

**DRILLING PLAN  
Powder Wash 19-1**

**1094' FSL x 1261' FEL, SEC 19-T12N-R97W SHL  
1250' FSL x 830' FEL, SEC 19-T12N-R97W BHL  
MOFFAT COUNTY, COLORADO**

**1. FORMATION TOPS:**

<b><u>Formation</u></b>	<b><u>(TVD)</u></b>	<b><u>(MD)</u></b>
Wasatch	Surface	Surface
Ft. Union (BW)	4,780'	4,826' Possible O&G
Ft. Union (T4)	6,080'	6,126' Possible O&G
Ft. Union (China)	6,750'	6,796' Possible O&G
Total Depth	8,500'	8,546'

**2. ANTICIPATED DEPTHS OF OIL, GAS, WATER AND OTHER MINERAL BEARING ZONES:**

All fresh water and prospectively valuable minerals encountered during drilling will be recorded by depth and adequately protected.

**3. PRESSURE CONTROL:**

Notify the BLM and/or State office prior to pressure testing.

- A. Below 9 5/8" surface casing – equipment & test plan (1,509' to 8,546' MD).
1. 11" 3,000 psi double gate with blind rams and appropriate pipe rams.
  2. 11" 3,000 psi annular preventer and drilling spool or BOP with 2 side outlets.

Note: Depending on rig selection the BOP stack may be 11" or 13 5/8". Additionally, the BOP stack may be 3M or 5M rated but will be tested per 3M requirements.

- B. Test pressures and times are as follows:
3. BOP: 3,000 psi (High) 250 psi (Low) – 10 min each
  4. Choke Manifold & Lines: 3,000 psi (High) 250 psi (Low) – 10 min each
  5. Annular Preventer: 1,500 psi (High) 250 psi (Low) – 10 min
  6. Surface Casing: 1,500 psi – 30 min
  7. Formation Integrity Test: Drill out 10' of new hole below casing. Perform FIT to 10.0 ppg EMW below surface casing.
- C. Function test pipe rams & blind ram on trips and annular once per week.
- D. All casing strings below conductor shall be tested to 0.22 psi/ft or 1,500 psi, whichever is greater, but not to exceed 70% of the minimum internal yield. BOP equipment will be tested when initially installed, whenever any seal subject to test pressure is broken, following related repairs, and at 30 day intervals.

- E. Ram type preventers and associated equipment shall be tested to the approved stack working pressure if isolated by a test plug or to 70% of the internal yield pressure of the casing if the BOP stack is not isolated from the casing. Annular preventers shall be tested to 50% of the rated working pressure.
- F. BOP and related equipment shall meet the minimum requirements of Onshore Oil & Gas Order No.2 for equipment testing, procedures, etc., for the appropriate 3M approved system. Individual components will be operable as designed.
- G. Auxiliary Equipment:
  - 1. Manually operated upper & lower kelly cock valves.
  - 2. Floats may be run above any mud motor.
  - 3. Monitoring of the mud system will be visual and with PVT equipment.
  - 4. Manually operated, full opening floor valves that are capable of fitting all drill stem connections will be available in the full open position on the drill floor.

#### 4. CASING PROGRAM:

Hole Size	Csg Size	Top	Btm (MD)	(TVD)	Wt ppf	Grade	Thread	Type
20"	16"	0'	80'	80'	Conductor			
12-1/4"	9-5/8"	0'	1,509'	1,500'	36.0	J55 or K55	LTC	New
7-7/8"	4-1/2"	0'	8,546'	8,500'	11.6	P110	LTC	New

Casing Strengths:				Collapse	Burst	Tensile (min.)
9 5/8"	36.0#	J55 or K55	LTC	2,020 psi	3,520 psi	453,000 lb.
4-1/2"	11.6#	P110	LTC	7,580 psi	10,690 psi	279,000 lb.

#### MINIMUM DESIGN FACTORS:

COLLAPSE: 1.125 based on 0.1 psi/ft fluid back-up inside, 0.52 psi/ft gradient

BURST: 1.000 based on 0.52 psi/ft gradient, no fluid on backside

TENSION: 1.800 based on casing string weight in 9.9 ppg mud

Area Fracture Gradient: 0.75 psi/foot

#### 5. CEMENTING PROGRAM:

**Conductor:** As needed. Cement to surface with construction cement.

**9 5/8" Surface Casing:** **Cemented from surface to 1,509' (MD)**

**Lead:** 0' – 1,009'. 250 sx (643 cuft) Varicem w/ 0.125 lbm/sk Poly-E-Flake (LCM Additive) + 0.25 lbm/sk Kwik Seal (LCM Additive). Slurry wt: 12.0 ppg, Slurry yield: 2.571 cuft/sx, Excess: 100%.

**Tail:** 1,009' - 1,509'. 185 sx (333 cuft) Varicem w/ 0.125 lbm/sk Poly-E-Flake (LCM Additive) + 0.25 lbm/sk Kwik Seal (LCM Additive). Slurry wt: 13.5 ppg, Slurry yield: 1.824 cuft/sx, Excess: 100%.

4 centralizers total are used. One set inside the shoe of the conductor casing and 1 each on the bottom three joints of the surface casing. Additional centralizers may be used as needed.

**4-1/2" Production Casing: Cement from 0' to 8,546' (MD)**

**Lead:** 0' – 4,326'. 595 sx (1,321 cuft) EconoCem System w/ 0.25 lbm/sk Poly-E-Flake (LCM Additive) + 0.25 lbm/sk Kwik Seal (LCM additive). Slurry wt: 11.5 ppg, Slurry yield: 2.22 cuft/sx. Excess: 30% in open hole.

**Tail:** 4,326' - 8,546. 845 sx (1,257 cuft) EconoCem System w/ 1 % Bentonite (Light Weight Additive) + 0.05 % SA-1015 (Low Fluid Loss Control) + 0.15 % HR-5 (Retarder) + 0.125 lbm/sk Poly-E-Flake (LCM additive) + 0.25 lbm/sk Kwik Seal (LCM Additive). Slurry wt: 13.5 ppg, Slurry yield: 1.49 cuft/sx, Excess: 30%.

4 centralizers total are used. One set inside the shoe of the surface casing and 1 each on the bottom three joints of the production casing. Additional centralizers may be used as needed.

Actual volumes will be adjusted using any caliper logs obtained from open hole logging.

**6. MUD PROGRAM/CIRCULATING MEDIUM:**

Fresh water or fresh water mud will be used from surface to TD. No chrome constituent additives will be used in the mud system on Federal, State and Indian lands without prior regulatory agency approval to ensure adequate protection of fresh water aquifers. Sufficient mud materials to maintain mud properties, control lost circulation and to contain well bore pressures will be available at the wellsite.

The 9 5/8" surface casing will be drilled out 10' and a Formation Integrity Test will be attempted to an equivalent of 10.0 ppg. Anticipated mud weight at 4-1/2" production casing point will be < 10.0 ppg. Maximum mud weight in the open hole at TD is expected to be less than < 10.0 ppg.

± MD	Mud Wt (ppg)	Fun Vis (cp)	PV (cp)	YP (lb/100ftft)	FL (ml/30')	pH	Type
0' – 1,500'	8.4 - 8.8	26 - 35	NC	NC	NC	NC	FW/Native
1,500' – ±3,000'	8.4 – 8.8	26 – 28	1 - 10	1 - 5	NC	8.0 - 9.5	FW/Native
**±3,000' – 8,546'	8.8 – 9.9	34 – 42	8 - 20	5 - 12	6 - 10	9.0 – 10.0	WBM

\*\*Depending on hole conditions, may optionally mud up below shoe in which case mud properties on 3rd line will apply from surface shoe depth to TD.

**7. LOGGING, TESTING, & CORING:**

Triple Combo: TD to base of surface casing.

No DST's or cores are planned for this well.

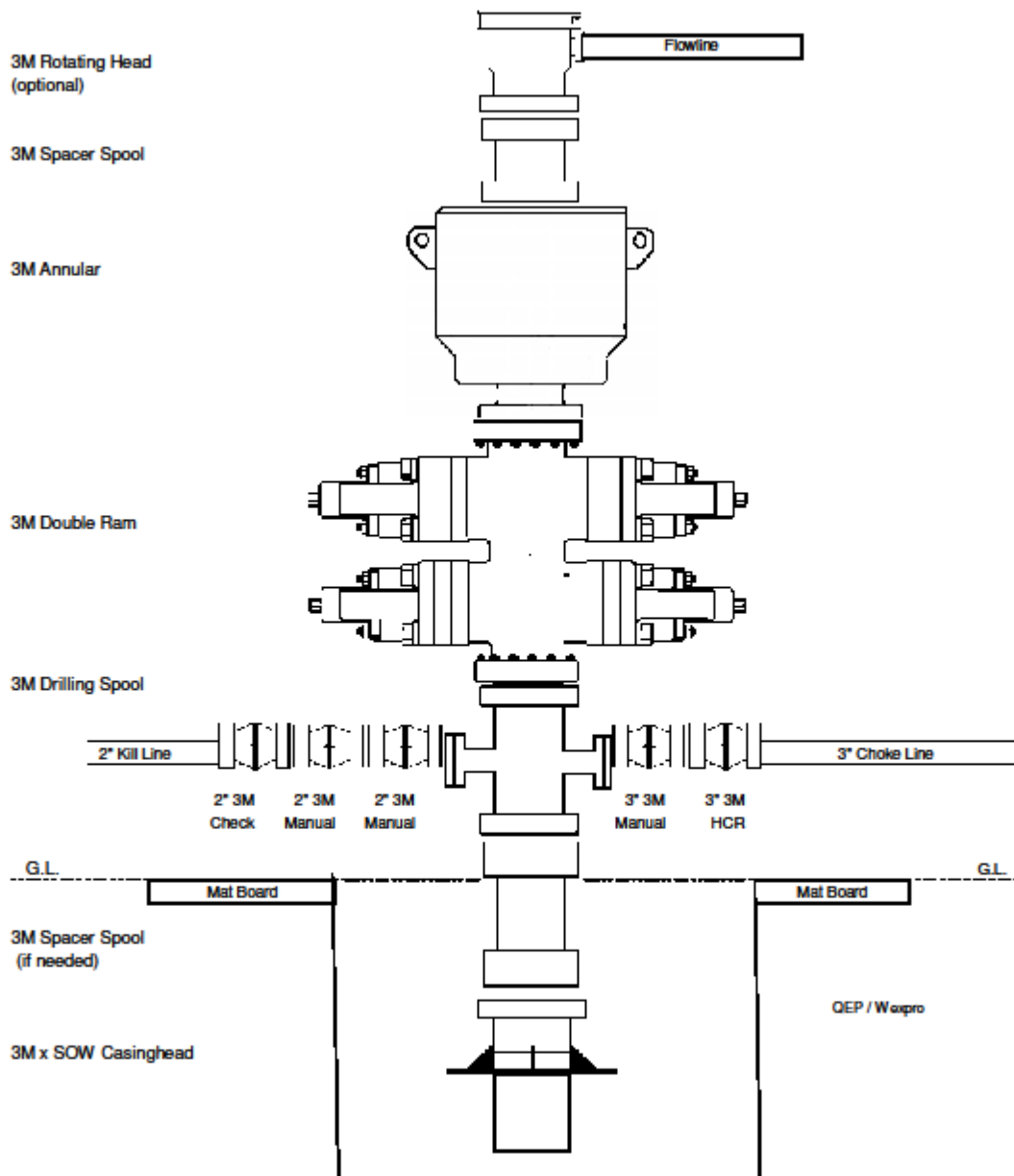
**8. ABNORMAL PRESSURE AND TEMPERATURE:**

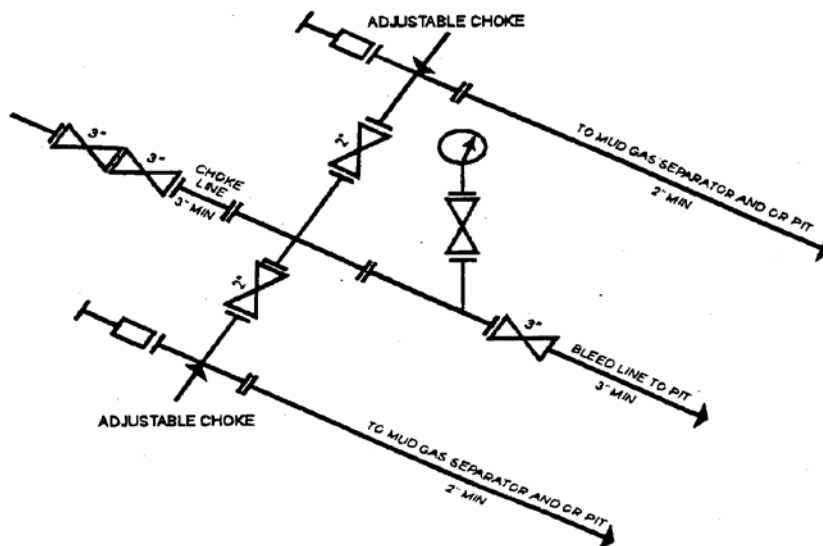
No abnormal temperatures or pressures are anticipated. No H<sub>2</sub>S has been encountered or is known to exist from previous wells drilled to similar depths in the general area.

BHT = 170°F at TD. Expected reservoir pressure at TD is < 4,376 psi.

Maximum anticipated Surface SIP is less than 3,000 psi  $[(4376 \text{ psi} - (.22 \text{ psi/ft} * 8,500 \text{ ft}) = 2,506 \text{ psi}]$ .

**QEP**  
**3M BOP x 3M Annular**  
**Minimum Requirements**





3M CHOKE MANIFOLD EQUIPMENT - CONFIGURATION OF CHOKES MAY VARY  
 [54 FR 39528, Sept. 27, 1989]