challenge
Gain better understanding of fracture half-length to enhance fracture design and optimize well spacing for planned infill drilling program.

solution
Implement StimMAP LIVE* real-time microseismic fracture diagnostics service in two monitor wells, one parallel and one orthogonal to fracture propagation.

results
Successfully mapped full hydraulic fracture length, enabling infill spacing to optimize reservoir drainage without drilling unnecessary wells.

“the combination of Schlumberger technical expertise and fit-for-purpose treatment and monitoring technologies enabled us to understand how to design the optimal fieldwide infill drilling program without spending more money than necessary.”

independent operator, rocky mountains

overcome limitations of single monitor well
An independent operator working in the US Rocky Mountain region has been actively producing from tight gas sand reservoirs. To optimize well spacing for a planned infill drilling program, the operator needed to gain a better understanding of fracture half-lengths created by hydraulic stimulation treatment.

Having previously used microseismic monitoring in the field, the operator knew the microseismic signal attenuated over a relatively short distance in these particular sands—within about 1,200 ft. Therefore, using only a single monitor well could have several shortcomings. If a fracture propagated parallel to the direction of the monitor well, microseismic monitoring might map only one fracture wing, i.e., the one extending in that direction. The other wing might extend beyond the range of detection in the opposite direction. However, even if the fracture propagated orthogonal to the monitor well, if the full fracture length exceeded the detection range, it might prove impossible to map it completely. Without knowing the full fracture length, it would be challenging to determine the infill spacing required to maximize production without overspending on unnecessary wells.

three-dimensional view of microseismic events caused by 6 stages of a 24-stage, 2-well stimulation treatment observed from 2 monitoring wells.
CASE STUDY: Rocky Mountain operator uses two microseismic monitor wells to reveal full fracture half-length in tight gas sands

Optimize infill drilling program and reservoir performance
Monitoring the fracture treatments from two wells instead of one successfully revealed the full fracture length. The second monitor well indicated the fracture half-length was nearly twice the length observed in the first monitor well. Thus, having a “second opinion” proved critical to success.

Schlumberger consultants demonstrated that the hydraulic fracture treatments stimulated at least 1,000 to 1,200 ft half-length (within the 1,200-ft radius of microseismic signal detection). Therefore, the full fracture length was at least 2,000 to 2,400 ft. Based on this information, the operator was able to improve subsequent fracture designs and to determine where to place infill wells that would optimize reservoir performance—without incurring the extra costs of drilling wells on tighter spacing than strictly required.

Implement fully integrated dual-well diagnostics
Based on prior experience with Schlumberger, the operator engaged specialists from Data & Consulting Services, Wireline, and Well Services to perform an integrated 24-stage hydraulic fracturing and dual-well microseismic monitoring operation.

The Schlumberger StimMAP LIVE diagnostics service delivers data within 30 seconds while the fracture treatment is being pumped. This enables consulting personnel to integrate and interpret microseismic events, and correlate them with fracturing data. As a result, engineers can modify the pumping procedures in real time and optimize the final fracture geometry.

To monitor two treatment wells and characterize the full microseismic cloud, the operator decided to use two monitor wells—one oriented roughly parallel to, and the other orthogonal to, the typical east-west azimuth of fracture propagation. With remote access to real-time data, the operator was able to see and control what was happening downhole during every stage of fracture operations—both in the field and in the office.

Map view of 2 treatment wells and 2 monitor well locations, indicating the approximately 1,200-ft detection radius of the microseismic signal.

Map view of microseismic events created by Stage 8 in two treatment wells, observed from both monitor wells.