

GEOLOGIC & DRILLING PROGNOSIS

Prepared: 18-Feb-21 DC

WELL NAME: RG 542-18-297
Directional from the pad RG 41-18-297

API: 05-103-12473-00
STATE: CO
COUNTY: RIO BLANCO
BOTTOM HOLE LOCATION: Sec. 18 T 2S R 97W
TYPE OF UNIT: FED
FEDERAL EA: Yes
HARDLINE: No

Unspaced

ELEVATION (ft):
PAD (ft): 6621
GROUND (ft): 6620
KELLY BUSHING (ft): 6651

RIG INFORMATION:
RIG NAME: HP 329
KB HEIGHT (ft): 30

ESTIMATE TOPS:

Formation	TVD	MD	Formation Resource Notes
Green River	921	931	Potentially Useable Water
A Groove	1081	1098	Potentially Useable Water
B Groove	1266	1291	Potentially Useable Water
Dissolution Surface	1581	1621	Possible Lost Circ Zone
Orange Marker	2456	2535	Potentially Useable Water
Wasatch	2661	2750	Potentially Useable Water
Top of "G" Sand	5021	5216	Possible Lost Circ Zone
Fort Union	5351	5561	Gas and Limited Use and Quality Water
Ohio Creek	6661	6931	Possible Lost Circ Zone
Mesaverde	6661	6931	Gas and Limited Use and Quality Water
Approx. Top Gas	7751	8036	Gas and Limited Use and Quality Water
Cameo Coals	10101	10386	Gas, Coal, and Limited Use and Quality Water
Rollins SS	10681	10966	Gas and Limited Use and Quality Water
Cozzette	10831	11116	Gas and Limited Use and Quality Water
Corcoran	11051	11336	Gas and Limited Use and Quality Water
Upper Sego	11411	11696	Gas and Limited Use and Quality Water
Lower Sego	11711	11996	Gas and Limited Use and Quality Water
TD	11831	12116	

MUD LOGGING: Type: (Optional) Remote Gas Unit
Interval: Base of surface casing to TD with total gas only

OPEN HOLE LOGS: Specifics: (Optional) Triple-Combo (DIL-GR-SP-Neutron Density)
Interval: GR from TD to surface, DIL-SP and Neutron Density from TD to 100' inside surface casing

CASED HOLE LOGS: Specifics: Pulsed Neutron Log (e.g. RMTE, RPM, or RST)
Processing: Emulation Triple Combo Using OH logs and training well
Cement Evaluation: CBL

CSG & CEMENT PROGRAM: SHOE TEST REQUIRED

	Csg Size (in)	Depth Set (tvd)	Depth Set (md)	Hole Size (in)	Approx. Cmt Tail (ft3)	Tail Yield (ft3/sx)	Approx. Sx Tail	Approx. Cmt Lead (ft3)	Lead Yield (ft3/sx)	Approx. Sx Lead	WOC (hrs)
Conductor:	20	84	84	30	228	199					
Surface	13.375	1381	1421	17.5	N/A	N/A	N/A	1086	2.34	464	
Intermediate	9.625	3161	3250	12.25	172	2.10	82	172	2.40	72	
Liner or Production:	4.5	11831	12116	8.75/7.875	1446	1.85	784	373	2.00	187	
					Surface (sacks): 464		Intermediate (sacks):	154	Prod. (sacks): 970		

ANTICIPATED PRESSURES (psi)

MASP	Prod Csg Test Pressure	Anticipated BHP	Prod. Csg. Grade
2,899	8,500	5,501	P-110

MUD PROGRAM: (Do not deviate from mud engineer's recommendation without prior consent from Parachute office)

FROM (md)	TO (md)	TYPE MUD	#/GAL	VIS	WL	CHEMICALS
0	3250	WBM	8.33-9.0	45-50	7-15	Bentonite/PHPA
3250	12116	LSND	8.7-10.0	40-80	6-10	PHPA/Barite

(Write mud added to system on tour sheets and report all mud mixed and daily cost in morning report)

LOST CIRCULATION: Report depth and bbls of mud lost on morning report and tour sheet. Any severe lost circulation problems should be reported immediately to well supervisor.

SURVEYS: Run every 100' on surface hole and trips unless otherwise instructed.

TEP GEOLOGIST: Office Cell
Stephen Sunnenberg 281-936-0361 303-918-4327 ssunnenberg@terraep.com
(note: if there are questions concerning TD or logging, please call Geologist)

CASING & CEMENTING PLAN

Operator: Terra Energy Partners
Well Name & Number: RG 542-18-297
Location: Ryan Gulch

Casing Design Calculations											
Type of Casing	Size of Hole (inches)	Size of Casing (inches)	Weight per Foot (lbs/ft)	Grade	Thread	Interval (ft)	(ft) Length (feet)	Setting Depth (TVD feet)	Collapse (psi)	Burst (psi)	Tension (lbs)
Surface	17.5	13.375	54.5	J-55	BTC	0-1421	1,421	1,381	1130	2735	853,000
Intermediate	12.250	9.625	36.0	J-55	LTC	0-3250	3,250	3,161	2,020	3,520	453,000
Production	8.750	4.500	11.6	P-110	DWC/C	0-12116	12,116	11,831	8,860	12,150	417,000

Surface Casing Shoe	Intermediate Casing Shoe	Production Casing Shoe
Max MW = 9.2 ppg HP = 661 psi	Max MW = 9.2 ppg HP = 1,512 psi	Max MW = 10.0 ppg HP = 6,152 psi

True Vertical Depth = 11,831
Bottom Hole Pressure = 5,501
Pore Pressure Gradient = 0.465
Max. Sur. Pressure = 2,899
BOP Required = 3M
5M system will be used as per A

Bottom Hole Temperature = 230 degrees Fahrenheit

Casing Safety Factors			
Surface Casing	Pb = 3.53	Min = 1.100	Pass
	Pc = 1.71	Min = 1.125	Pass
	Sj = 11.01	Min = 1.500	Pass
Intermediate Casing	Pb = 1.21	Min = 1.100	Pass
	Pc = 1.34	Min = 1.125	Pass
	Sj = 3.87	Min = 1.500	Pass
Production Casing	Pb = 4.19	Min = 1.100	Pass
	Pc = 1.44	Min = 1.125	Pass
	Sj = 2.97	Min = 1.500	Pass

Cement Design Calculations

Estimating Cement for Ryan Gulch Wells (Permitting purpose only)

Critical Depths - Permitting Purposes Only	
Casing/Formation	Measured Depth
Surface Casing	1,421 ft
Intermediate Casing	3,250 ft
Top of Mesaverde	6,931 ft
Top of Gas	8,036 ft
Total Depth	12,116 ft

Production Cement Tops (Permitting Purposes Only)	
Cement Slurry	TOC - Measured Depth
Scavenger	3,050 ft
Lead	6,731 ft
Tail	7,836 ft

Surface Cement	Lead
Cement Tops	Surface
Volume, bbls	176
Annular vol w/ excess, ft ³	1086
Volume, sacks	464
Slurry Weight, ppg	12.3
Slurry Yield, ft ³ /sk	2.340
Mixwater, gal/sk	13.40
Annular Capacity (BBI)	0.1237
Annular Capacity (CF)	0.6947
Excess	0.1
Total Sacks	464
Total Cubic Ft.	1,086

Intermediate Cement	Lead	Tail
Cement Tops	2,250	2,750
Volume, bbls	28	28
Annular vol w/ excess, ft ³	172	172
Volume, sacks	72	82
Slurry Weight, ppg	12.3	12.8
Slurry Yield, ft ³ /sk	2.400	2.100
Mixwater, gal/sk	13.30	11.30
Annular Capacity (BBI)	0.0558	0.0558
Annular Capacity (CF)	0.3132	0.3132
Excess	0.1	0.1
Total Sacks =	154	
Total Cubic Ft. =	345	

Production Cement	Scavenger	Lead
Cement Tops	3,050	6731
Volume, bbls	201	60
Annular vol w/excess, ft ³	1,244	373
Volume, sacks	405	187
Slurry Weight, ppg	11.0	12.7
Slurry Yield, ft ³ /sk	3.074	1.999
Mixwater, gal/sk	18.830	11.000
Annular Capacity (BBI)	0.0547	0.0547
Annular Capacity (CF)	0.3072	0.3072
Excess	0.1	0.1
Total Sacks =		
Total Cubic Ft. =		

NOTES:

Surface Casing 17-1/2" hole to TD - Cement to surface.
54.5# 13-3/8" J-55, BTC surface casing will be ran.
10% excess is included in calculations.
Normal Surface excess is 40% over gauge hole
Normal Intermediate excess is 50% over gauge hole
Normal Production excess is 45% over gauge hole.

Casing Design Calculations

Surface Casing - 54.5#	Intermediate Casing - 36#
<p>Burst</p> <p>Bottom Hole Pressure = TVD * Pore Pressure Gradient = 3161 * 0.465 = 1469.865 psi</p> <p>Pburst = Bottom Hole Pressure - (0.22 * TVD) = 1469.865 - (0.22 * 3161) = 774.445 psi</p> <p>Pb = Casing Burst Rating / Pburst = 2735 / 774.445 = 3.53</p> <p>Pb ≥ 1.1 3.53 ≥ 1.1</p> <p>Collapse</p> <p>If: Max MW * Setting TVD * 0.052 ≥ Pore Pressure Gradient * Setting TVD 9.2 * 1381 * 0.052 ≥ 0.465 * 1381 660.6704 ≥ 642.165</p> <p>Pcollapse = Max MW * Setting TVD * 0.052 = 660.6704 psi</p> <p>Else: Pcollapse = Pore Pressure Gradient * Setting TVD = 642.165 psi Pcollapse = 660.6704 psi</p> <p>Pc = Casing Collapse Rating / Pcollapse = 1130 / 660.6704 = 1.71</p> <p>Pc ≥ 1.125 1.71 ≥ 1.125</p> <p>Tensile</p> <p>Tension = (Weight1 * Length1) = (54.5 * 1421) = 77444.5 lbs</p> <p>Sj = Casing Tension Rating / Tension = 853000 / 77444.5 = 11.01</p> <p>Sj ≥ 1.5 11.01 ≥ 1.5</p>	<p>Burst</p> <p>Bottom Hole Pressure = TVD * Pore Pressure Gradient = 11831 * 0.465 = 5501.4 psi</p> <p>Pburst = Bottom Hole Pressure - (0.22 * TVD) = 5501.415 - (0.22 * 11831) = 2898.6 psi</p> <p>Pb = Casing Burst Rating / Pburst = 3520 / 2898.595 = 1.21</p> <p>Pb ≥ 1.1 1.21 ≥ 1.1</p> <p>Collapse</p> <p>If: Max MW * Setting TVD * 0.052 ≥ Pore Pressure Gradient * Setting TVD 9.2 * 3161 * 0.052 ≥ 0.465 * 3161 1512.2 ≥ 1469.865</p> <p>Pcollapse = Max MW * Setting TVD * 0.052 = 1512.2 psi</p> <p>Else: Pcollapse = Pore Pressure Gradient * Setting TVD = 1469.9 psi Pcollapse = 1512.2 psi</p> <p>Pc = Casing Collapse Rating / Pcollapse = 2020 / 1512.2224 = 1.34</p> <p>Pc ≥ 1.125 1.34 ≥ 1.125</p> <p>Tensile</p> <p>Tension = (Weight1 * Length1) = (36 * 3250) = 117000 lbs</p> <p>Sj = Casing Tension Rating / Tension = 453000 / 117000 = 3.87</p> <p>Sj ≥ 1.5 3.87 ≥ 1.5</p>
	<p>Production Casing</p> <p>Burst</p> <p>Bottom Hole Pressure = TVD * Pore Pressure Gradient = 11831 * 0.465 = 5501.4 psi</p> <p>Pburst = Bottom Hole Pressure - (0.22 * TVD) = 5501.415 - (0.22 * 11831) = 2898.6 psi</p> <p>Pb = Casing Burst Rating / Pburst = 12150 / 2898.595 = 4.19</p> <p>Pb ≥ 1.1 4.19 ≥ 1.1</p> <p>Collapse</p> <p>If: Max MW * Setting TVD * 0.052 ≥ Pore Pressure Gradient * Setting TVD 10 * 11831 * 0.052 ≥ 0.465 * 11831 6152.1 ≥ 5501.415</p> <p>Pcollapse = Max MW * Setting TVD * 0.052 = 6152.1 psi</p> <p>Else: Pcollapse = Pore Pressure Gradient * Setting TVD = 5501.4 psi</p> <p>Pcollapse = 6152.1 psi</p> <p>Pc = Casing Collapse Rating / Pcollapse = 8860 / 6152.12 = 1.44</p> <p>Pc ≥ 1.125 1.44 ≥ 1.125</p> <p>Tensile</p> <p>Tension = Weight * Length = 11.6 * 12116 = 140546 lbs</p> <p>Sj = Casing Tension Rating / Tension = 417000 / 140545.6 = 2.97</p> <p>Sj ≥ 1.5 2.97 ≥ 1.5</p>