Randall Creek 4-32H

SHL: NE/NE Section 32-T12N-R62W
BHL: SE/SE Section 32-T12N-R62W
Weld County, Colorado

DRILLING PLAN

1. *Estimated Tops of Important Geologic Markers & Anticipated Water, Oil, Gas or Mineral Formations:*

Formation	TVD (ft) @ 0' VS	MD (ft)	Hydrocarbon/Water Bearing Zones
White River	0	0	
Fox Hills	931	931	
Pierre Shale	1170	1170	
Terry Sandstone	3645	3645	
Hygiene	4255	4255	
KOP (start curve)	6793	6793	
Niobrara	7175	7235	Oil
Niobrara 'B' Chalk	7251	7405	Oil
Intermed. Csg. Pt.	7271	7543	
Lateral (@ BHL)	7271	11296	

All shows of fresh water and minerals will be adequately protected and reported.
Gas detection to be operational prior to drilling the Frontier.

2. *Pressure Control Equipment:*

All well control equipment shall be in accordance with Onshore Order #2 for 3M systems.

Well control equipment will be rigged up after setting surface casing.

The minimum specifications for pressure control equipment that will be provided are included on the attached schematic diagram showing size and pressure ratings.

3000# BOP with 4" or 4-1/2" Pipe Rams
3000# BOP with Blind Rams
3000# Annular

Auxiliary equipment to be used:

- Upper kelly cock with handle available.
- Stabbing Valve

The choke manifold will include appropriate valves and adjustable chokes. The kill line will have one check valve.

Ram type preventers will be pressure tested to full working pressure (utilizing a tester and test plug) at:

- Initial installation
- Whenever any seal subject to test pressure is broken
- following related repairs
- 30 day intervals

The annular preventer will be pressure tested to 50 percent of the rated working pressure.

All pressure tests shall be maintained at least 10 minutes or until provisions of test are met, whichever is longer.

Annular preventers shall be functionally operated at least weekly.

Pipe and blind rams shall be activated each trip.

A BOPE pit level drill will be conducted weekly for each drilling crew.

All tests and drills will be recorded in the drilling log.

The accumulator will have sufficient capacity to open the HCR valve, close all rams plus the annular preventer, and retain 200 psi above pre-charge pressure without the use of closing unit pumps. The system will have two independent power sources to close the preventers in accordance with 3M system requirements outlined in Onshore Order #2.

Remote controls shall be readily accessible to the driller. Master controls shall be at the accumulator.

3. CASING & CEMENTING PROGRAM:

A. The proposed casing program will be as follows:

Section	Measured Depth (ft)	Hole Size (“)	Size (“)	Grade	Weight	Thread	Condition
Surface	0 – 1400	13 ½	9 5/8	J-55	36.0	STC	New
Intermediate	0 – 7543	8 ¾	7	P-110	23.0	LTC	New
Production*	6693 – 11296	6 ¼	4 ½	HC P-110	11.6	LTC	New

*4 ½” production string will be a liner, utilizing a liner hanger with pack-off assembly.

Size (“)	Grade	Weight (lbs./ft.)	Thread	Collapse (psi)	Burst (psi)	Pressure Gradient Collapse (psi/ft.)	Pressure Gradient Burst (psi/ft.)
9 5/8	J-55	36.0	STC	2020	3520	0.47	0.50
7	P-110	23.0	LTC	5650	8720	0.50	0.50
4 ½	HC P-110	11.6	LTC	8650	10690	0.50	0.50

All casing strings below the conductor shall be pressure tested to 0.22 psi/ft. of casing string length or 1500 psi, whichever is greater, but not to exceed 70% minimum internal yield.

B. The proposed cementing program will be as follows:

Surface String: Cement will be circulated to surface. Estimated volume (gauge hole + 50% excess):

730 sx Type III Cement + 1% $CaCl_2$ + 0.25#/sx Cello flake @ 14.5 ppg, 1.41 ft^3/sx.
Top Out (if required): Type III Cement + 2% $CaCl_2$ @ 14.5 ppg, 1.41 ft^3/sx.

Intermediate String: Cement will be circulated to surface. Estimated volume (gauge hole + 30% excess):

Lead (0 - 500' above KOP): 655 sx Premium Lite + 3% gel + 0.25#/sx Cello flake @ 12.5 ppg, 1.89 ft^3/sx
Tail (500' above KOP - ICP): 145 sx 50/50 Poz/G + 3% gel + 20% Silica Flour @ 13.5 ppg, 1.71 ft^3/sx.

Actual cement volumes used on intermediate string will be calculated and adjusted based upon average hole size as determined by a lag @ 7,680'. 10% excess will be pumped on both slurries.

Production Liner: Un-cemented with Swell Packers

OR

340 sx Premium Lite High Strength D @ 13.0 ppg, 1.82 ft^3/sx.

Cement will be brought up to the top of the liner (100' above KOP) . Estimated volume (gauge hole + 30% excess in open hole, 0% excess in 7" x 4-1/2" casing annulus.)

Actual cement volumes used on the production liner will be calculated and adjusted based upon average hole size as determined by a lag @ the lateral MTD. 10% excess will be used in open hole and 0% excess in 7" x 4-1/2" casing annulus.

After cementing, but before commencing any test, the casing string will stand cemented until cement has reached a compressive strength of 500 psi at the shoe. WOC times will be recorded in the driller's log.

4. DRILLING FLUIDS PROGRAM:

Interval	Type	Weight (ppg)	Viscosity	Ph	Water Loss (cc)	Remarks
Surface	Spud	8.4-9.0	30-45	8	NC	WBM – Gel/Lime as req'd
Intermediate	LSND	8.4-9.6	28-60	8-9	NC – 8	Water to KOP, WBM - polymer system KOP – ICP
Production	LSND	9.0-9.6	40-50	8-9	8	WBM - polymer system

NC = no control. Sufficient quantities of mud material will be maintained on site or be readily accessible for the purpose of assuring well control. SPR will be recorded on daily drilling report after mudding up. Electronic/mechanical mud monitoring equipment will be utilized and will include a pit volume totalizer (PVT), stroke counter, and flow sensor as a minimum.

5. EVALUATION PROGRAM:

OH Logs (while drilling): MWD-GR Surface Casing to MTD

OH Logs (wireline): None anticipated

Cores: None anticipated

DST's: None anticipated

6. ABNORMAL CONDITIONS:

No anticipated abnormal pressures or temperatures expected to be encountered. No hydrogen sulfide expected.

Anticipated bottom-hole pressure is approximately 3630 psi (9.6 ppg EMW)

7. OTHER INFORMATION:

The anticipated starting date and duration of the drilling and completion operations will be as follows:

Starting Date: Upon Approval
Duration: 45 days

The well will be drilled from surface location to bottom hole location per attached directional plan. The proposed well path should not pose any collision or interference concerns with any existing wells along its proposed path.

Footage at top of productive zone (Intermediate casing shoe):
967' FNL & 1096' FEL, Sec 32-T12N-R62W

A completion rig will be used for completion operations. All conditions of this approved plan will be applicable during all operations conducted with the completion rig.