

Understanding North Dakota's Natural Gas Production and Midstream Infrastructure

Justin J Kringstad

Geological Engineer

Director

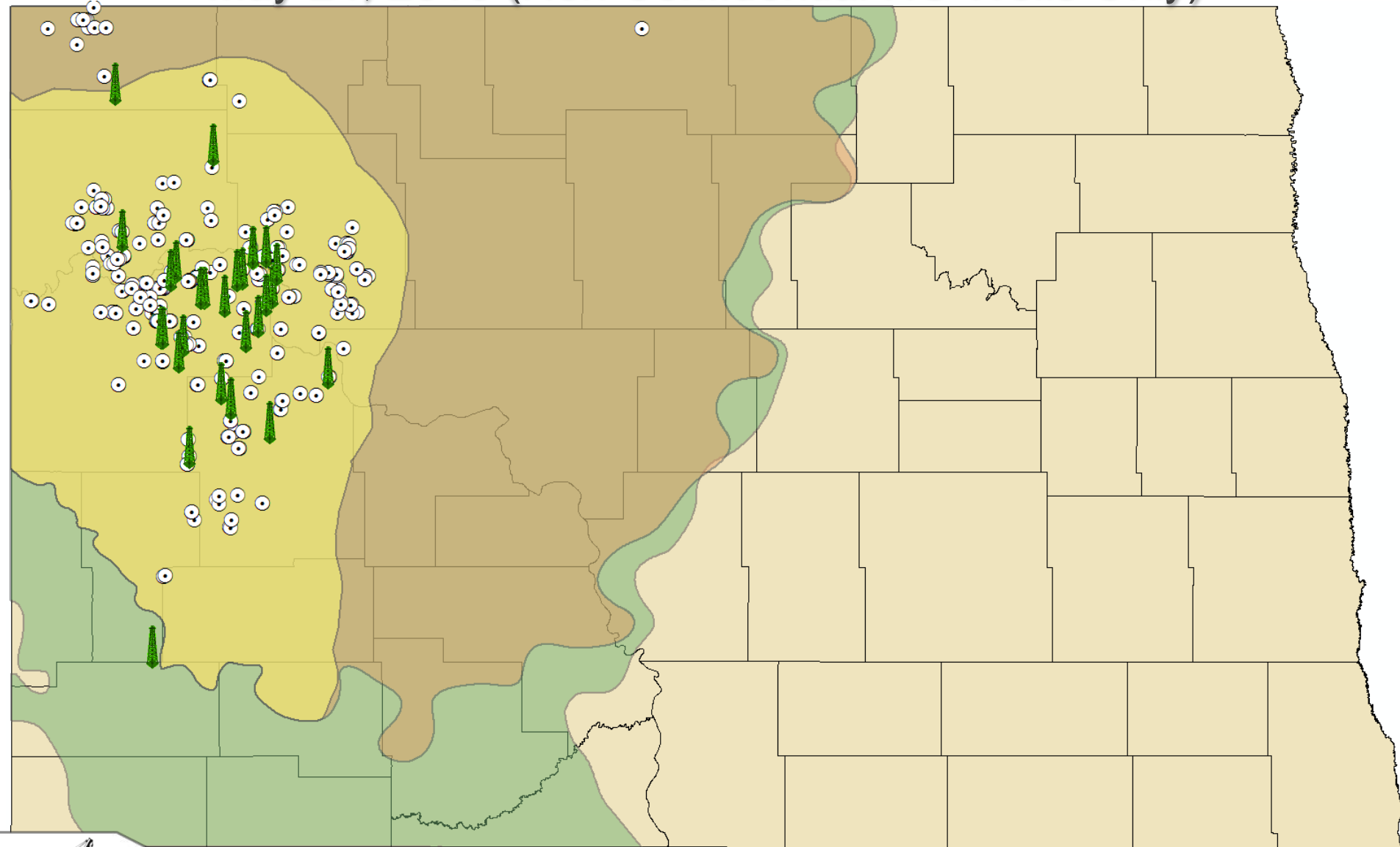
North Dakota Pipeline Authority

May 24, 2016

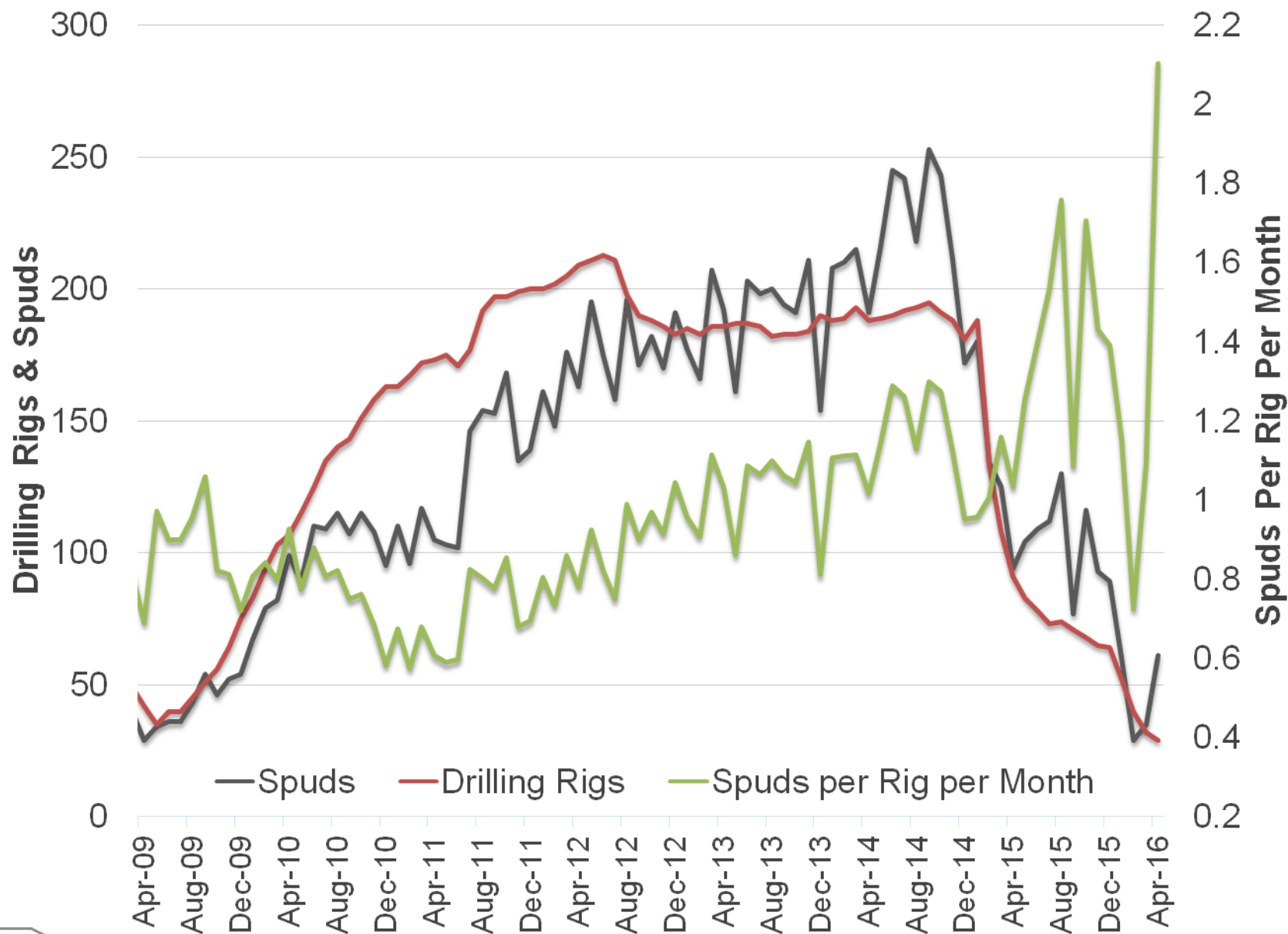


28 Rigs and 690 NC Wells:

May 24, 2016 (Non Confidential NC Wells Only)

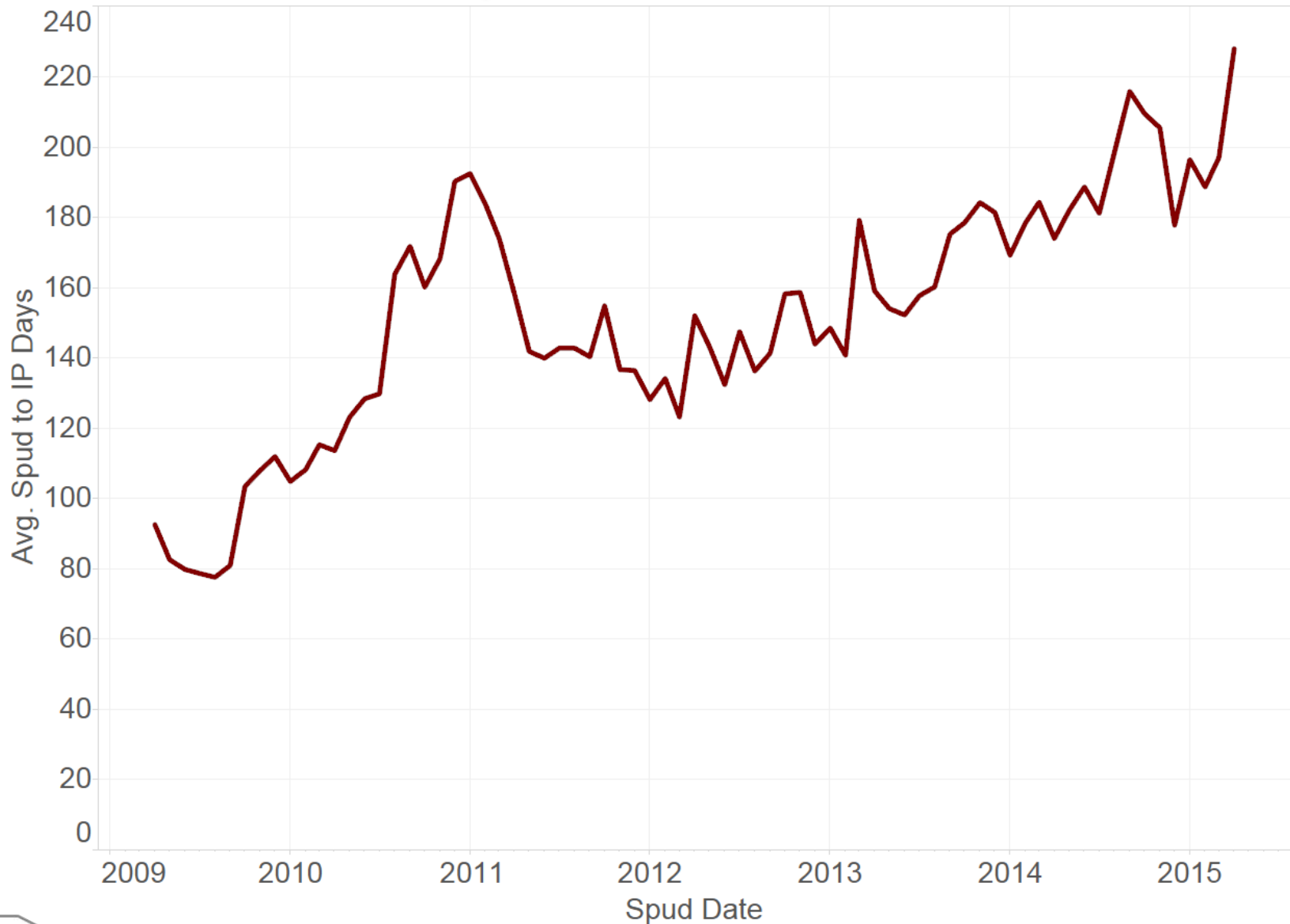


North Dakota Drilling Activity

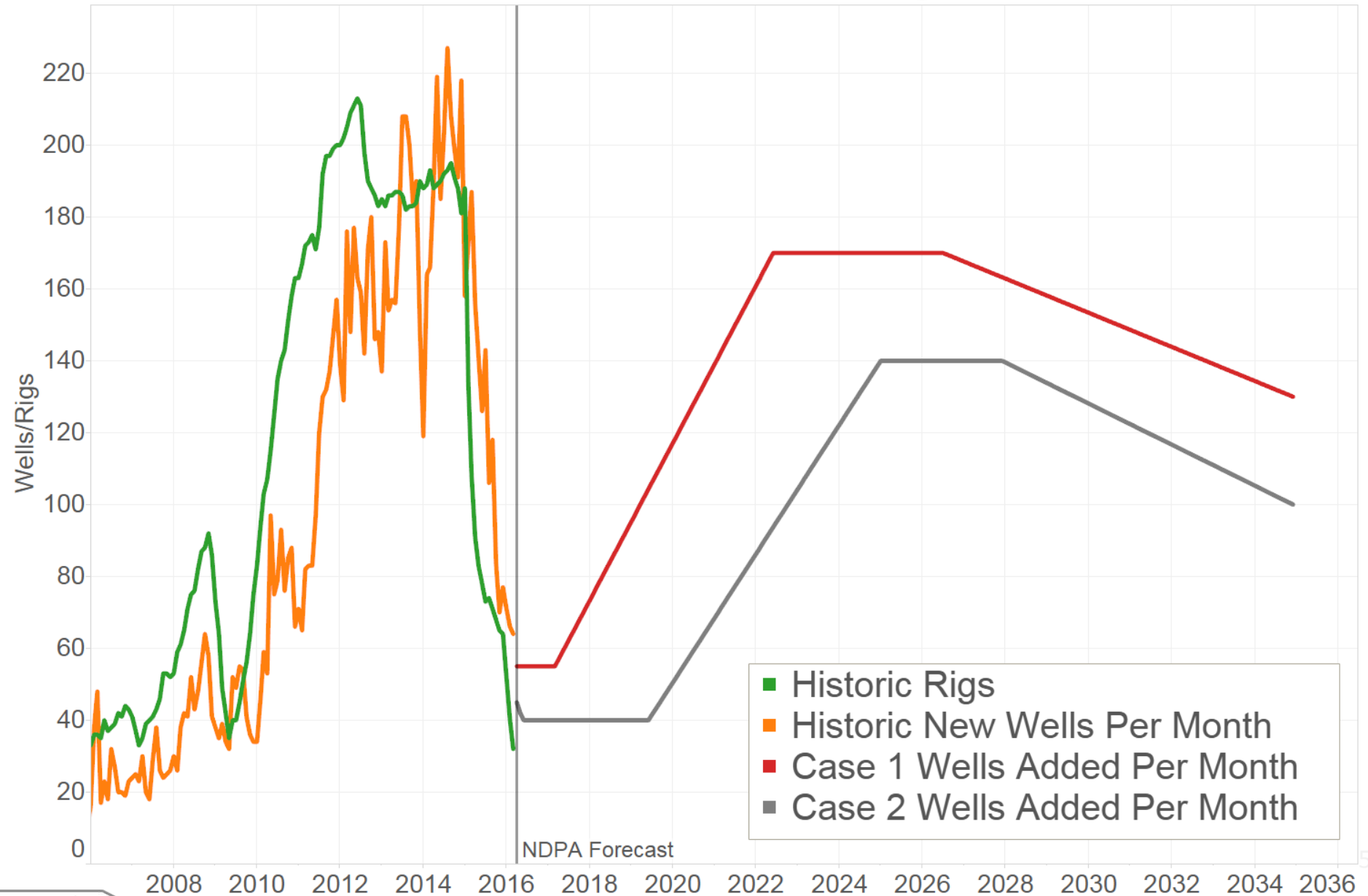


Understanding Current Production Dynamics

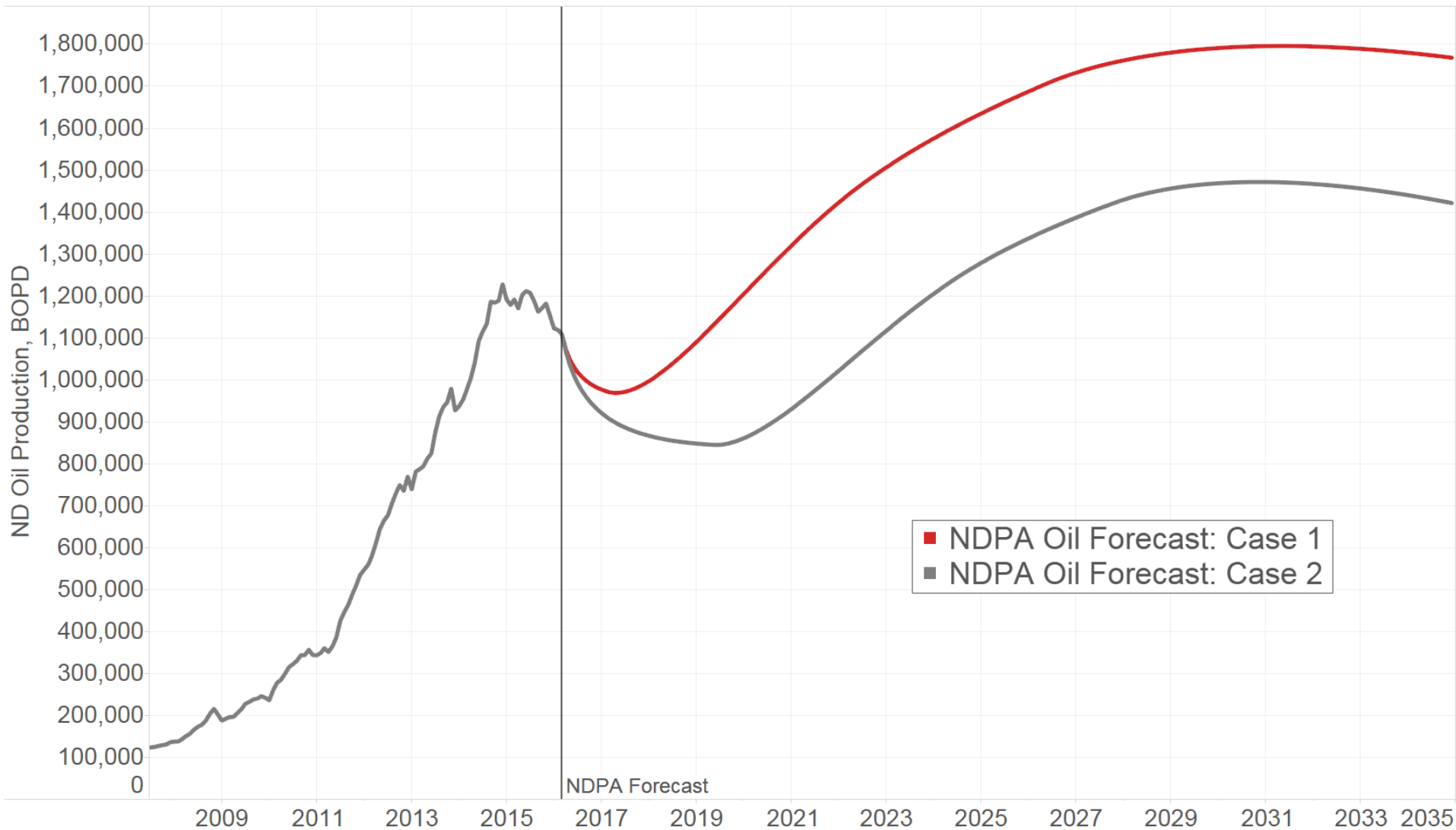
Non-Confidential Spud to Initial Production Timeline



North Dakota Forecast Activity Assumptions



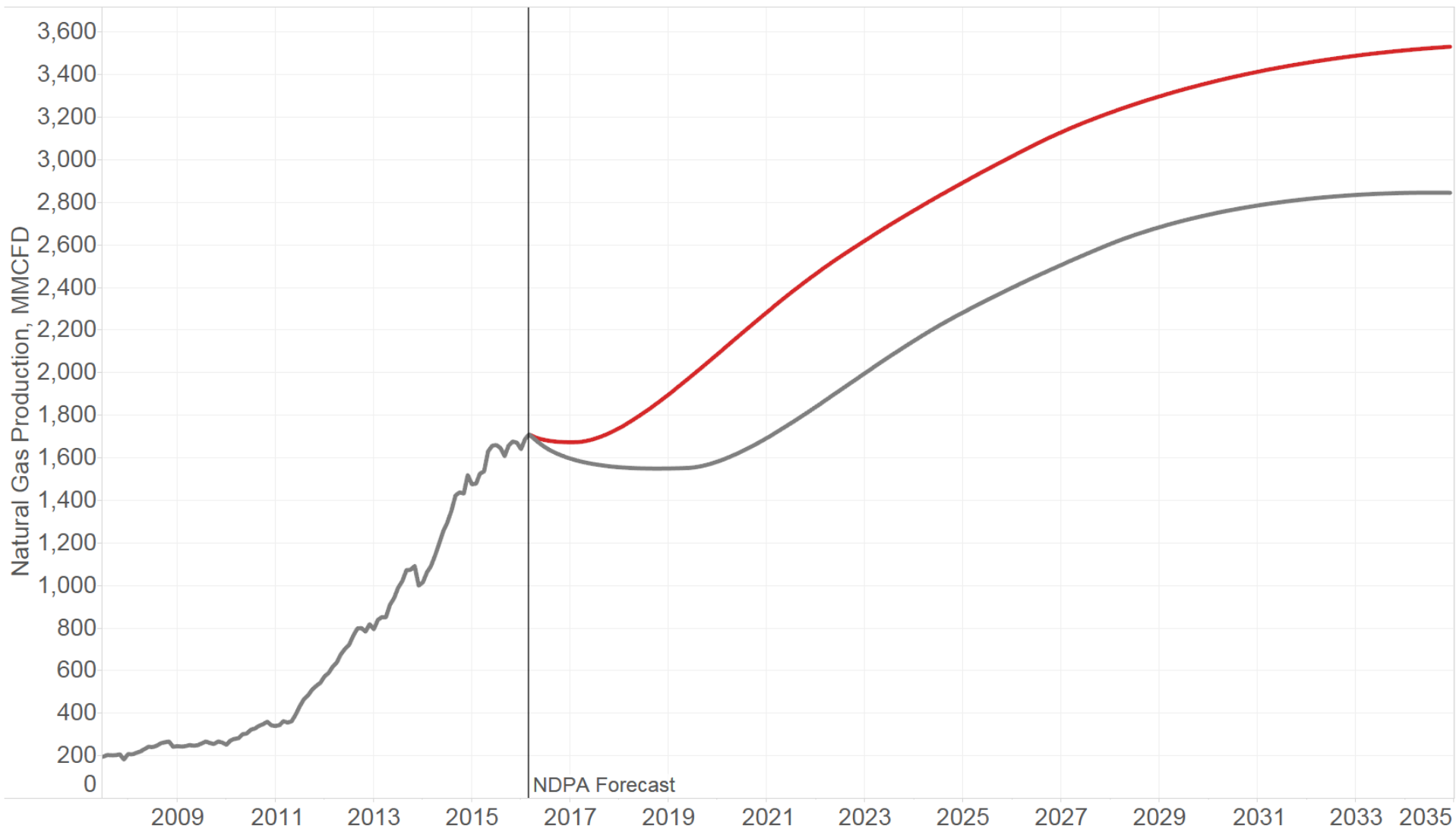
North Dakota Oil Production Forecast



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



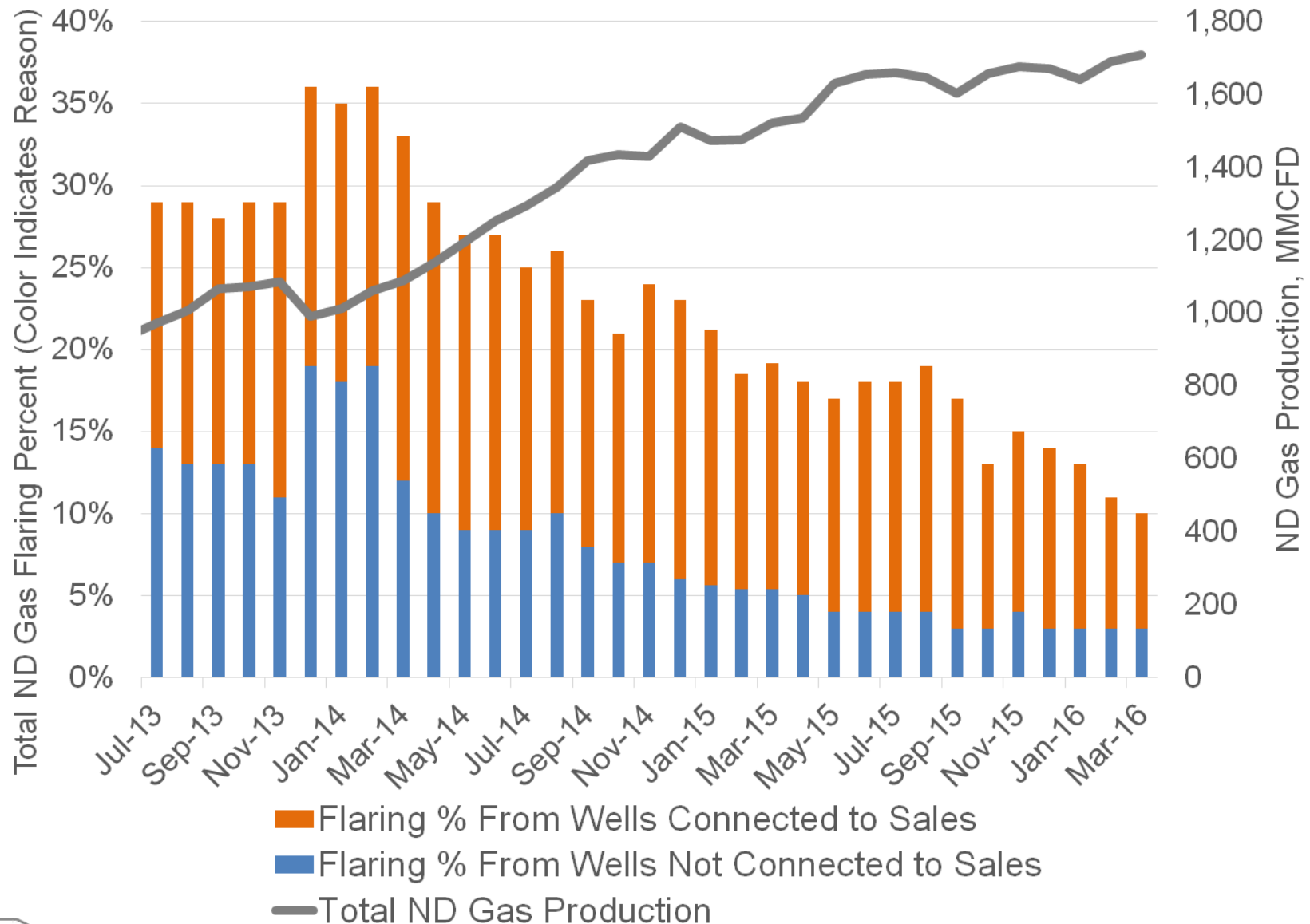
North Dakota Gas Production Forecast



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



Solving the Flaring Challenge



Example Bakken Gas Quality

Component	Mole %	GPM	% of Liquids
Nitrogen	5.21%	NA	NA
Carbon Dioxide	0.57%	NA	NA
Hydrogen Sulfide	0.01%	NA	NA
Methane	57.67%	NA	NA
Ethane	19.94%	5.32	52.5%
Propane	11.33%	3.11	30.7%
Isobutane	0.97%	0.32	3.1%
Normal Butane	2.83%	0.89	8.8%
Isopentane	0.38%	0.14	1.4%
Normal Pentane	0.55%	0.20	2.0%
Hexane+	0.36%	0.16	1.5%
Totals	99.82%	10.14	100.0%

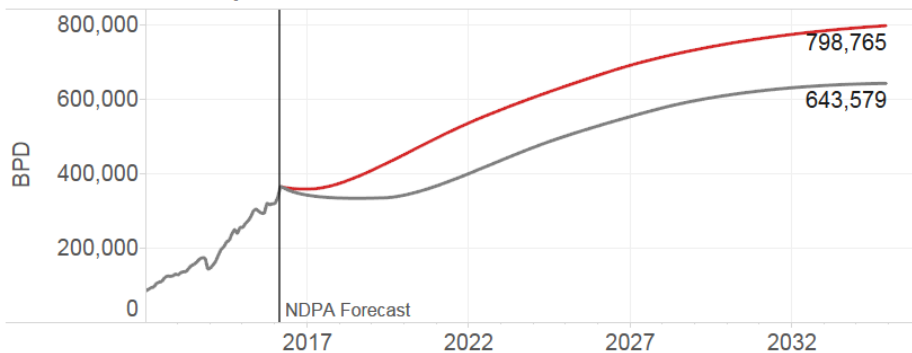
Gas Stream BTU Value	1,399
-----------------------------	--------------

Mole % Source: Energy & Environmental Research Center (EERC)

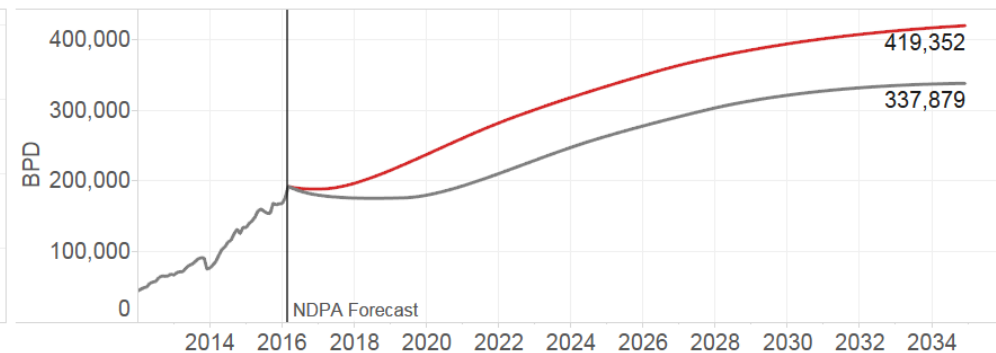


North Dakota Captured* NGL's

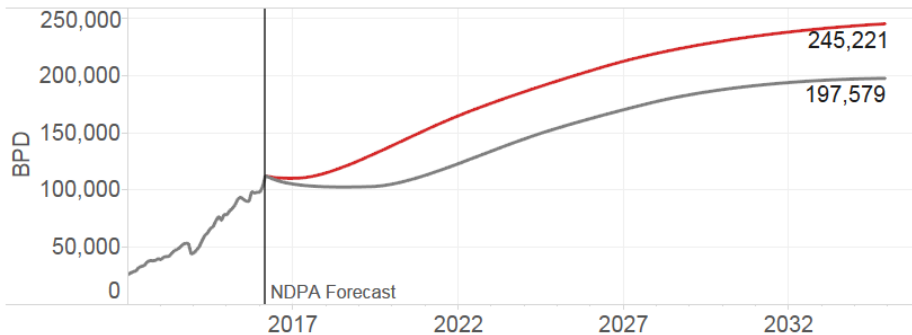
All Natural Gas Liquids



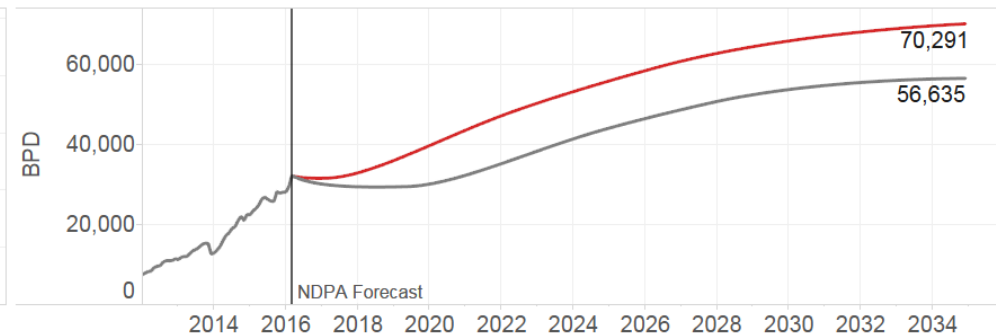
Ethane



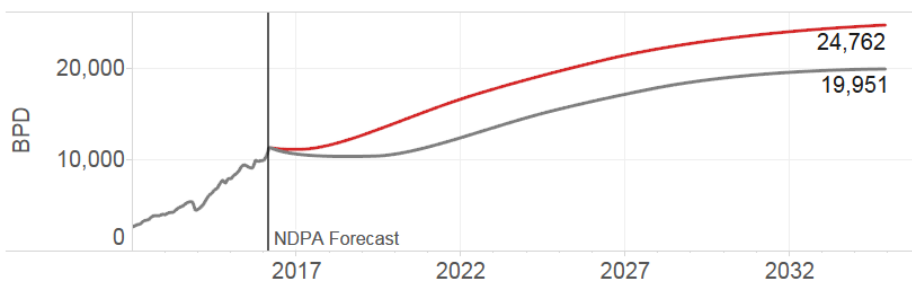
Propane



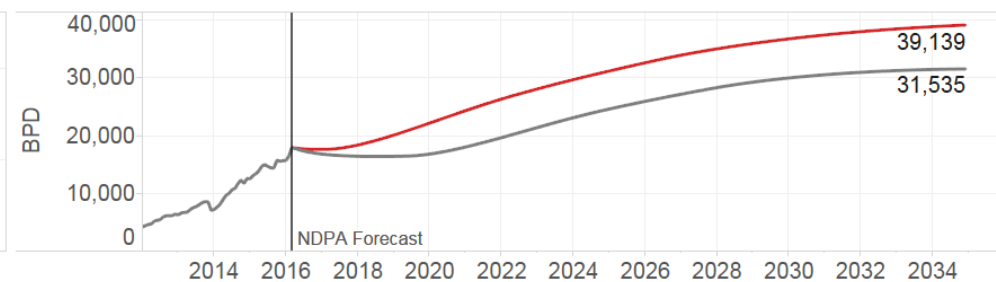
Butane



Isobutane



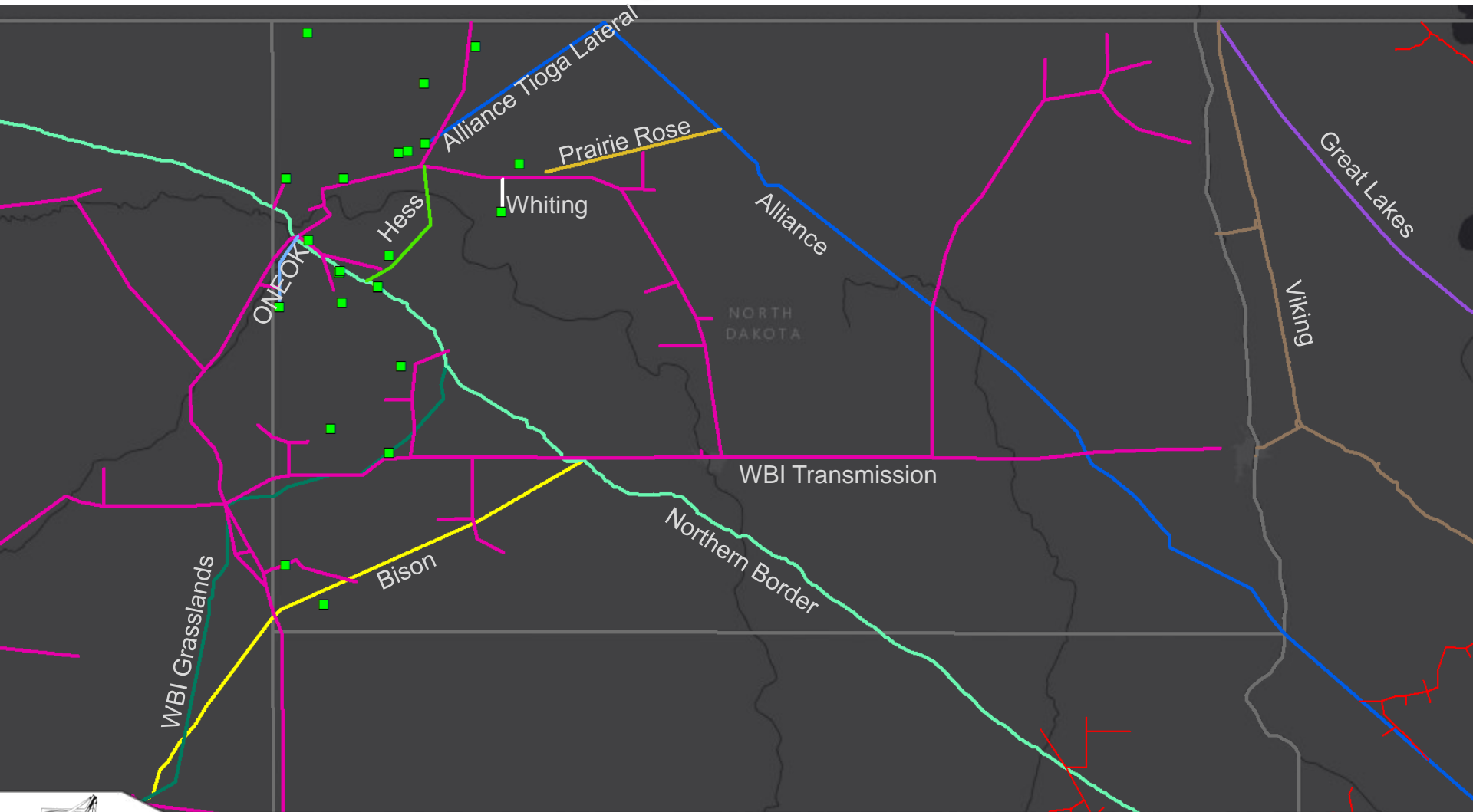
Natural Gasoline



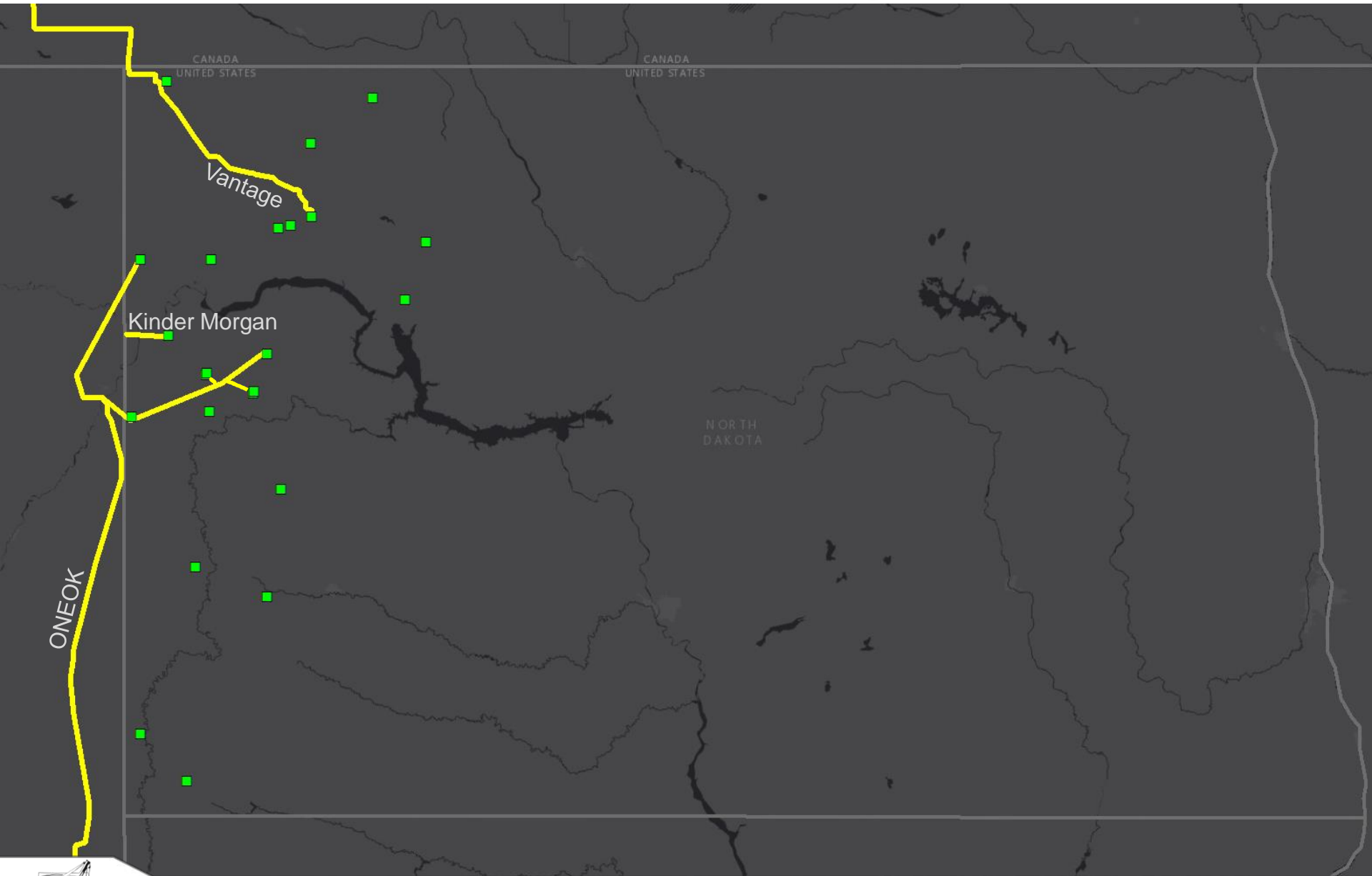
**Non-flared NGL's & Assumes 10 GPM*



Major Gas Pipeline and Processing Infrastructure



Dedicated NGL Pipelines



Vantage Ethane Pipeline

10", 80 Mile Pipeline
Capacity: 68,000 BPD

Purity Ethane to Canada

Source: Tioga Gas Plant

Expanding to ONEOK
Stateline Plants (Q3-16)



ONEOK Bakken NGL Pipeline

ONEOK Bakken NGL Pipeline Q1 2016 Flows:
116 mbpd (ONEOK May 2016 Presentation)

ONEOK Garden Creek, McKenzie, Lonesome
Creek, and Stateline Plants. Additional 3rd
Party Plant Connections.

Additional Barrels Received in Wyoming's
Powder River

Y-Grade Service

Current Capacity 135 mbpd

North Dakota

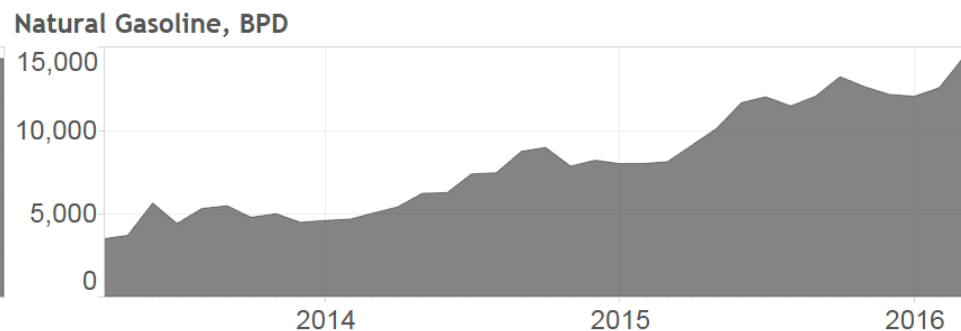
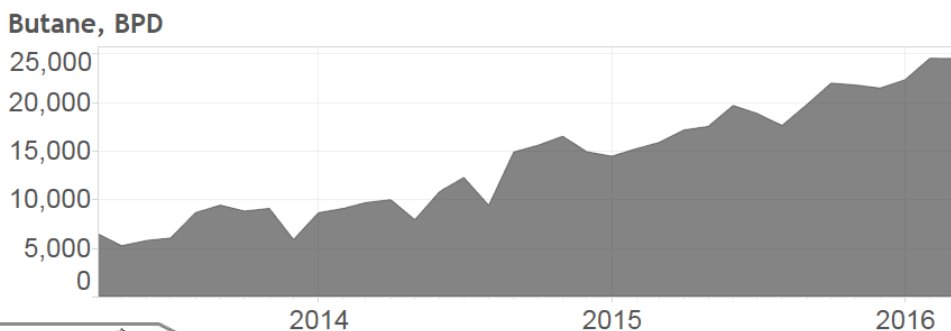
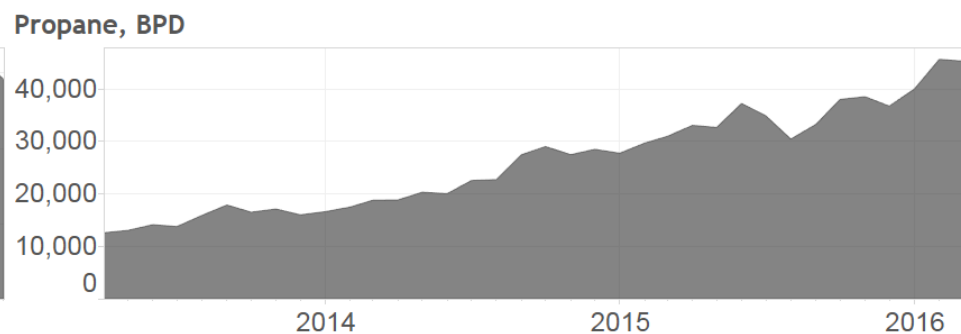
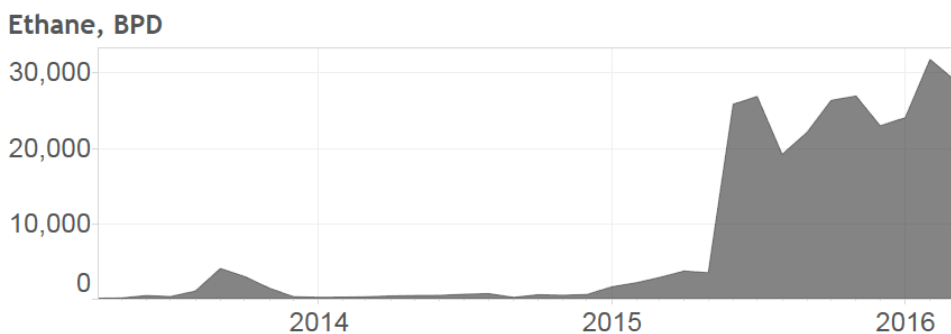
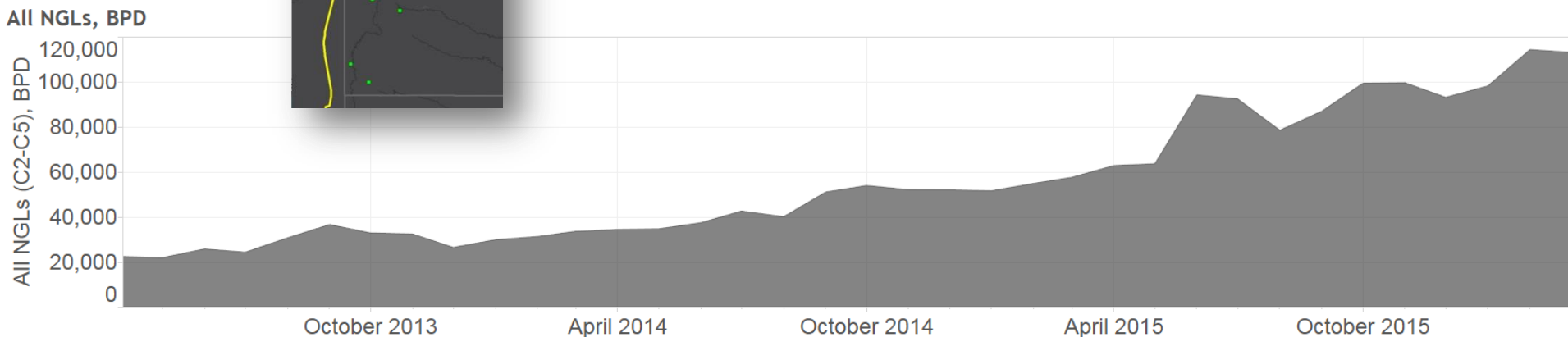
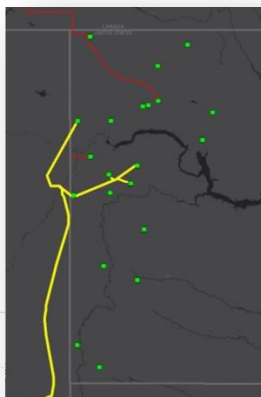
South Dakota

Nebraska

Iowa

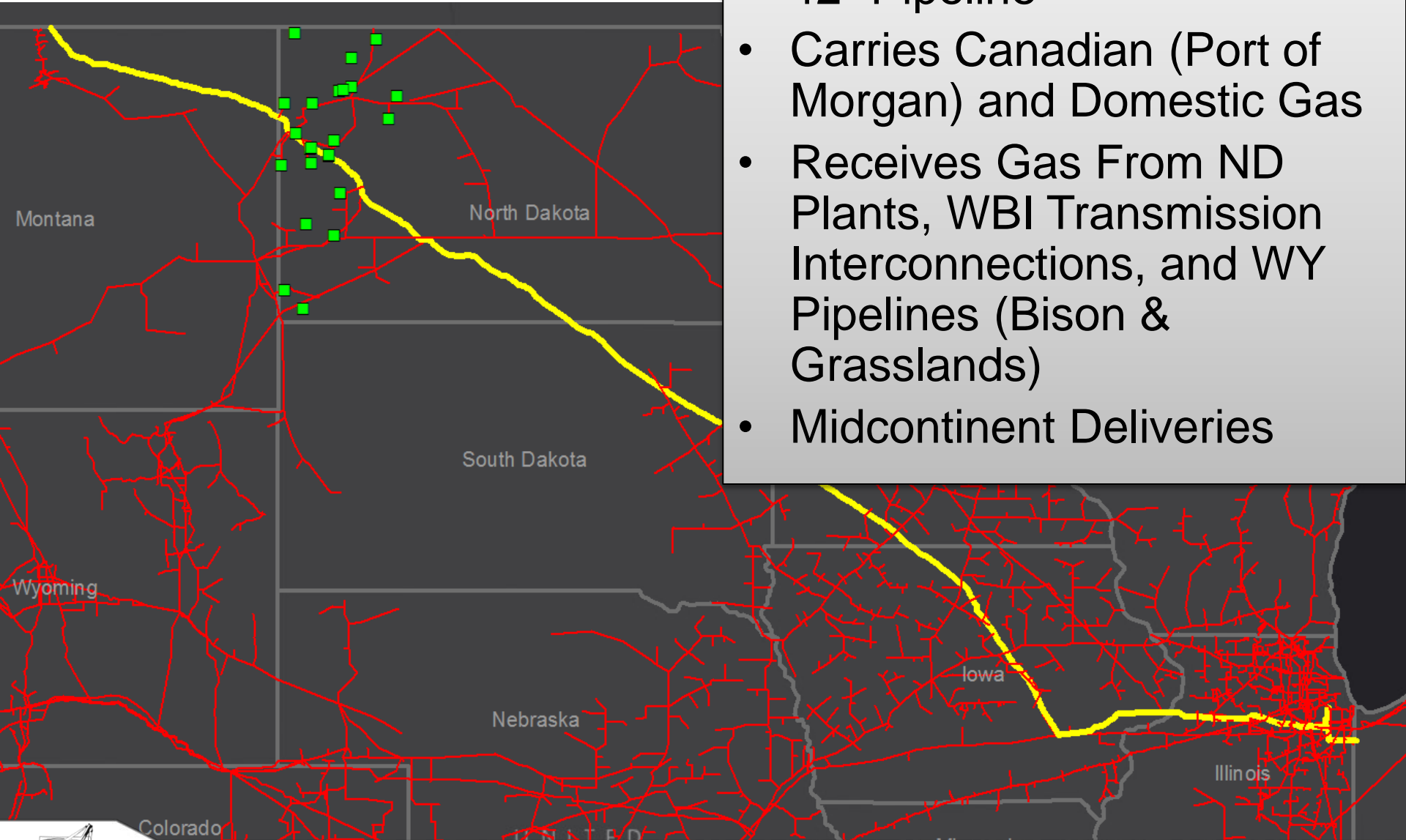


Plant Volumes Connected to Bakken NGL Pipeline

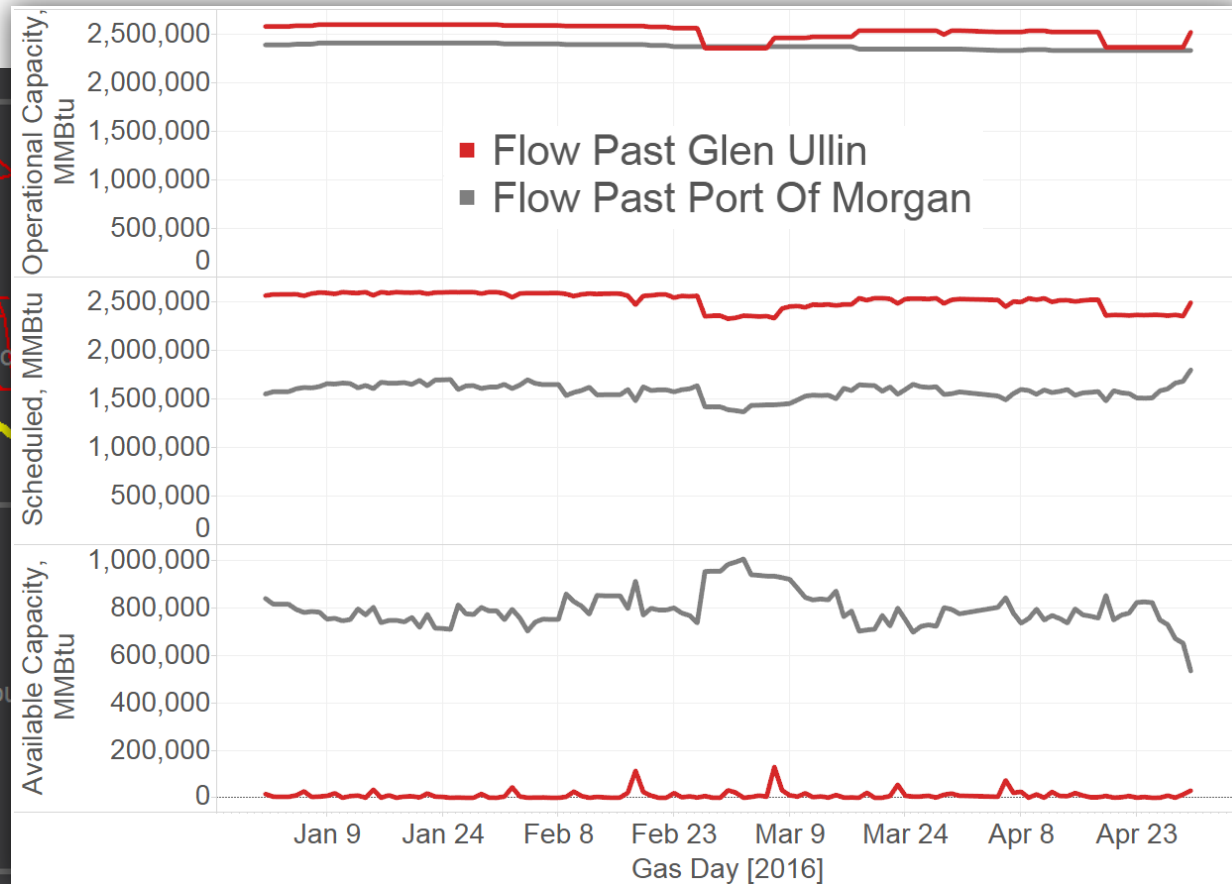
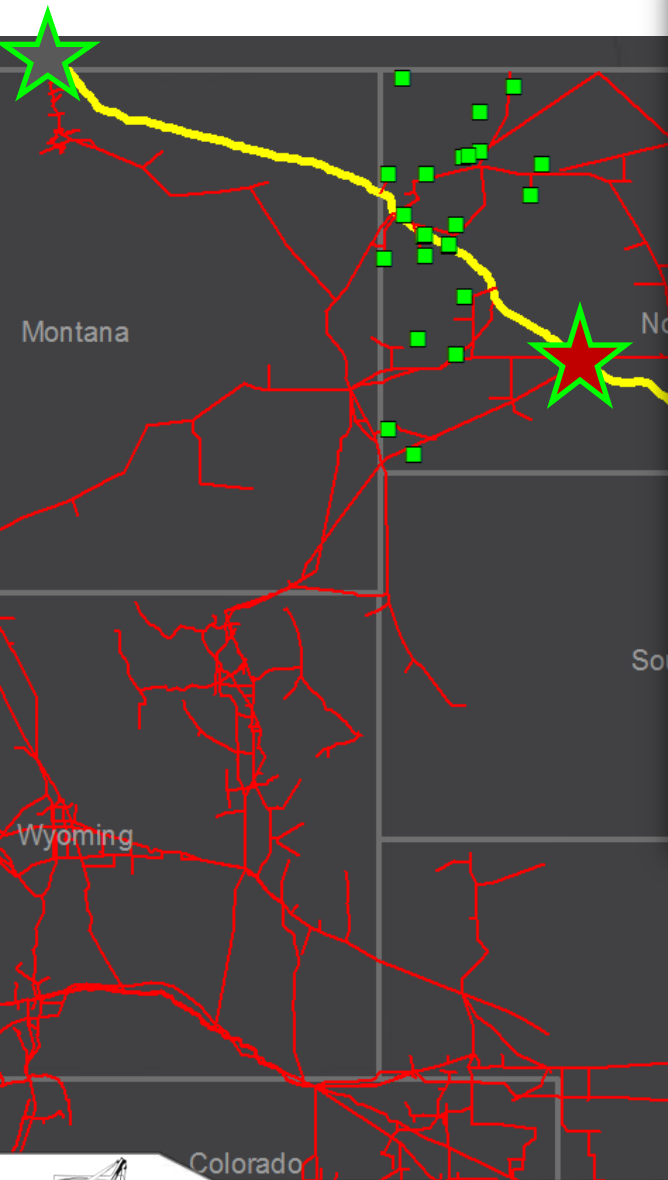


Northern Border Pipeline

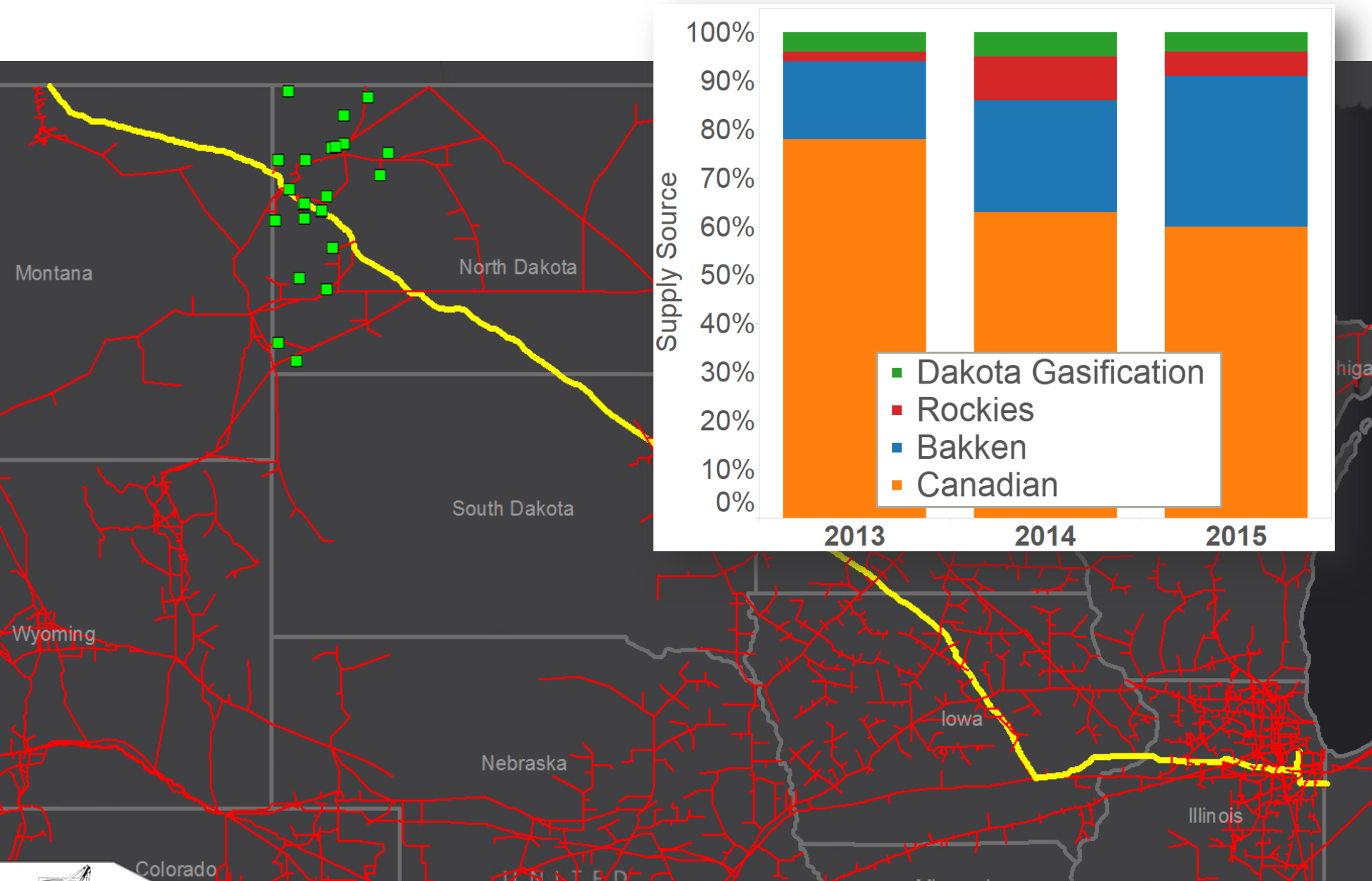
- 42" Pipeline
- Carries Canadian (Port of Morgan) and Domestic Gas
- Receives Gas From ND Plants, WBI Transmission Interconnections, and WY Pipelines (Bison & Grasslands)
- Midcontinent Deliveries



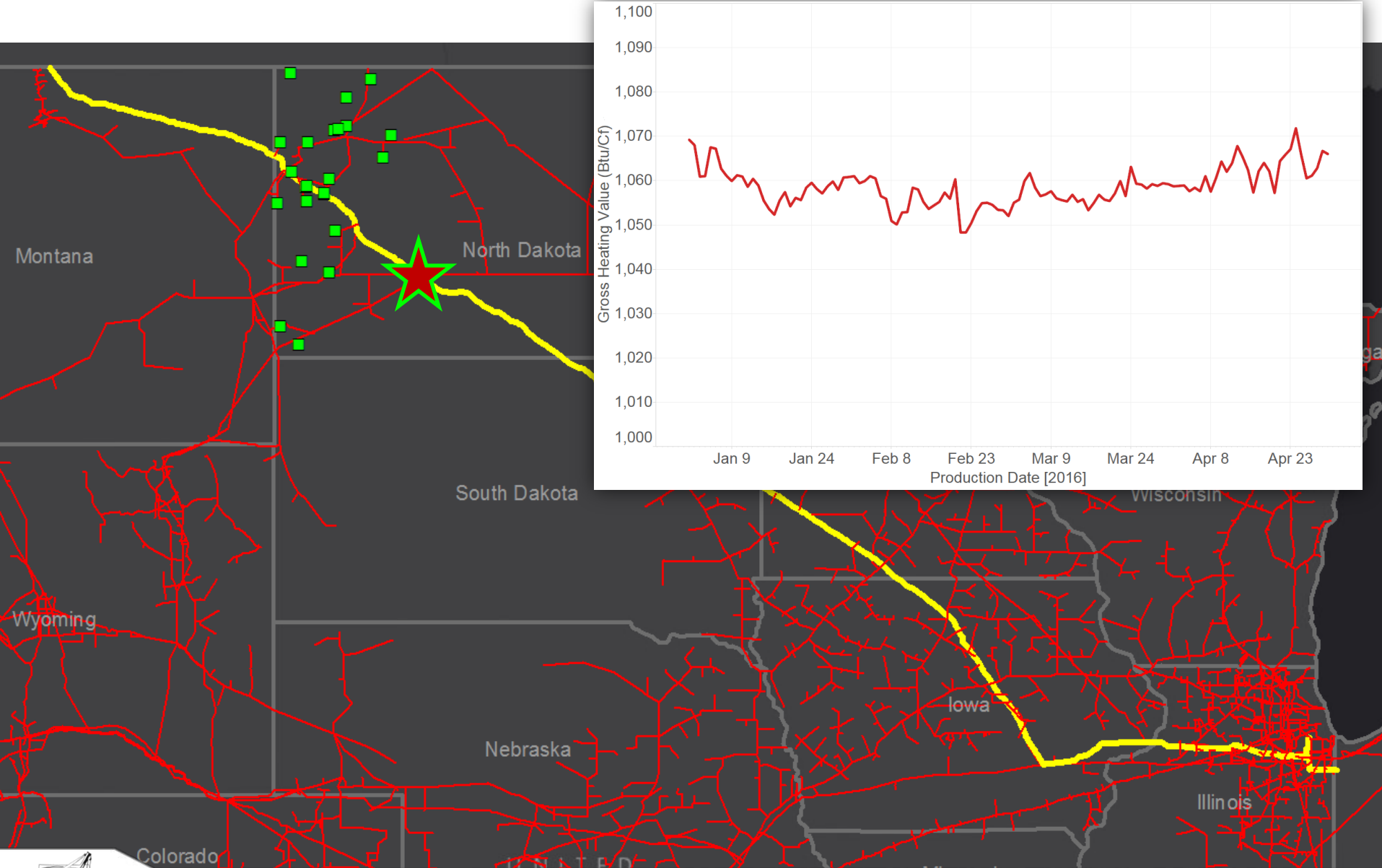
Northern Border Pipeline* (2016)



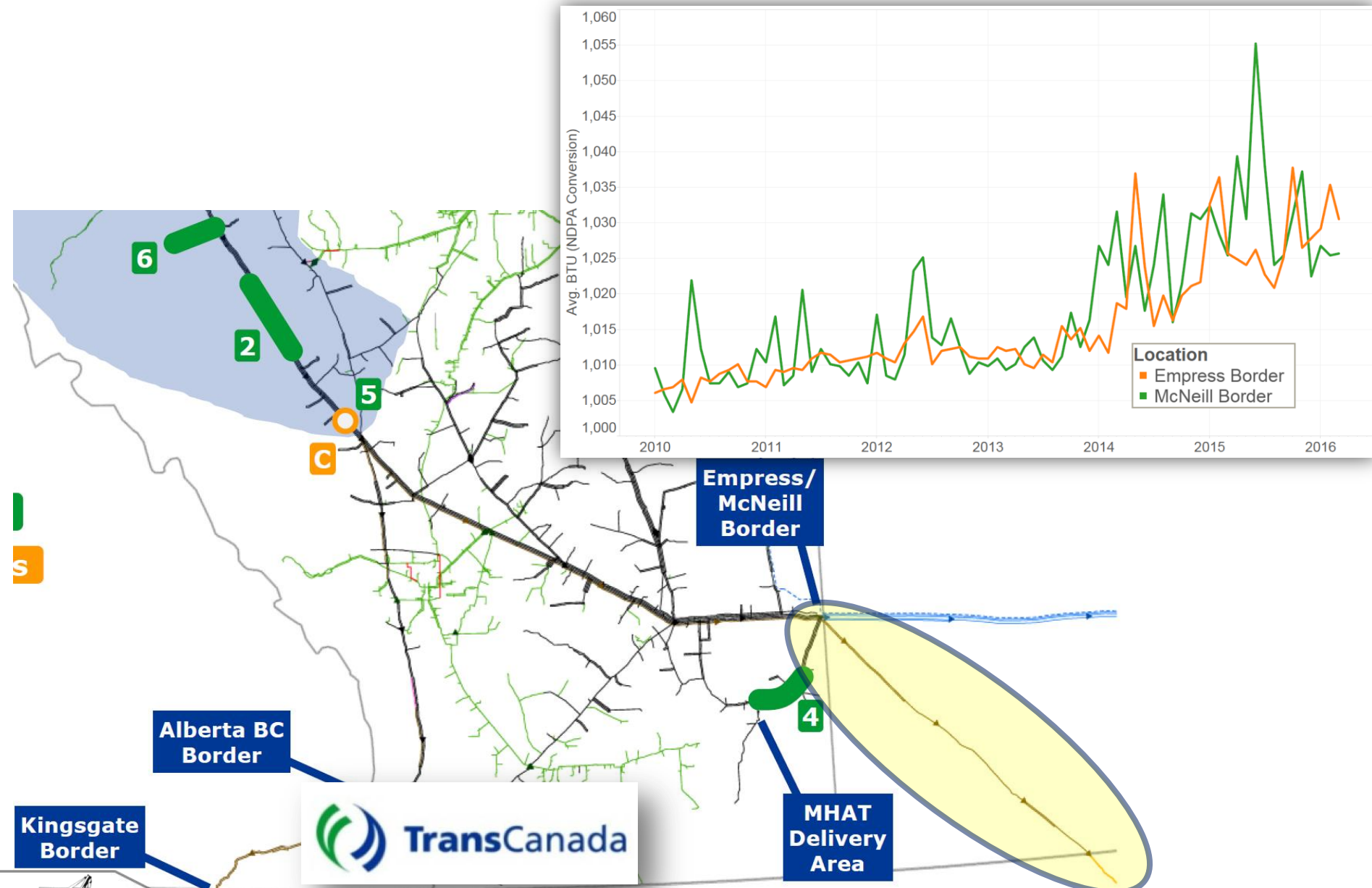
Northern Border Receipt Mix*



Northern Border Glen Ullin* (2016)

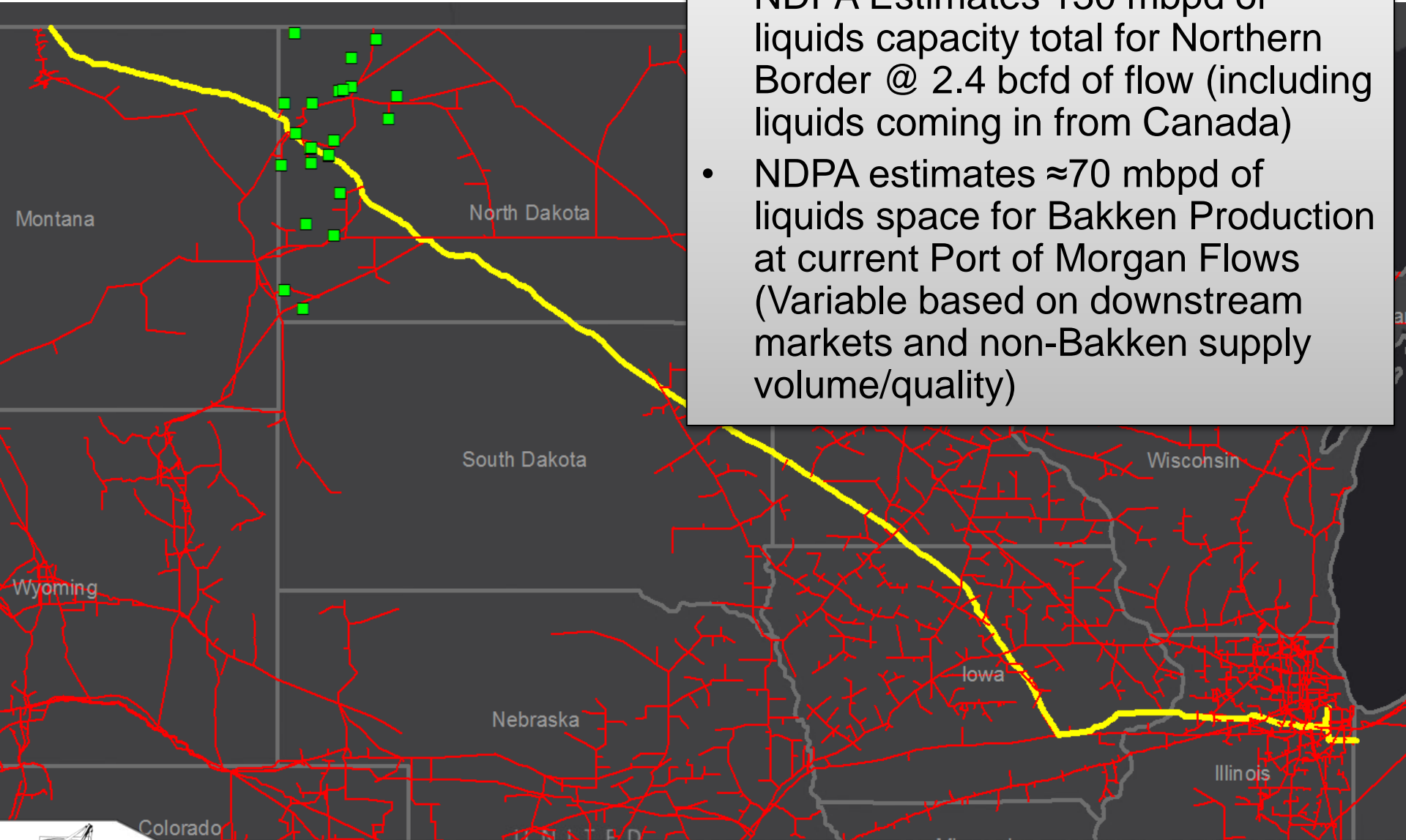


Foothills Pipeline

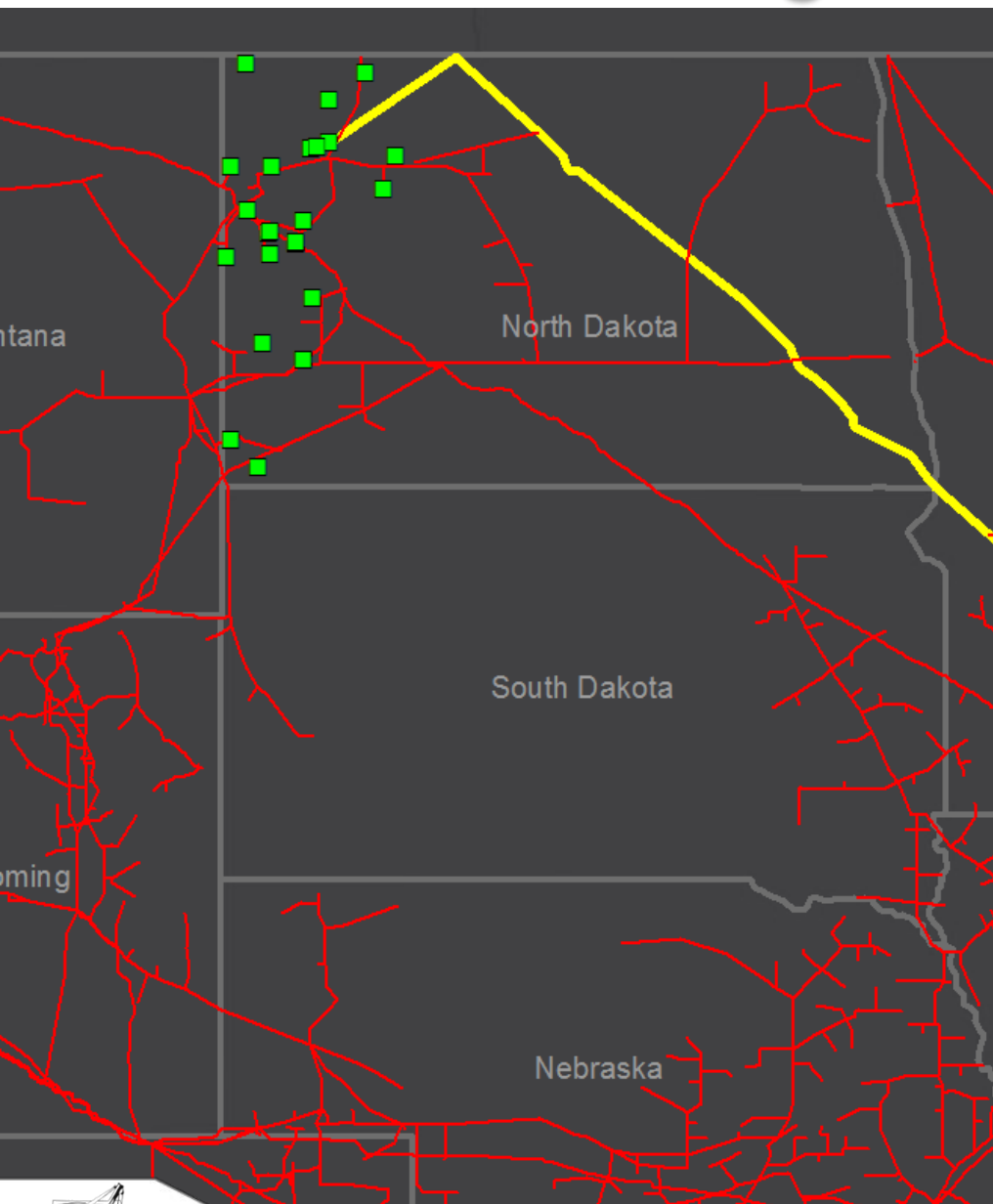


Northern Border Pipeline

- NDPA Estimates 130 mbpd of liquids capacity total for Northern Border @ 2.4 bcf/d of flow (including liquids coming in from Canada)
- NDPA estimates ≈ 70 mbpd of liquids space for Bakken Production at current Port of Morgan Flows (Variable based on downstream markets and non-Bakken supply volume/quality)



Alliance Tioga Lateral Pipeline



12", 80 Mile Pipeline
Capacity: 126 MMCFD

2016 Scheduled Flows:
70,000-85,000 MMBTU
1,235 BTU Gas

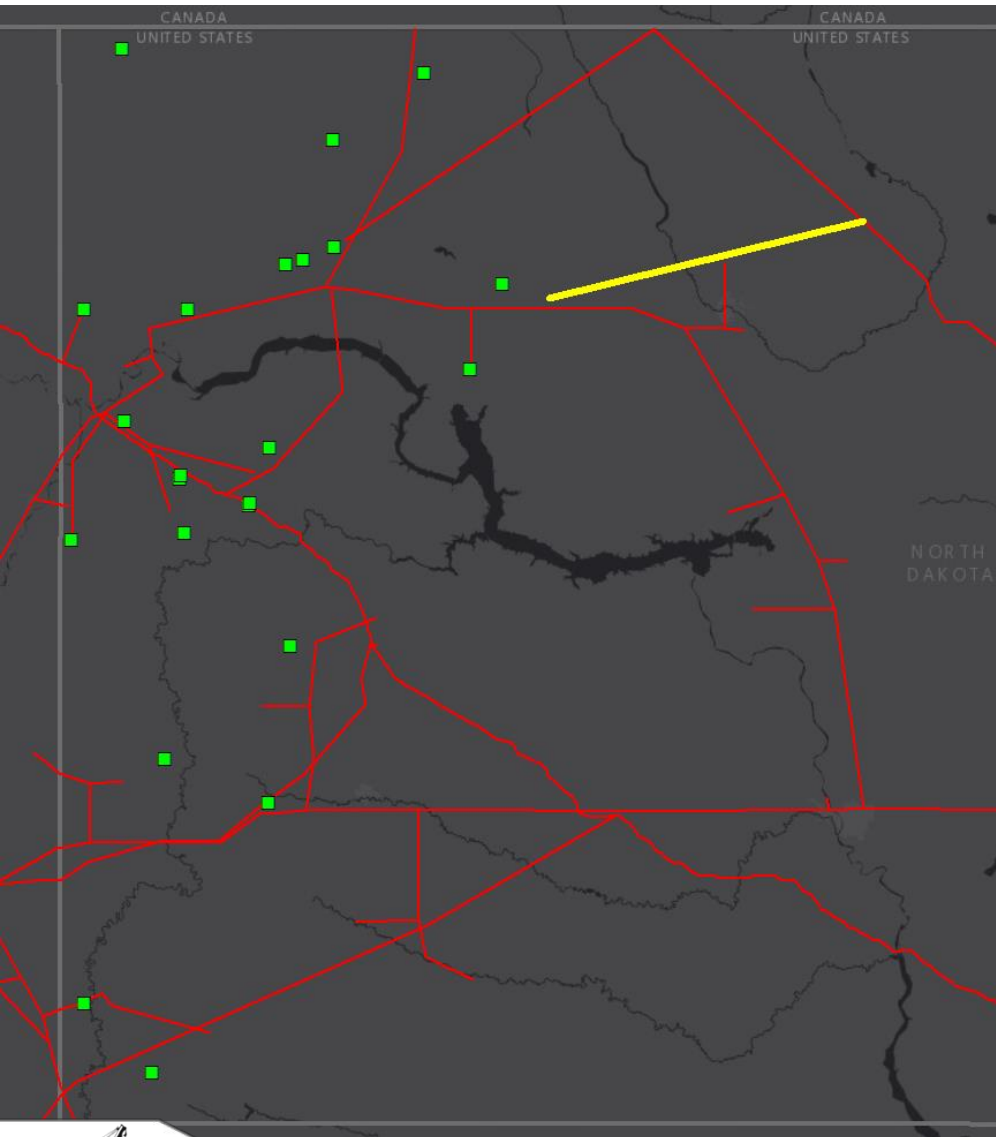
2016 Available Capacity:
5,000-10,000 MMBTU
1,446 BTU Limit With Waiver

Gas Sources: Tioga Gas Plant

Expandable with Compression



Aux Sable Prairie Rose Pipeline



12", 83 Mile Pipeline
Capacity: 120 MMCFD

2016 Scheduled Flows:
125,000-140,000 MMBTU
1,330-1,400 BTU Gas

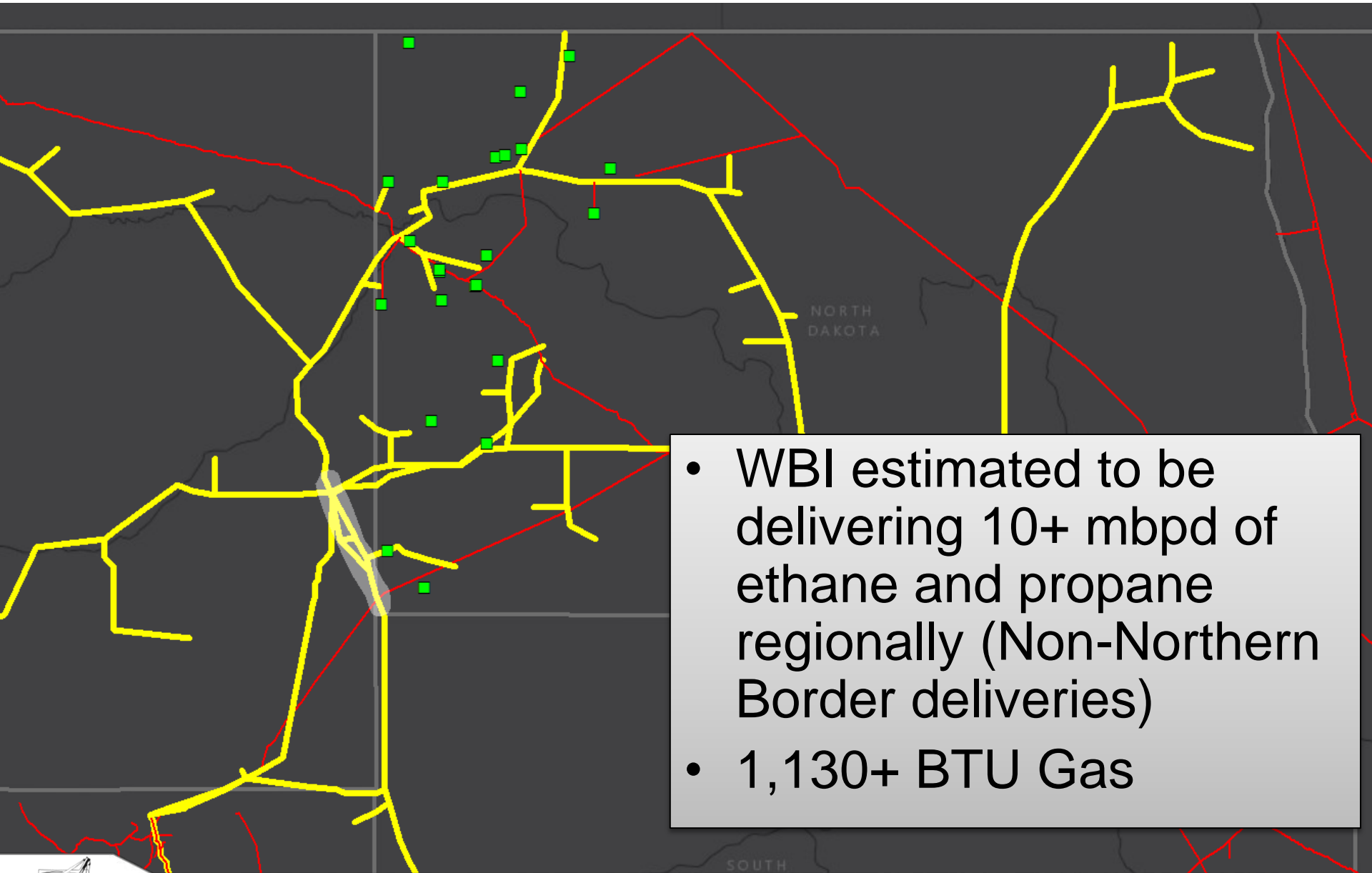
2016 Available Capacity:
15,000-25,000 MMBTU
1,550 BTU Limit With Waiver

Gas Sources: Robinson Lake
Plant and 3rd Party Gathering

Palermo Truck Rack For NGL
Deliveries: 5-10 MBPD



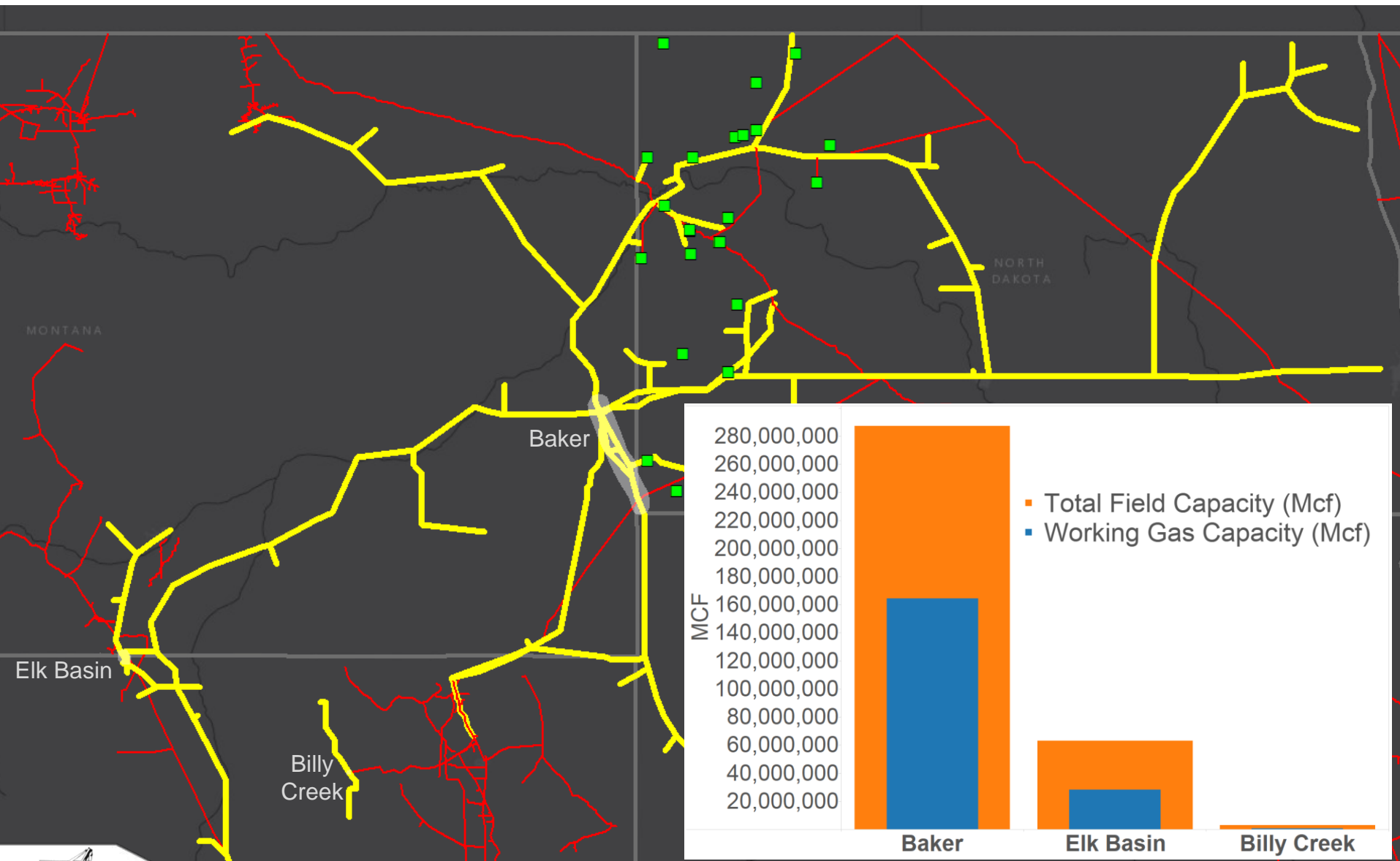
WBI Transmission Pipelines



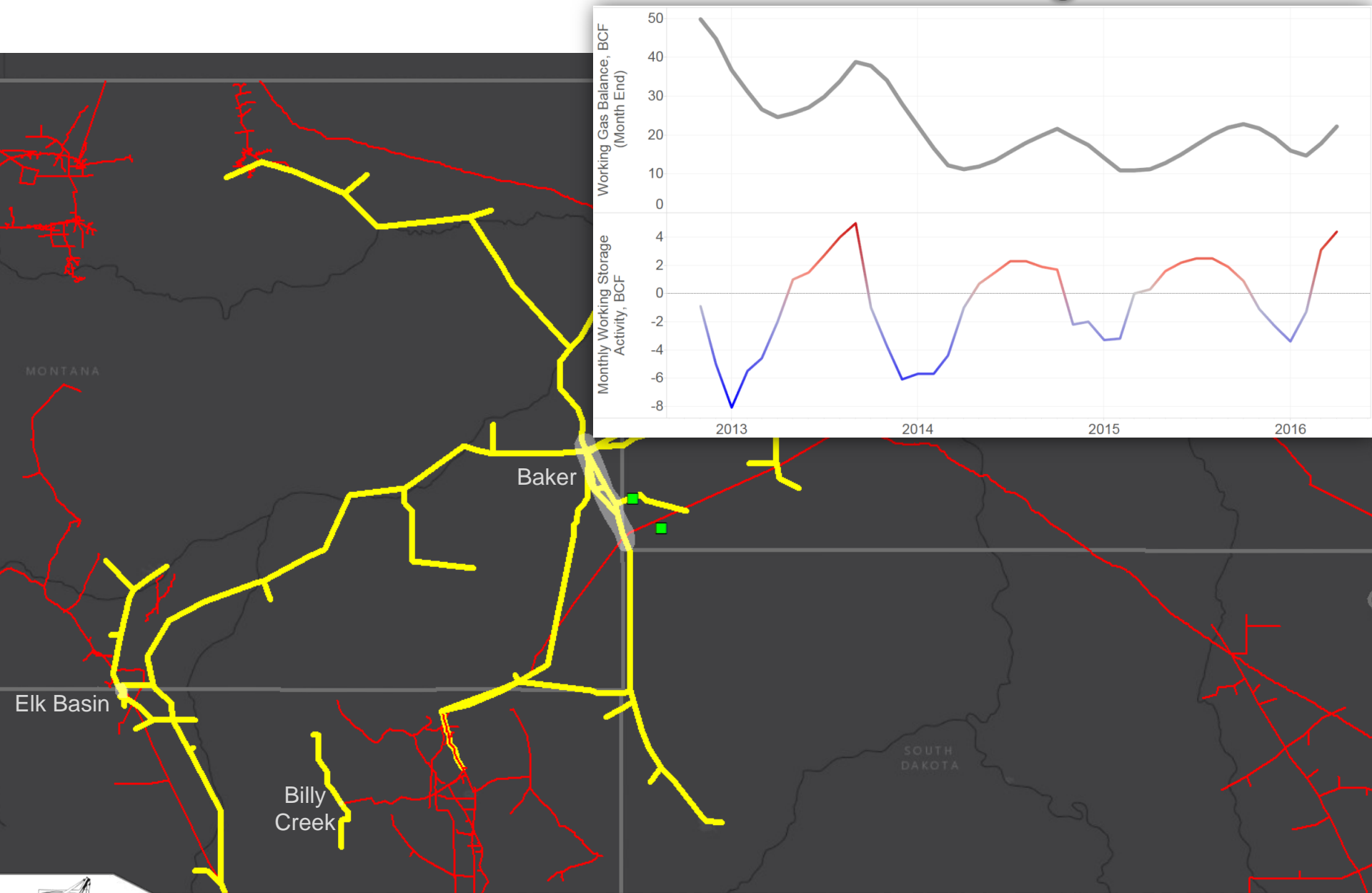
- WBI estimated to be delivering 10+ mbpd of ethane and propane regionally (Non-Northern Border deliveries)
- 1,130+ BTU Gas



WBI Transmission Storage

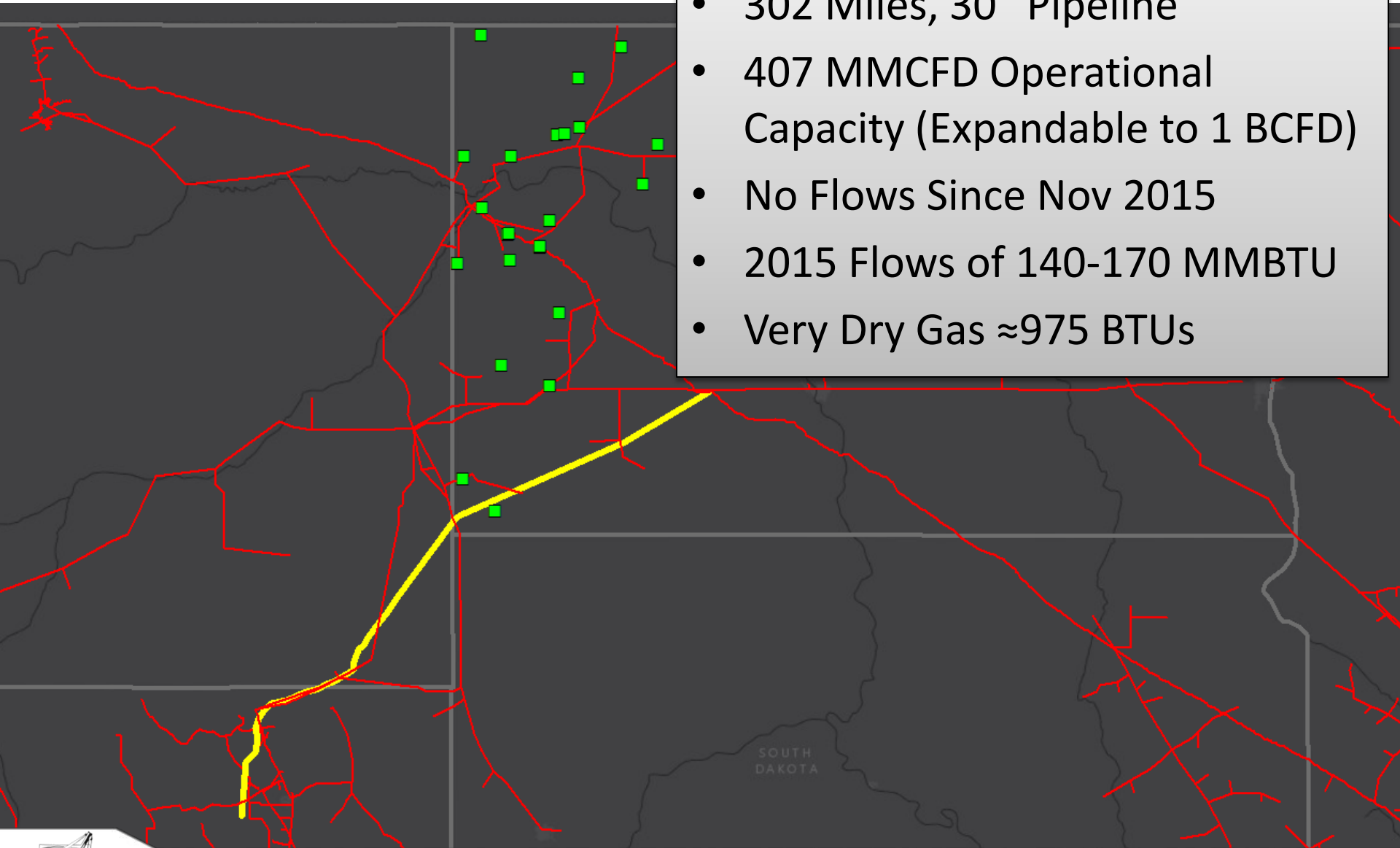


WBI Transmission Storage

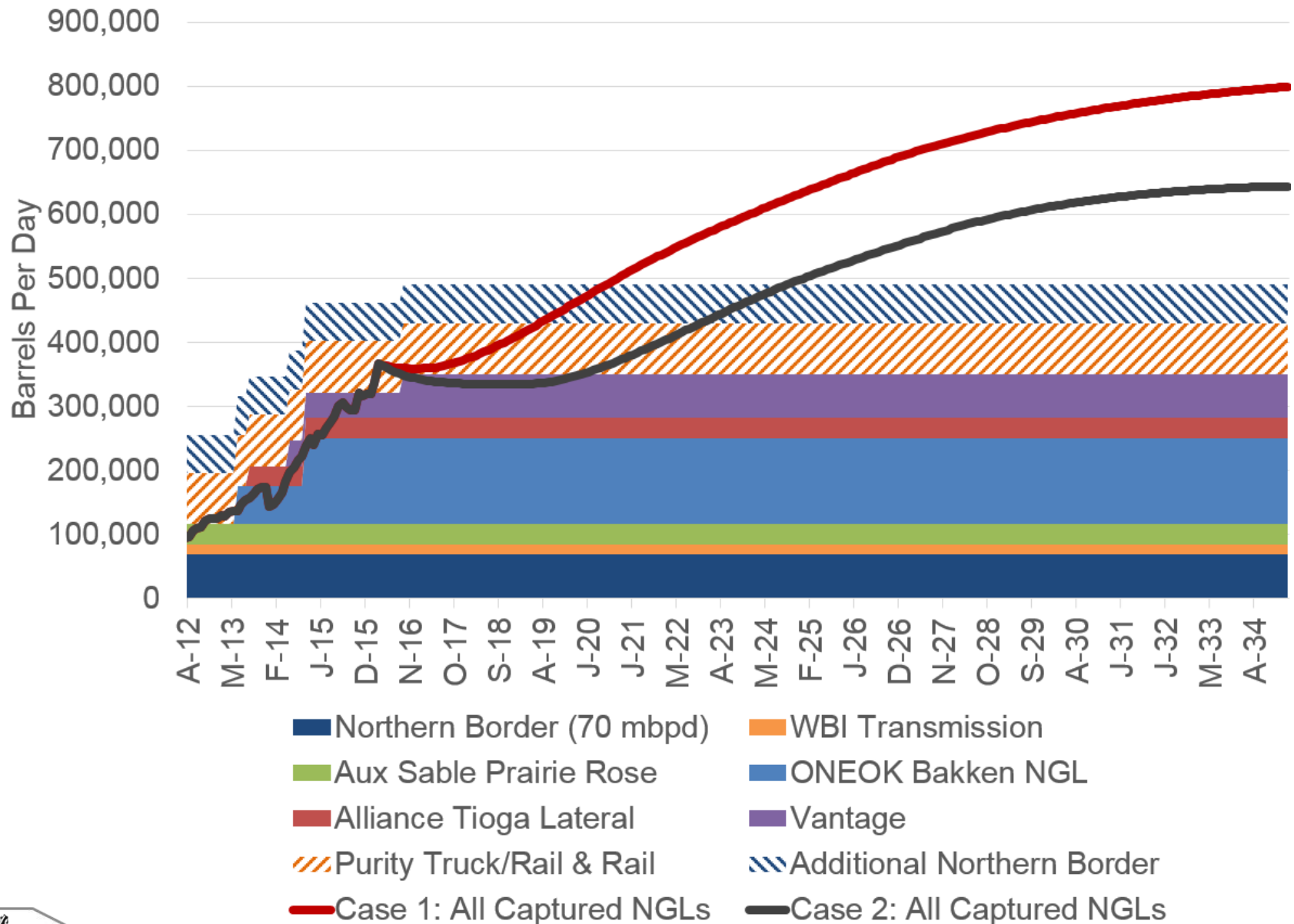


TransCanada Bison Pipeline

- 302 Miles, 30" Pipeline
- 407 MMCFD Operational Capacity (Expandable to 1 BCFD)
- No Flows Since Nov 2015
- 2015 Flows of 140-170 MMBTU
- Very Dry Gas ≈ 975 BTUs



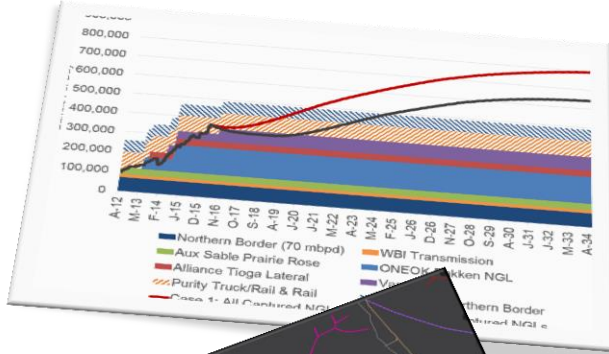
NGL Capacity Is Complicated...



NGL Capacity Is Complicated...

Key Challenges

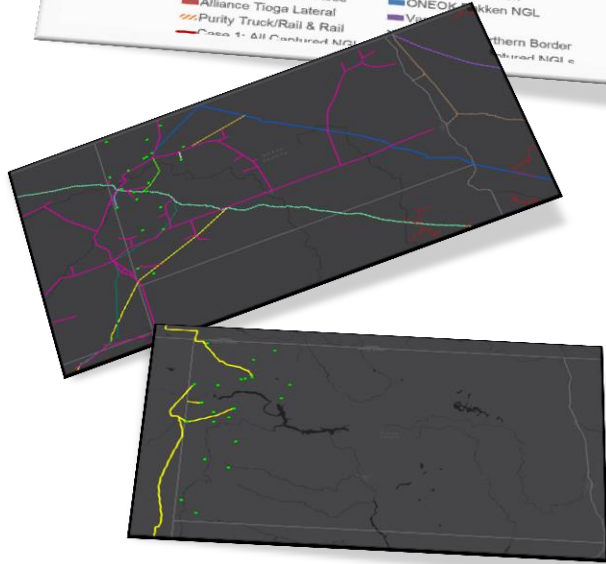
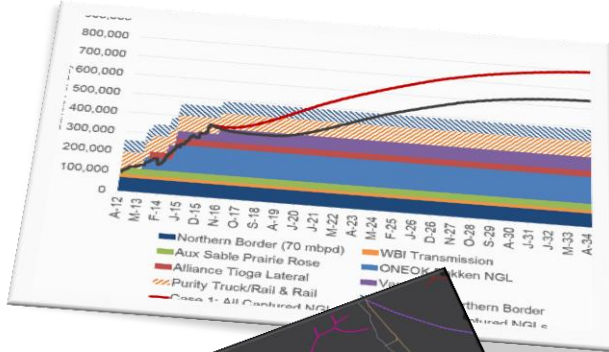
- Plant complexity varies
 - Y-grade vs purity product
 - Ethane capture equipment
- Scattered plant locations
- Market pricing
- Pipelines vary by type of product they can ship
- Uncertainty of Canadian and Wyoming volumes and quality
- Seasonal product demand



NGL Capacity Is Complicated...

Potential Solutions

- New, expanded, or repurposed pipeline systems
- Local consumption by new petrochemical industries
- Creative market solutions to manage plant NGL/BTUs
- Enhanced oil recovery
- Rail movements of excess products



Contact Information

Justin J. Kringstad, Director
North Dakota Pipeline Authority

600 E. Boulevard Ave. Dept. 405
Bismarck, ND 58505-0840

Phone: (701)220-6227

Fax: (701)328-2820

E-mail: jjkringstad@ndpipelines.com

Websites:

www.pipeline.nd.gov

www.northdakotapipelines.com



**Know what's below.
Call before you dig.**

