BAKKEN BASICS

AADE Annual Technical Symposium

January 19, 2011

Ross Lubbers and Cole Walton
Locator Map

WILLISTON BASIN

Development Area

XTO Properties

Mid-Continent Region

Eastern Region
Barnett Shale
Appalachia Region
San Juan Region
Mid-Continent Region
Permian Region
Gulf Coast

SASKATCHEWAN

MANITOBA

NORTH DAKOTA

SOUTH DAKOTA

MONTANA

WYOMING
Bakken 2010 Program

450,000 net acres

Primary Reservoir Objectives

Middle Bakken & Three Forks

5 – 6 operated rigs

55 horizontal wells

$4.3 – $7.2MM/well (gross)

400 – 600 MBOE/well
Pay !

Target TVD:
9,200 – 10,600’

Pore Pressures
9.5 - 14.5 ppg

Pay porosities average <8% and permeabilities from .05 to .001 millidarcies
Current Config - Long Single Lateral

Goals:
Drill Fast and Safe (Minimize NPT)
Provide Reliable Wellbore for the Long Hall

How do we get there?

- Initial well in center of unit
- Fulfill lease obligations
- Prove up acreage
- Infill at later date
### Surface Hole

**13-1/2” tri-cone**  
FW w/ sweeps  
Set 9-5/8” @ 1,200 – 2,100’

<table>
<thead>
<tr>
<th>Issues</th>
<th>Responses</th>
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<tbody>
<tr>
<td>Hole Cleaning</td>
<td>Pump Rate</td>
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<tr>
<td>Lost Circulation</td>
<td>Top Job</td>
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<tr>
<td>During Cementing</td>
<td>Cement Squeeze</td>
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*Shale*  
*Pay*
Intermediate Hole

8-3/4” PDC
OBM
KOP 600-700’ above pay
12 - 14 deg/100 build rate
7” Set in Producing Horizon
9,500 – 11,000’ MD
(9,200 – 10,600’ TVD)

Issues

- Hole Cleaning
- Shallow Deviation
- N2 Kicks
- Reactive Shales
- PDC Bit Damage
- Salt Zones
- Lost Circulation

Responses

- Pump Rate
- Dir Drill Vertical
- MW > 9.5 ppg
- OBM
- Slower RPM’s at Bit
- Driller Experience
- Wiper Trips / FW Sweeps
- 7” 32# HC L-80 or P-110
- Gauge Hole & Good
- Cement Job
- Max MW 11.5 ppg
- Avoid Swab / Surge
- / Excessive ECD
Production Hole

6” PDC
Brine Water (9.5 – 10.5 ppg)
TD 19,500 – 23,800’ (MD)
(9,500 – 10,400 lateral)
4-1/2” Liner (KOP to TD)
with 18 – 24 Swell Packers,
Liner Hanger Packer, &
Pre-perf’d Toe Section

Issues                        Responses
Hole Cleaning              Pump Rate
Staying in Zone             Geo-Steer Using
High Pressure               MWD - GR &
with Perm                   Mudlogger Experience
MWD & Motor Life            OBM ( > 12 ppg)
Torque & Drag               Slower RPM Motor
(last 1/3 of hole)         Real Time Vibration
                          Monitoring
                          Lubricants
Brine Emulsion
Torque and Drag Issues

Dakota Fed 6" Hole Lateral - Modeled Hookload at Depth as Indicated at Surface - Steering w/ Bent Motor

- 30K WOB - No Rotary RPM - With Lubricant
- 30K WOB - No Rotary RPM - No Lubricant
- With Lubricant - Extended to Zero Hookload

With the addition of lubricants, total section drilled to 20,890' MD, extending lateral ~1,590' beyond what was theoretically achievable without lubricants.

Without lubricant, theoretical maximum attainable TD is ~19,300.

With lubricant, theoretically maximum attainable TD is ~22,200, extending lateral at least 2,900' beyond what was achievable without lubricants.
Off-Unit Surface Locations

**SECTION DETAILS**

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<th>Azl</th>
<th>TVD</th>
<th>N-S</th>
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**WELL DETAILS:**

Elaine Federal 12X-19 Plan A Rev 0 BH Tgt

**Section Line**

- Kickoff at 10474.74 ft
- Total Depth = 22700.55 ft
- Turn Rate = 4.00°/100 ft
- Begin Turn at 13914.63 ft
- End Turn at 14687.74 ft

Elaine Federal 12X-19 Plan A Rev 0 BH Tgt

- Total Depth = 22700.55 ft
- Turn Rate = 4.00°/100 ft
- Begin Turn at 2293.06 ft
- End Turn at 3409.86 ft

**Ground Level:**

- 2011.00
- 725744.41
- 136017.26
- 47°37'39.600 N
- 102°58'2.460 W

- Created By: Isaiah Rodolph
- Date: 10/11/2010
- Checked: __________________________ Date: ____________
- Reviewed: __________________________ Date: ____________
Drilling Challenges

• High Pressure with Conductivity
  • Drilling Brine Contamination
  • OBM – Loss of Penetration Rate

• Geosteering In Zone

• Downhole Tool Reliability

• Topography / Regulatory Agencies / Land Owners
  • Longer Laterals
  • Pad Drilling

• Skilled People & Costs!
Williston Basin Activity Level

North Dakota Rig Count

Date

Rig Count

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

2008 – 2009 Days vs. Depth

Bakken 2008 - 2009
Probability Based on 2009 Data
Spud-Release

- 2008 Wells
- 2009 Wells
- 2008 Average
- 2009 Average

Total Footage Drilled

P1, P10, P25, P50, P75, P90

P99
2009 – 2010 Days vs. Depth

Bakken 2009 - 2010
Probability Based on 2009 Data
Spud-Release

- 2009 Wells
- 2010 Wells
- 2008 Average
- 2009 Average
- 2010 Average

Total Footage Drilled

- P1
- P10
- P25
- P50
- P75
- P90

- p99
Cost Pressures

Drilling $/Day to Rig Release

- Majority of Well Costs Incurred Before 2010
- Majority of Costs Incurred in 2010

Graph showing the trend of drilling $/Day to rig release from June 2008 to March 2011.
Cost Pressures

Drilling $/ft to Rig Release

- Majority of Costs Incurred Before 2010
- Majority of Costs Incurred in 2010

Rig Release Date

Jun-08 Sep-08 Dec-08 Mar-09 Jun-09 Sep-09 Dec-09 Mar-10 Jun-10 Sep-10 Dec-10 Mar-11

$/ft
Questions?