



Arkoma Woodford Shale Overview

AADE Symposium 2009

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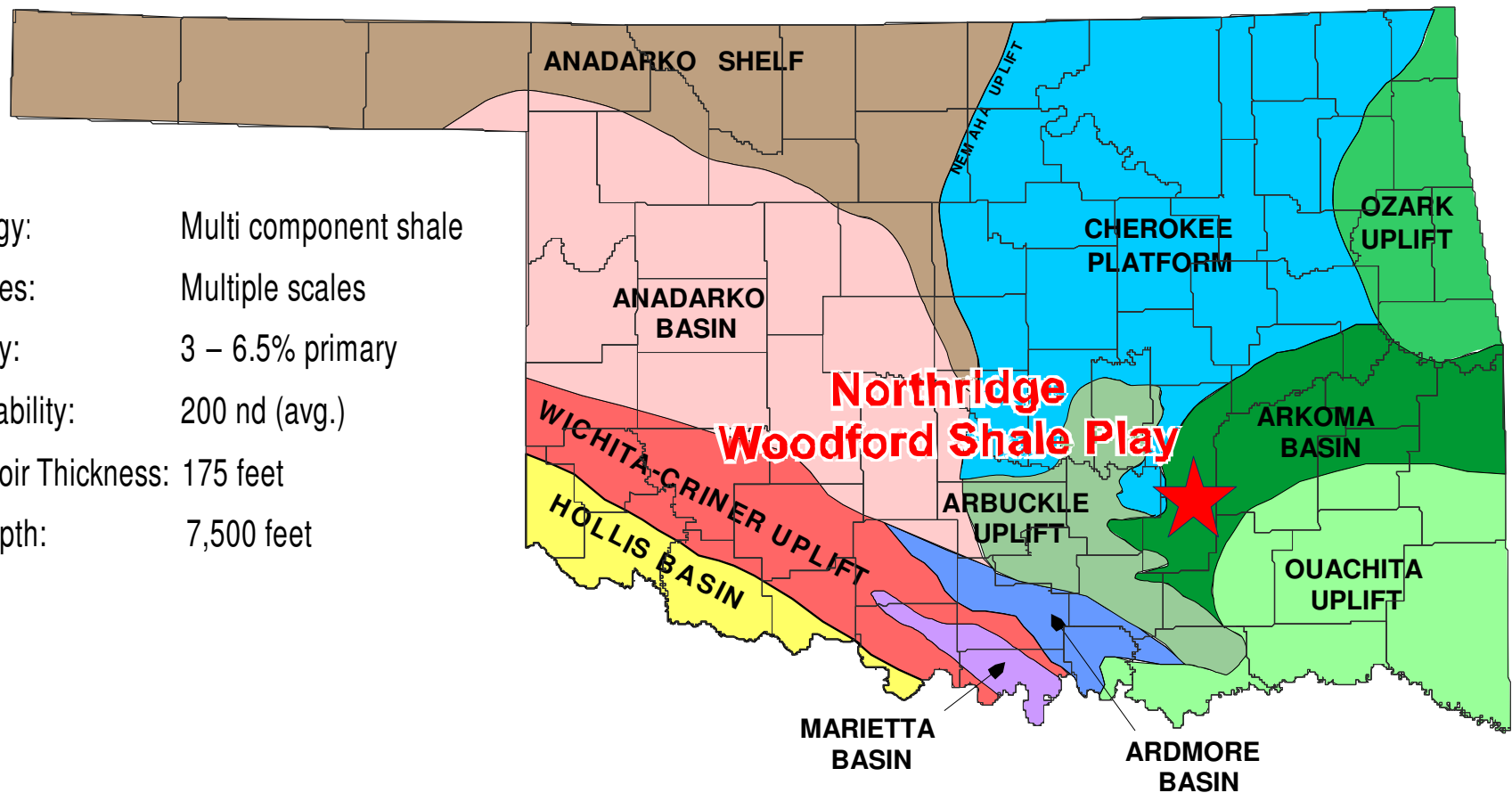
Arkoma Woodford Development

- General overview of area
- Lithology
- Activity History
- Challenges in each hole section
- Solutions

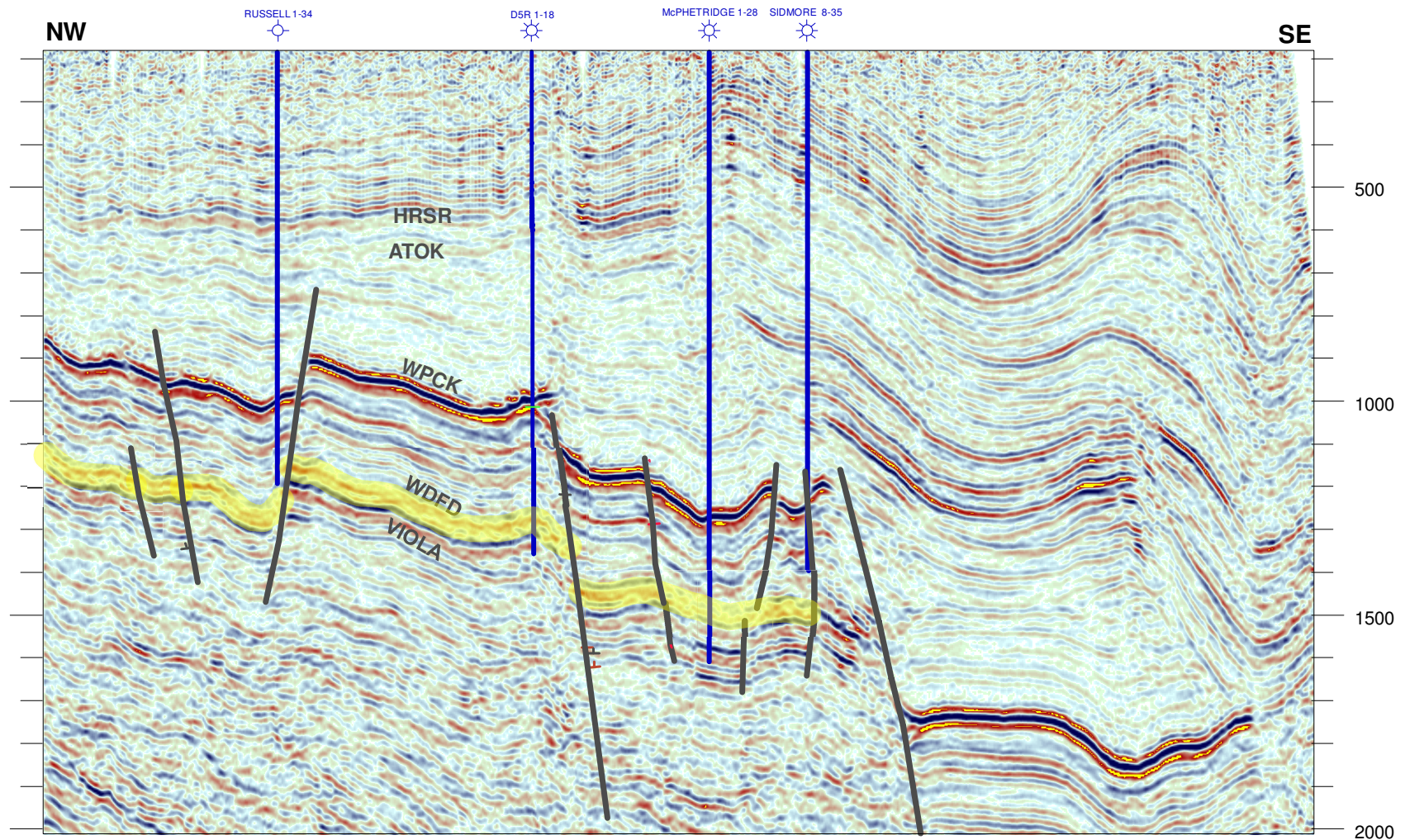


Woodford Shale

- Lithology: Multi component shale
- Fractures: Multiple scales
- Porosity: 3 – 6.5% primary
- Permeability: 200 md (avg.)
- Reservoir Thickness: 175 feet
- Drill depth: 7,500 feet



Area Seismic NW to SE



Arkoma DVN Wells

Year	Spuds		
2005	6	1 rig	
2006	21	2 rigs	
2007	43	5 rigs	
2008	46	6 rigs	
2009	34	4 rigs	est.
Total	150		



Vertical Hole Section

- **Challenges**
 - **Hole Stability, Lost Circulation, Formations**
 - Very Water Sensitive, Sloughing, Hole Stability Issues
 - Lost Circulation in Upper Part of Atoka
 - Wapanuka LS, 30Kpsi UCS, hard transition from shale (PDC)
 - Cromwell SS ~27Kpsi UCS, continues bit damage from uphole
 - **Solutions**
 - OBM for less severe loss areas
 - Intermediate 9-5/8” CSG and WBM in theft areas
 - Drilling practices, limit ROP and RPM in transition zones with PDC
 - Retain more cutter life with good practices uphole

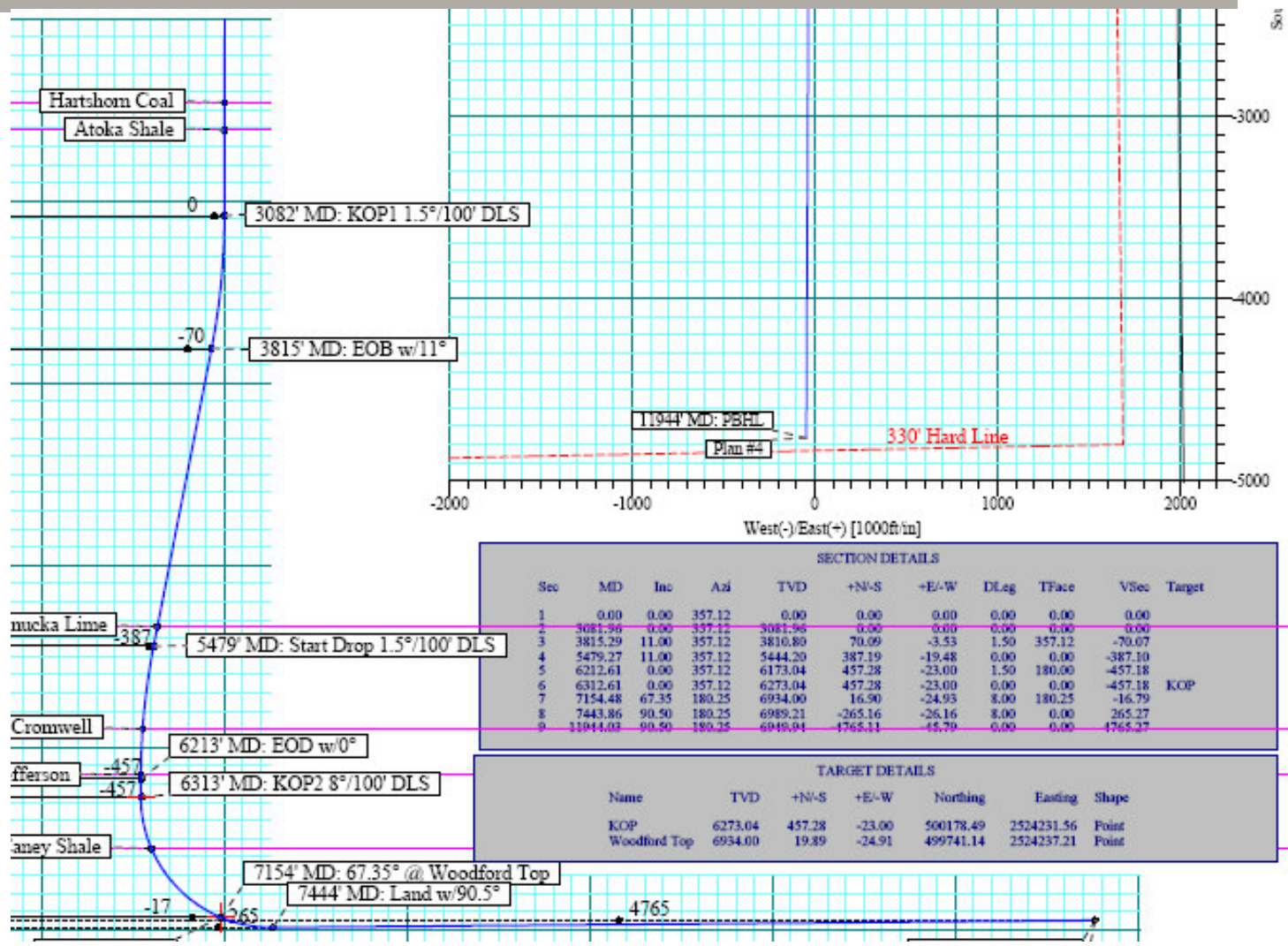
Curve/Build Hole Section

- **Challenges**
Formations, BURs, Bit life, TF Control
- Top of Curve Section - Caney Shale, Woodford top
 - BUR 8° - 10°, BUR hard to achieve in softer shale
 - 2 TCIs to complete curve section
 - Interbedded Formation makes TF control difficult w/ PDC
 - Kickpad problems when using PDC
- **Solutions**
 - Use kickpad with TCI to achieve BUR needed
 - LS mtr decreases Krevs while giving acceptable ROP, bit life
 - PDC somewhat successful in cleaner lithology
 - PDC will not drill top layer of Woodford w/o trip, BUR, use TCI

Lateral Section (Woodford Sh)

- **Challenges**
- **Formation Content, Hole Cleaning, Geology/Faulting**
 - Imbedded Chert and Qtz. nodules scattered randomly in Shale
 - Cuttings beds in long laterals creates problematic trips
 - Faulting/Karsts in formation- out-of-zone drilling
- **Solutions**
 - Diamond-enhanced TCIs and heavy set PDCs for high chert content areas when possible
 - Patience, strict adherence to circulation, hole cleaning and trip techniques helps makes tripping uneventful
 - Geosteering corrections after faults, following dip angle,

Well Profile and Formations Tangent Vertical Section



Other Solutions for Success

- Overall Well Solutions/Improvement

- People
 - Crews, Consultants, Office
- Equipment
 - Rigs, Directional, Fluids, Bits
- Teamwork between all brings safety and efficiency



Thank You.