Appendix B
Orchard Master Development Plan

10-POINT DRILLING PLAN

SUBMITTED BY ENCANA OIL & GAS (USA) INC.

(BLM Conditions of Approval would supersede operator-proposed actions.)

All lease and/or unit operations will be conducted in such a manner that full compliance is made with applicable laws, regulations (43CFR3100), Onshore Oil and Gas Orders No. 1 and No. 2 and the approved Plan of Operations. The Operator is fully responsible for the actions of its subcontractors. A copy of the Conditions of Approval will be furnished to the field representatives to ensure compliance.

EnCana Oil & Gas (USA) Inc. will be operating under its Nationwide Bond # RLB0004733.

1. **Estimated Tops of Important Geologic Markers**
    a. Formations and depths will be submitted with the site specific APD.

2. **Estimated Depths of Anticipated Water, Oil Gas or Mineral Formations**
    a. The proposed casing and cementing program has been designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use.

       The surface casing shall be cemented back to surface either during the primary cement job or by remedial cementing.

3. **Pressure Control Equipment**
    a. Minimum working pressure on rams and BOPE will be 3,000 psi.
    b. Function test and visual inspection of the BOP will be conducted daily and noted in the IADC Daily Drilling Report.
    c. Both high and low pressure tests of the BOPE will be conducted.
    d. The Annular BOP will be pressure tested to a minimum of 50% of its rated working pressure.
    e. Blind and Pipe Rams/BOP will be tested to a minimum of 100% of rated working pressure (against a test plug)
    f. BOP testing procedures and testing frequency will conform to Onshore Order No. 2.
    g. BOP remote controls shall be located on the rig floor at a location readily accessible to the driller. Master controls shall be on the ground at the accumulator and shall have the capability to function all preventors.
    h. The kill line shall be 2” minimum and contain two kill line valves, one of which shall be a check valve.
    i. The choke line shall be 3” minimum and contain two choke line valves (3” minimum).
    j. The choke and manifold shall contain two adjustable chokes.
    k. Hand wheels shall be installed on all ram preventors.
    l. Safety valves and wrenches (with subs for all drill string connections) shall be available on the rig floor at all times.
    m. Inside BOP or float sub shall also be available on the rig floor at all times.
    n. Upper Kelly cock valve (with handle) shall be available at all times.

Proposed BOP and Choke Manifold arrangements are attached.

4. Proposed Ca

Casing	Depth	Hole Size	Size	Weight	Grade	Cement Volume
Conductor	0-40'	+/- 24"	16"	0.25" Wall	X42	+/- 5 yds ready mix (to surface)
Surface	Surface to 630' - 1500'	12 1/4"	8 5/8"	24#	J-55, STC All New	± 450 sks - ± 1060sks Class (G) 15.8ppg 1.17 ft^3/sx
Production Option #1	0' - 6300'	7-7/8"	5 ½"	17#	I-80, LTC All New	450 - 650 sx TXI 13.5 ppg 1.26 ft^3/sx
Production Option #2	0' – 6300'	7 7/8"	4 ½"	11.6#	I-80 LTC New	550 - 750 sx TXI 13.5 ppg 1.26 ft^3/sx

Casing and Cementing Program

a. The specific casing setting depths will vary depending on well location and drilling conditions. The depths listed in the table give the approximate anticipated setting depth.
b. The contingency string will be in situations in which sever drilling conditions are encountered. Hazards such as severe lost circulation or hole stability problems would warrant the use of a contingency string.
c. The proposed casing and cementing program shall be conducted as approved to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use. The casing setting depth shall be calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. Determination of casing setting depth shall be based on all relevant factors, including: presence/absence of hydrocarbons, fracture gradients, usable water zones, formation pressures, lost circulation zones, other minerals or other unusual characteristics.
d. All casing, except conductor casing, shall be new or reconditioned and tested. Approval will be obtained from the Authorized Officer prior to using reconditioned casing. Used casing shall meet or exceed API standards for new casing.
e. The surface casing shall be cemented back to surface either during the primary cement job or by remedial cementing. Cement volumes based on 100% excess above annular volume; or as required based on field experience to ensure cement is circulated to surface. If drive pipe is used, it may be left in place its total length is less than twenty feet below the surface. If the total length of the drive pipe is equal to or greater than twenty feet, it will be pulled prior to cementing surface casing, or it will be cemented in place.
f. Surface casing shall have centralizers on the bottom three joints, with a minimum of one centralizer per joint.
g. Top plugs shall be used to reduce contamination of cement by displacement fluid. A bottom plug or other acceptable technique, such as a suitable pre-flush fluid, inner string cement method, etc. shall be utilized to help isolate the cement from contamination by the mud being displaced ahead of the cement slurry.
h. All casing strings below the conductor shall be pressure tested to 0.22 psi per foot of casing string length or to 1500 psi, whichever is greater, but not to exceed 70% of the minimum internal yield. If pressure declines more than 10% in 30 minutes, corrective action shall be taken.
i. Casing design is subject to revision based on geologic conditions encountered.

5. Proposed Casing and Cementing Programs:

a. Surface casing @ 1500' MD; 8-5/8" 24# J-55 STC

Purpose: Protect shallow fresh water and contain MASP to TD
Maximum anticipated mud weight at surface casing depth: = 9.0 ppg
Maximum anticipated mud weight at TD: = 9.0 ppg
Maximum anticipated equivalent formation pressure at TD = 7.7 ppg

Casing String				Casing Strength Properties			Minimum Design Factors		
Size	Weight (lb/ft)	Grade	Connection	Collapse (psi)	Burst (psi)	Tensile (1000 lb)	Collapse	Burst	Tension
8-5/8"	24	J/K-55	STC	1370	2950	244	1.00	1.10	1.50

Collapse Design:
Evacuated 8-5/8" 24# J-55casing with 9.0 ppg drilling fluid density:
Load = 9.0*0.052*1500' = 702 psig
Rating: = 1370
S.F. = 1.9

Burst Design: Assume kick with partially evacuated hole and an influx gradient of 0.22 psi/ft.
8-5/8" 24# J-55
MASP (Load) = 6300'*(0.4-0.22) psi/ft = 1134 psig
Rating: = 2950 psig
S.F. = 2.6

Tensile Design: Designed on Air Weight * Buoyancy + overpull margin
8-5/8" 24# J-55
Rating: = 372,000 lbs
Load: 1500'*24#*0.862+100,000 lbs (OPM) = 131,032 lbs
S.F. = 2.8

b. Production Casing @ 6300' MD; 4-1/2" 11.6# OR 5-1/2" 17# I-80, LTC

Maximum Anticipated Mud Weight at Total Depth = 9.0 ppg
Maximum Anticipated Equivalent Formation Pressure at Total Depth = 7.7 ppg
Maximum Surface Treating Pressure for Fracturing Operations = 7000 psig
Assumed Gas Gradient for Production Operations = 0.115 psi/ft

Casing String				Casing Strength Properties			Minimum Design Factors		
Size	Weight (lb/ft)	Grade	Connection	Collapse (psi)	Burst (psi)	Tensile (1000 lb)	Collapse	Burst	Tension
5-1/2"	17	I-80	LTC	6260	7740	348	1.00	1.10	1.3
4-1/2	11.6	I-80	LTC	6350	7780	212	1.00	1.10	1.3

Collapse Design: Designed on evacuated casing properties with 9.0 ppg drilling fluid density with no internal back-up.
5-1/2" 17# I-80 Weakest Collapse Resistance
5-1/2" 17# I-80 from 0' to 6300'
Load = 9.0*0.052*6300' = 2948 psig
Rating = 6260 psig
S.F. = 2.1

Burst Design: Assume maximum surface shut-in pressure during production, and maximum surface treating pressure during fracture stimulation operations.

5-1/2" 17# I-80 Weakest Burst (Internal Yield) Resistance
Design Consideration #1: Maximum Surface Shut-In Pressure
Design Point #1: 5-1/2" 17# I-80 from 0' to 6300'
MASSIP (Load) = 6300'*(0.40-0.115) psi/ft = 1795 psig
Rating = 7740 psig
S.F. = 4.3

Design Consideration #2: Maximum Surface Treating Pressure During Frac Operations
Design Point #1: 5-1/2" 17# I-80 from 0' to 6300'
MATP: = 7000 psig
Rating: = 7740 psig
S.F. = 1.1

Design Point #2: 5-1/2" 17# I-80 @ TD
Load: Frac grad – FW frac fluid:
(0.75-0.433) psi/ft*6300' = 1997 psig
Rating: = 7780 psig
S.F. = 3.8

Tensile Design: Designed on Air Weight * Buoyancy + overpull margin

Tensile design loads are a function of the casing weight; therefore, both varieties of casing are tested below.

Design Option #1 – 5-1/2" 17# I-80 LTC at surface
Load = (6300'*17 lb/ft*0.862) +100,000 lbs (OPM) = 192,320lbs
Rating = 348,000 lbs
S.F. = 1.8

Design Option #2 – 4-1/2" 11.6# I-80 LTC at surface
Load = (6300'*11.6 lb/ft*0.862) +100,000 lbs (OPM) = 162,994 lbs
Rating = 212,000 lbs
S.F. = 1.3

*Cementing Volume Design Clarification:
Surface Casing @ 630' to 1500':
*Cement designed to cover the entire string with 100% excess.
Production Casing
*Designed to 200' above top of Mesaverde/Ohio Creek formation. Volume assumes 7-7/8" gauge hole diameter plus 30%.
*If open-hole logs are run, cement volumes will be determined from the caliper plus 10% excess.

6. **Directional Drilling Program**
An S-shaped directional design will be used to reach the targeted bottom hole locations. In general, a target radius of 200' will be used. Specific directional plans for each well will be included with the APD.

7. **Proposed Drilling Fluids Program**

DEPTH	*MUD TYPE*	*DENSITY Lb/gal*	*VISCOSITY (sec/qt)*	*FLUID LOSS (cc)*
0' – 1500'	Fresh Water Gel	8.4 - 9.0	28 – 35	NC
1500' – TD	LSND	8.8 – 9.0	35 – 45	5 - 15 cc

a. The drilling fluids have been designed for optimal wellbore hydraulics and hole stability. Mud flow and volume will be monitored both visually and with electronic pit volume totalizers.

Proposed Alternative Drilling Fluids Program

In the event that geological conditions permit, an unconventional drilling system may be utilized. Fluids in the system include, but are not limited to, air/nitrogen, mist, foam, and aerated muds. Below listed are three unconventional fluid options and physical characteristics.

DEPTH	*MUD TYPE*	*DENSITY lbs/gal*	*VISCOSTIY (Equivalent YP)*	*FLUID LOSS (cc)*
1500' - TD	Air/N2, Mist	<0.5	5	N/A
1500' - TD	Foam	0.5 – 4	20	<5
1500' - TD	Aerated Mud	4-8	8-25	5-10

8. **Testing, Coring and Logging**
   a. Drill Stem Testing – none anticipated
   b. Coring – As deemed necessary by geology
   c. Mud Logging – Optional
   d. Logging:

Open Hole	Logging Interval
PEX (Optional)	AIT-GR-Neutron/Litho-Density From TD to surface casing

Cased Hole	Logging interval
CBL/CCL/GR/VDL	As needed for perforating control
RST	In lieu of PEX

9. **Air/Mist Drilling**
The following equipment will be in place and operational during air/gas drilling:
   - Properly lubricated and maintained rotating head
   - Spark arrestor on engines or water cooled exhaust
   - Blooie line discharge 100 feet from well bore and securely anchored
   - Straight run on blooie line
   - Deduster equipment
   - All cuttings and circulating medium shall be directed into a reserve or blooie pit
   - Float valve above bit
   - Automatic igniter or continuous pilot light on the blooie line

- Compressors will be located in the opposite direction from the blooie line a minimum of 100 feet from the wellbore
- Mud circulating equipment, water, and mud materials sufficient to maintain the capacity of the hole and circulating tanks or pits

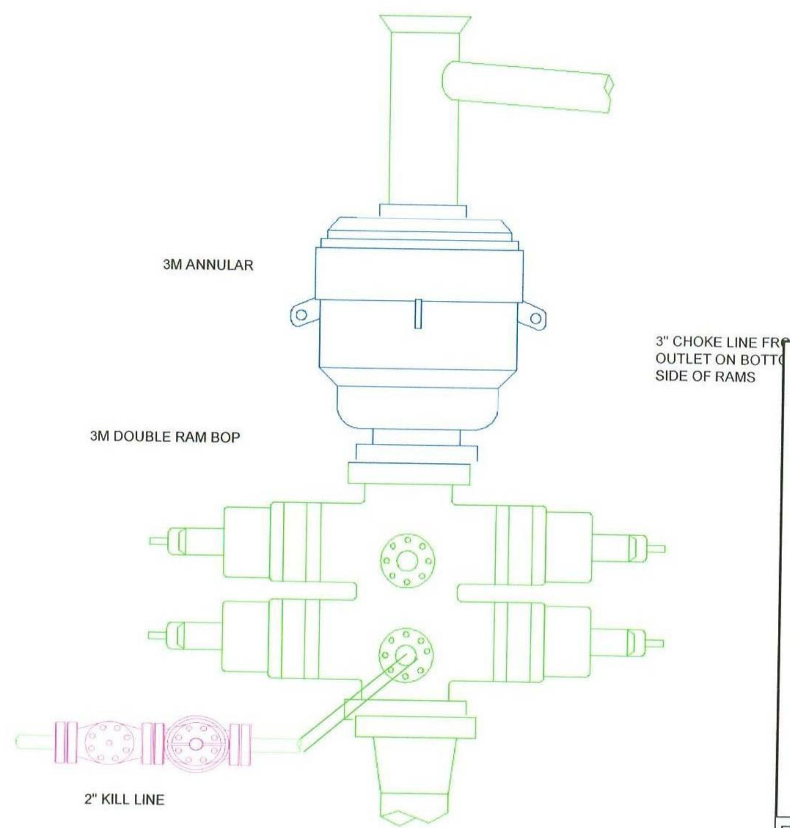
10. Abnormal Pressures or Temperature

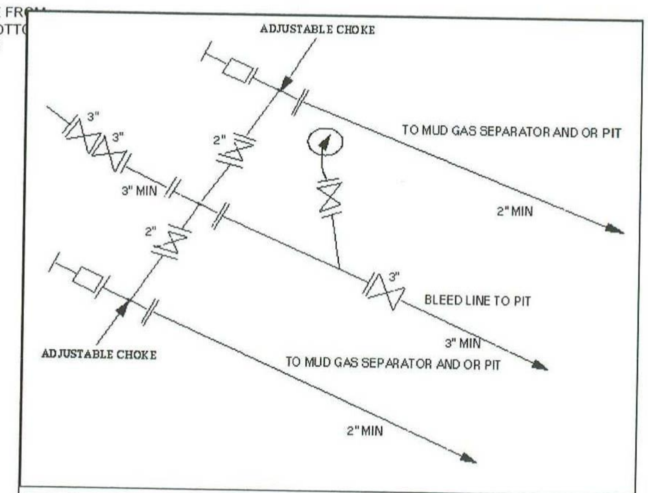
a. This area is known to be underpressured. Lost circulation has been experienced in offset wells. Barite and a selection of "sized" lost circulation materials will be kept on location during drilling operations.

The anticipated bottom hole pressure is 6300*0.40 psi/ft = 2520 psi
The maximum anticipated surface pressure is 6300*(0.4-0.22) psi/ft = 1134 psi
b. No hydrogen sulfide has been encountered or is known to exist from previous drilling in the area at this depth.

11. Anticipated Start Date and Duration of Operations

Drilling operations are expected to require ± 12 days on each well. Completion operations are anticipated to begin within 15 days of finishing the drilling portion of the last well on each pad. Completion operations will require approximately 30 days.

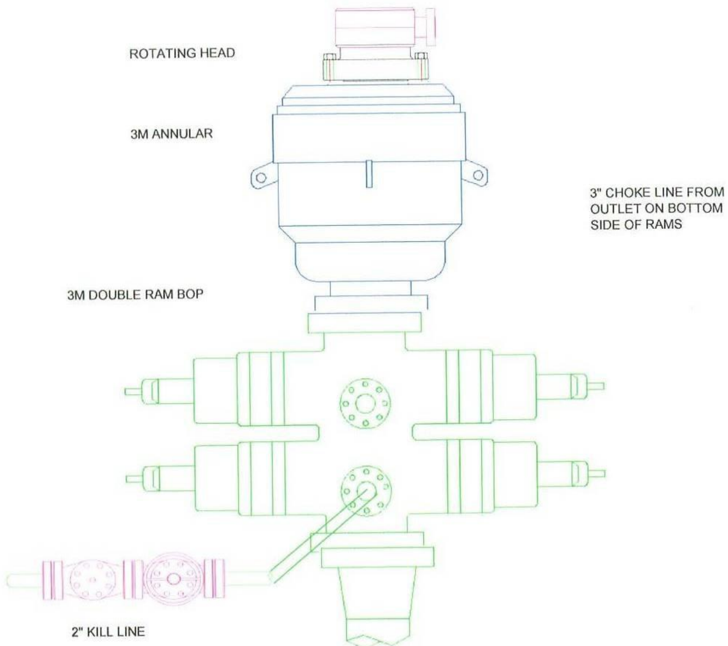


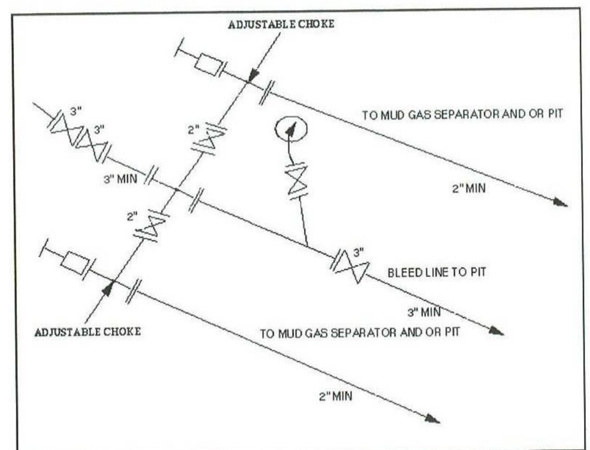


3M CHOKE MANIFOLD EQUIPMENT - CONFIGURATION OF CHOKES MAY VARY
[54 FR 39528, Sept 27, 1989]

3M BOP.xls

ATTACHMENT A





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

3M BOP w Rot Head.xls

ATTACHMENT B