

# Drilling Workflow Delivers Better Well Completions and Higher ROI

## The Challenge

The Exploration & Production division of Williams, an integrated natural gas company, was having difficulty verifying precise wellbore placement relative to the target zone in the Barnett Shale. As a result, they could not properly reconcile drilling and geophysical data. This uncertainty about lateral location in the reservoir target zone was adversely impacting their ability to advise completion engineers about geologic hazards to avoid.

## The Assessment

The Williams team was using standard gamma ray steering techniques that were insufficient for them to “see” the bit location during drilling. They were unable to interpret anomalies in the LWD and could not determine if wells were being optimally positioned within the best target zone.

Williams needed to drill faster and smarter; their goal was to cut drilling time to less than three weeks per well to reduce time and expenses. To accomplish this, they would have to identify and stay within the target zone for the entire lateral section.

Paradigm demonstrated that fluctuations in target zone depth and occasional sub-seismic and barely seismic-discernable faults

were the source of the problem and caused the drill bit to deviate from the optimum target zone. This resulted in increased drilling time due to sliding delays, decreased reservoir exposure and ultimately reduced production and return on investment per well.

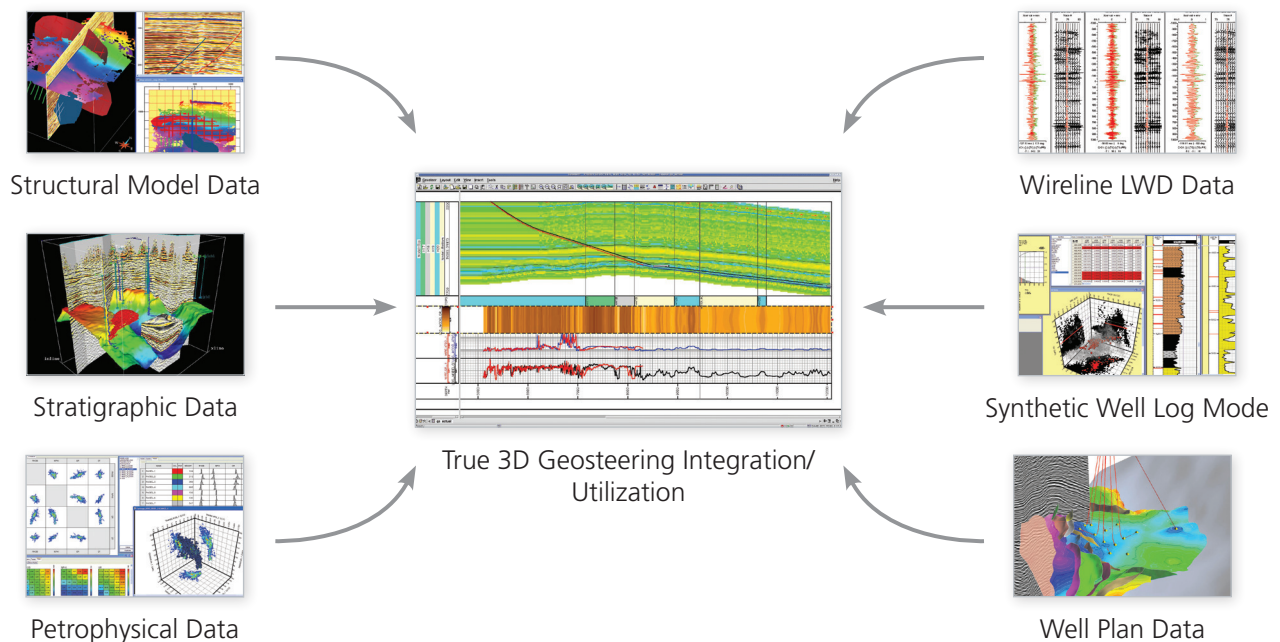
## The Solution

Paradigm® Geolog® Geosteer® provided fast updates from LWD, rapid adjustments to the structural model, and allowed for proper and consistent well placement.

The integrated real-time workflow provided by Paradigm applications supported the fast creation of log-scale geosteering models ahead of drilling, facilitated interactive updates to geosteering models while drilling, and enabled re-planning of wells using updated models to deliver consistent wellbore placement.

### This workflow delivered:

- Accurate and reliable directional drilling information
- True 3D visualization of the structure, stratigraphy, well logs and well paths, using dynamic data in a real-time setting
- Seismic and geophysical interpretation calibration



## The Result

Paradigm drilling solutions gave Williams the ability to make informed and rapid decisions about the actual location of the horizontal lateral in the target zone. This knowledge shortens the well cycle time to less than three weeks through a reduction in time spent sliding versus rotating.

Williams can now interpret structural changes, seismic anomalies and determine sub-seismic faults with confidence in areas such as the Barnett Shale. Paradigm drilling solutions also aid in the calibration of the geophysical data and provide a higher degree of confidence around the interpretation of 3D seismic data.

Post-drill analysis now provides a method with which to learn from past wells and be properly prepared for formerly unpredictable challenges. The drilling is more efficient, produces better wells and provides greater return on investment.

“No other well drilling technology does what the Paradigm geosteering and drilling technology does,” said Scott Roth, Williams E&P staff geoscientist. Williams can now confirm that we are staying within our target zone throughout the lateral.

Using Paradigm solutions, Williams has gained significant improvements in:

- The integration of science
- Hands-on utilization
- Reaction time
- Confidence in the ability to tackle problems
- Drill bit accuracy to less than 10 foot difference in seismic interpretation
- Validation for geologic and geophysical data
- Reservoir exposure
- Fracturing, through improved stratigraphic visualization

Previously, Williams had adopted a “best information available” approach, but they were unable to see or react to unexpected structural and stratigraphic changes in the reservoir. Now they react with confidence through validated results, and they will continue to use Paradigm Geosteer on all their future wells.

*“Paradigm geosteering software accomplishes what the human mind is incapable of processing. It combines the information from 3D seismic surveys with the data obtained from MWD tools and produces an excellent visual display of the actual well path while drilling. This display allows us to verify that we are in our target zone and clearly indicates when adjustments to inclination are necessary to remain in the target zone. The end result is laterals properly placed in the target zone, which should yield better completions, higher production rates and greater return on investment.”*

» Scott Roth, Staff Geoscientist, Williams E&P