

Entek GRB LLC  
**Cantling Creek Federal 27-4**  
751' FNL 394' FWL (NW/4 NW/4)  
Sec. 27 T12N R88W  
Routt County, Colorado  
Surface: Federal  
Federal Mineral Lease: COC59662

**DRILLING PROGRAM**  
**(All Drilling Procedures will be followed as Per Onshore Orders No. 1 and No. 2)**

This Application for Permit to Drill (APD) is filed under the Notice of Staking (NOS) process as stated in Onshore Order No. 1 (OSO #1) and supporting Bureau of Land Management (BLM) documents. This NOS process included an onsite meeting on July 28, 2011, prior to the submittal of this application, at which time the specific concerns of Entek GRB LLC (Entek) and the BLM were discussed. All specific concerns of the BLM representatives are addressed herein, as are specific stipulations from the BLM.

Please contact Ms. Kristen Stocks with Entek at 307-200-1930, if there are any questions or concerns regarding this Drilling Program.

**SURFACE ELEVATION** - 7061.5' (Un-graded ground elevation)

**SURFACE FORMATION** – Lewis Shale

**ESTIMATED FORMATION TOPS**

Almond	411'	Sandstone
Pioneer	825'	Coal
Darling	1,025'	Coal
BWF	1,350'	Coal
Trout Creek	1,492'	Sand
Iles Coal	2,642'	Coal
DFS	2,742'	Sand
Hatfield	2,877'	Sandstone
Cherokee Creek	2,970'	Sandstone
Deep Creek	3,600'	Sandstone
Mancos	3,786'	Shale
Cow Creek/MRPS	4,283'	Sand
Shannon	4,616'	Sandstone and Siltstone
Mancos C	5,215'	Sand
Niobrara	6,100'	Shale, Sandstone, & Limestone
Frontier	7,151'	Sandstone
<b>TOTAL DEPTH</b>	<b>7,600'</b>	

**ESTIMATED DEPTHS OF ANTICIPATED WATER, OIL, GAS, OR MINERAL BEARING FORMATIONS**

Estimated depths at which water, oil, gas or other mineral-bearing formations are expected to be encountered:

Pioneer	825'	Water Some Gas
Darling	1,025'	Water Some Gas
BWF	1,350'	Water Some Gas
Trout Creek	1,492'	Water Some Gas
Iles Coal	2,642'	Water Some Gas
DFS	2,742'	Water
Deep Creek	3,600'	Gas
Mancos	3,786'	Gas Oil
Cow Creek/MRPS	4,283'	Gas Oil
Shannon	4,616'	Gas Oil
Niobrara	6,100'	Oil and Gas
Frontier	7,151'	Oil and Gas

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

**CASING PROGRAM**

<b>Total Depth (TD)</b>	<b>Hole Diameter</b>	<b>Casing Diameter</b>	<b>Casing Weight and Grade</b>	<b>Cement</b>
0 – 40'	16"	14"	Conductor Casing	Redi Mix to surface
0' – 2,800'	12-1/4"	9-5/8"	J-55 36# ST&C New	To surface (Lead: ±837 sxs Varicem; Tail: ±193 sxs Varicem)*
0' – TD	8-3/4"	7"	HCP-110 23# LT&C New	To 2600' (Lead: ±310 sxs HES Light Standard; Tail: ±223 sxs ECONOCEM) **

\* Cement volume calculated with 100% excess.

\*\* Cement volume calculated with 15% excess, and actual volumes will be based on caliper logs with 10% excess.

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

**Casing Design Factors:**

9-5/8" Surface: (all numbers calculated on a void hole)  
Tension: 3.91 (BLM Requires 1.6)  
Burst: 1.03 (BLM Requires 1)  
Collapse: 1.58 (BLM Requires 1.125)

7" Production:  
Tension: 9.1  
Burst: 2.55  
Collapse: 3.88

Yields:	Surface:	Lead:	Varicem = 2.94 ft <sup>3</sup> /sx (11.5 ppg) 17.8 gps
		Tail:	Varicem yield = 1.8 ft <sup>3</sup> /sx (13.5 ppg) 9.17 gps
	Intermediate:	Lead:	HES Light Standard yield = 2.03 ft <sup>3</sup> /sx (12.5 ppg) 10.96 gps
		Tail:	ECONOCEM = 1.26 ft <sup>3</sup> /sx (14.2 ppg) 5.56 gps

Surface casing top 100' will use 1" tubing, with Class "G" cement with 2% CaCl<sub>2</sub> if necessary.

Cement additives – (Note: Some additives are Sanjel proprietary products. If another cement contractor is used, these blends and products may vary slightly).

Cement additives:

Surface:	Lead:	<b>Varicem</b> 3 lbm/sk PhenoSeal Medium (Lost Circulation Preventative)
	Tail:	<b>Varicem</b> 3 lbm/sk PhenoSeal Medium (Lost Circulation Preventative)
Production:	Lead:	<b>Halliburton Light Standard</b> 0.2 % Halad(R)-567 (Low Fluid Loss Control) 0.5 % D-AIR 3000 (Defoamer) 0.35 % HR-7 (Retarder) 6 lbm/sk Silicalite Compacted (Additive Material) 0.3 % Econolite (Additive Material) 0.15 % Fe-2 (Additive Material)
	Tail:	<b>ECONOCEM (TM) SYSTEM</b> 0.25 % HR-5 (Retarder) 3 lbm/sk Silicalite Compacted (Light Weight Additive) 0.15 % Econolite (Light Weight Additive)

#### PRESSURE CONTROL

- See attached blowout preventer diagram.

BOPs and choke manifold will be installed and pressure tested before drilling out of surface casing (subsequent pressure test will be performed whenever pressure seals are broken), and then will be checked daily as to mechanical operating condition. BOPs will be pressure tested at least once every 30 days. Ram type preventers and related pressure control equipment will be pressure tested to related working pressure of the stack assembly if a test plug is used. If a plug is not used, the stack assembly will be tested to the rated working pressure of the stack assembly or 70% of the minimum internal yield of the casing, whichever is less. Annular type preventers will be pressure tested to 50% of their working pressure. All casing strings will be pressure tested to 0.22 psi/ft or 1,500 psi, whichever is greater, not to exceed 70% of the internal yield. If a 5M system or greater is used, the casing shoe will be tested by drilling 5-20' out from under the shoe and pressure tested to a maximum expected mud weight equivalent as shown in the mud program listed below.

A manual locking device (i.e. hand wheels) or automatic locking devices shall be installed on the BOP stack. Remote controls capable of both opening and closing all preventers shall be readily accessible to the driller.

The choke manifold and accumulator will meet or exceed Onshore Order No. 2 (OSO #2) standards. The BOP equipment will be tested after any repairs to the equipment. Pipe rams, blind rams and annular preventer will be activated on each trip and weekly BOP drills will be conducted with each crew. All tests, maintenance, and BOP drills will be documented on rig "tower sheets".

Statement of Accumulator System and Location of Hydraulic Controls

*The drilling rig has not been selected for this well. Selection will take place after approval of this application is granted. Manual and/or hydraulic controls will be in compliance with OSO #2 for 2,000 psi system.*

*A remote accumulator will be used. Pressures, capacities, location of remote hydraulic and manual controls will be identified at the time of the BLM supervised BOP test.*

MUD PROGRAM

0'	-	40'	Water
40'	-	2,800'	Natural Gel
			M.W.: 8.6 -10 ppg
			Visc.: 40 – 50
			PV: 10 – 20
			YP: 10 – 15
			pH: 8.5 – 9.0
			WL: 9 – 10
2,800'	-	TD'	Flexdrill-flexfirm potassium silicate
			M.W.: 8.5 – 9.0 ppg
			Visc.: 38 – 45
			PV: 8 – 16
			YP: 10 – 12
			pH: 10.5 – 11.0
			WL: 9 – 12

*Sufficient mud materials to maintain mud properties, control lost circulation and to contain a "kick" will be available on location.*

AUXILIARY EQUIPMENT

- A. Upper Kelly cock; lower Kelly cock will be installed while drilling and tested at the time of the BOP test.
- B. Inside BOP or stabbing valve with handle (available on rig floor).
- C. Safety valve(s) and subs to fit all string connections in use.
- D. Mud monitoring will be per visual observation.

LOGGING, CORING TESTING PROGRAM

- A. Logging: Platform Express - Array Induction Litho Density/Compressed Neutron, Density Neutron, Density Induction, and Cement Bond Log.
- B. Coring: None planned – Whole core or rotary sidewall cores as warranted.
- C. Testing: None planned – Drill Stem tests may be run on shows of interest.

ABNORMAL CONDITIONS

- A. Pressures: No abnormal conditions are anticipated.  
Anticipated BHP gradient: 0.45 psi/ft
- B. Temperatures: No abnormal conditions are anticipated.
- C. H<sub>2</sub>S: None Anticipated.
- D. Estimated bottomhole pressure: 3,600 psi

ANTICIPATED START DATE

September 26, 2011

COMPLETION

The location pad will be sufficient size to accommodate all completion equipment activities and equipment. A string of 2-7/8", 6.5#, N-80, EUE 8rnd will be run as production tubing. It is anticipated that the Niobrara and Frontier formations will require stimulation. Finalized stimulation plans will be done based on D-fit or other pressure pre-work information.

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### SURFACE and PRODUCTION CASING DESIGN

Proposed Total Depth	7,600	TVD	BHP at Producing Depth	3,420	Producing TD x Gradient
Proposed Depth of Surface Casing	2,800	Feet	Hydrostatic Head of Gas/Oil/Mud:	1,672	Producing TD x 0.22 psi/ft
Proposed Depth of Production Csg	2,800	Feet	Mud Weight - Production	10.00	#/gal
Formation Gradient	0.450	Psi/ft	Mud Weight - Surface	8.80	#/gal
Assume	0%	full of water on opposite side of pipe for Burst calculations			

#### SURFACE CASING

##### MAXIMUM DESIGN SURFACE PRESSURE

0.450	Bottom Hole Pressure	7,600	minus	0% Hydrostatic Head		
	PSI/FT x		minus	0.000	PSI/FT x	2800
	3420	psi	minus		0	psi
						<b>3420 psi</b>

##### CASING STRENGTH

	Weight / Type	Collapse (psi)	Burst (psi)	Tension (lbs)
9 5/8" 36# J55 STC	36.00	2020	3520	394,000
9 5/8" 36# H40	36.00	1740	2560	294,000

##### DESIGN FACTORS

SAFETY FACTORS	<b>Tension (dry)</b>	9 5/8" 36# J55 STC	100,800	lbs	#/ft x TVD	
		9 5/8" 36# J55 STC	Safety Factor	design/actual	<b>3.91</b>	<b>Tension OK</b> 1.600
		9 5/8" 36# H40	Safety Factor	design/actual	<b>2.92</b>	<b>Tension OK</b> 1.600

##### Burst

Assume 0% water column on Pipe/Hole annulus

9 5/8" 36# J55 STC	Safety Factor	design/actual	<b>1.03</b>	<b>Burst OK</b>	1.000
9 5/8" 36# H40	Safety Factor	design/actual	<b>0.75</b>	<b>Design Failed</b>	1.000

##### Collapse

	Hydrostatic =	0.052 x MW Surf x depth	1281	Against Atmosphere Inside Pipe	
9 5/8" 36# J55 STC	Safety Factor =	design/actual	<b>1.58</b>	<b>Collapse OK</b>	1.125
9 5/8" 36# H40	Safety Factor =	design/actual	<b>1.36</b>	<b>Collapse OK</b>	1.125

#### Production Casing

##### MAXIMUM DESIGN PRODUCING PRESSURE

0.450	Bottom Hole Pressure	7,600	minus	0% Hydrostatic Head		
	PSI/FT x		minus	0.000	PSI/FT x	7600
	3420	psi	minus		0	psi
						<b>3420 psi</b>

##### CASING STRENGTH

	Weight / Type	Collapse (psi)	Burst (psi)	Tension (lbs)
7" 23# HCP 110 LTC	23.00	5650	8720	590,000
7" 26# J55 STC	26.00	4320	4980	334,000

##### DESIGN FACTORS

SAFETY FACTORS	<b>Tension (dry)</b>	#/ft x TVD	64,400	lbs	23.00	2,800	ft
		#/ft x TVD	72,800	lbs	26.00	2,800	ft
	7" 23# HCP 110 LTC	Safety Factor	design/actual	<b>9.161</b>	<b>Tension OK</b>	1.600	
	7" 26# J55 STC	Safety Factor	design/actual	<b>4.588</b>	<b>Tension OK</b>	1.600	

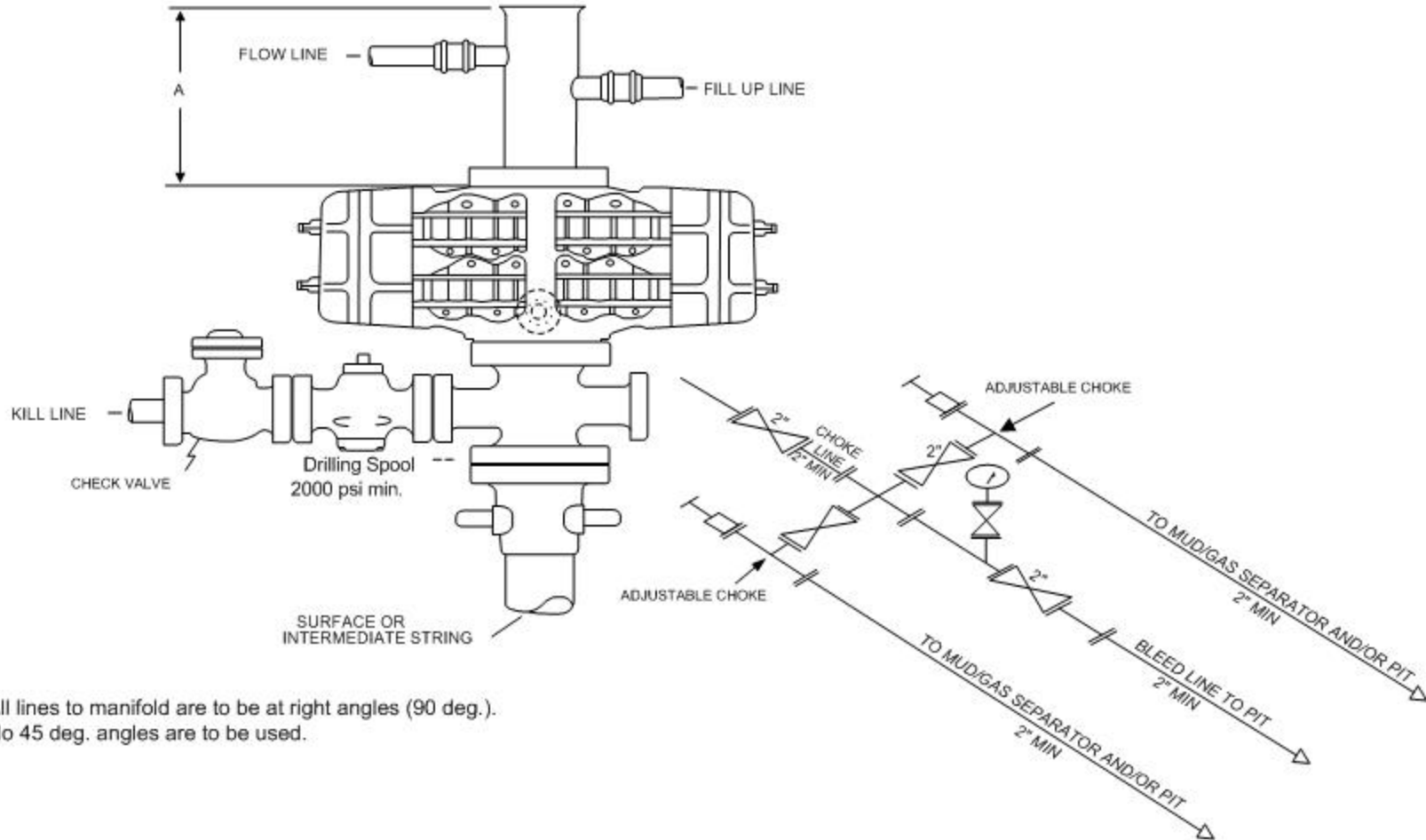
##### Burst

Assume 0% water column on Pipe/Hole annulus

7" 23# HCP 110 LTC	Safety Factor	design/actual	<b>2.550</b>	<b>Burst OK</b>	1.000
7" 26# J55 STC	Safety Factor	design/actual	<b>1.456</b>	<b>Burst OK</b>	1.000

##### Collapse

	Hydrostatic =	0.052 x mud wt x depth	1456		
7" 23# HCP 110 LTC	Safety Factor =	design/actual	<b>3.880</b>	<b>Collapse OK</b>	1.125
7" 26# J55 STC	Safety Factor =	design/actual	<b>2.967</b>	<b>Collapse OK</b>	1.125



All lines to manifold are to be at right angles (90 deg.).  
No 45 deg. angles are to be used.

2M CHOKE MANIFOLD EQUIPMENT – CONFIGURATION MAY VARY

## BLOWOUT PREVENTER

2,000 psi minimum