Core Counties:
- Beckham
- Washita
- Custer
REGIONAL GEOLOGIC SETTING
PLAY TIME LINE

- Hogshooter is Nuisance Zone for Deep Wells
- Q2 2010 Apache Spuds First Two Wells
  Each have IP of 2,000 bbl & +3,000 MMCF/Day
- Frenzied Offsetting in Late 2010 & Early 2011
- 2011 Continued Mapping and Development Drilling
- 2012 ?
WELL PLAN

- 4 wells per section; N-S orientation.
- Ensure Legal Entry Point
  - 330’ from North or South Line
  - 500’ from East or West Line
- 10 DLS Curve
- Steer Lateral as needed by Geology
  - Targets every 500’ with a ±10’ window
**ORIGINAL CASING DESIGN**

**Surface:**
1,500’ of 12-1/4” Hole, 9-5/8” Casing

**Intermediate:** Cover *Brown Dolomite* & *Cottage Grove*
10,200’ of 8-3/4” Hole, 7” Casing & Stage Tool

**Production:** 6-1/8” Hole & 4.5” Casing
11,300’ TVD
15,700’ MD
DRILL-THRU CASING DESIGN

Surface: Cover Water Zones
700’ of 17.5” Hole, 13-3/8” Casing

Intermediate: Cover Brown Dolomite
5,400’ of 12.25” Hole, 9-5/8” Casing & Stage Tool

Cottage Grove open while drilling lateral.

Production: 8.75” Hole & 5.5” Casing
11,300’ TVD 15,700’ MD
SURFACE HOLE

- Cover Fresh-water zones
- Takes 1 day to drill with Mill Tooth
- Spud Mud
Zones of concern:
- Brown Dolomite at 5,000’ – Losses and corrosive.
- Heebner at 8,900’ – Deviation issue.
- Tonkawa at 9,500’ – May kick.
- Cottage Grove at 10,100’ – Lost circulation.

Entering lateral, pressure profile is consistent. Vertical hole issues are primary driver to casing decisions.
VERTICAL HOLE

- Drill with rotary pendulum assembly.
  - Drifts 150’ North to Northwest by KOP.

- 9.0 ppg water-based mud pre-treated with LCM

- Typically 1 bit to reach KOP.
  - Use 5-blade PDC bit with 16mm cutters.
  - Revert to 6-blade if a trip is made.
CURVE

- Drill with bent motor and 5-blade, 13mm PDC.
  - 1.83° bend to achieve 10 DLS
  - No significant dead-zones

- 8.9 ppg oil-based mud.
  - Fines as needed.

- Typically 1 bit and 2.5 days.
LATERAL

- Drill with motor and neutral BHA.
  - RSS once comfortable with bits in an area.

- 8.9 ppg oil-based mud.
  - Fines as needed.

- Variability in lateral ROP
  - 6 and 7-blade PDCs with 13mm preferred.
  - More aggressive gives higher instantaneous ROP. Worth it?
  - Diamond impreg bit and turbine?
LATERAL & GEO-STEERING

- Compromise between geology and casing run.
- Targets every 500’ and use a ±10’ window.
- Bit walks more than in the deeper washes.
CASING DESIGN BENEFITS & RISKS

- Drill-through can be done successfully.

- Should drill-through be standard practice?
  - Can you live with 4.5” production casing?
  - Would you rather spend $700K on casing or lost mud?

- What about the one train-wreck?
PROBLEMS SEEN

Do all geologists want to be in the same rock?
- Rigs across the street drill entirely different: Pyrite streaks, losses, stuck pipe, and geologic side-tracks.
- Differences due to geology or geologist?

Our pendulum assembly much slower than offset.

Bit strategy.

Fracture initiation pressures higher than expected.
APACHE GO-FORWARD PLAN

- Continue to map and assess acreage.

- No drill-through. Too much risk, too little gain.
  - Set 1,500’ of 9-5/8” surface and set 7” at KOP.
  - 6-1/8” lateral and 4.5” production casing.

- Performance motor in vertical pendulum.

- Lighten production cement, but NO FLARE!
EXTENT OF FIELD?

HOGSHOOTER POTENTIAL?