MT Tech John “Jocko” Evans Spring Technical Symposium

Maximizing Hydraulic Fracture Intensity to Optimize Shale Development in the Powder River Basin (PRB)

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Ballard Petroleum Holdings, LLC

April 11, 2025

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Agenda

- Brief History of Ballard
- Niobrara and Mowry Shale Targets
  - Geologic overview
  - PRB development history
  - Focus on Niobrara
- Ballard Historical Shale Development
  - Technical learnings
- Current Development Program
  - Application of previous learnings
- Future Development Plans

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Ballard Petroleum Holdings, LLC

- Private O&G Exploration and Production Company Formed in 1992
- Headquarters in Billings, MT; Field Office in Gillette, WY
  - 27 employees in Billings, 18 employees in Gillette
- Q1 2025 Average Gross Operated Production: 11,564 BOEPD (75% oil)
- Core Expertise in Unconventional Play Development
  - Robust evaluation of new and upcoming technologies
- History of an Early Mover in Resource Play Development
  - Drilled first Turner horizontal well in PRB
  - First mover in deep horizontal Frontier play in Converse County in 2008
- Current Development Focus in Powder River Basin
  - Horizontal development in Parkman, Sussex, Turner, Niobrara and Mowry
  - Horizontal waterflood in Parkman

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Niobrara and Mowry Geologic Overview

- Extensive Plays in the PRB
- Niobrara
  - Mature source rock, main source for upper Cretaceous
  - Type I kerogen (oil)
  - 2-4% TOC
  - Over-pressured (~.7 psi/ft)
- Mowry
  - Mature source rock, main source for lower Cretaceous
  - Type II kerogen (oil/gas)
  - 2-5% TOC
  - Over-pressured (~.7 psi/ft)

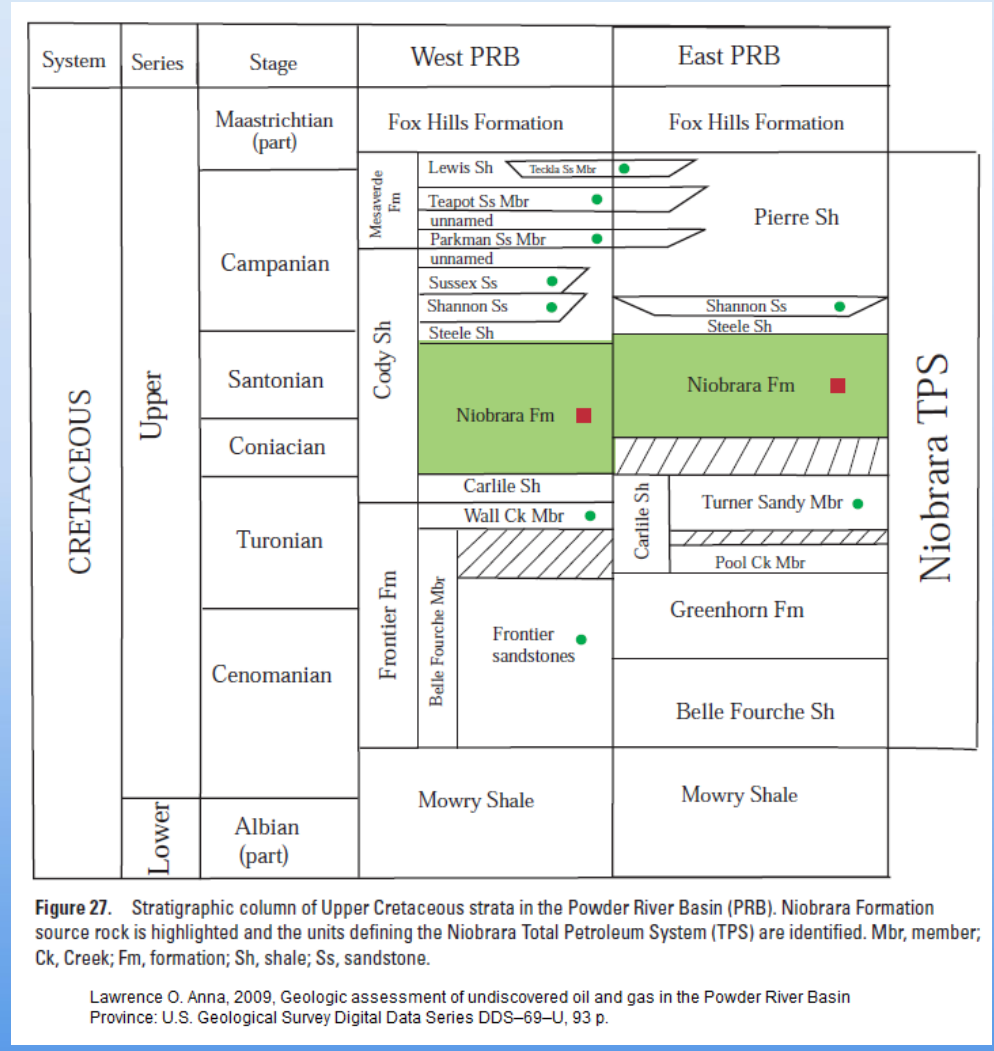

Figure 27. Stratigraphic column of Upper Cretaceous strata in the Powder River Basin (PRB). Niobrara Formation source rock is highlighted and the units defining the Niobrara Total Petroleum System (TPS) are identified. Mbr, member; Ck, Creek; Fm, formation; Sh, shale; Ss, sandstone.

Lawrence O. Anna, 2009, Geologic assessment of undiscovered oil and gas in the Powder River Basin Province: U.S. Geological Survey Digital Data Series DDS–69–U, 93 p.

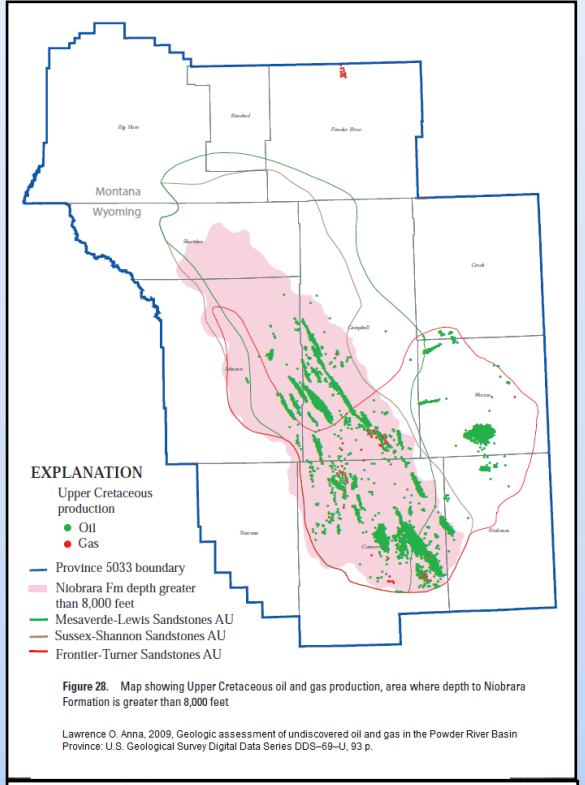

Figure 28. Map showing Upper Cretaceous oil and gas production, area where depth to Niobrara Formation is greater than 8,000 feet

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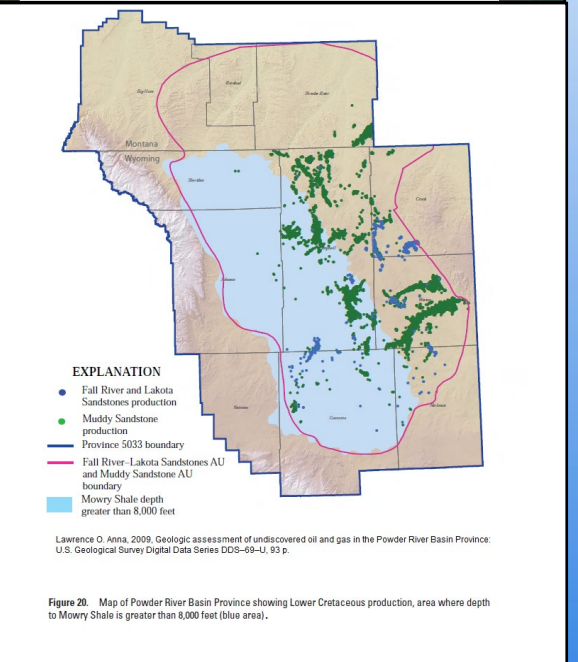

Lawrence O. Anna, 2009, Geologic assessment of undiscovered oil and gas in the Powder River Basin Province: U.S. Geological Survey Digital Data Series DDS–69–U, 93 p.

Figure 20. Map of Powder River Basin Province showing Lower Cretaceous production, area where depth to Mowry Shale is greater than 8,000 feet (blue area).

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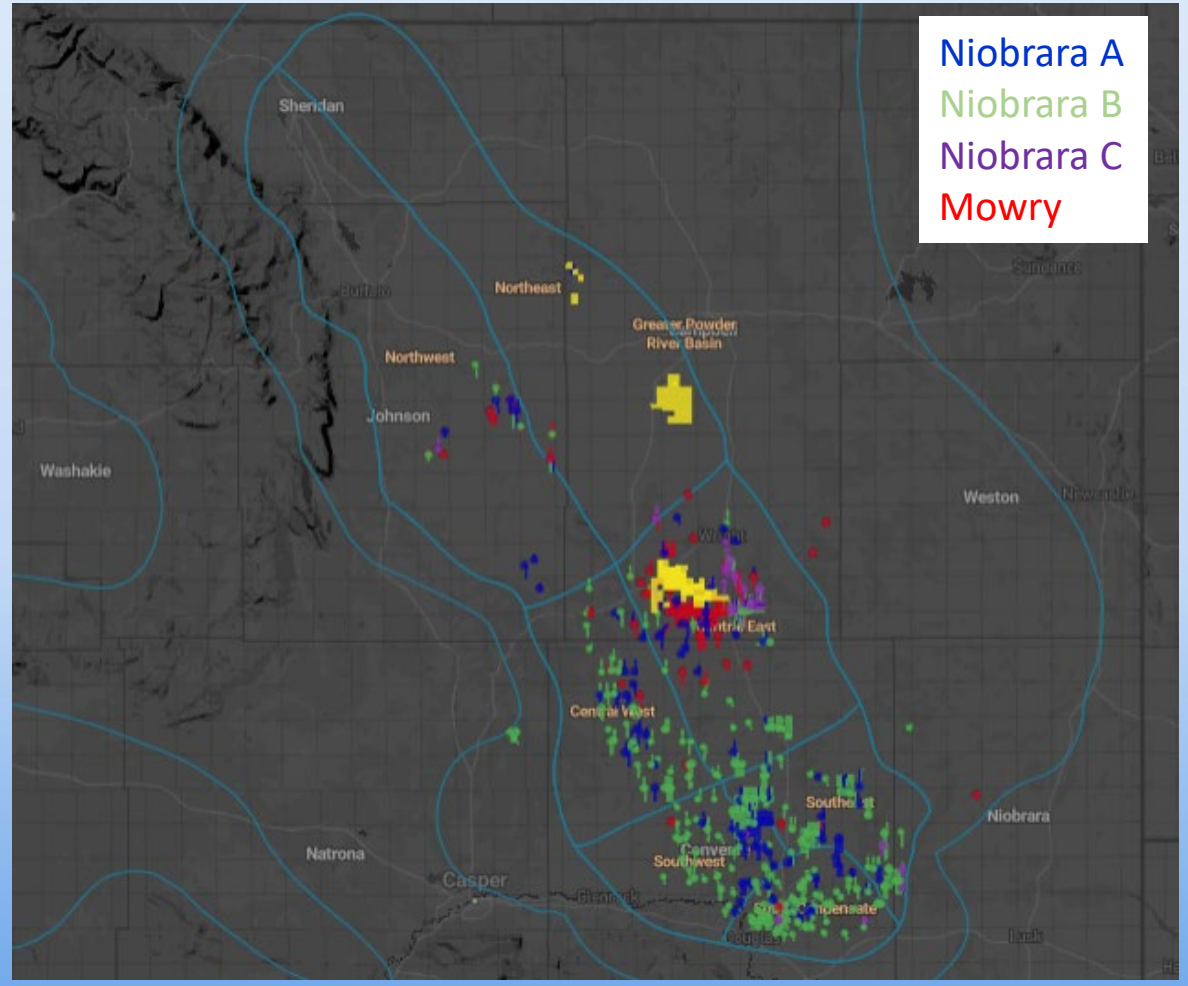
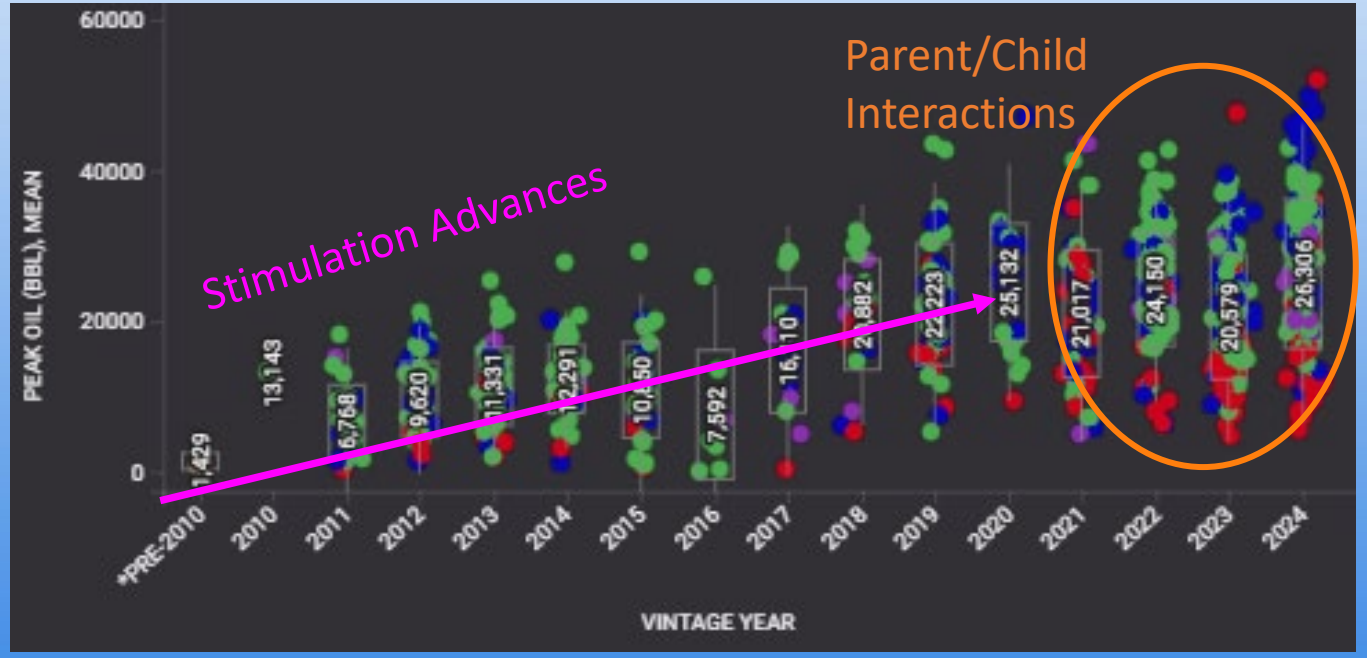
Production Evolution of PRB Shale Development



- ~800 Horizontal Shale Wells Drilled Since 2003
- Advances in Stimulation Technology has Allowed for Year Over Year Increase in Production Results
- Parent-Child Interaction with Infill Drilling Poses Greatest Technological Challenge to Continued Production Increases
  - How can we make our stimulations more complex and add well locations at the same time?



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2024 Shale Program Goals

- Increase Stimulated Rock Volume (SRV)
  - Optimize perf/cluster design
  - Decrease gel loadings
  - Maximize pumping rates
- Optimize Proppant Placement
  - Counter-prop design
- Minimize Parent-Child Interaction in the Niobrara
  - Frac protect existing well
- Utilize New/Best Technologies

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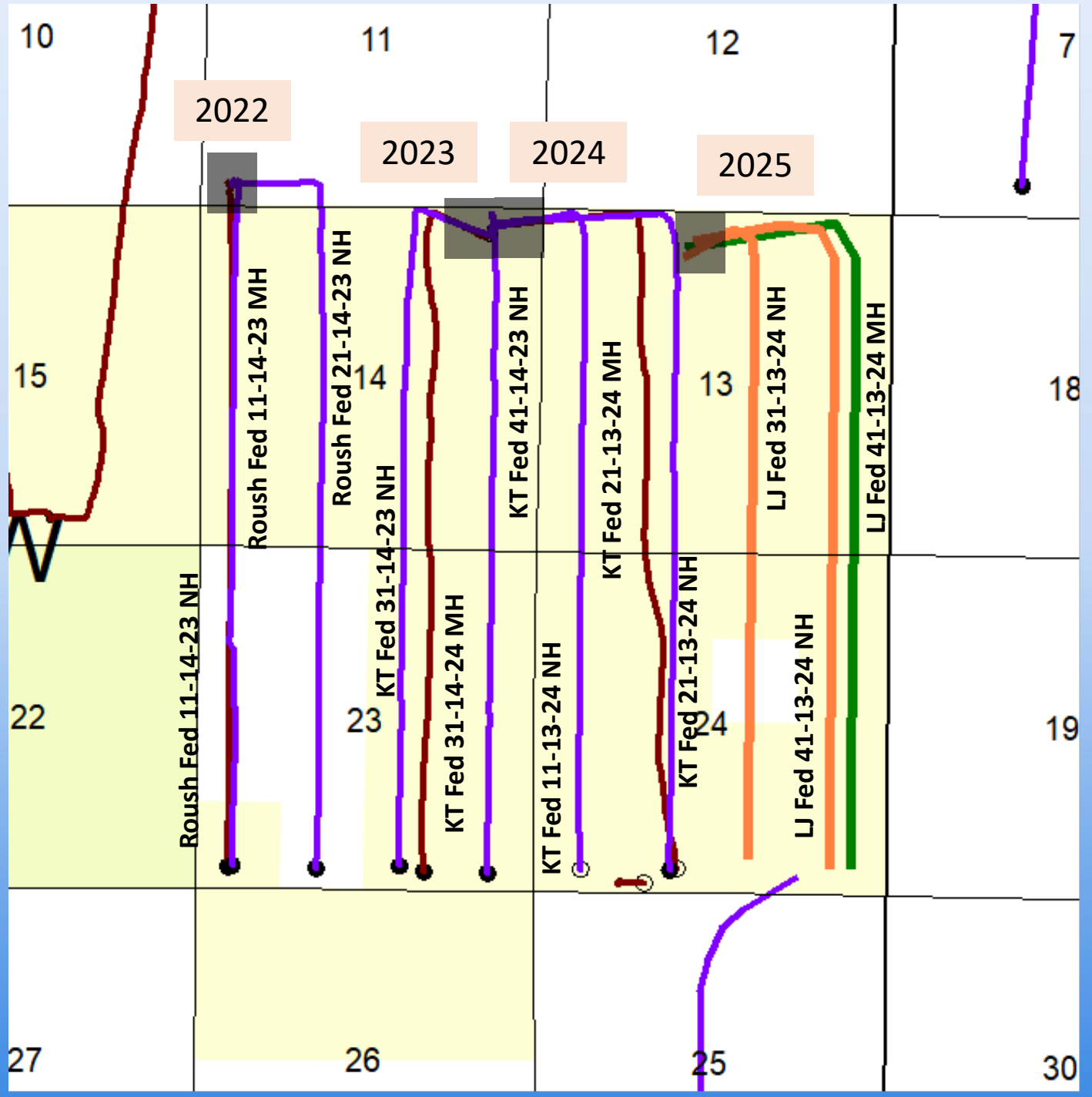
Shale Development

- Roush Wells First Production 12/2022
- KT Fed 31 and 41 Wells First Production 10/2023
  - No frac protect or proactive SI for Niobrara
- KT Fed 11 and 21 Wells First Production 11/2024
  - KT 41 Niobrara well frac protected with continuous water injection



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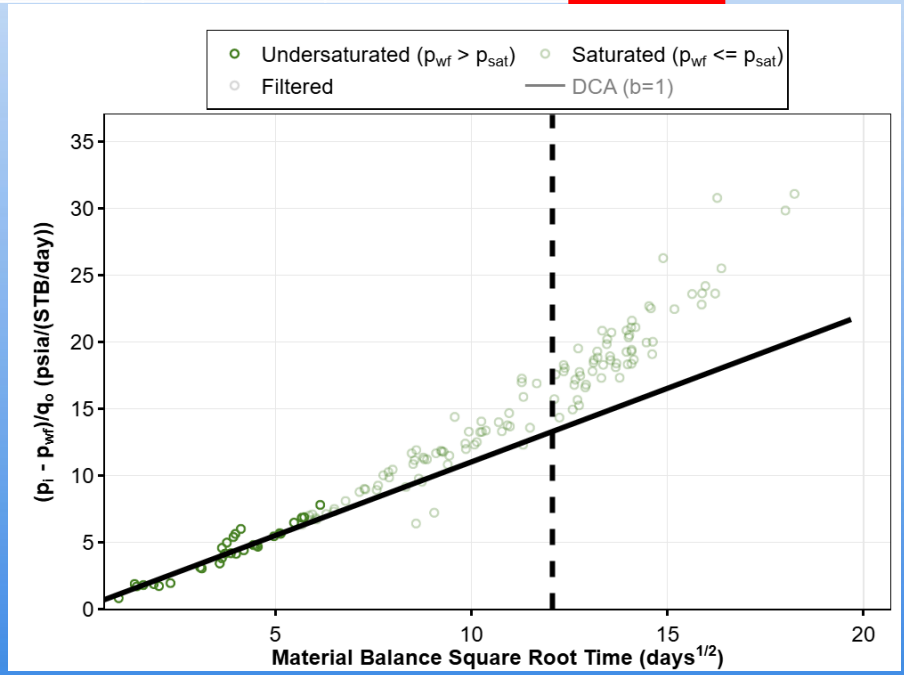
Niobrara Shale Development

Well	Reservoir	Lateral Length	Stages	Stage Spacing	Clusters / Stage	bbls/ft Pumped	lbs /ft Pumped	Sand Schedule	Pump Rate Avg/Max	ArootK
Roush Fed 11-14-23NH	Niobrara	10,017	47	213	14	46	3,002	100-mesh	90/100	57,538
Roush Fed 21-14-23NH	Niobrara	9,957	47	212	14	47	2,990	100-mesh	90/99	55,868
KT Fed 31-14-23 NH	Niobrara	9,472	43	220	10	46	2,809	100-mesh	99/106	37,185
KT Fed 41-14-23 NH	Niobrara	9,546	44	217	10	45	2,810	100-mesh	98/103	49,490
KT Fed 11-13-24 NH	Niobrara	9,628	42	229	10	59	2,305	Counter prop	101/113	59,843
KT Fed 21-13-24 NH	Niobrara	9,628	42	229	10	61	2,472	Counter prop	104/114	76,059

- Slickwater Stimulations with Decreasing Gel Loadings
- Increasing Pump Rates
- Different Proppant Schedule
- Increasing Complexity Evaluated with Analytical RTA (Whitson)



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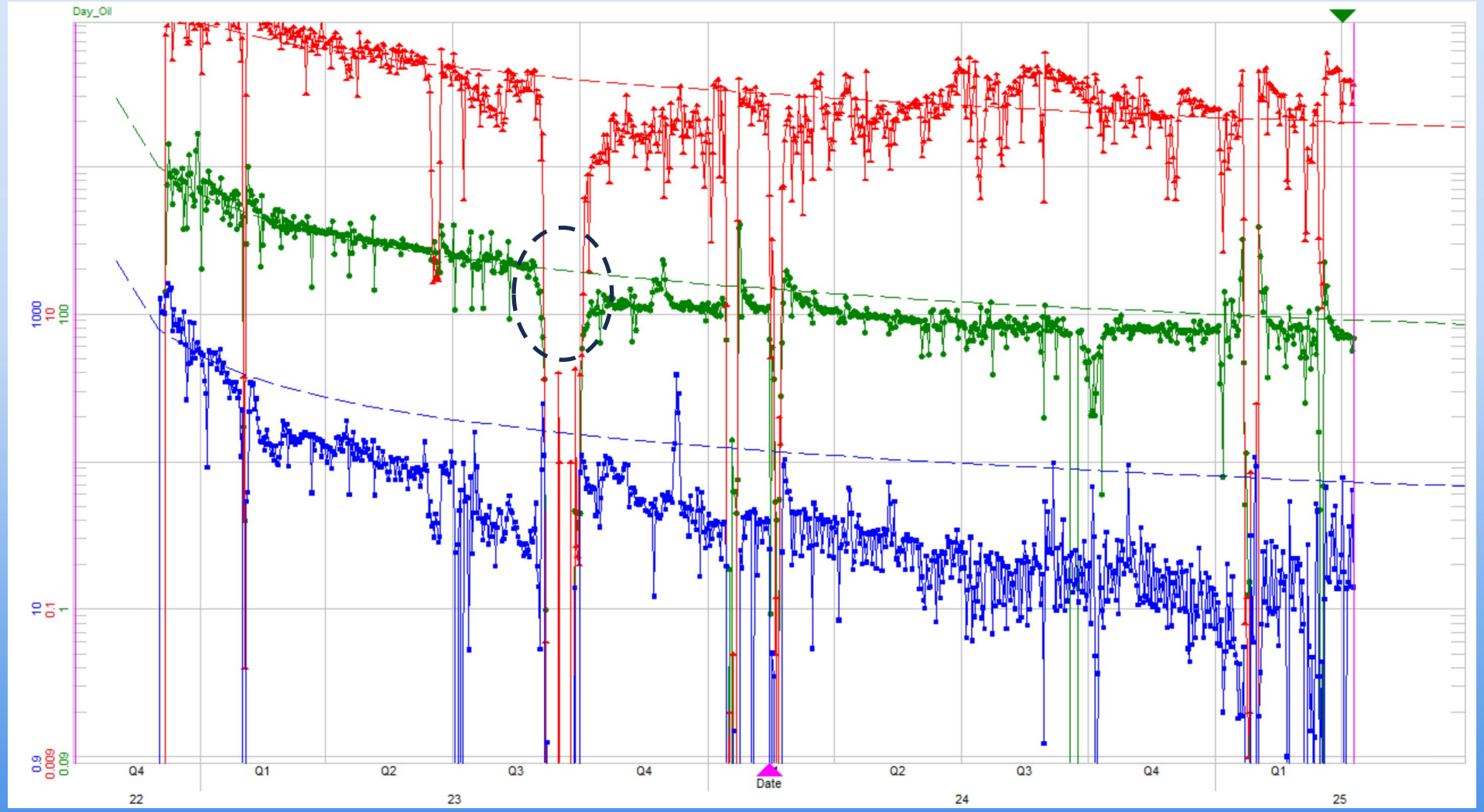
Frac Hit (Roush Fed 21-14-23 NH)

- Kept Producing Parent Until Hit by Child Frac
- Severely Impacted Oil Performance
  - 41% reduction in oil rate
  - Over 100 mbo reserves reduction



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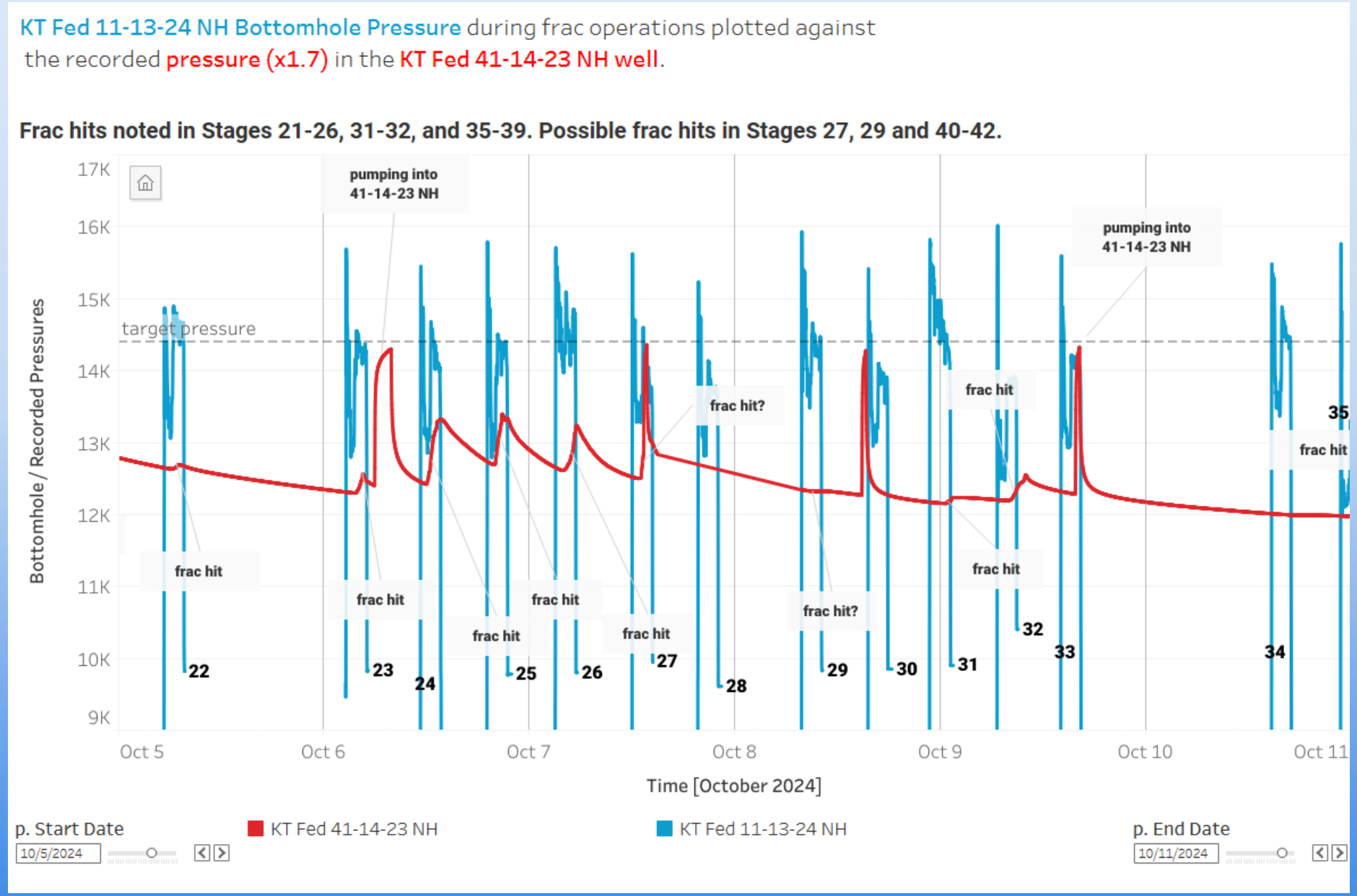
Frac Protect (KT Fed 41-14-23 NH)

- Injected ~65,000 bbls of Water into “Parent”
- Used Surface Readout Bottomhole Pressure Gauge to Maintain Water Injection
- Frac Hits were Observed Throughout Treatment



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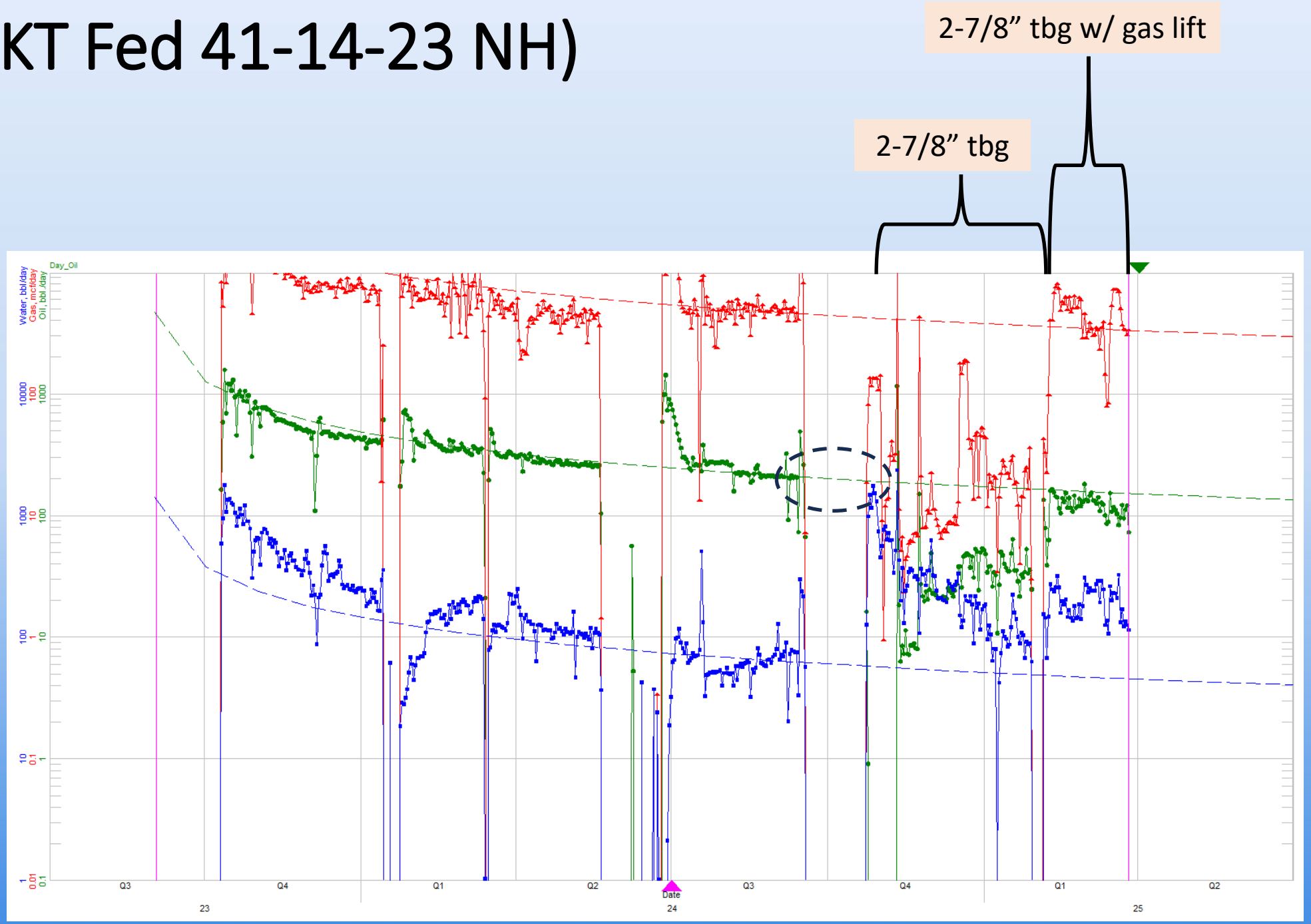
Frac Protect (KT Fed 41-14-23 NH)

- Well has almost Recovered Post Frac



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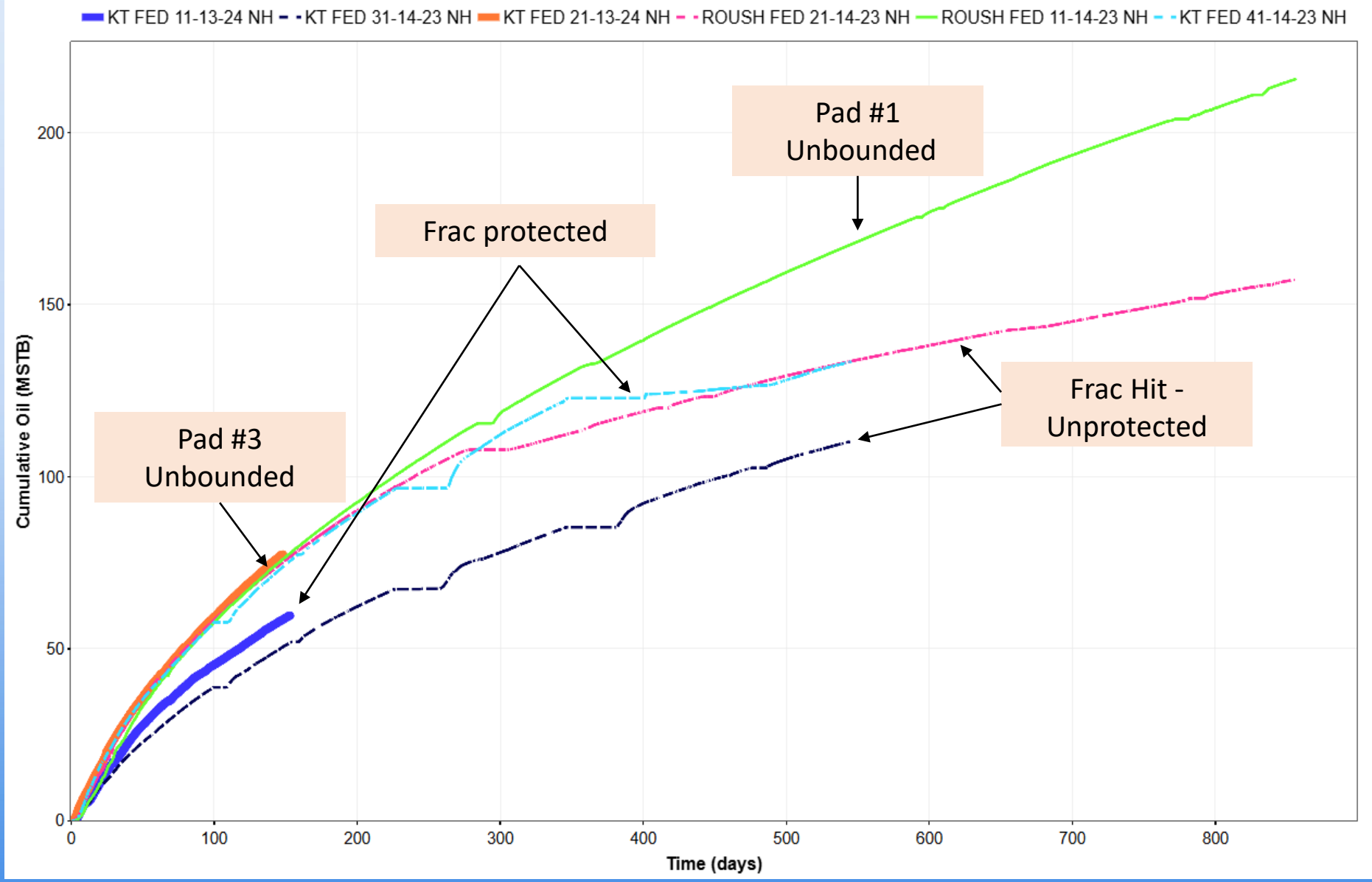
Niobrara Cumulative Oil Production Comparison

- Great Results on Unbounded Wells
  - Slight increase with newest completion design
- Unprotected Frac Hit Pair - Slope Change on Existing Well and Reduced Performance on Stimulated Well
- Protected Frac Hit Pair Saw Same Slope Pre and Post Stimulation on Existing Well and Improved Performance on Stimulated Well



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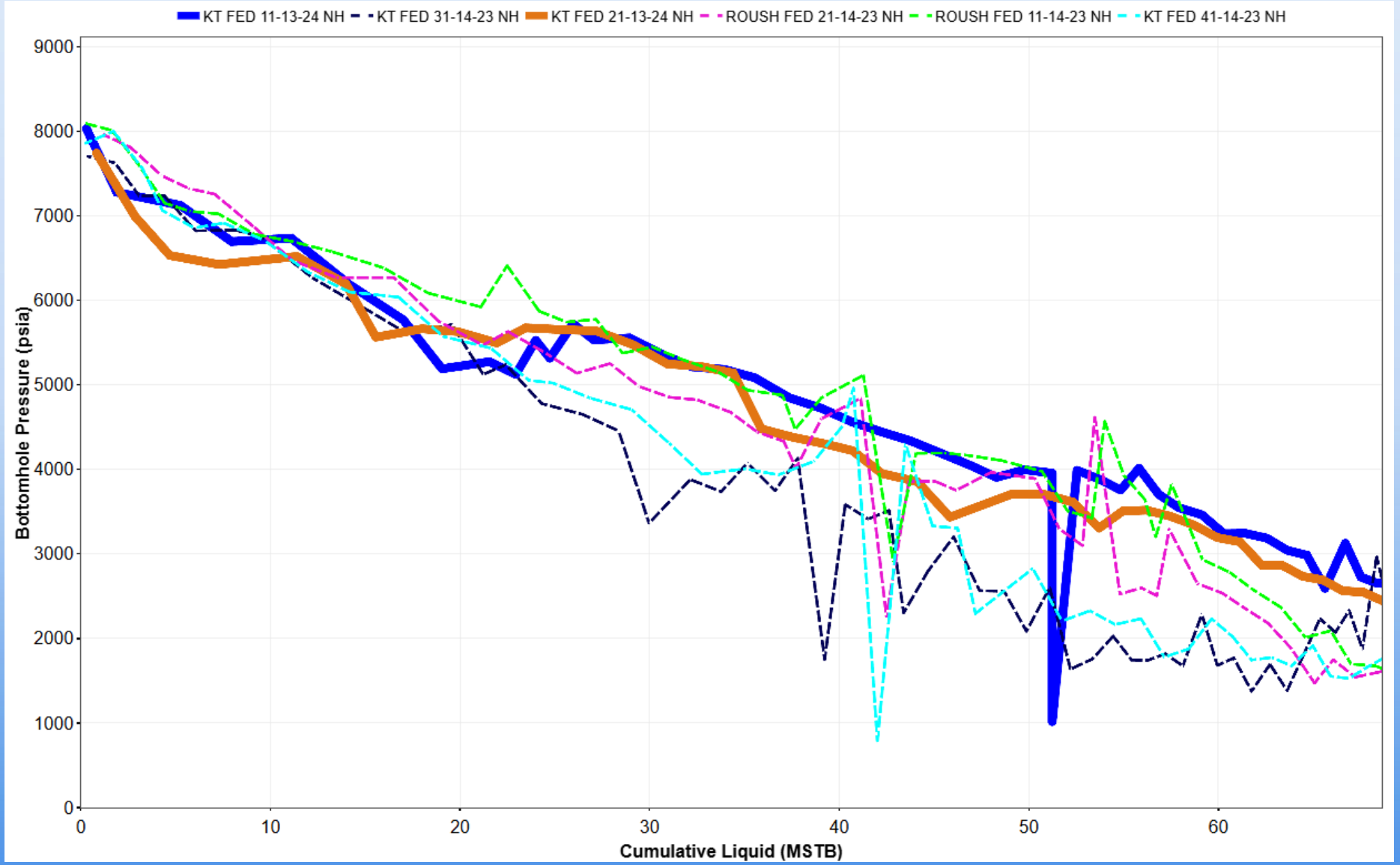
Niobrara Cumulative Liquid Rate vs Pressure Comparison

- Higher Pressures Later in Time Showing Indication of Contacting More Un-depleted Reservoir



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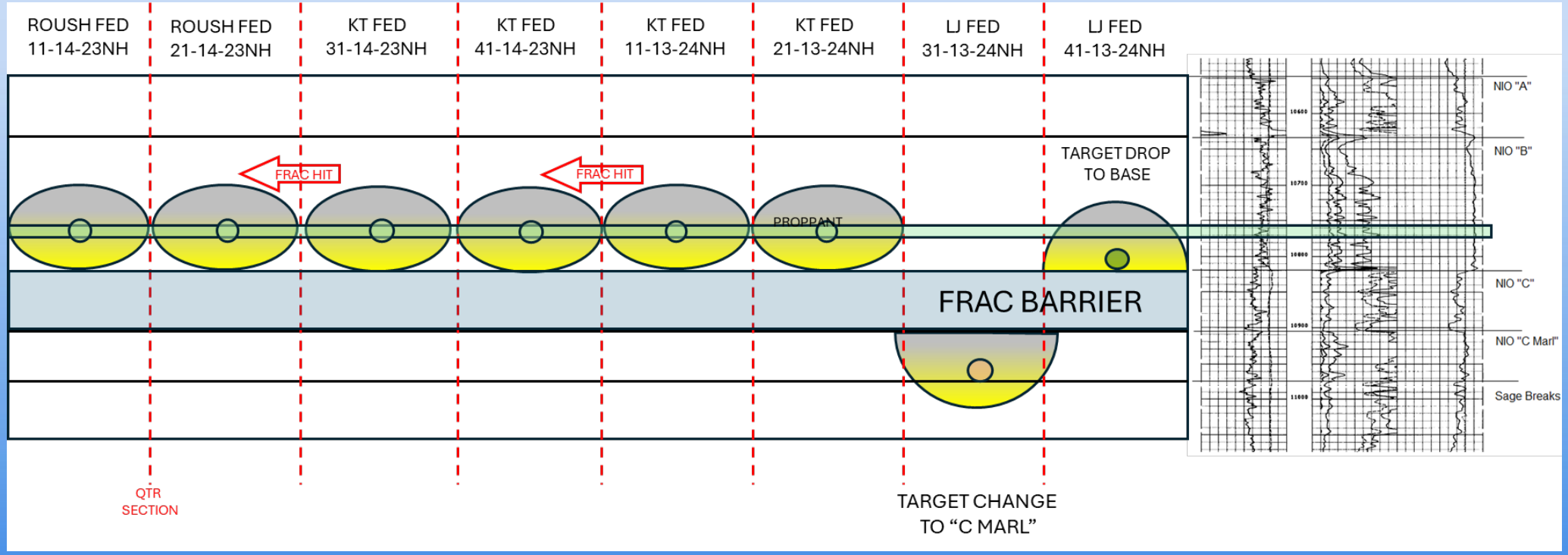
Current Development

- 3-Well Shale Pad (2 NIO, 1 Mowry)
- Changing Niobrara Landing Zones
  - Previously targeted higher in the Niobrara B
  - Changing one well to the Lower Niobrara B to improve fracturing geometry
  - Changing another well to test the Niobrara C for incremental reserves with fracturing barrier to the Niobrara



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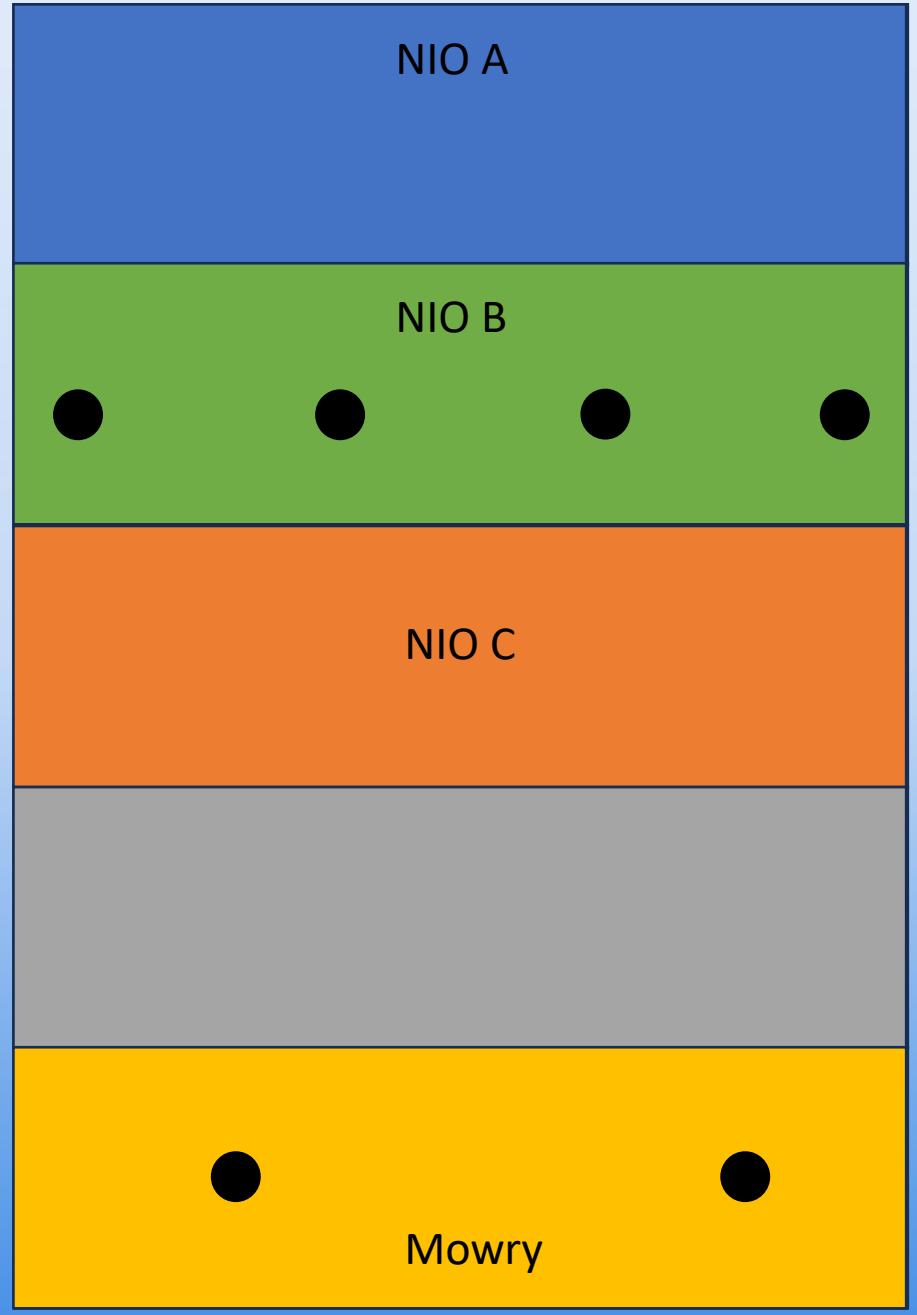
Future Considerations

- Current Development is 4 NIO B and 2 Mowry Locations
- Evaluate Wine Racking and Potentially Tighter Spacing in Both the Niobrara and Mowry Intervals
- Continue to Optimize High Intensity Stimulations
  - Casing design to maximize treatment rates
  - Micro proppant slurry in pad
  - Far field diverters
- Continue to Evaluate and Utilize New Technologies



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Questions?

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