

MULTI-POINT AND ONE-POINT BACK PRESSURE TEST FOR GAS WELL

Form G-22
Revised 1-1-73

Type Test ☒ Initial ☐ Annual ☐ Special		Test Date 8-3-78	
Company Cleary Petroleum Corporation		Connection Gas Company of New Mexico	
Pool South Salt Lake		Formation Morrow	
Completion Date 6-29-78		Total Depth 14047'	Plug Back TD 13710
		Elevation 3688 G.L.	Form or Lease Name New Mexico Federal "A"
Sec. Size 5 1/2"	Wt. 15.5, 17, 20	d 4.778 min.	Set At 14004'
Perforations: From 13314'	To 13693'		Well No. 2
Perforations: From	To		Unit G 4 T-21-S R-32
Type Well - Single - Bordenhead - G.C. or G.O. Multiple Single		Perforations: Set At 13202'	County Lea
Producing thru Tubing	Reservoir Temp. °F 230	Mech. Annual Temp. °F 60	Baro. Press. - P _a 13.2
L 13504	H 13504	G _g 0.703	% CO ₂ 0.68
		% N ₂ 0.168	% H ₂ S None
		Prover	Meter Run 4"
			Flange

FLOW DATA						TUBING DATA		CASING DATA		Duration of Flow
NO.	Prover Line Size	X	Orifice Size	Press. p.s.i.g.	Diff. h _w	Temp. °F	Press. p.s.i.g.	Temp. °F	Press. p.s.i.g.	
SI							2380	74	Packer	
1.	4.026		1.50	740	86.5	72	1420	78	Packer	1 hour
2.	4.026		1.50	738	54.8	75	1600	77	Packer	1 hour
3.	4.026		1.50	739	28.1	76	1820	76	Packer	1 hour
4.	4.026		1.50	738	10.2	77	2050	76	Packer	1 hour
5.										

RATE OF FLOW CALCULATIONS							
NO.	Coefficient (24 Hour)	$\sqrt{h_w P_m}$	Pressure P _m	Flow Temp. Factor Ft	Gravity Factor Fg	Super. Compress. Factor, Fpv	Rate of Flow Q, Mscf/d
1.	10.84	255.25	753.2	.9887	1.193	1.083	3535
2.	10.84	202.89	751.2	.9859	1.193	1.082	2799
3.	10.84	145.39	752.2	.9850	1.193	1.082	2004
4.	10.84	87.53	751.2	.9840	1.193	1.082	1205
5.							

NO.	P _r	Temp. °R	T _r	Z	Gas Liquid Hydrocarbon Ratio	289	Mcf/Std.
1.					A.P.I. Gravity of Liquid Hydrocarbons	51.8	Deg.
2.					Specific Gravity Separator Gas	0.703	X X X X X X X X
3.					Specific Gravity Flowing Fluid	X X X X X	713
4.					Critical Pressure	P.S.I.A.	668 P.S.I.A.
5.					Critical Temperature	R	395 R

P _r 2393.2	P _c ² 5727					
NO.	P _r ²	P _w	P _w ²	P _c ² - P _w ²	(1) $\frac{P_c^2}{P_c^2 - P_w^2} = 1.85160$	(2) $\left[\frac{P_c^2}{P_c^2 - P_w^2} \right]^n = 1.85160$
1.	1444.3	2086	3641			
2.	1623.0	2634	3093			
3.	1867.7	3488	2239			
4.						
5.						

Absolute Open Flow	5183	Mscf/d @ 15.025	Angle of Slope θ	45°	Slope, n	1.00
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Remarks:

WORK SHEET FOR STEPWISE CALCULATION

MPANY Cleary Petroleum Corporation LEASE New Mexico Federal "A" WELL NO. 2 DATE _____

CATION: UNIT

SECTION

TOWNSHIP

RANGE

DATE _____

2

WELL N

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MPANY

13504	H	13504	L/H	1.00 G	$0.713 \times \text{CO}_2$	0.68 N_2	$1.68 \text{ H}_2\text{S}$	0.00
d	F_r	Q_m	M_{cfd}	$(L/H) (F_r Q_m)^2$	P_{cr}	668	T _{cr}	395

NE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		13504	6752		0						
2	GH		9628	4814		0						
3	37.5GH		361063	180532		0						
1	P _c or P _n		3012.2	2565.4	2551.5	2092.1	2055.4	2059.6				
5	P _r		4.51	3.84	3.82	3.13	3.08	3.08				
5	T		690	613	613	536	536	536				
7	T _r		1.75	1.55	1.55	1.36	1.36	1.36				
3	Z		0.882	0.795	0.795	0.675	0.675	0.675				
3	P/Z P/Z	$4 \div 8$	3415.19	3228.98	3211.48	3098.42	3043.20	3049.48				
3	P/TZ	$9 \div 6$	4.9496	5.2675	5.2390	5.7806	5.6776	5.6893				
	$(P/TZ)^2/1000$	$(10^2/1000)$										
	$L/H(FQ_n)^2$											
		$11 + 12$										
	I _n	$10 \div 13$	202.038	189.843	190.878	172.991	176.130	175.768				
	$M=P_n^{-1}$			447	461	459	496	492	492			
	$N=1_n + 1_{n-1}$			391.882	392.916	363.869	367.008	366.645				
	M x N	15×16			180802			180389				
	$\Sigma (M \times N)$	$\Sigma 17$			180802			361192				

$$\Delta P = \frac{202.038 + 4 \times 190.878}{3 + 361063} = \frac{1083190}{1141.318} = 949.1$$

Rate No. 3

MPANY Cleary Petroleum Corporation LEASE New Mexico Federal "A" TOWNSHIP SECTION UNIT 13504 H 13504 L/H 1.00 G 0.713 % CO₂ 0.68 N₂ 0.17 % H₂S 0.00

CATION: WELL NO. 2 DATE

d F_r Q_m M² cfd (L/H) (F_r Q_m)² P_{cr} 668 T_{cr} 395

NE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	H		13504	6752		0						
2	GH		9628	4814		0						
3	37.5GH		361063	180532		0						
4	P _c or P _n		2726.2	2418.6	2307.8	1890.4	1860.8	1850.0	1866.3	1864.2		
5	P _r		4.08	3.47	3.45	2.83	2.79	2.77	2.79	2.79		
6	T		690	613	613	536	536	536	536	536		
7	T _r		1.75	1.55	1.55	1.36	1.36	1.36	1.36	1.36		
8	Z		0.875	0.795	0.795	0.680	0.636	0.683	0.682	0.682		
9	P/Z P/Z	$\frac{4}{8} \div \frac{8}{8}$	3115.66	2918.33	2904.76	2780.02	2923.93	2708.69	2736.57	2733.36		
10	P/TZ	$\frac{9}{9} \div \frac{6}{6}$	4.5154	4.7607	4.7386	5.1866	5.4551	5.0535	5.1055	5.0996		
11	$(P/TZ)^2 / 1000$	$(10^2 / 1000)$										
12	L/H (F _r Q _m) ²											
13	$\frac{11}{11} + \frac{12}{12}$											
14	I _n	$\frac{10}{10} \div \frac{13}{13}$	221.462	210.052	211.033	192.804	183.315	197.882	195.865	196.095		
15	M = P _n - P _{n-1}			408	418	417	447	458	441	444	443	
16	N = I _n + I _{n-1}			431.514	432.495	403.837	394.348	408.915	406.898	407.128		
17	M x N	$\frac{15}{15} \times \frac{16}{16}$			176458					180765		
18	$\sum (M \times N)$	$\sum \frac{17}{17}$			176458					357223		

$$\Delta P = \frac{221.462 + 4 \left[\frac{3 \left[361063 \right]}{221.033} + 196.095 \right]}{1083190} = \frac{1083190}{1261.689} = 850.5 \quad P = 2726.2 - 850.5 = 1867.7$$

WORK SHEET FOR STEPWISE CALCULATION

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PRESSURE
(SURFACE)
Rate no. 2

(P_f & P_s)
(P_c & P_w)

Form C-122-E

MPANY Cleary Petroleum Corporation LEASE New Mexico Federal "A" WELL NO. 2 DATE

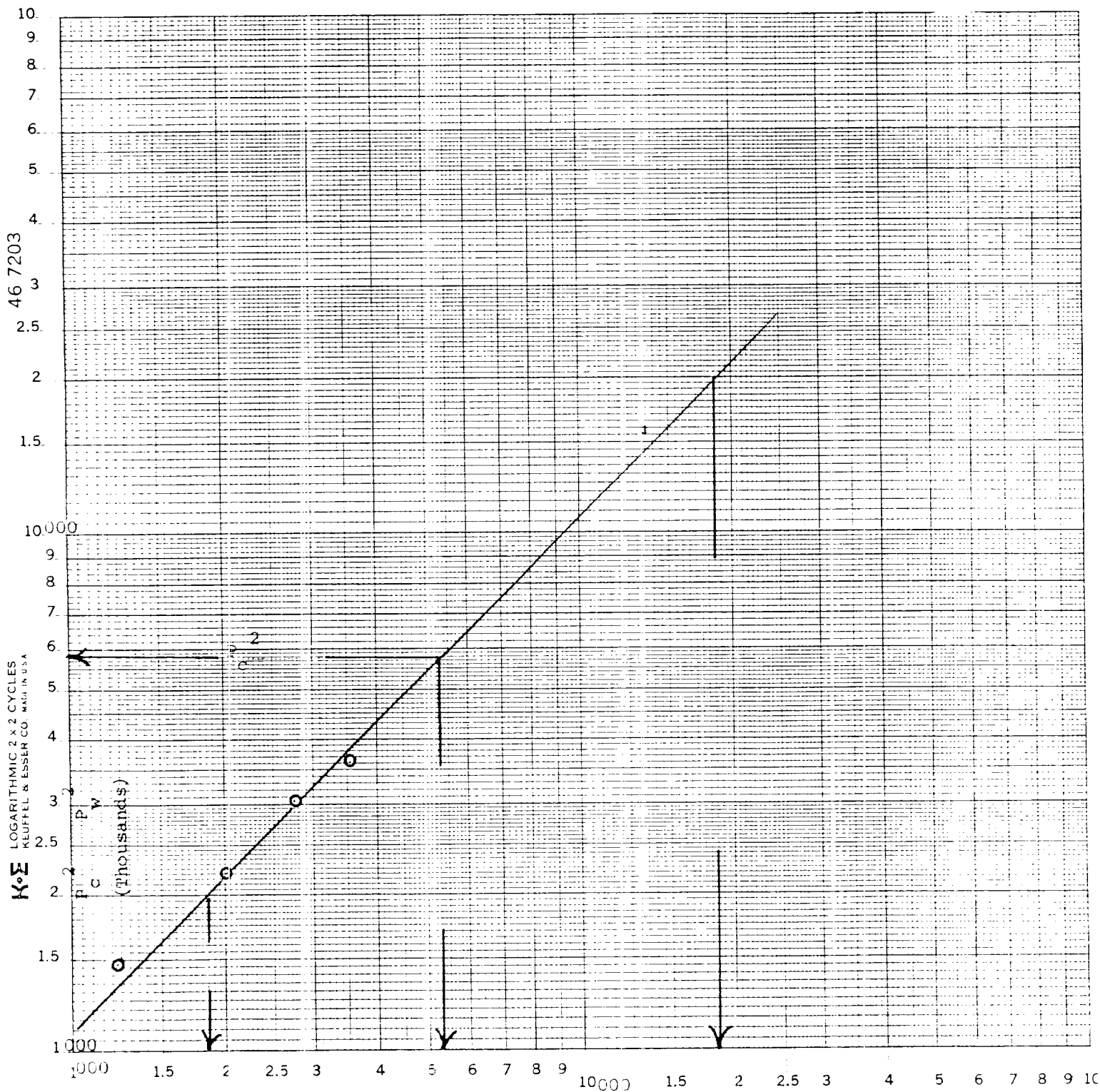
CATION: UNIT SECTION TOWNSHIP RANGE

13504 H 13504 L/H 1.00 G 0.713 & CO₂ 0.68 N₂ 0.17 H₂S 0.00
d F_r Q_m M² cfd (L/H) (F_r Q_m)² P_{cr} 668 T_{cr} 395

NE	ITEM	SOURCE	1	2	3	4	5	6	7	8	9	10
1	Q _m		13504	6752		0						
2	GH		9628	4814		0						
3	37.5GH		361063	180532		0						
4	P _c or P _n		2359.2	2006.3	1998.6	1638.8	1618.7	1621.5				
5	P _r		3.53	3.00	2.99	2.45	2.42	2.43				
6	T		690	614	614	537	537	537				
7	T _r		1.75	1.55	1.55	1.36	1.36	1.36				
8	Z		0.875	0.801	0.801	0.700	0.702	0.701				
9	P/Z P/Z	4 ÷ 8	2697.77	2504.72	2495.19	2341.76	2307.20	2313.72				
10	P/TZ	9 ÷ 6	3.9098	4.0827	4.0671	4.3608	4.2965	4.3086				
11	(P/TZ ² /1000	(10 ² /1000										
12	L/H (F _r Q _m) ²											
13		11 + 12										
14	I _n	10 ÷ 13	255.767	244.938	245.873	229.315	232.750	232.094				
15	M = P _n - P _{n-1}			353	361	360	380	377	378			
16	N = 1 _n + 1 _{n-1}			500.705	501.640	475.188	478.623	477.267				
17	M x N	15 x 16			181092			180194				
18	Σ (M x N)	Σ 17			181092			361286				

$$\text{Delta } P = \frac{3[361063]}{255.767 + 4[245.873]} + 232.094 = \frac{1083190}{1471.353} = 736.2 \quad P = 2359.2 - 736.2 = 1623.0$$

OPERATOR: CLEARY PETROLEUM
 LEASE: New Mexico Federal "A"
 WELL NO.: 2
 FIELD: South Salt Lake
 COUNTY: Lea
 DATE:



Q in MCF/Day
 $Q_1 = 18500$ MCF
 $Q_2 = 1850$ MCF
 $n = 1.00000$

$\log Q_1 = 4.26717$
 $\log Q_2 = 3.26717$

ABSOLUTE OPEN FLOW 5183 MCF/Day

SUBSURFACE WELL TESTING

P. O. BOX 5254
MIDLAND, TEXAS 79701

"Quality Testing Oil & Gas Wells"

PHONE
915/682-7580

BOTTOM HOLE PRESSURE REPORT

Operator Cleary Petroleum Corporation Lease New Mexico Federal "A" Well No. 2
Field South Salt Lake Reservoir Morrow Datum _____
Test Date August 3, 1978 Well Status Shut In Hours Shut In 72:00
Tubing 2 7/8" Depth 13202' End Open Packer 13202 S. N. 1.94 L.D. _____
Casing 5 1/2" Depth 14047' Perf. 13314-693' Total Depth P.B. 13710'

	Depth	Press. Lbs/Sq. In.	Press.	Gradient Lbs/Ft.
Tubing Press. <u>2380#</u>	Surface	2380		
Casing Press.	13504	3450	1070	.079
Top of Fluid. <u>None</u>	0	0		
Top of Water. <u>None</u>	13504	3450	Ctr. of Perfs.	.079
Temp. @ <u>13504'</u> <u>188°</u>				
Elev. KB <u>3710'</u> GI <u>3588'</u>				
Last Test Date <u>7-26-78</u>				
Press. Last Test <u>3571#</u>				
Change <u>121#</u> Per Day.				
Inst. No. <u>16527-N</u> Cal. <u>M78-1</u>				
Tested By. <u>Leon Arnett</u>				
Calcu. By. <u>L. Arnett</u>				
Prod. Index. Bbls/day/lb.				
Drop.				
Cumulative prod.				

Remarks:

Air Monitoring
Complete Gas Service
Consulting Chemists
Corrosion Fatigue Testing
Pollution Control
Water Analysis