CASE STUDY

# Two Innovative Technologies Team Up to Avoid Frac Hits in the Eagle Ford

## Objective: Mitigate the Risk of Frac Hits

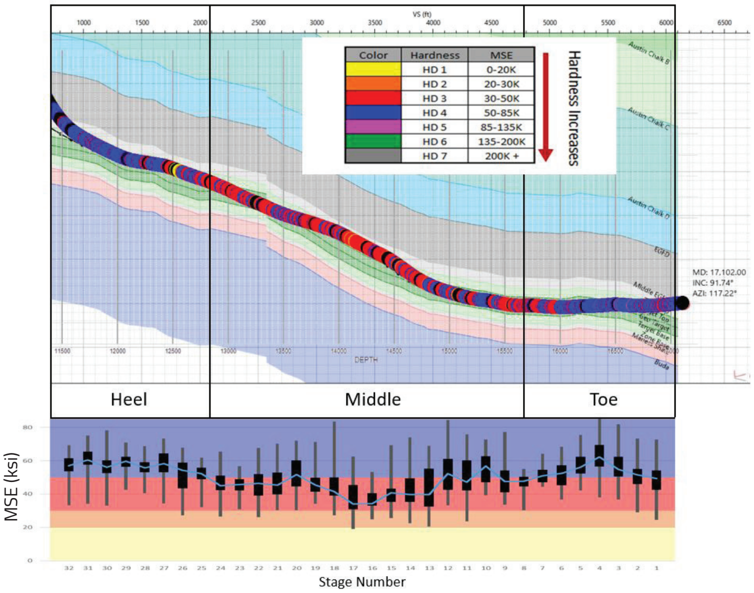
As US shale plays move into development mode, operators have uncovered a new challenge: Reduced well spacing often leads to increased probability of a frac hit. Unchecked, the risk of frac hits can be devastating to the economics of these plays. During a December 2018 fracturing operation in the Eagle Ford shale play, the parent well's productivity was a key driver to the value of the asset – and the operator was determined to avoid interference from a child well.

### Reservoir Characterization of the Subject Well

To help mitigate this risk, NexTier employed the LateralScience℠ method to predict which sections of the subject well were most likely to develop longer half-lengths that might pose a potential threat to the parent well. In particular, the first seven stages at the toe of the well were physically close enough to the parent well to warrant extra caution.

The LateralScience trajectory plot shown in Fig. 1 below was encouraging, since the first seven stages were particularly tougher-to-drill (blue) facies, which normally translates to shorter frac half-lengths. This bodes well for avoiding communication with the parent well. For the remainder of the lateral, stages 8 to 25 were primarily in the easier-to-drill (red) facies, while stages 26 to 32 were back to blue.

If the objective had been strictly to optimize the fracture network, the recommendation would be to simply use a "hard rock" treating schedule for the heel and the toe, while deploying a "soft rock" approach for the 18 red stages in the middle section. However, since the primary driver was to avoid frac hits, the customer decided on a different strategy.



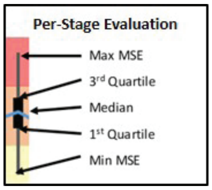




**Fig. 1:** Color variations along the lateral indicate changes in rock strength, which infer differences in fracture half-length.

### Hydraulic Frac Execution and Monitoring

The treatment schedule executed (Table 1 on next page) was designed to be cautious and to ensure minimal risk to the parent well. Compared to the rest of the lateral, stages 1 to 7 were treated with 28% less slurry volume and 35% less proppant volume – as well as a slightly lower max proppant concentration. As these stages were executed, the frac properties were observed in real time using Seismos-Frac™ hydraulic fracture monitoring.

As shown in Fig. 2, the average half-length for these stages was 373 ft, which left a large buffer zone for the parent well. In contrast, stages 16 and 17 produced half-lengths as long as 875 ft. The operation was a success from the frac-hit mitigation perspective, but there was still more to be learned from the rest of the lateral.

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### Quantifying Impact of Parameter Changes

To understand how changes in the treatment schedule affect propagation of the fracture network, we conducted a comparison of the heel stages and toe stages. LateralScience analysis showed that these two intervals shared similar MSE profiles, so we expected them to frac in a like manner. However, in this case, the heel stages received a treatment that was approximately 30% more aggressive than the toe stages. The Seismos-Frac monitoring results quantified the impact: The half-length in the heel was 38% longer (517 ft avg), with the same frac height (48 ft) and a 22% reduction in frac width.

To understand how changes in the geologic facies would impact propagation of the fracture network, we compared the middle stages and heel stages. All these stages were treated with the same schedule, with no adjustment to account for changes in rock strength. Once again, the Seismos-Frac™ monitoring results once again quantified the impact: The softer stages in the middle section produced 24% longer half-lengths (643 vs 517 ft), with identical widths and comparable heights.

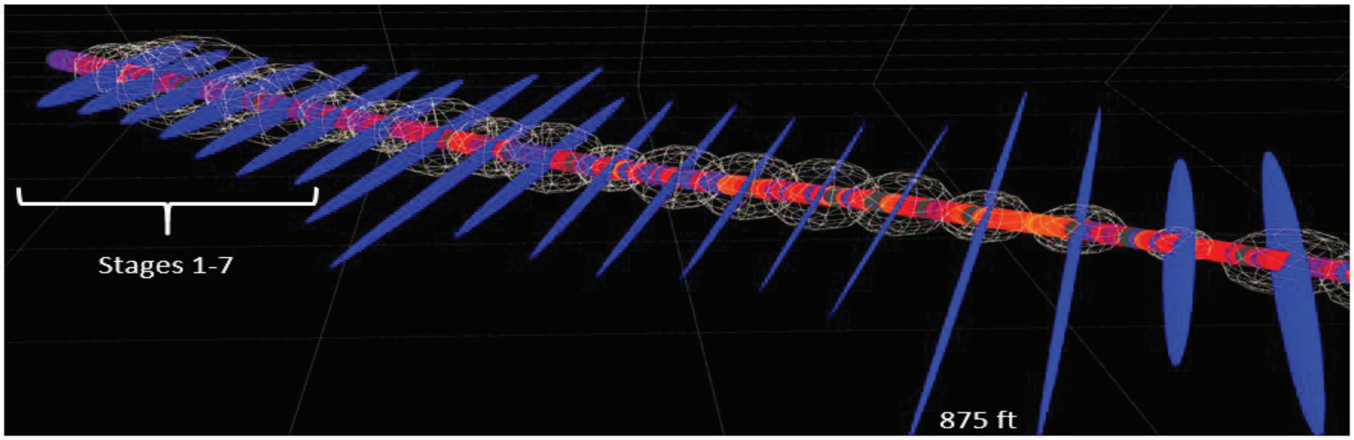


**Fig. 2:** Seismos-Frac Results for Stages 1-19

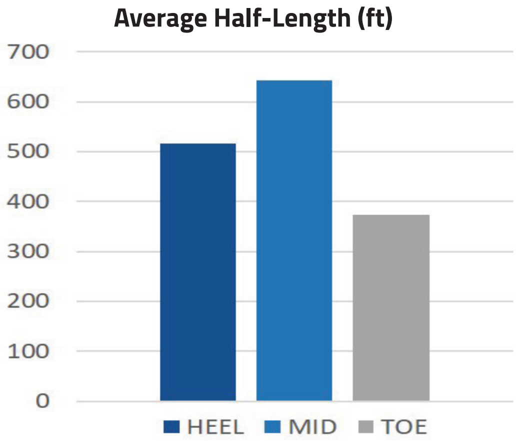


**Fig. 3:** Half-Length Variations Along Wellbore Sections

| Product | Stages 1-7 | Stages 8-32 |
|---|---|---|
| 100 Mesh (lb) | 250,000 | 343,000 |
| 30/50 W (lb) | 100,000 | 0 |
| 40/70 W (lb) | 0 | 200,000 |
| Slurry Vol (gal) | 6,852 | 9,486 |
| Max Prop Con (lb/gal) | 2.5 | 3.0 |

**Table 1:** Treatment Schedules by Stage Group