Interference Testing to Advance Appraisal and Development Strategies

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# Interference Testing Objective

Objective within DVN

- Quantify connectivity between infill wells

- In $\downarrow$k MFHWs, the connectivity is driven by fracture overlap (complex system)

- Leverage information to impact future development decisions

Simplistic Example: More Complex in Reality

WB 1   WB 2

— Isolated Fracture   — Overlapping Fracture
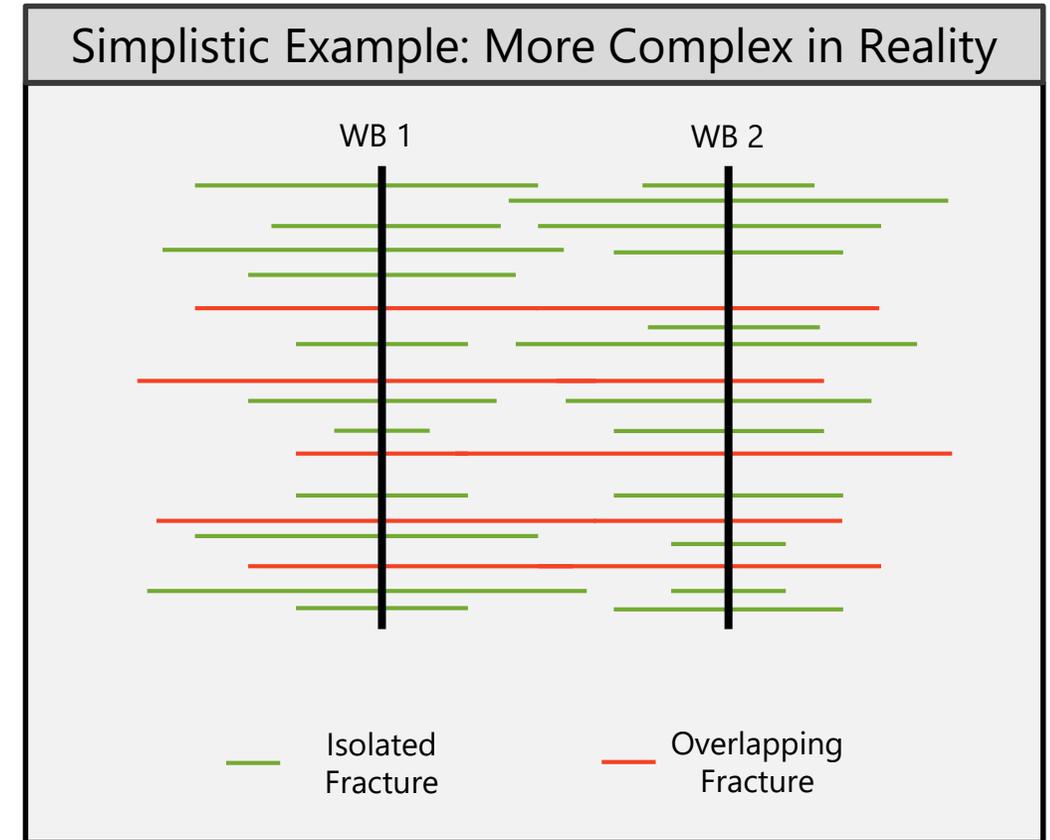
Interference Testing Options

Several Interference testing options exist. Devon is primarily focusing on PTA approaches to capture high resolution data and characterize fracture overlap between infill wells in low perm systems

Production or Rate Transient Test			
Initial Infill Conditions	**Source Well**	**Monitor Well**	**Data Analysis**
Flowing Wells	Shut In	**Remain Flowing**	Rates + Pressures

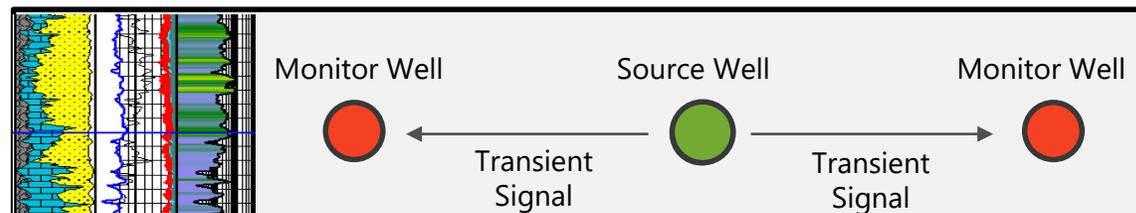| Pressure Transient Test			
Initial Infill Conditions	**Source Well**	**Monitor Well**	**Data Analysis**
Shut-In	Sequence Online	**Remains Shut In**	Pressure Only
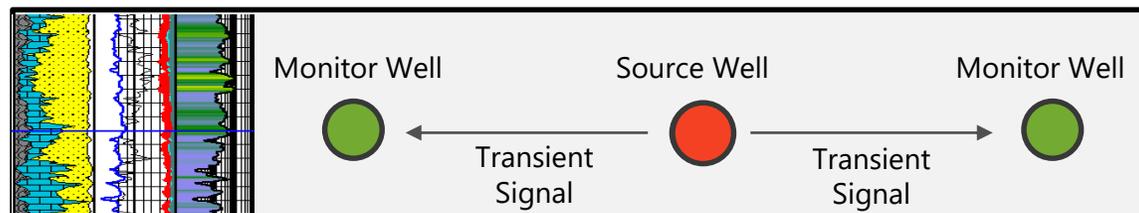
Con: ↓Signal to noise, instantaneous liquid measurements

Pro: Low cost, minimal planning, happens routinely

Con: Recommend downhole gauge, increased planning

Pro: High resolution, improved characterization of fracture overlap

🔴 Shut In   🟢 Flowing

Testing Design and Data Analysis
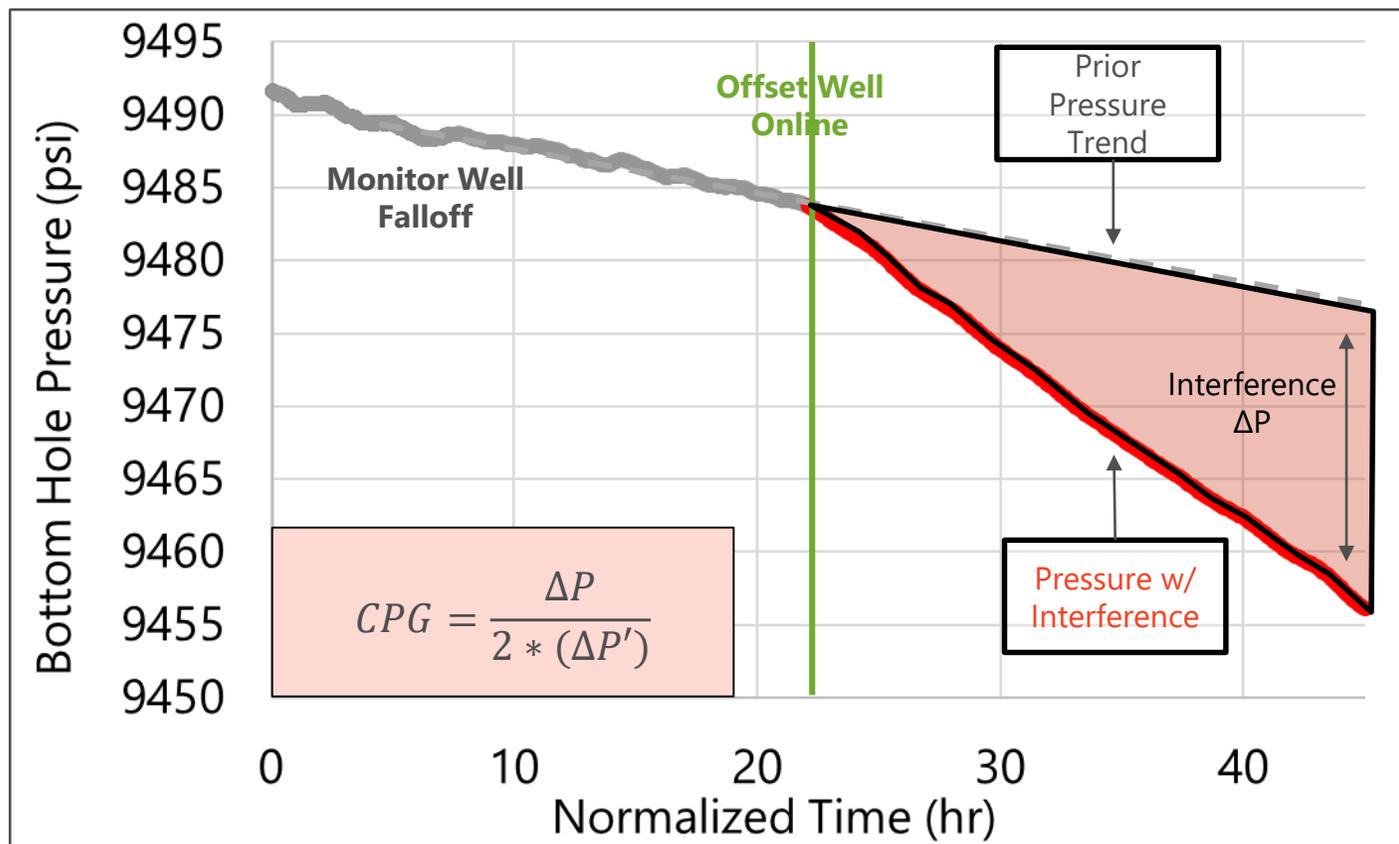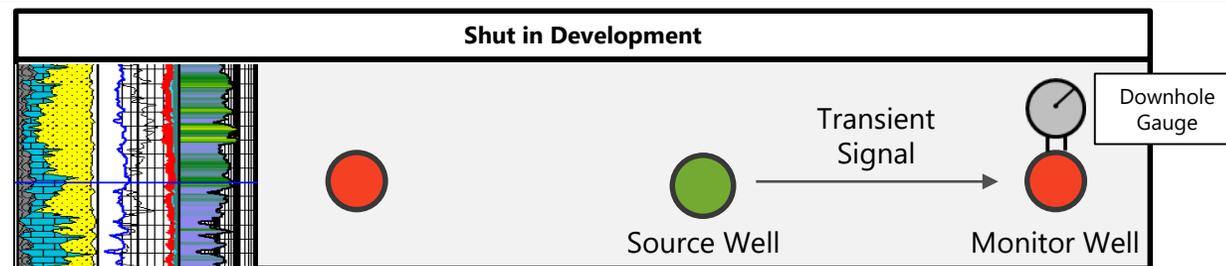
Additional Resources

- Chow Pressure Group: SPE 191407

- Pioneer/Kappa Publication

Approach

- Run downhole gauge in one or several wells

- Monitor falloff and obtain stable conditions

- Systematically put offset wells on production

- **Monitor deviation from stable conditions**

Benefits

- High quality data vs other approaches

- Can quantify level of well connectivity

- CPG ranges from 0 – 1 (index)

Shut in Development

Transient Signal — Source Well — Monitor Well — Downhole Gauge

Offset Well Online · Prior Pressure Trend · Monitor Well Falloff · Interference ΔP · Pressure w/ Interference

$$CPG = \frac{\Delta P}{2 * (\Delta P')}$$

Testing Design and Data Analysis
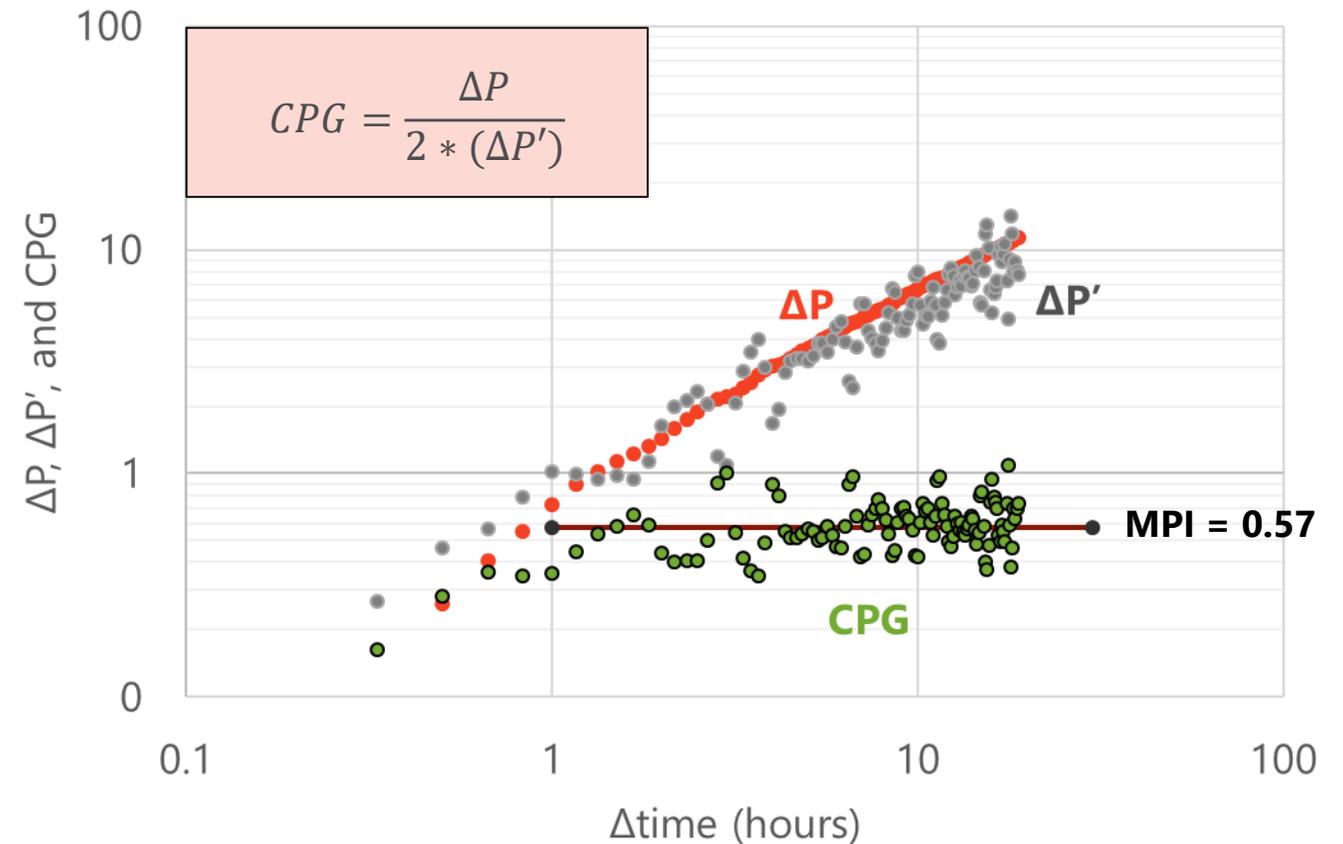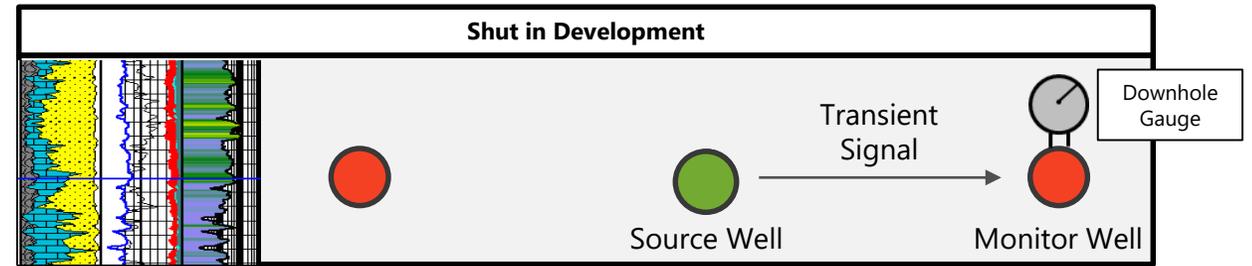
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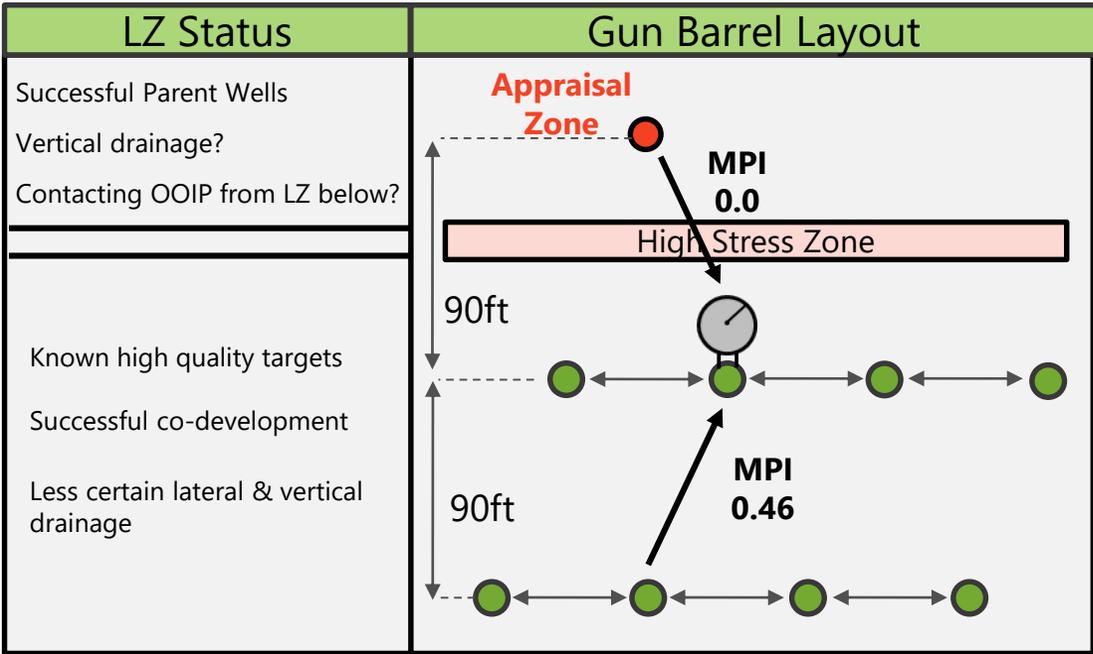
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Shut in Development

Transient Signal

Downhole Gauge

Source Well   Monitor Well

$$CPG = \frac{\Delta P}{2 * (\Delta P')}$$

ΔP   ΔP'

CPG

MPI = 0.57

ΔP, ΔP', and CPG

Δtime (hours)

Case 1: Assessing Staggered Development

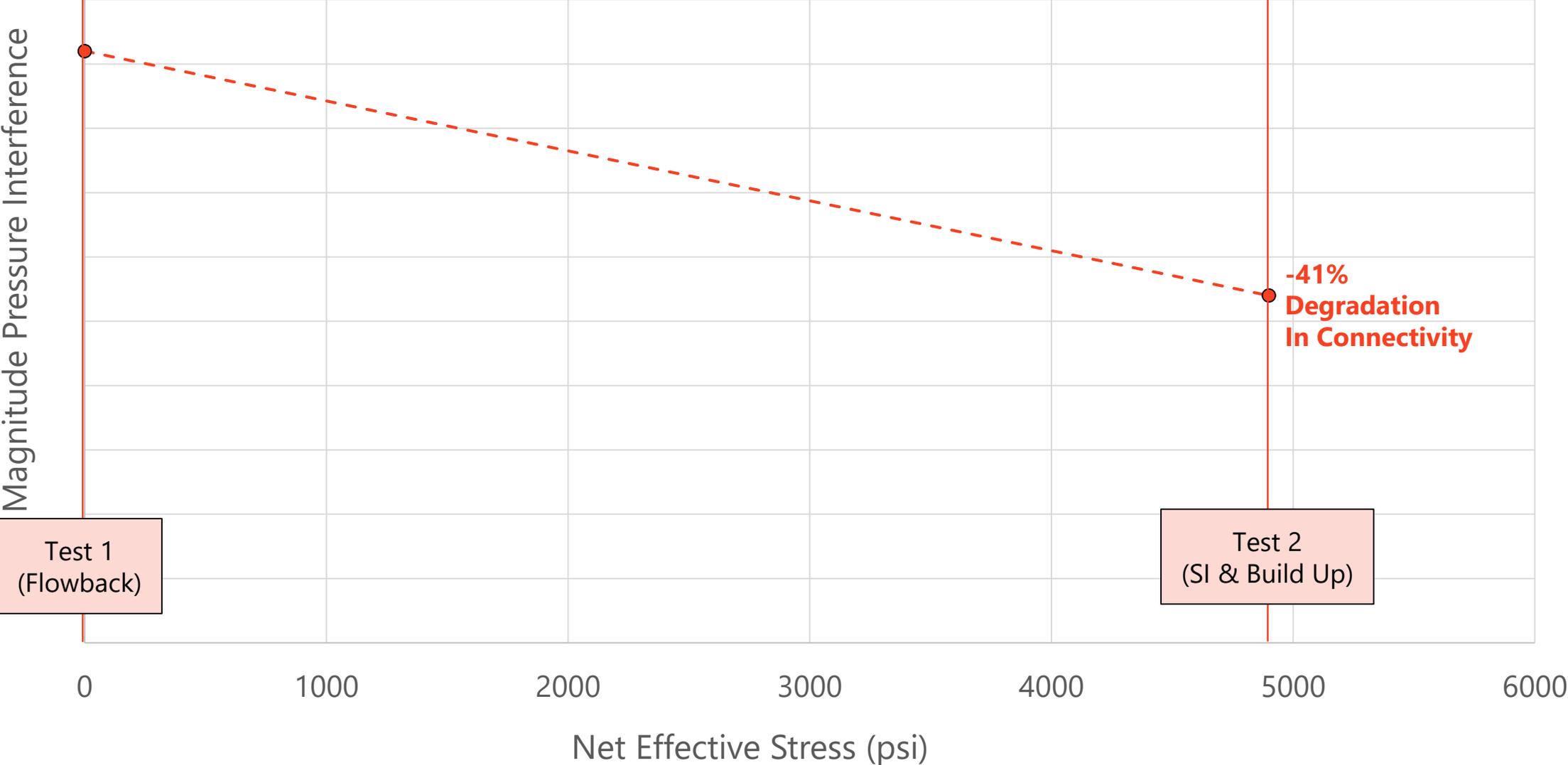| LZ Status	Gun Barrel Layout
Successful Parent Wells Vertical drainage? Contacting OOIP from LZ below?	
Known high quality targets Successful co-development Less certain lateral & vertical drainage	

- Value to Team
  - Calibrate frac models
  - Refine expectations of contacted OOIP
  - Enhance characterization of appraisal zone sweet spots
  - Allows for considerations on completion fluid & volume
  - Develop it independently later?

Case 2: Understanding Fracture Degradation

2020 Reservoir Technology Symposium
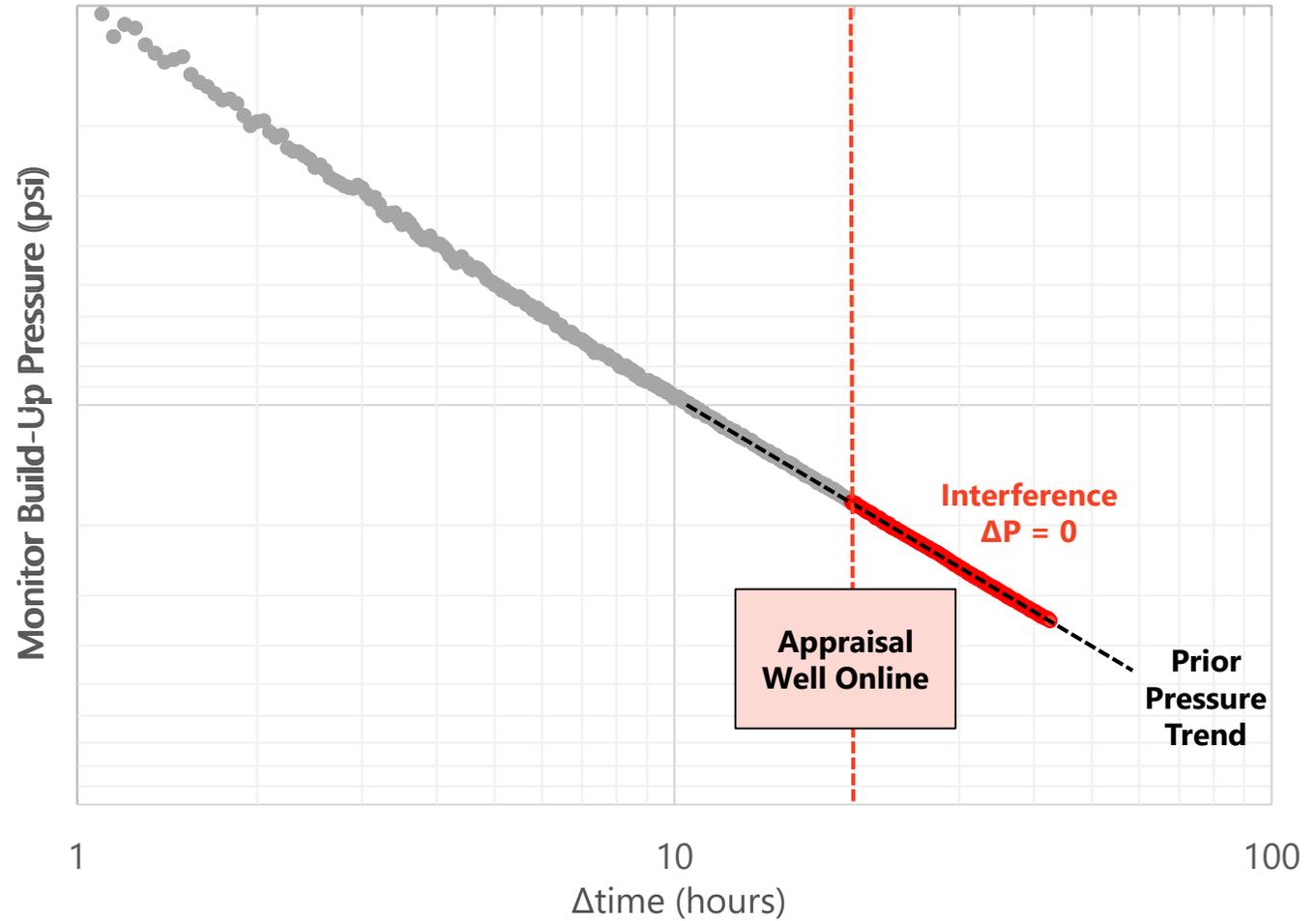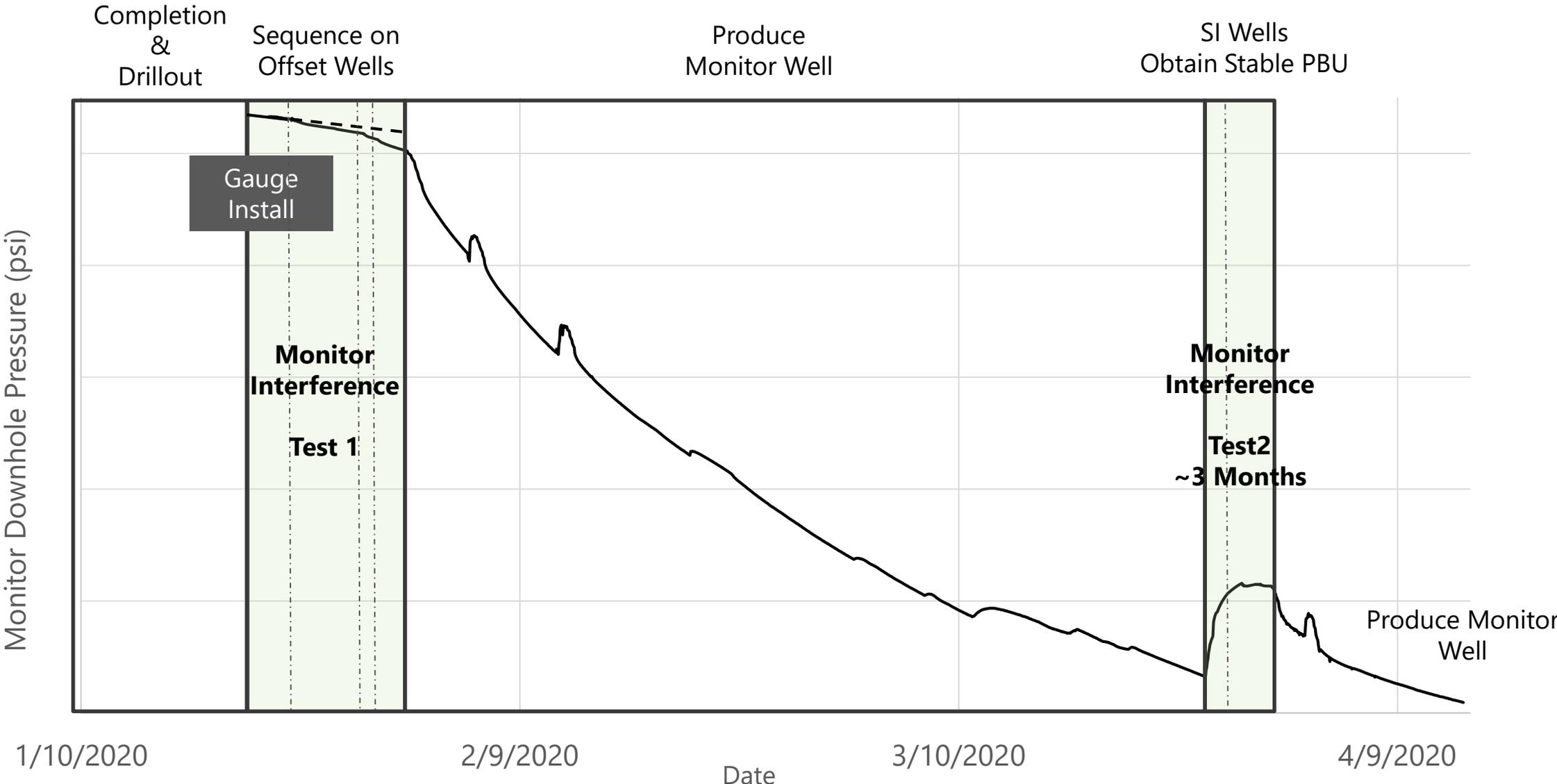
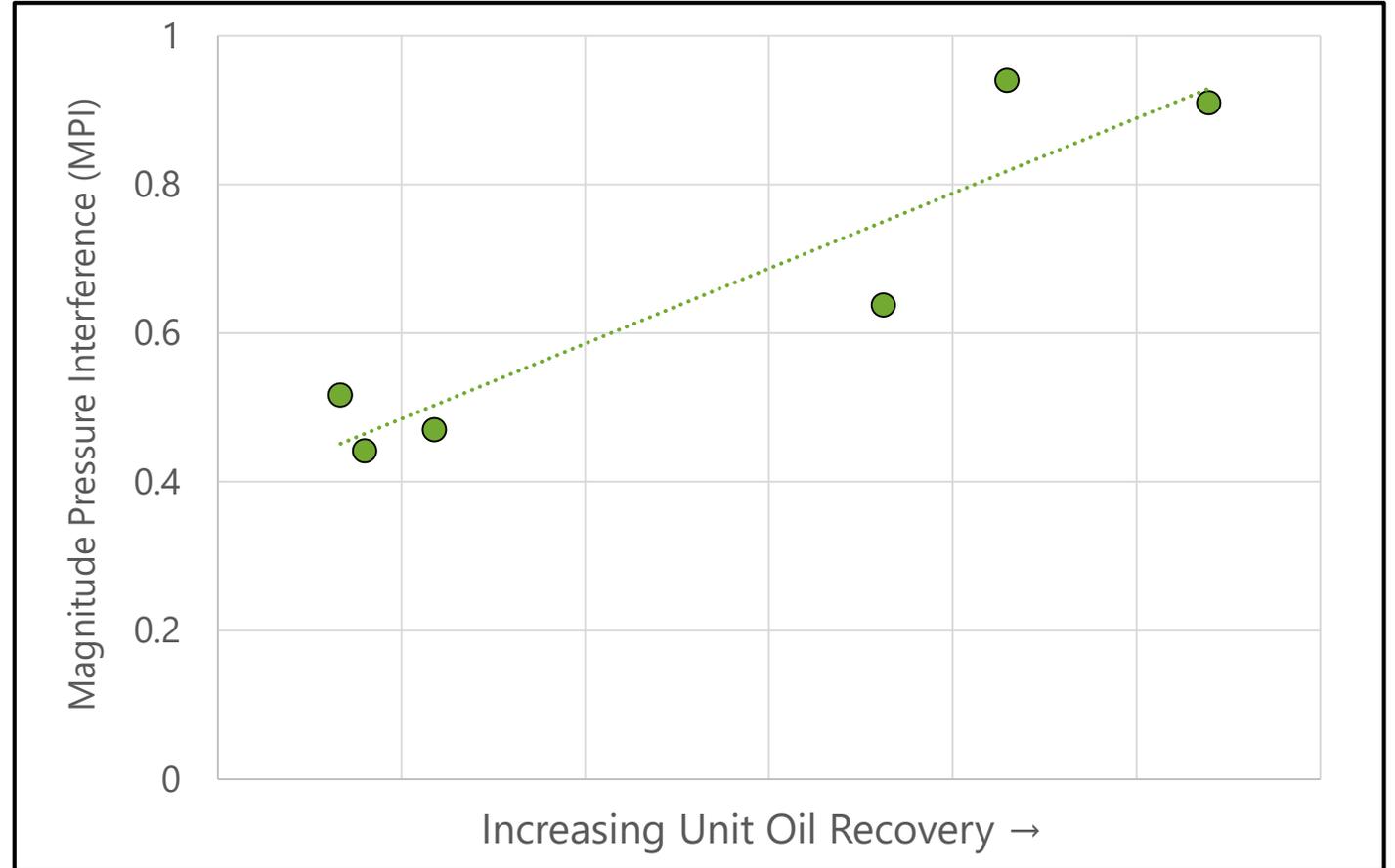# Case 2: Understanding Fracture Degradation

Case 3: Completion Volume Optimization

Strategy

Conducted Interference Tests on multiple units with varying development strategies

Notes & Takeaways
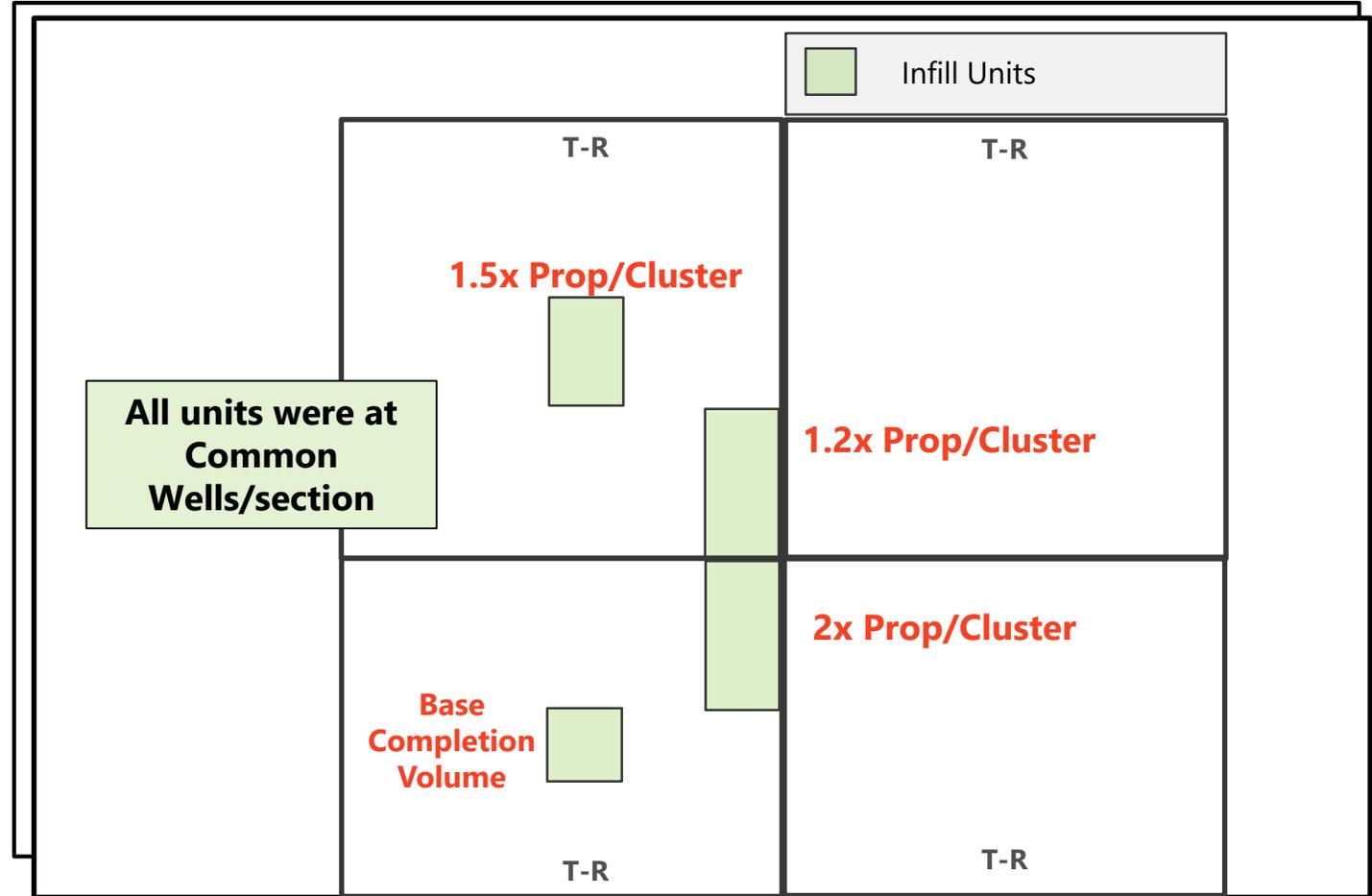
- ↑ MPI led to ↑ Unit Recovery

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Notes & Takeaways

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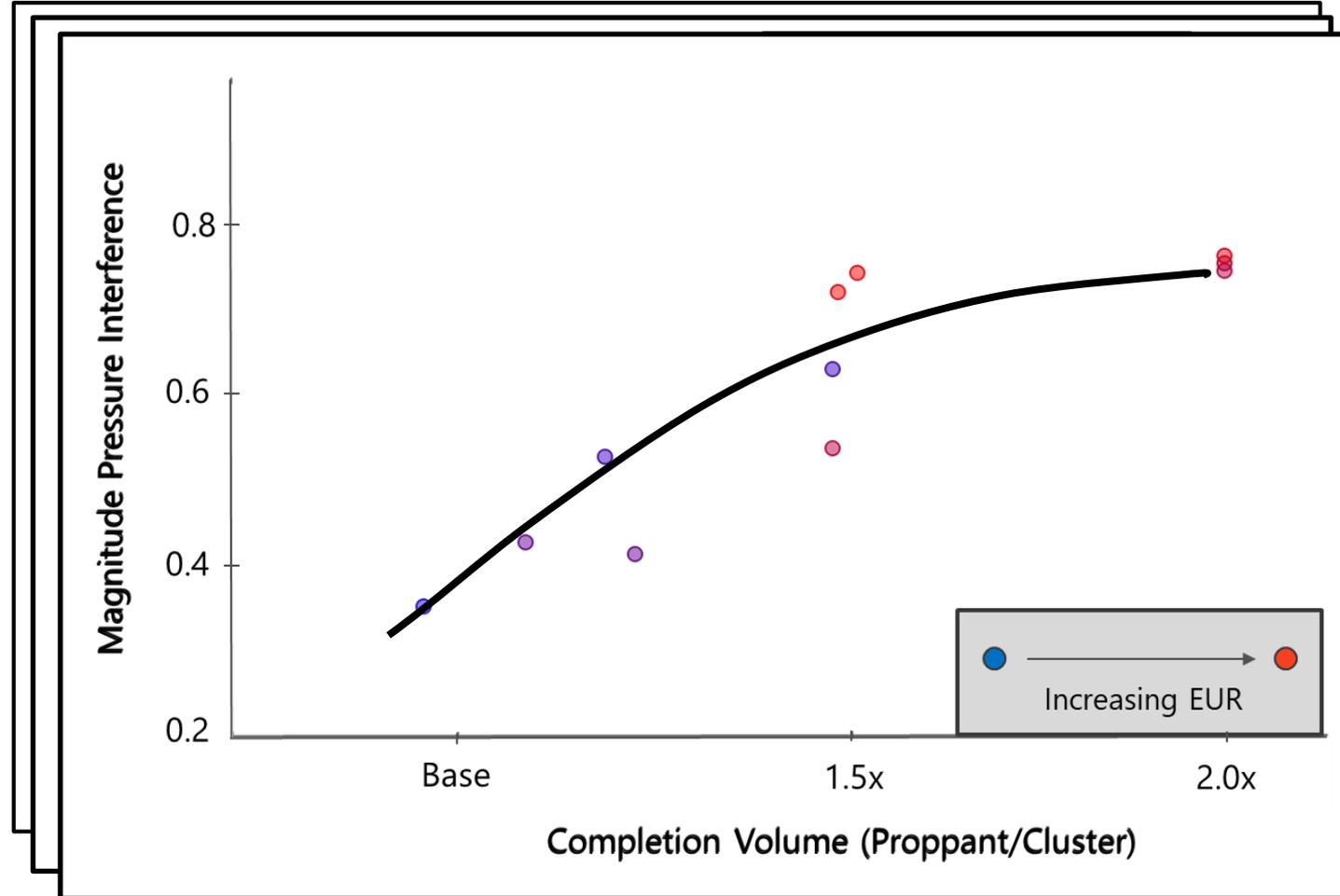- Obtained Interference tests to assess impact to MPI at varying prop volume

- ↑ Prop/Cluster provided ↑ MPI, at constant and light well spacing

- Dataset provided insights into diminishing returns of prop volume

Summary

- Short duration tests and data is cost effective to acquire

- Valuable technology for assessing connectivity throughout the producing lifecycle

- Interference tests can provide unique insights about conductive fracture overlap that adds value to appraisal and field development decisions

  - Vertical connectivity across various landing zones

  - Fracture degradation through wells lifecycle

  - Completion and well spacing optimization

Thank You

Acknowledgments		
Mark Wilkins Kyle Dahlgren Kyle Haustveit Austin Qualls Chris Ketter	Jason Garrett Brendan Elliot Chris Cope Scott Baker	Mouin Almasoodi Travis Black Brett Pribble Jason Hildebrand Aubrey Humbolt