



Validation of Well Placement Within Planned Ellipse of Uncertainty

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Planning a Well

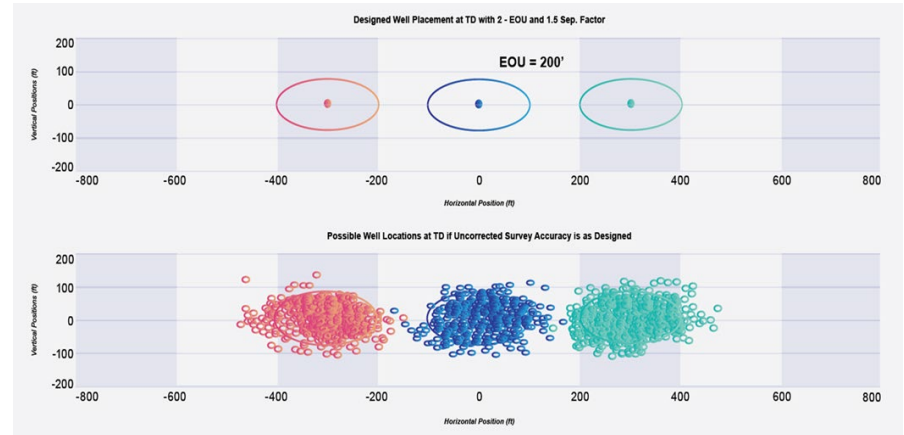
- Maximizing Reservoir Recovery
- Minimizing Risk
- AC Scans
- Well Spacing for pad drilling
- What error model will be used?

It is assumed that the surveys of this well, future wells, and previous wells all fit within that error model

What that assumption means

*Using 2-sigma EOU and 1.5
Separation Factor*

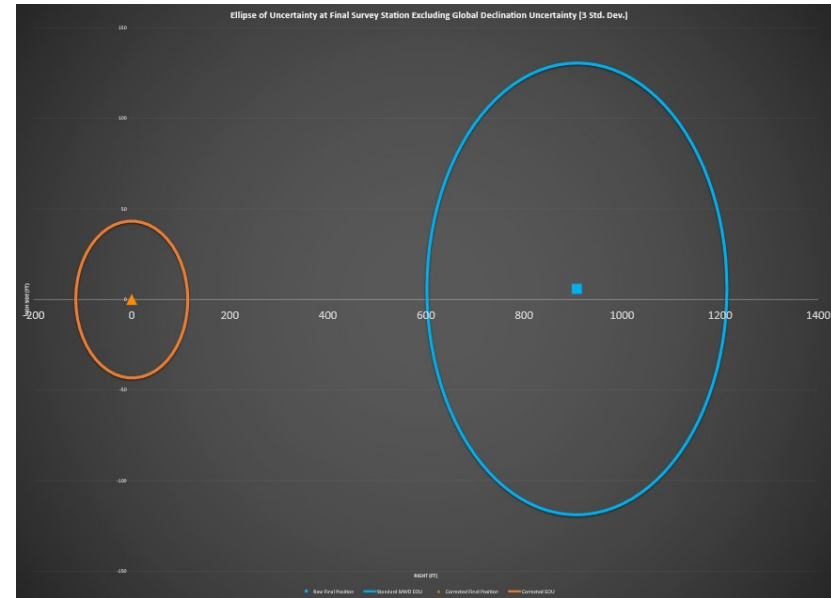
- 95% of the wells will fall within the planned EOU
- 3 well crossings per 1000
- 300' of well spacing across pads



Double Checking the Assumptions

Compared the corrected left/right final position vs the uncorrected final position and calculated EOU

- 1750 Wells in Permian, Delaware, and Eagleford Basin
- 86 rigs - 25 service companies - 8 operators

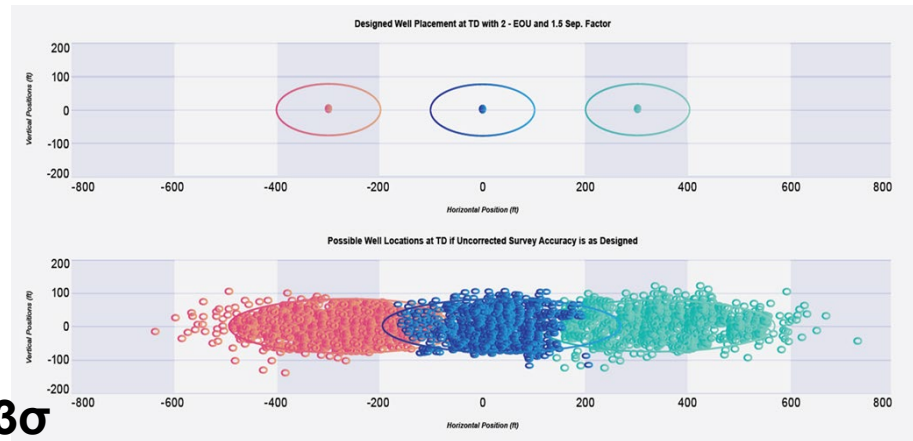


What really happened?

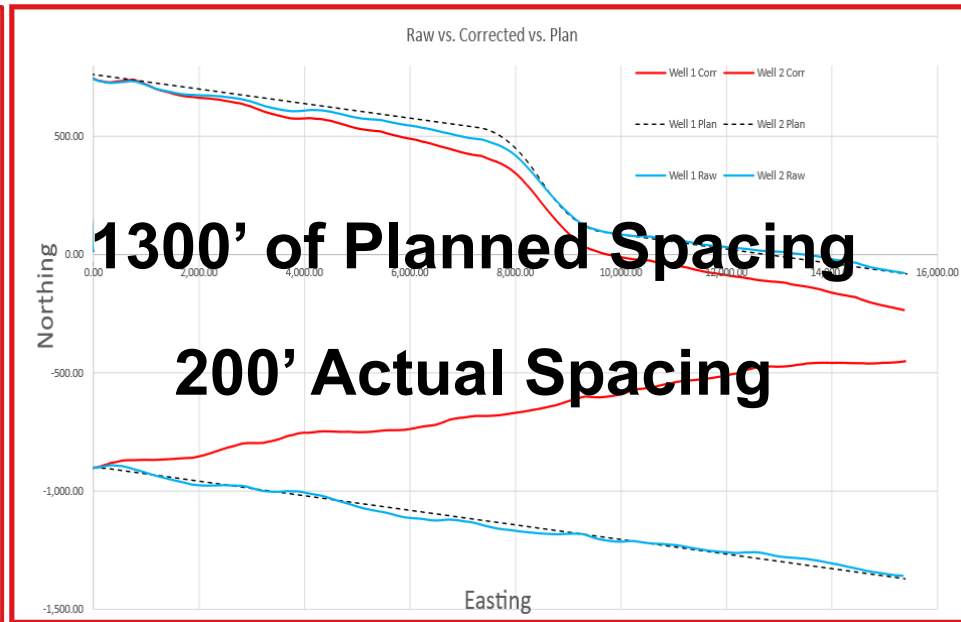
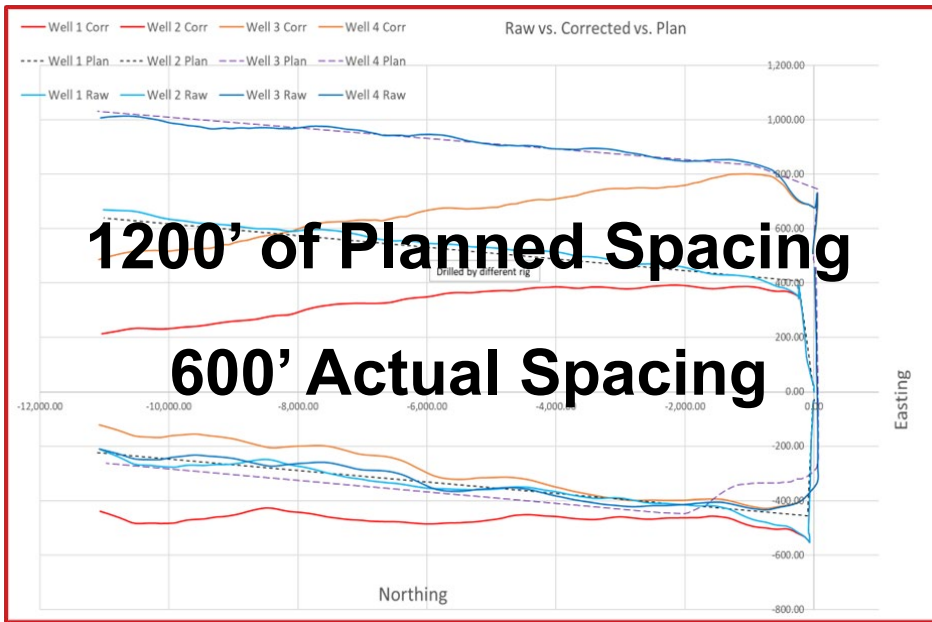
Using 2-sigma EOU and Only accounting for left/right movement

Wells outside of the Planned EOU

- 746 wells of 1750 tested (42.63%)
- 40% of wells drilling +/-30° N/S
- 69% of wells drilling +/-30° E/W
- **427 wells (24.4%) fell outside of 3 σ**

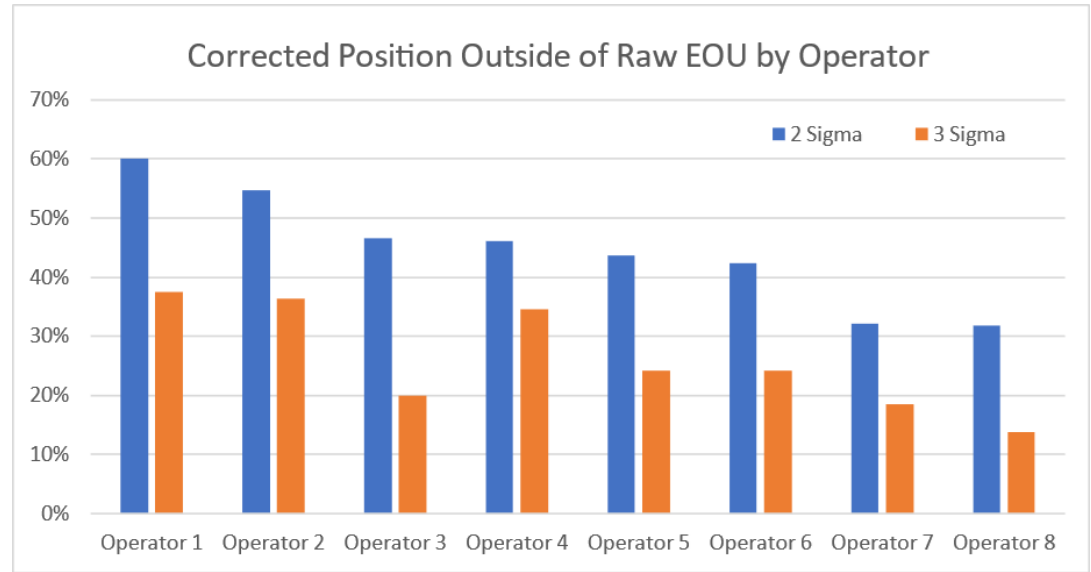


Horizontal Well Placement: *Real Life Examples*



Summary

- 658 more wells were outside EOU than assumption of 2 sigma model
- 59% moved right 41% moved left





Questions?