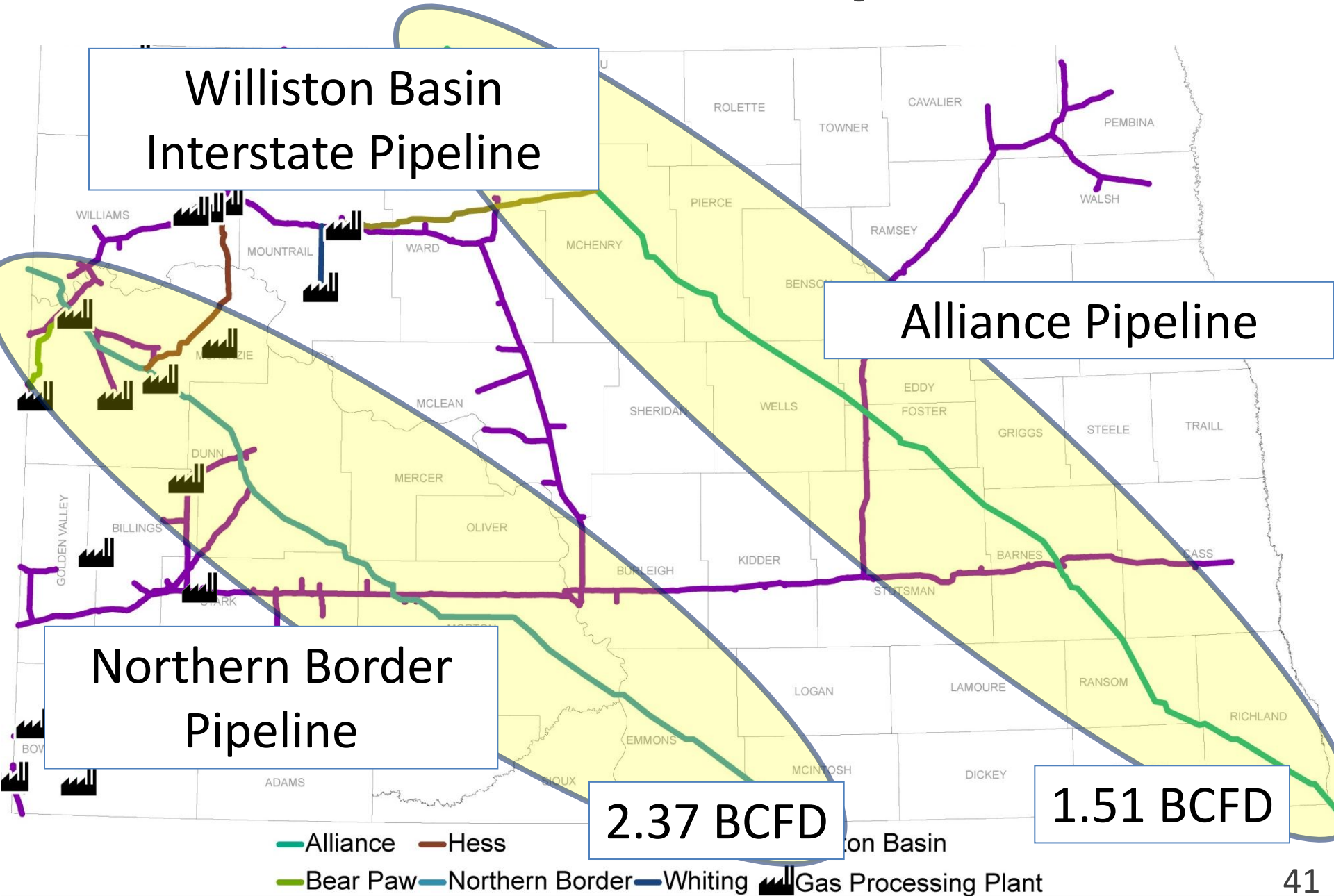
# First Time Gas Sales Per Month



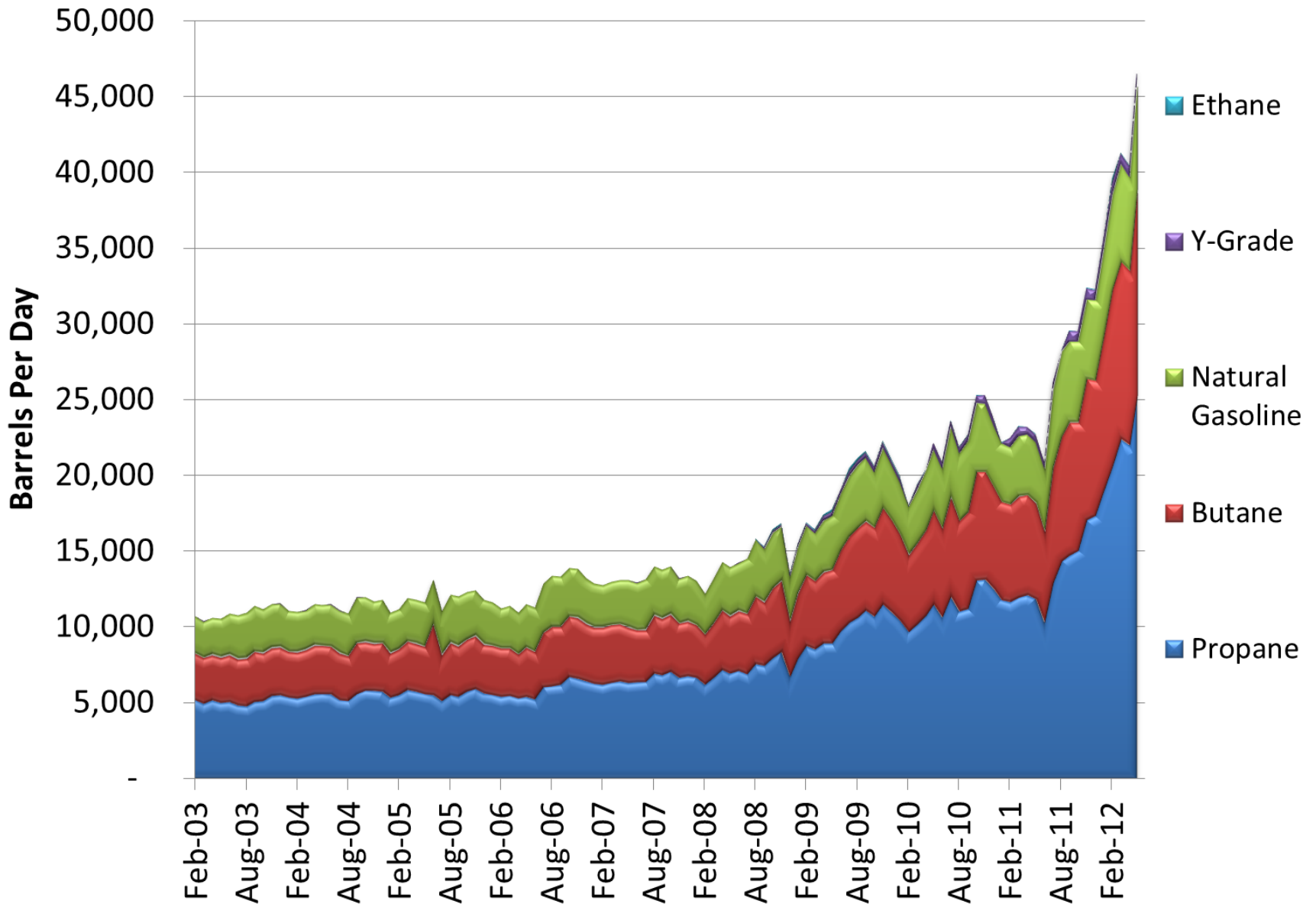
# ND Gas Gathering Statistics



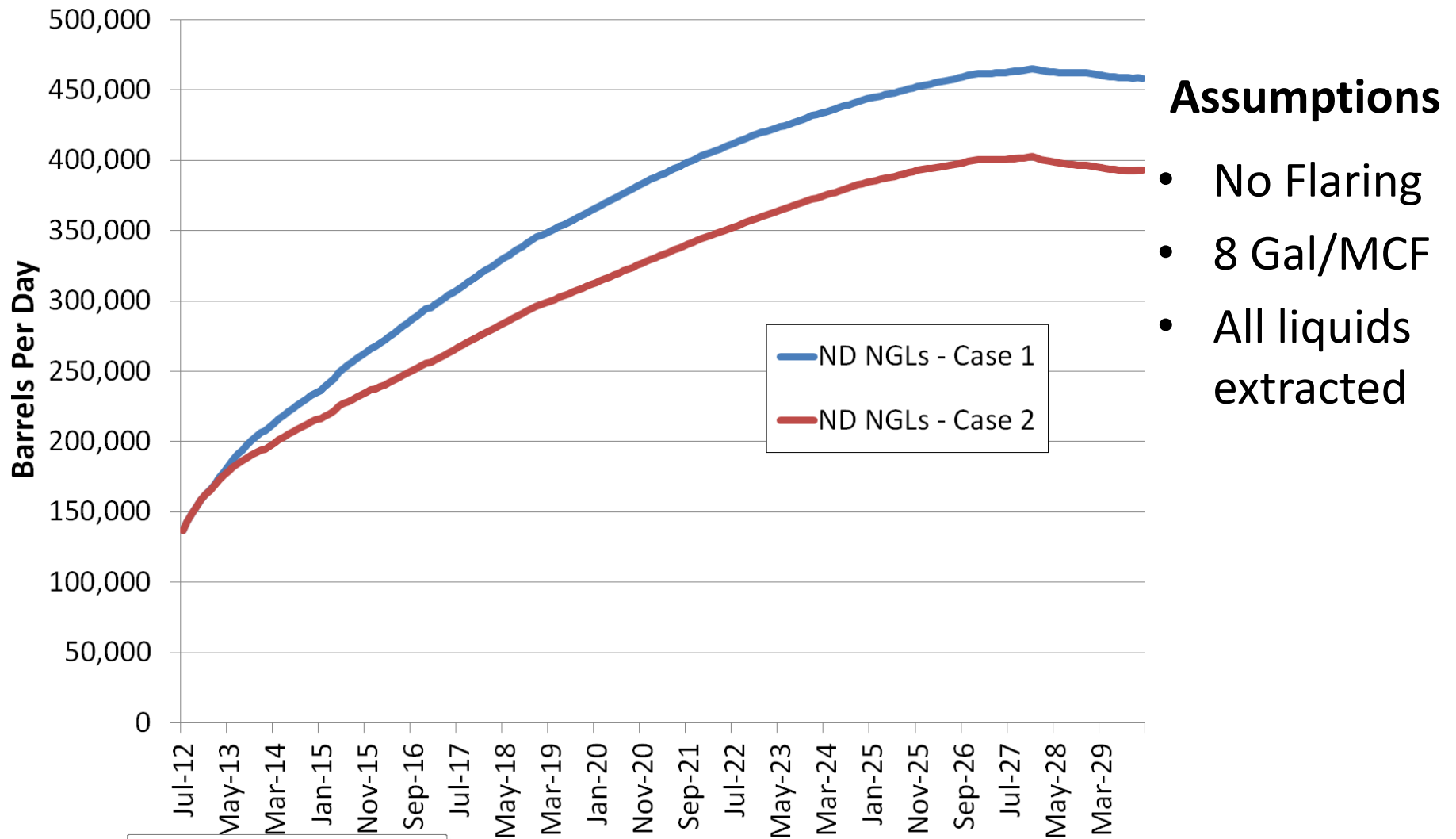
# ND Natural Gas Pipelines



# ND Gas Plant NGL Production

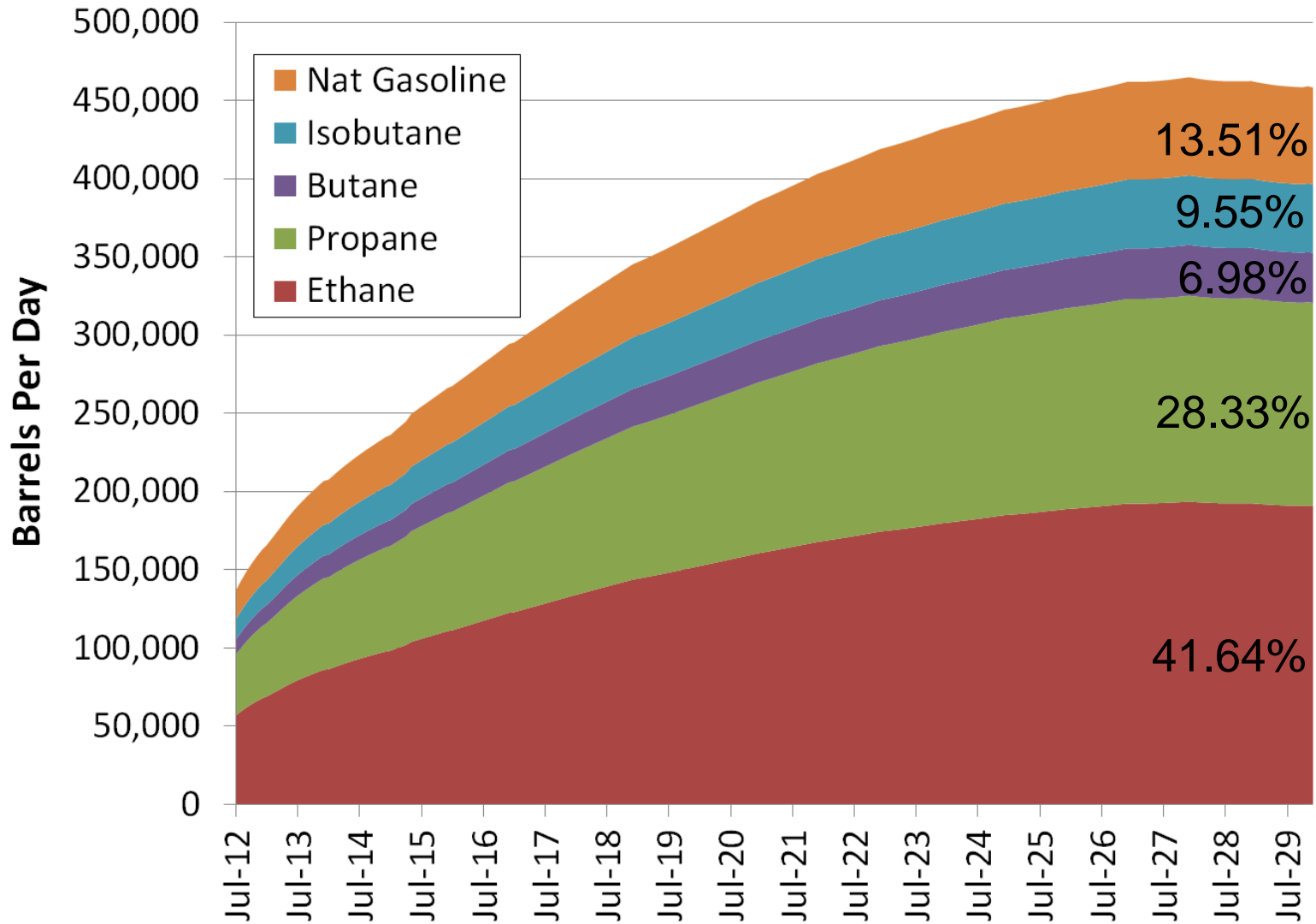


# North Dakota NGL Potential





# Case 1: ND NGL Potential\*

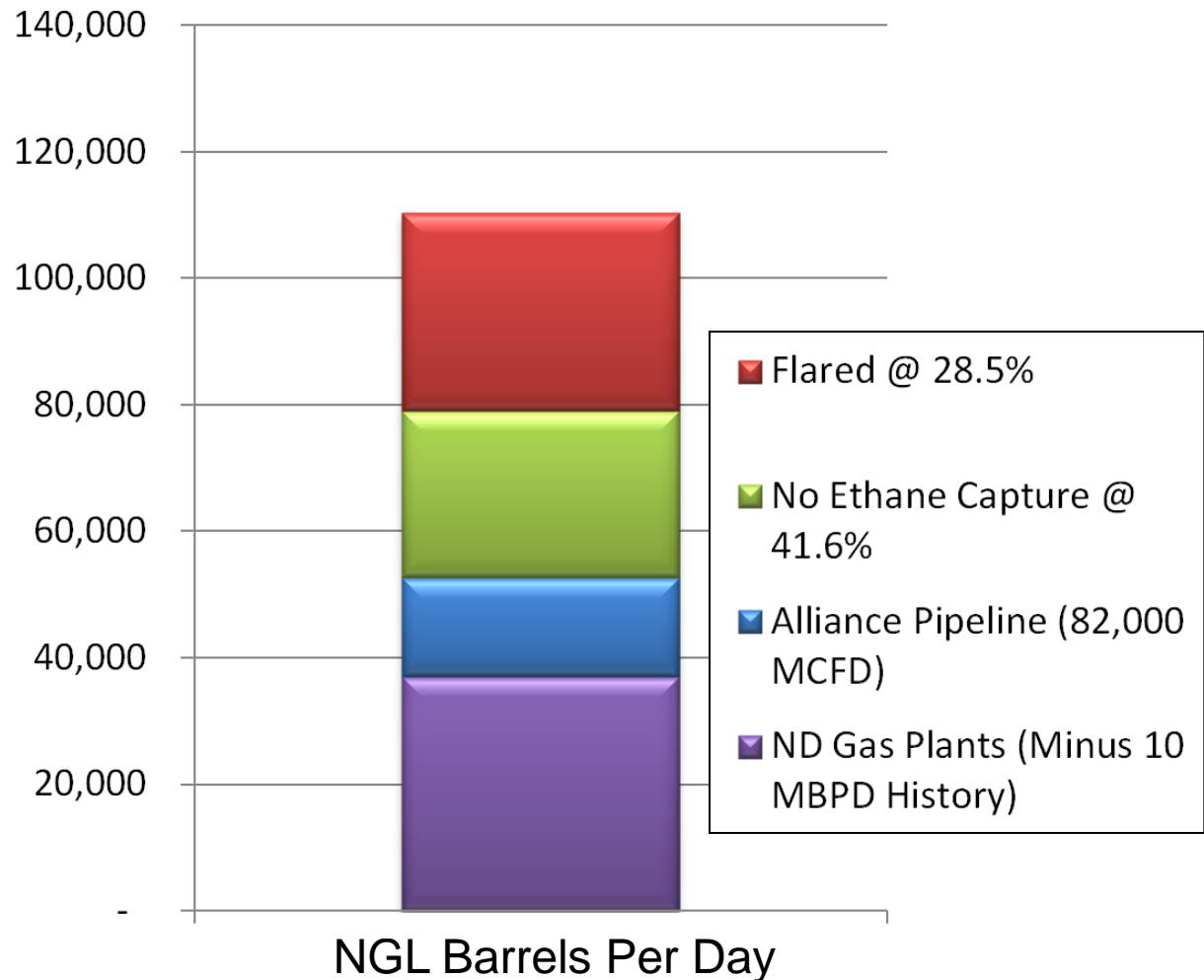


\*Using NGL breakdown from the July 2012 BENTEK Natural Gas Study

# May 2012 Bakken/TF NGL's

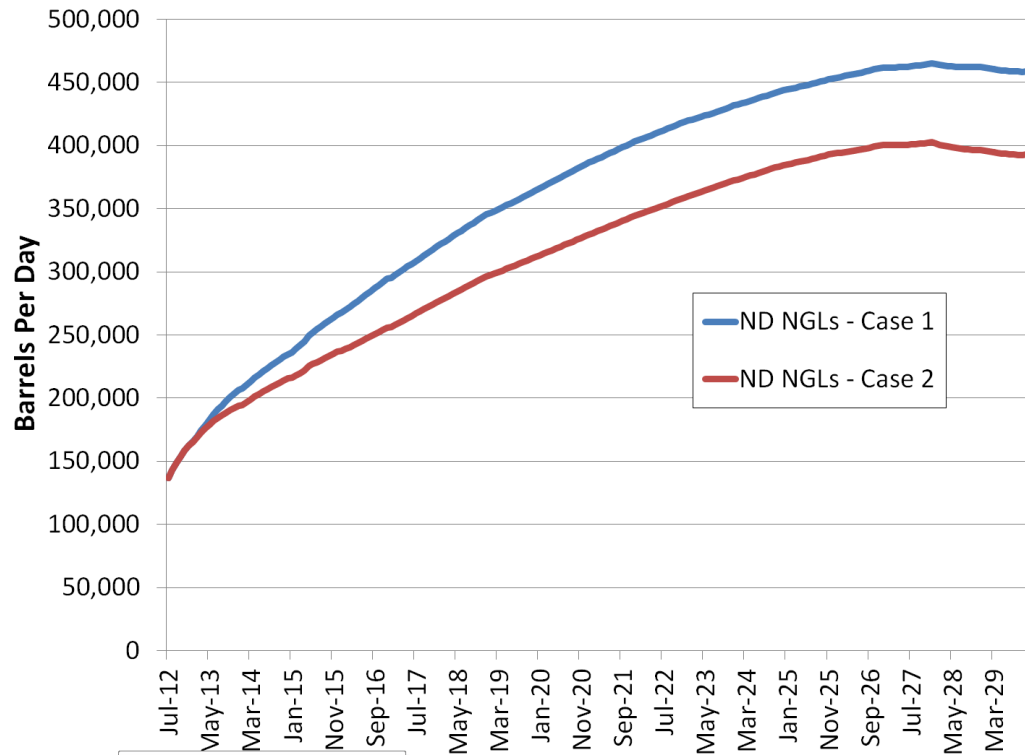
## Assumptions

- May Bakken Gas 579,000 MCFD
- 8 Gal/MCF
- $(8/42) * 579,000 = 110,286$  BPD



*\*This is an illustration only and should not be considered official industry data*

# Moving Future NGL Volumes



## Transportation Options

- Trucking Regionally
- Rail Transportation
- Vantage Pipeline (Ethane)
- ONEOK Bakken Pipeline (Y-Grade)
- Alliance Pipeline (Rich Gas)
- New Pipeline Infrastructure??

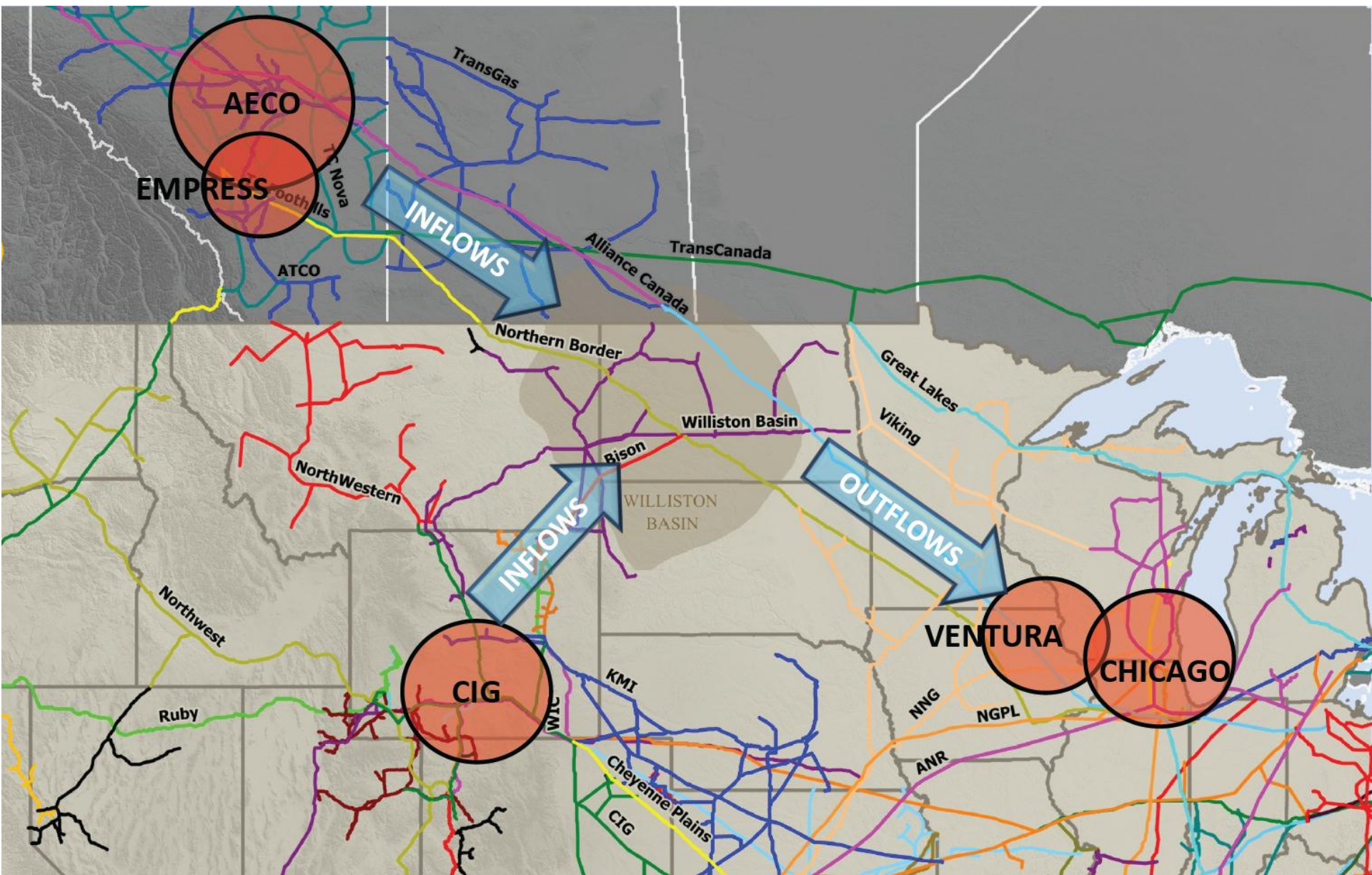
# Natural Gas Study

## Transmission Future

**WILLISTON BASIN**

**The Williston Basin:**  
Greasing the Gears for Growth in North Dakota

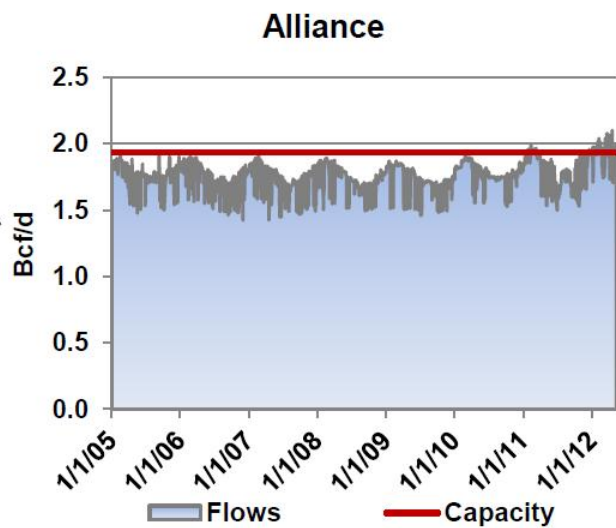
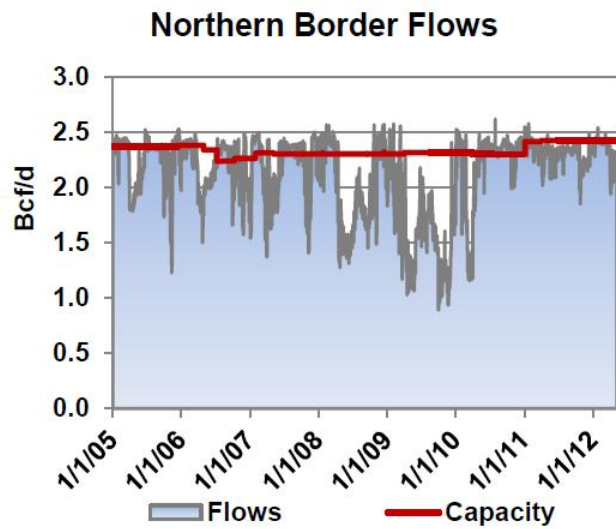
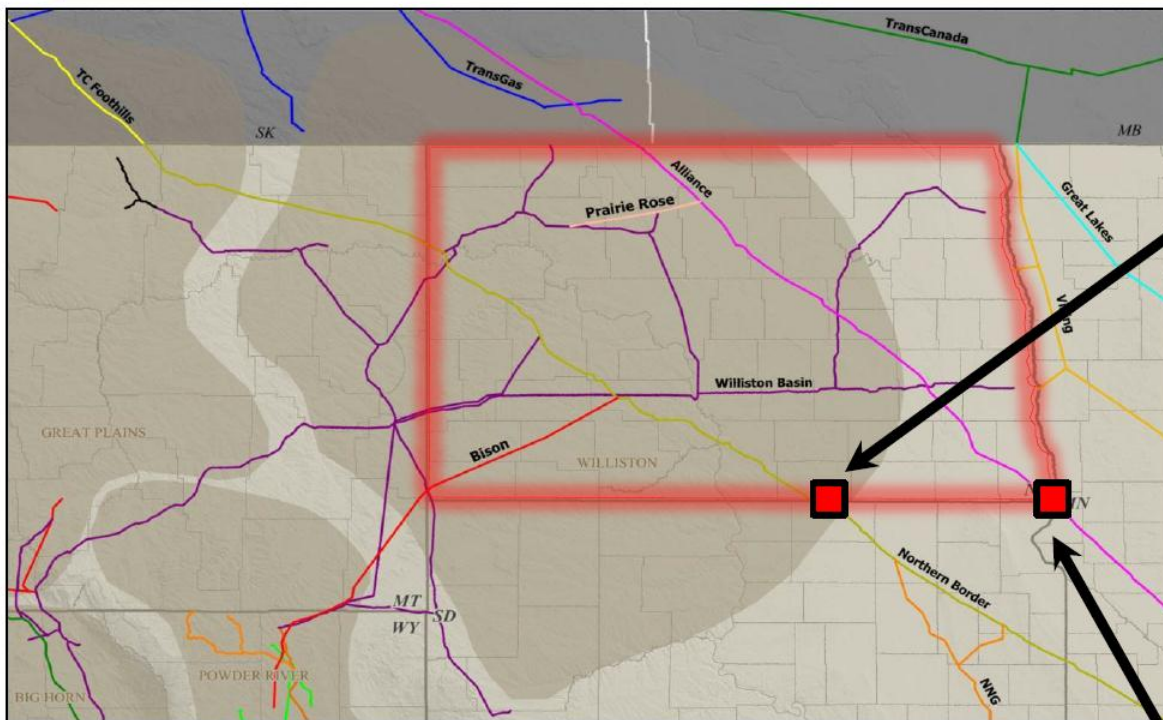
**BENTEK**  
Energy



Source: BENTEK Energy July 2012 Report



# Open Capacity Leaving N. Dakota Is Tight



- Northern Border and Alliance Serve As the Primary Routes to Transport Gas From the Region.
- Each Have Limited Open Mainline Capacity to Carry Additional Williston Supply.



**NORTH DAKOTA GOVERNOR'S  
PIPELINE SUMMIT**  
Bismarck, ND – June 14, 2012

Home Governor First Lady Lt. Governor Administration Boards and Commissions

Home | Pipeline Summit

## Pipeline Summit

Posted on: Monday, July 2, 2012 Duration: 2:34:0

Welcome to the  
NORTH DAKOTA GOVERNOR'S  
**PIPELINE**  
SUMMIT

00:00 00:00

Full 2.5 Hours Replay: <http://www.governor.nd.gov/node/1459>



# Contact Information

North Dakota Pipeline Authority

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Bismarck, ND 58505-0840

Phone: (701)220-6227

Fax: (701)328-2820

E-mail: [jjkringstad@ndpipelines.com](mailto:jjkringstad@ndpipelines.com)

Websites:

[www.pipeline.nd.gov](http://www.pipeline.nd.gov)

[www.ndpipelines.wordpress.com](http://www.ndpipelines.wordpress.com)



Know what's below.  
Call before you dig.

