

*“Before everything else;
getting ready is the secret of success.”*
– Henry Ford

HALLIBURTON

Triumphs and Tribulations of Tight Sands and Shale Plays
81st Annual IPAA Technical Conference
November 9, 2010

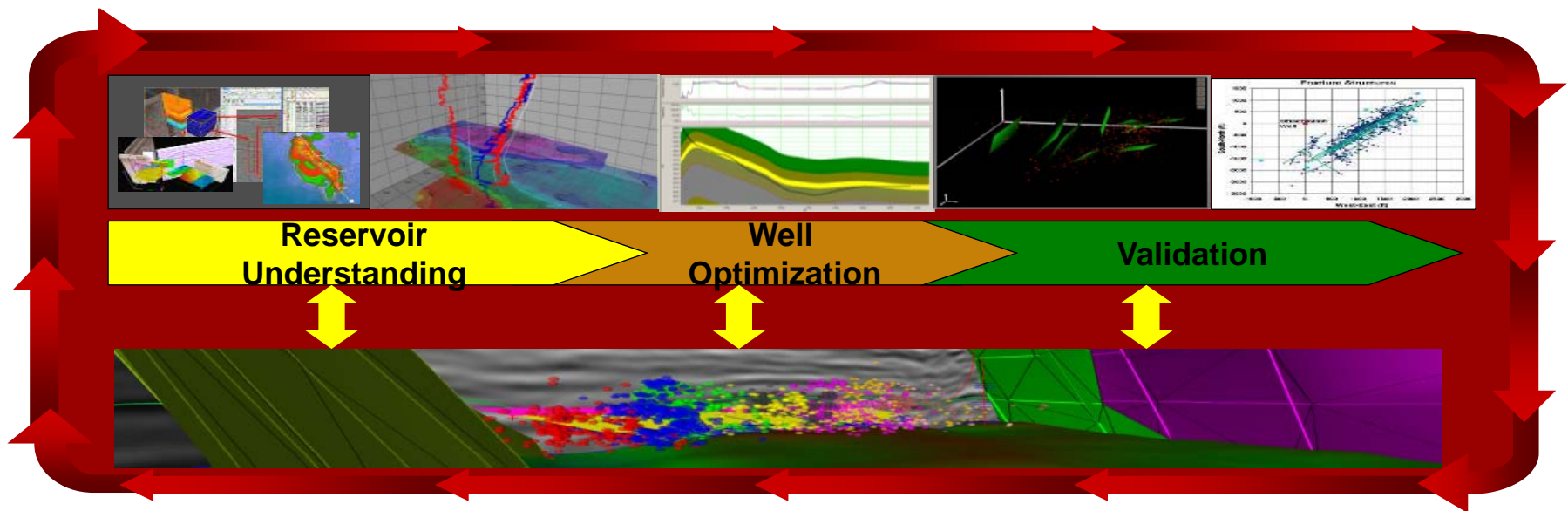
Dan Gualtieri, PMP
Consulting and Project Management Business Development Manager
dan.gualtieri@halliburton.com 281.575.3920

What we know today...

- There is always an opportunity to improve
- New technology can improve field economics
- Modeling increases efficiency and minimizes risk
- Re-evaluate often
- Economics is key
- Our understanding will evolve

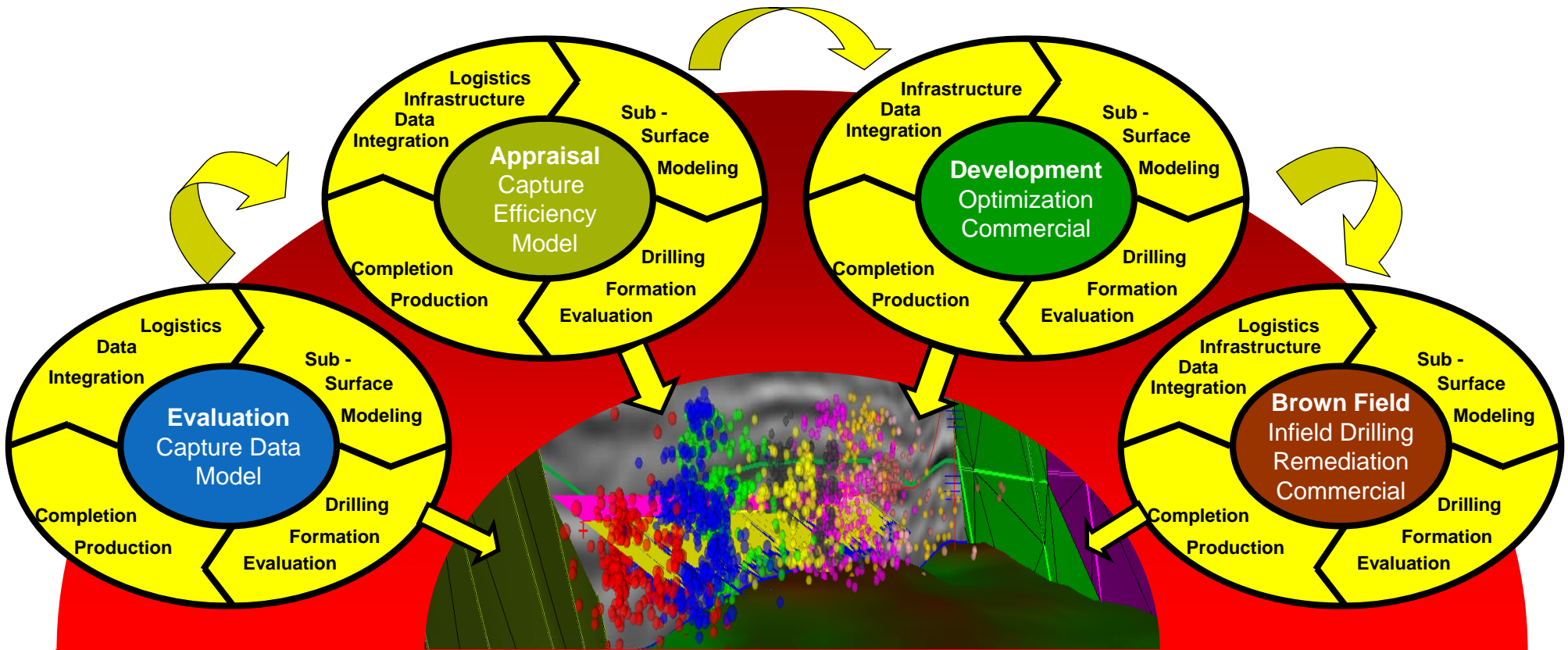
Unconventional Field Development – An Integrated Approach

- Proactively address reservoir and full field development challenges
 - An integrated process from exploration through to production to maximize the asset's potential



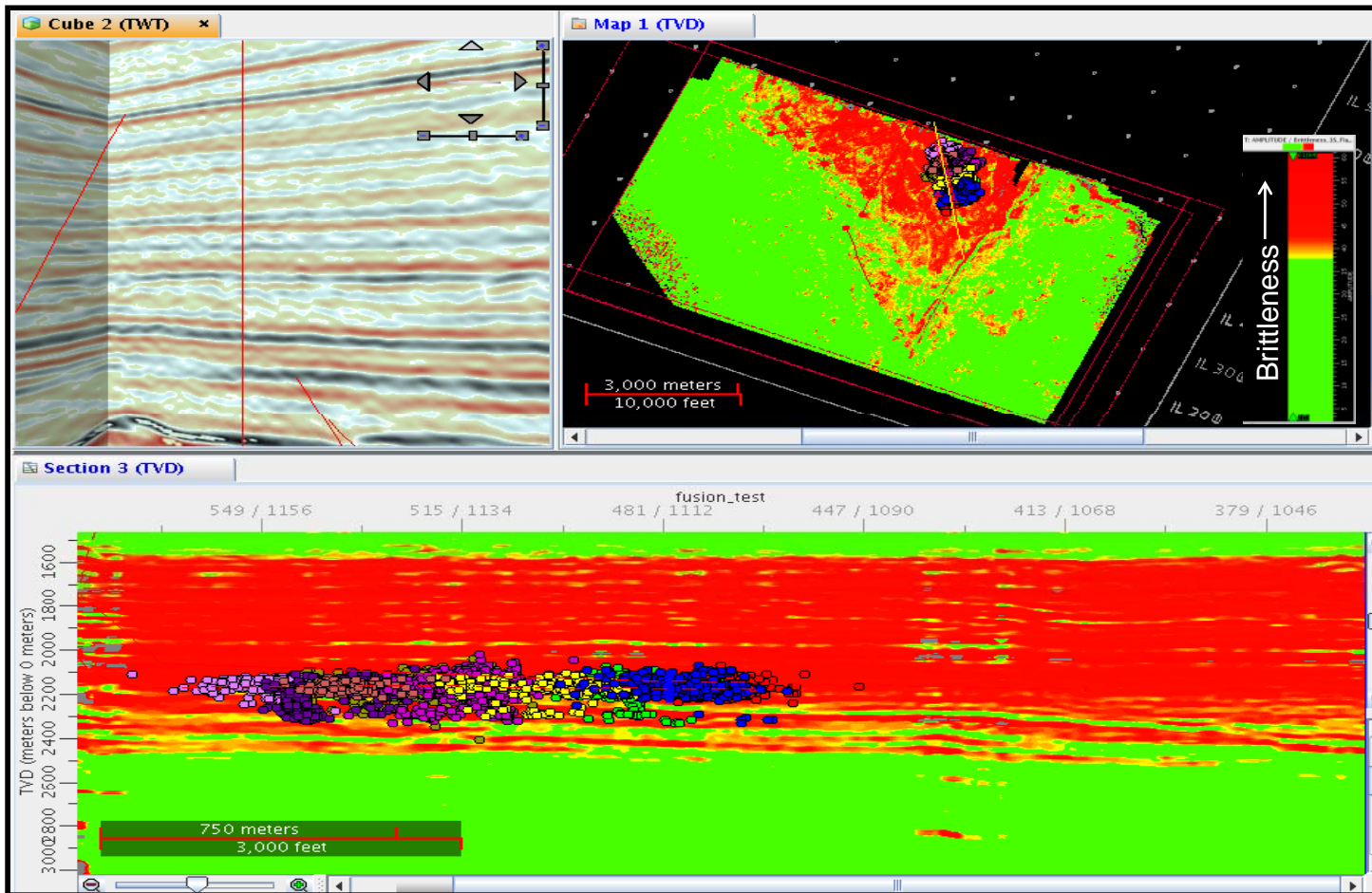
Full Field Integration, Visualization and Optimization

Life Cycle - Field Development Strategies



Full Field Integration, Visualization and Optimization

Stimulating the Right Rock



[3D SEISMIC
+
PETROPHYSICS]

*

FRACTURE
DESIGN
=
IMPROVED
ASSET
ECONOMICS

Unconventional Plays Required Operational Optimization

Drilling Solutions

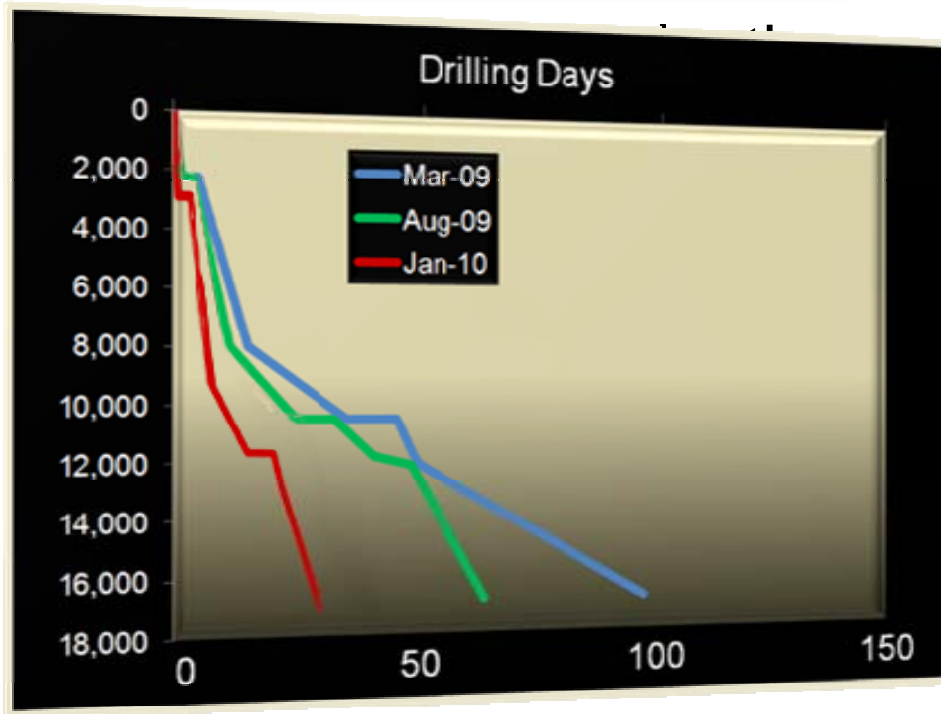
- Drilling Program Evaluation
 - Torque/Drag, Hydraulics, Vibrations, Swab-Surge, Stuck Pipe Analysis.
- Real-time Monitoring
- Tubular Integrity
- Drilling Performance
- Risk Management
- Contingency Planning

Total Completion Time

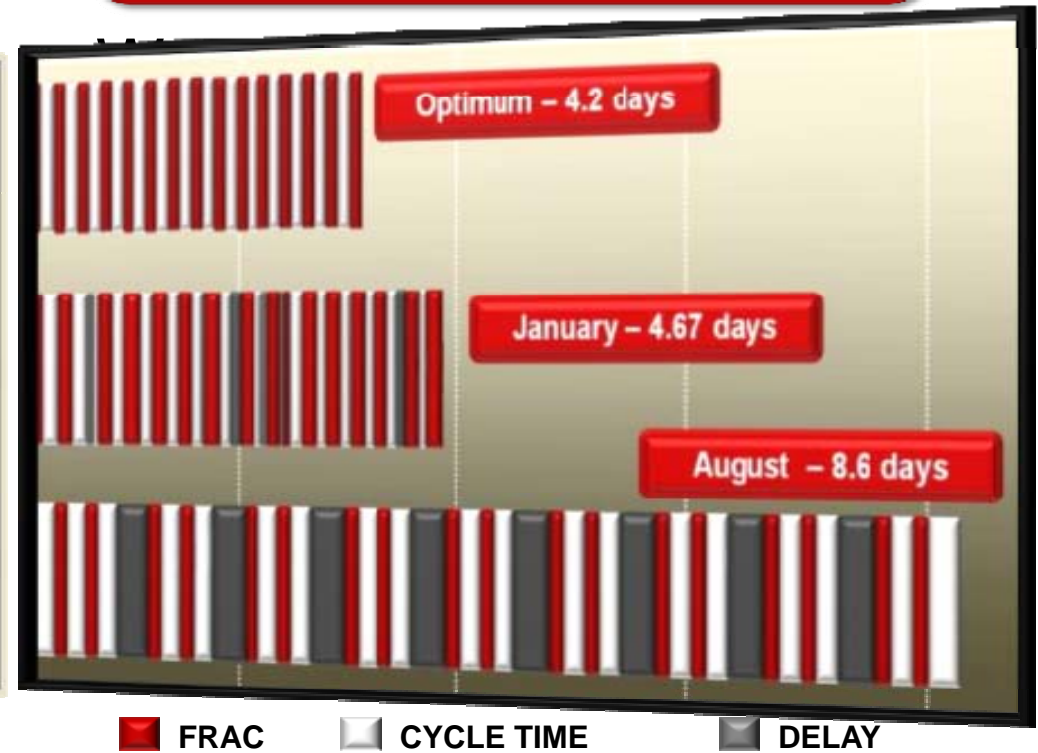
- Water Management
- Readiness of pipeline for hydrocarbon transport
- Surface Facilities Planning - economics
- Stimulation Capacity

Unconventional Plays Required Operational Optimization

Drilling Solutions



Total Completion Time

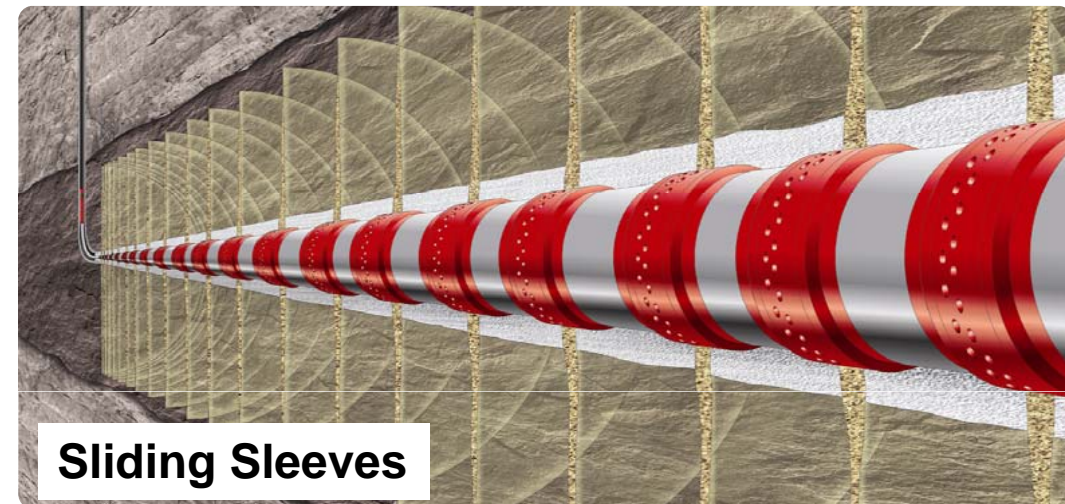
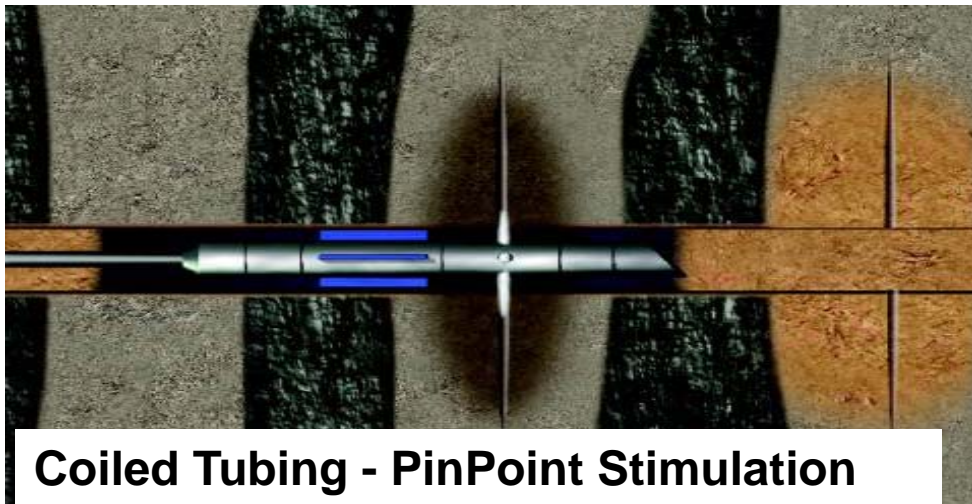
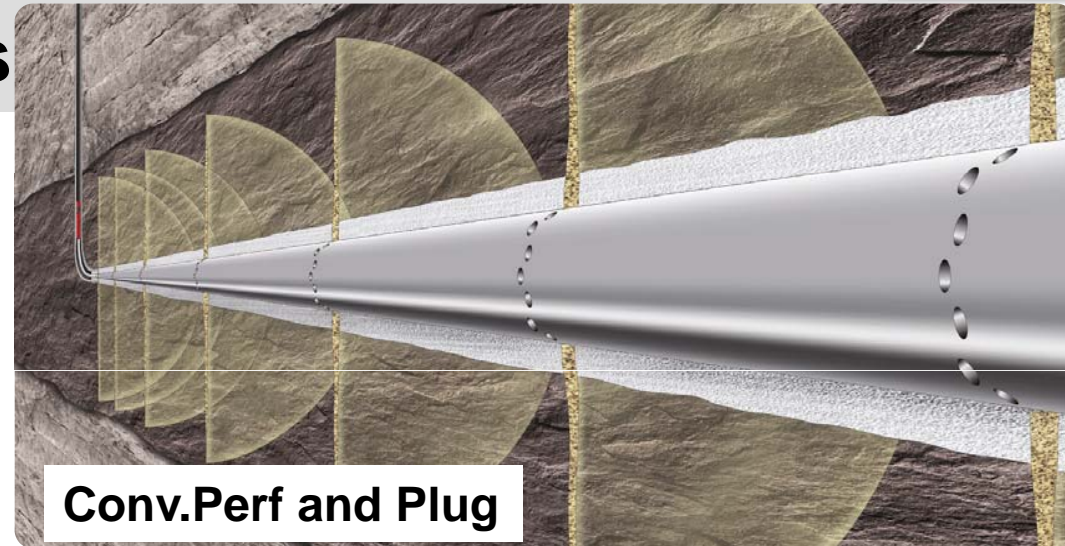


■ FRAC
 ■ CYCLE TIME
 ■ DELAY

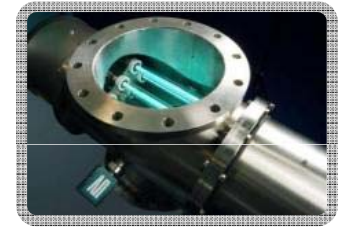
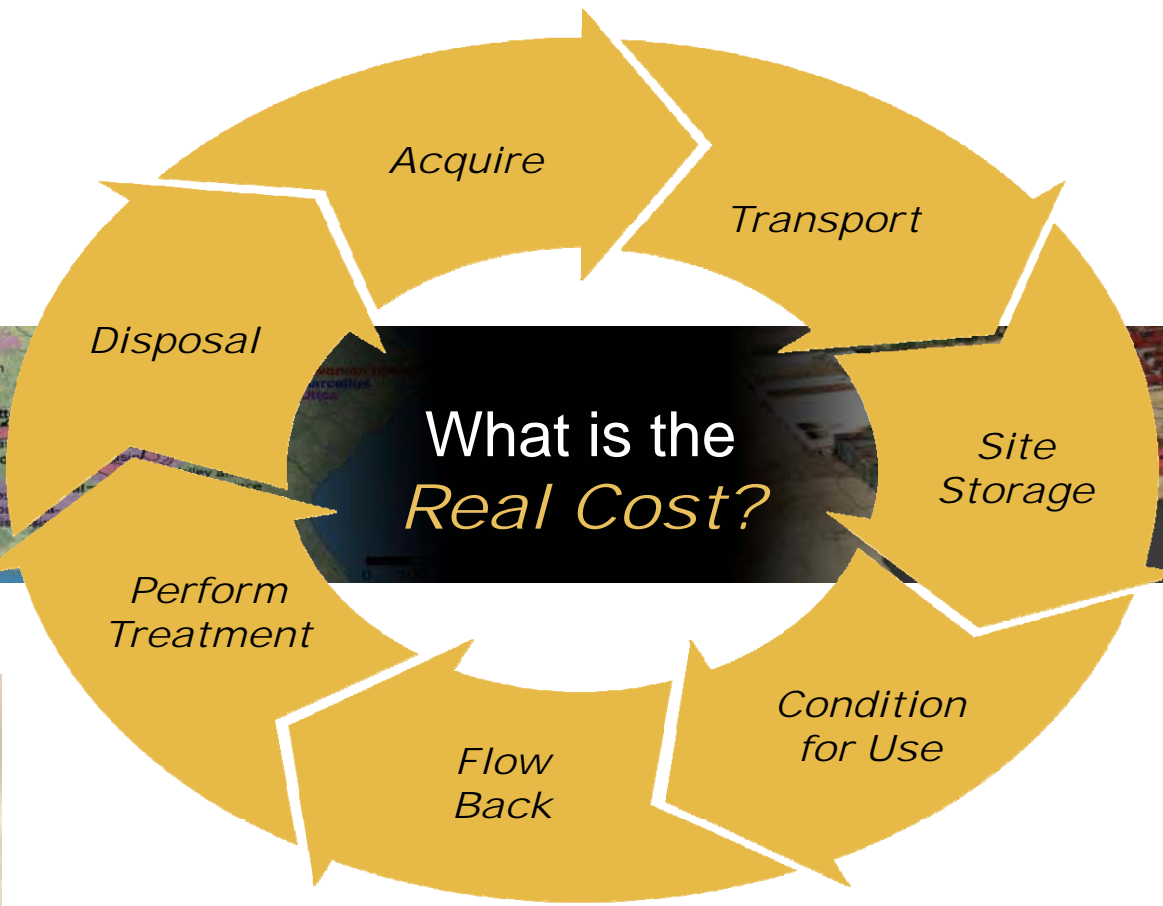
Unconventional Completions

■ Completion Evolution

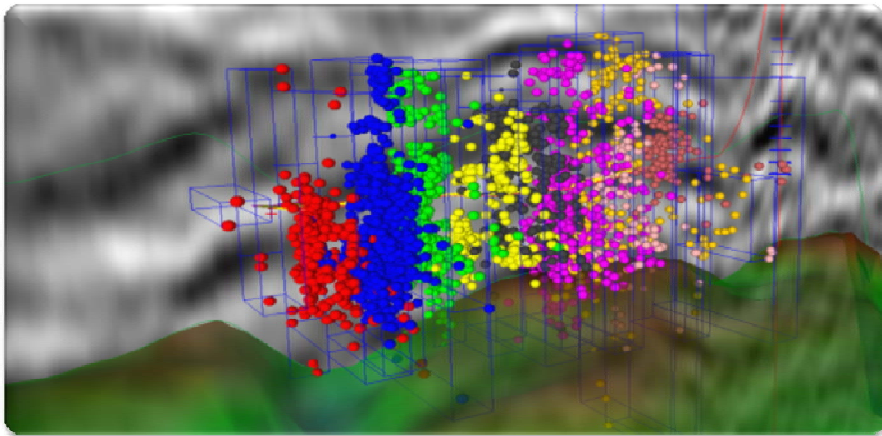
- Economics
- Reduced Completion Time
- Reduced Risk
- Targeted Placement



CHALLENGE: Reduce water costs while improving water quality



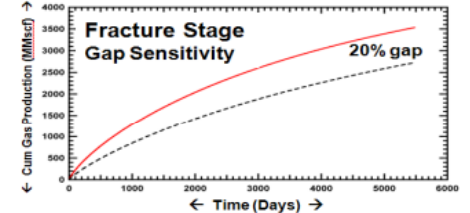
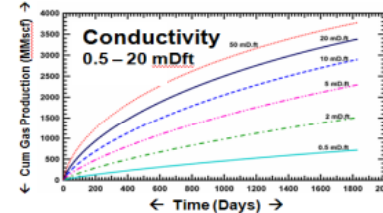
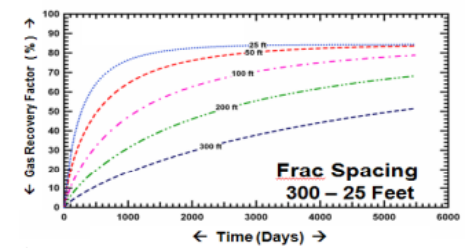
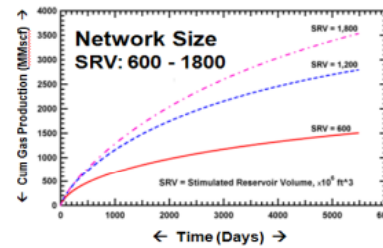
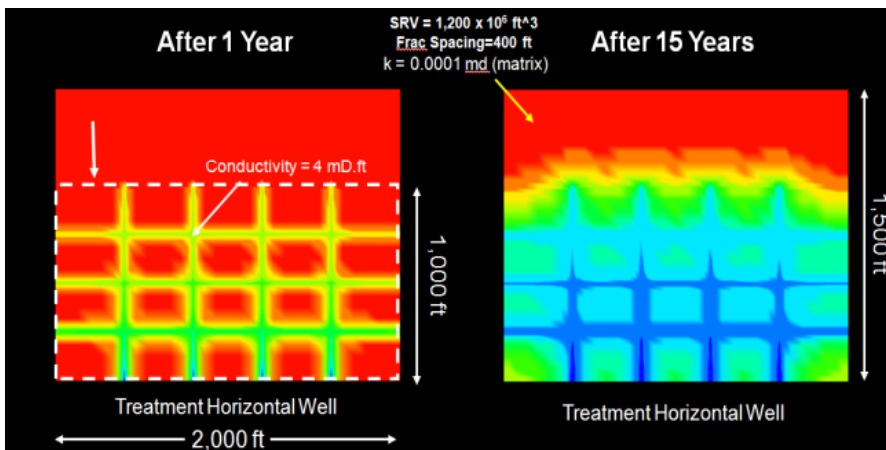
Stimulated Reservoir Volume – Evaluation to Optimization



Understanding production rates, well pressures and lateral production

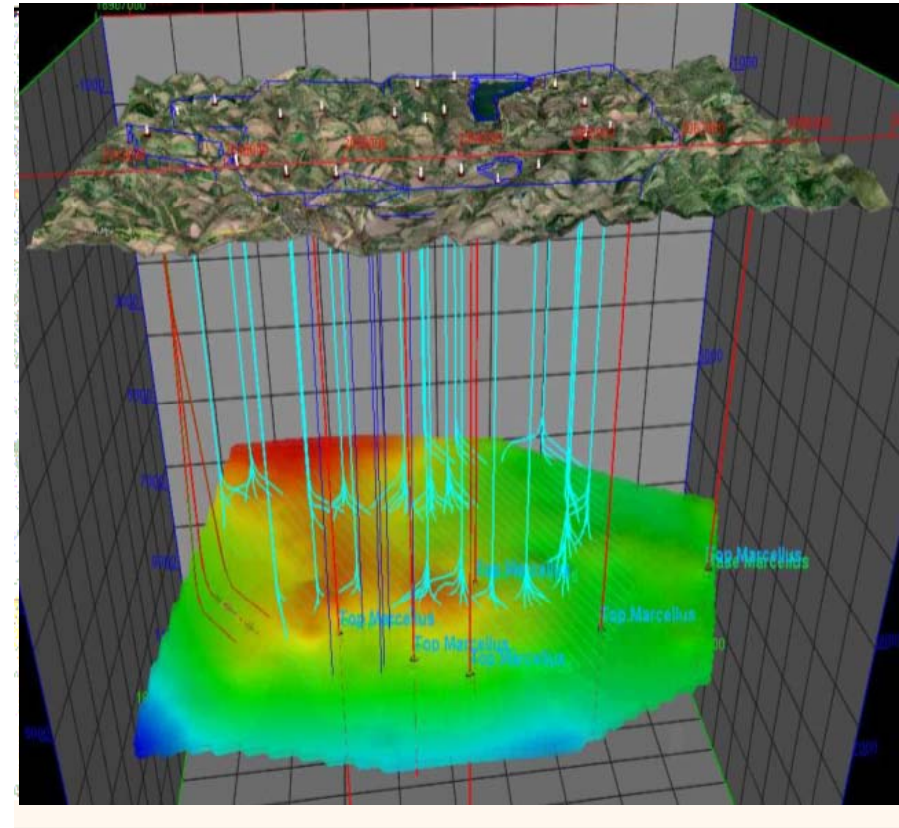
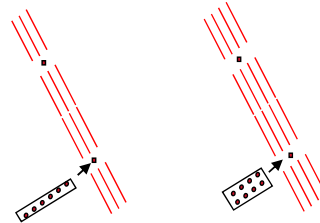
Distributed Production Profiles via:

- Production Array Log
- Distributed Temperature
- Modeling and history match analysis



Bringing it all together...

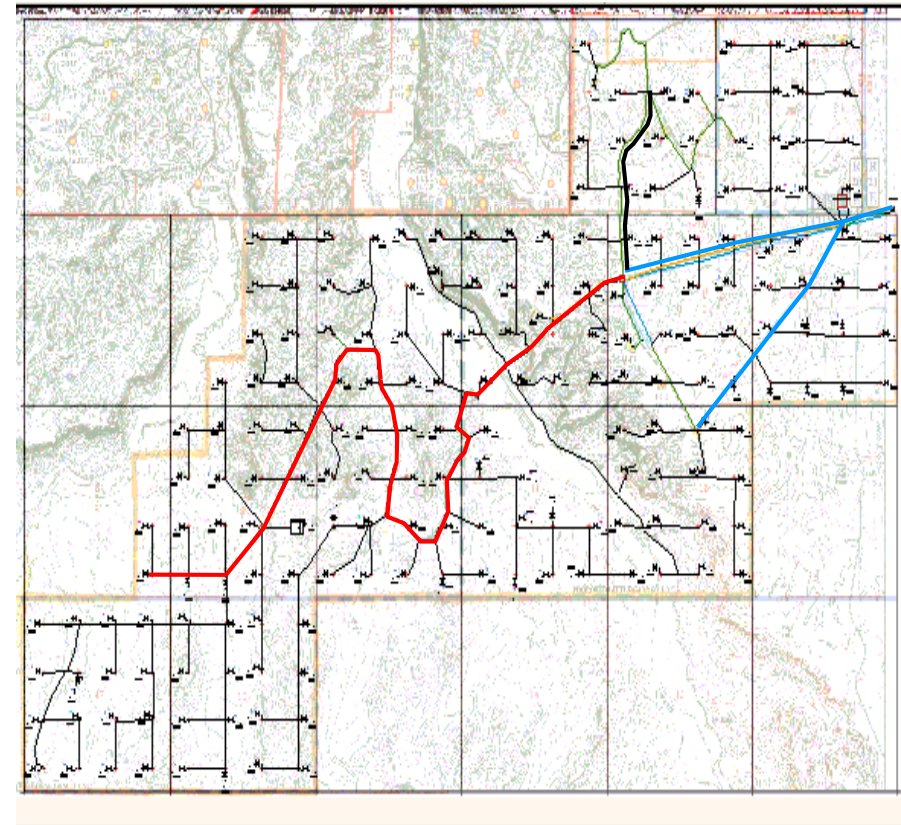
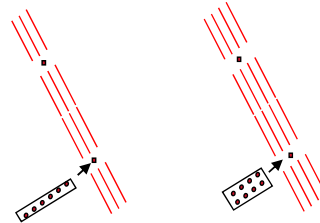
- Incorporating surface and subsurface data
 - Surface topography
 - Infrastructure, roads, no-go zones, flood plains
 - Drilling constraints
 - Collision avoidance
- Optimized asset development plan
 - Minimize # pad locations and drilling time
 - Environmental impact
 - Lateral length
 - Field economics
- Months of planning done in days
- Maximize reservoir contact



Collaborative Well Planning

Bringing it all together...

- Incorporating surface and subsurface data
 - Surface topography
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Surface Facilities Planning

Case Study: Optimized Shale Asset in Pennsylvania

■ Challenge:

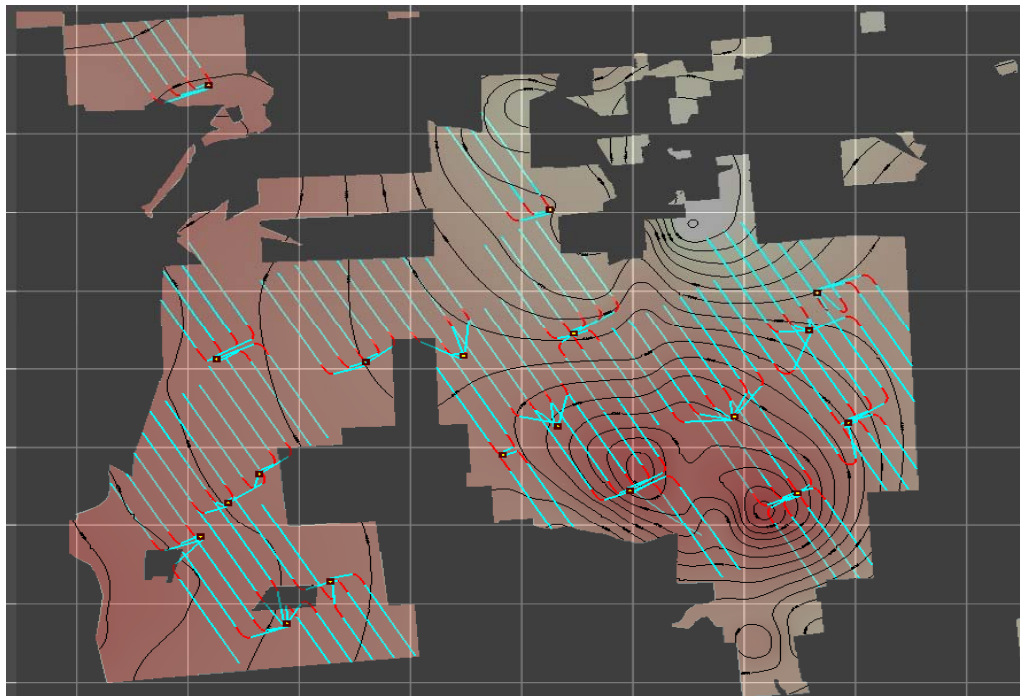
- Quickly choose locations in treacherous terrain for 450,000+ acres
- Optimize the use of slots within pads
- Increase lateral extent while decreasing pads
- Identify locations for reserves

■ Solutions:

- Collaborative Well Planning Process

■ Results:

- Saved \$45M in pad construction, while gaining nearly 2M feet of lateral length
- Reduce the number of drilling days by 520+ saving over \$25M



Conclusion: Lessons Learned

- Health, safety and environment
- Develop a strategic plan
- Drive processes and efficiencies
- Spend time modeling
- Evaluate the first wells; Quickly become asset focused
- Re-evaluate the asset often
- Document and share your lessons learned



Thank you. Questions?