

**Whiting Oil & Gas Corp.**  
**COTTONWOOD 07M-0602 Drill Plan**  
**March 3, 2017**

**Summary:**

The COTTONWOOD 07M-0602 well will be a horizontal well in the Niobrara formation. The well will be drilled to a KOP at 4810' TVD. A curve will be built to landed in the Niobrara at 5446' TVD. The lateral will be drilled with a 8-1/2" bit to TD at 16246 MD. A 5-1/2" casing string will be run with a marker joint to isolate the legal productive interval and cemented to surface. If hole issues occur during the drilling operation we will revert to the outlined contingency casing program.

**Surface Location:** 7-T9N-R57W  
306' FSL 847' FWL  
WELD, COLORADO

**Bottomhole Location:** 6-T9N-R57W  
100' FNL 495' FWL  
WELD, COLORADO

**DRILLING PROGRAM**

**1. ESTIMATED TOPS OF GEOLOGICAL MARKERS:**

Ground Level 4628'      Estimated KB 4649' (21')

<u>Formation</u>	<u>MD</u>	<u>Lithology</u>	<u>Hazard</u>
Fox Hills	Surface	Sandstone, shale, coal	Water
Pierre	1200'	Ss and dark grey shale	None
Niobrara	5354'	Chalk, limey shale, shale	Oil, gas, fractures
Horizontal Target (TVD)	5446'	Chalk, marl	Oil, gas, fractures
TD Niobrara Horizontal (MD)	16246'	-	-

**2. DIRECTIONAL PLANS**

KOP: 4905' MD, 4810' TVD  
BUILD RATE - AZIMUTH: 9/100', 0° Azimuth  
END OF BUILD: 5905' MD, 5446' TVD at 90° Inc and 360° Azimuth  
5 -1/2" CASING LANDED AT INTENDED BHL: 100' FNL 495' FWL 6-T9N-R57W  
7" CONTINGENCY CASING POINT: 5905' MD, 5446' TVD at 90° Inc and 360° Azimuth  
7" CONTINGENCY CSG POINT COORDINATES: 110' FSL & 609' FWL 7-T9N-R57W  
TD LATERAL: 16246' MD, 5446' TVD at 90° Inc and 358.58° Azimuth  
BH LOCATION: 100' FNL 495' FWL 6-T9N-R57W

See attached Directional Proposal Listings for more details.

### 3. PRESSURE CONTROL EQUIPMENT

#### A. Type:

Eleven (11) inch double gate hydraulic BOP with eleven (11) inch annular preventer with 5,000 psi Casinghead and 5,000 psi Tubinghead.

#### B. Testing Procedure:

The annular preventer will be pressure tested to 50% of stack rated working pressure for ten (10) minutes or until provisions of test are met, whichever is longer. The BOP, choke manifold, and related equipment will be pressure tested to approved BOP stack working pressure (if isolated from surface casing by a test plug) or to 70% of surface casing internal yield strength (if BOP is not isolated by a test plug). Pressure will be maintained for ten (10) minutes or until the requirements of the test are met, whichever is longer. At a minimum, the Annular and Blow-Out Preventer pressure tests will be performed:

- 1 When the BOPE is initially installed;
- 2 Whenever any seal subject to test pressure is broken;
- 3 Following related repairs; and
- 4 At thirty (30) day intervals.

Annular will be function tested weekly, and pipe & blind rams activated each trip, but not more than once per day. All BOP drills & tests will be recorded in IADC driller's log.

#### C. Choke Manifold Equipment:

All choke lines will be straight lines whenever possible at turns, tee blocks will be used or will be targeted with running tees, and will be anchored to prevent whip and vibration.

#### D. Accumulator:

Accumulator will have sufficient capacity to open hydraulically-controlled choke line valve (if so equipped), close all rams plus annular preventer, and retain a minimum of 200 psi above precharge on the closing manifold without the use of closing unit pumps. The fluid reservoir capacity will be double accumulator capacity and the fluid level will be maintained at manufacturer's recommendations. Accumulator precharge pressure test will be conducted prior to connecting the closing unit to the BOP stack.

#### E. Miscellaneous Information:

Choke manifold and BOP extension rods with hand wheels will be located outside rig sub-structure. Hydraulic BOP closing unit will be located at least twenty-five (25) feet from the wellhead but readily accessible to the driller. Exact locations and configurations of the hydraulic BOP closing unit will depend upon the particular rig contracted to drill this hole.

A flare line will be installed after the choke manifold with the discharge point of the flare line to a separate pit located at least 125 feet away from the wellbore and any existing production facilities.

A volume monitoring system with alarms will be used to monitor pit gains/losses along with visual backup.

#### 4. PROPOSED CASING PROGRAM

##### A. Casing Program: All New

Hole Size	Casing Size	Burst (psi)	Collapse (psi)	Tension (Body/Joint) (klbs)	Depth Set (md)
13-1/2"	9 5/8" 36PPF J-55 LTC	3,520	2,020	564/453	0' - 1450'
8-1/2"	5 1/2" 17# P-110 TXP	10,640	11,110	546/568	0' - 5905'
8-1/2"	5 1/2" 17# P-110 TXP	10,640	11,110	546/568	5905' - 16246'

9-5/8" surface casing will have centralizers as follows:

1. Install a bowspring centralizer at the first and second collars above the guide shoe.
2. Install one bowspring centralizer every third joint above the second collar.
3. Centralizer and basket placed 120' below the surface (or at the bottom of the third joint below the surface).
4. Centralizer and basket placed 80' below the surface (or at the bottom of the second joint below the surface).

5-1/2" production casing to be centralized every other joint.

7" contingency intermediate casing will have centralizers as follows:

1. Install floating standoff bands (positive standoff centralizers) one each joint to KOP.
2. After that centralize every third joint to surface with single bow spring centralizers.

Casing string(s) will be pressure tested to 0.22 psi/foot of casing string length or 1500 psi, whichever is greater (not to exceed 70% of the internal yield strength of the casing), after cementing and prior to drilling out from under the casing shoe.

##### B. Casing Design Parameters:

###### Surface Casing

Interval	Size	Burst (psi) <sup>a</sup> /SF	Collapse (psi) <sup>b</sup> /SF	Tension (klb) <sup>c</sup> /SF
0' - 1450'	9 5/8" 36PPF J-55 LTC	3520/3.44	2020/2.98	453/10.06

- a. based on frac gradient at shoe of 14 ppg
- b. based on full evacuation with 9 ppg fluid on backside
- c. based on casing string weight in 9 ppg mud  
String Weight in 9 ppg mud ≈ 45027 lbs

###### Production Casing

Interval	Size	Burst (psi) <sup>a</sup> /SF	Collapse (psi) <sup>b</sup> /SF	Tension (klb) <sup>c</sup> /SF
0' - 16246'	5 1/2" 17# P-110 TXP	10640/1.64	11110/3.14	568/2.33

- a. based on 6500 psi frac pressure.
- b. based on full evacuation with 12.5 ppg pore pressure on backside
- c. based on casing string weight in 10 ppg mud  
String Weight in 10 ppg mud ≈ 234013 lbs.

###### Contingency Intermediate Casing

Interval	Size	Burst (psi) <sup>a</sup> /SF	Collapse (psi) <sup>b</sup> /SF	Tension (klb) <sup>c</sup> /SF
0' - 5905'	7" 29PPF L-80 LTC	10640/1.26	11110/2.25	587/4.05

- a. based on 6500 psi frac pressure.
- b. based on full evacuation with 11 ppg pore pressure on backside
- c. based on casing string weight in 10 ppg mud  
String Weight in 10 ppg mud ≈ 145101 lbs.

**Contingency Production Liner**

<u>Interval</u>	<u>Size</u>	<u>Burst</u> (psi) <sup>a</sup> /SF	<u>Collapse</u> (psi) <sup>b</sup> /SF	<u>Tension</u> (klb) <sup>c</sup> /SF
4905' - 16246'	4½" 11.6PPF L-80 LTC	7780/1.43	6350/1.79	212/1.9

- a. based on 123177.07 psi frac pressure.  
b. based on full evacuation with ppg pore pressure on backside  
c. based on casing string weight in ppg mud  
String Weight in ppg mud ≈ 234013 lbs.

**5. PROPOSED CEMENTING PROGRAM**Surface Casing

CASING	SLURRY	FT. of FILL	CEMENT TYPE	XC (%)	WEIGHT (ppg)	YIELD (ft <sup>3</sup> /sx)
9-5/8"	Tail	1450	645 sxs of Type III Cement + 0.08 lbs/sack Static Free + 1% bwoc Calcium Chloride + 0.25 lbs/sack + Cello Flake + 60.4% Fresh Water.	25%	14.5	1.4

A cement top job is required if cement fallback is greater than 10' below ground level.

Production Casing

CASING	SLURRY	FT. of FILL	CEMENT TYPE	XC (%)	WEIGHT (ppg)	YIELD (ft <sup>3</sup> /sx)
5-1/2"	Lead	4405	551 sxs Premium Lite High Strength + 1% bwoc FL-63 + 0.3% bwoc ASA-301 + 0.4% bwoc R-3 + 0.01 gps FP-6L + 109.1% Fresh Water.	15%	12.5	2.12
5-1/2"	Tail	11841	2232 sxs (50:50) Poz (Fly Ash):Class G Cement + 2% bwoc Bentonite II + 1% bwoc FL-63 + 0.2% bwoc ASA-301 + 7 lbs/sack CSE-2 + 0.01 gps FP-6L + 62.9% Fresh Water.	15%	14	1.4

Cement volumes for the 5-1/2" Production Casing will be calculated to provide a top of cement to Surface.

### Contingency Intermediate Casing

CASING	SLURRY	FT. of FILL	CEMENT TYPE	XC (%)	WEIGHT (ppg)	YIELD (ft <sup>3</sup> /sx)
7"	Lead	4300	286 sxs (35:65) Poz (Fly Ash):Class G Cement + 0.06 lbs/sack Static Free + 0.1% bwoc R-3 + 46.46% bwoc LW-6 + 1% bwoc FL-25 + 0.5% bwoc Sodium Metasilicate + 5% bwoc CSE-2 + 85% Fresh Water.	20%	10.5	2.64
7"	Tail	1605	110 sxs (35:65) Poz (Fly Ash):Class G Cement + 0.06 lbs/sack Static Free + 54.44% bwoc LW-6 + 1% bwoc FL-25 + 0.5% bwoc Sodium Metasilicate + 20% bwoc Silica Sand, 100 mesh, Sacked + 5% bwoc CSE-2 + 100.6% Fresh Water.	35%	10.5	3.12

Cement volumes for the 7" Intermediate Casing will be calculated to provide a top of cement to Surface.

### Contingency Production Liner

CASING	SLURRY	FT. of FILL	CEMENT TYPE	XC (%)	WEIGHT (ppg)	YIELD (ft <sup>3</sup> /sx)
4-1/2"	Tail	11441	741 sxs (50:50) Poz (Fly Ash):Class G Cement +0.27% bwoc R-3 + 0.2% bwoc FL-63 + 0.6% bwoc + FL-52 + 3% bwoc Bentonite + 20% bwoc Silica + Flour + 0.2% bwoc BA-59 + 61.5% Fresh Water.	15%	14.5	1.68

All waiting on cement

## 6. MUD PROGRAM

<u>Depth (MD)</u>	<u>Mud System</u>	<u>MW</u>	<u>PV</u>	<u>YP</u>	<u>FL</u>
0' - 1450'	Water, Gel/Lime Sweeps	8.4 – 8.5	0 - 6	0 - 4	NC
1450' - 4905'	Water, Gel/Lime Sweeps	9.0 – 9.8	0 - 6	0 - 4	NC
4905' - 16246'	LSND	10.0 – 10.5	8 - 20	8 - 14	10 - 12

## **7. EVALUATION PROGRAM**

Cores: None planned

DST: None planned

Surveys: Deviation surveys every 500' to TD in both surface and production holes.

Mud Logger:

Samples: 30' samples surface to '  
10' samples ' to TD

Open Hole Logging Program: None planned

## **8. ABNORMAL CONDITIONS**

No abnormal pressures are anticipated. No H<sub>2</sub>S gas is anticipated.

Anticipated bottom hole

## **9. ANTICIPATED STARTING DATES**

### **A. Anticipated Starting Dates:**

Dirt work startup: April 2017

Spud: April 2017

Duration: 15 – 20 days