

Company Associated Petroleum Consultants, Inc. Lease & Well No. Steffen Estate #1
Elevation 1768 Kelly Bushing Formation Indian Cave Effective Pay - Ft. Ticket No. 16026
Date 7/16/82 Sec. 12 Twp. 29S Range 10W County Kingman State Kansas
Test Approved by Paul Con--- (SP?) Western Representative Vernon Wondra

Formation Test No. 1 Interval Tested from 2534 ft. to 2562 ft. Total Depth 2562 ft.

Packer Depth 2529 ft. Size 6 5/8 in. Packer Depth - ft. Size - in.

Packer Depth 2534 ft. Size 6 5/8 in. Packer Depth - ft. Size - in.

Depth of Selective Zone Set -

Top Recorder Depth (Inside) 2551 ft. Recorder Number 10266 Cap. 4775

Bottom Recorder Depth (Outside) 2554 ft. Recorder Number 6074 Cap. 5100

Below Straddle Recorder Depth - ft. Recorder Number - Cap. -

Drilling Contractor Heartland Drlg. Co. Rig #1 Drill Collar Length 457 I. D. 2 3/4 in.

Mud Type - Viscosity - Weight Pipe Length - I. D. - in.

Weight - Water Loss - cc. Drill Pipe Length 2048 I. D. 3.8 in.

Chlorides - P.P.M. Test Tool Length 29 ft. Tool Size 5 1/2 OD in.

Jars: Make WTC Serial Number 418 Anchor Length 28 ft. Size 5 1/2 OD in.

Did Well Flow? Yes Reversed Out No Surface Choke Size 3/4 in. Bottom Choke Size 5/8 in.

Main Hole Size 7 7/8 in. Tool Joint Size 4 1/2 FH in.

Blow: Gas to surface in four minutes. Gauged 2,075,000 CFPD (22#, 1 1/2" orifice) in ten minutes. Mud to surface in nineteen minutes.

Recovered 180 ft. of water (Chlorides 68,000 ppm)

Recovered - ft. of -

Recovered - ft. of -

Recovered - ft. of -

Recovered - ft. of -

Remarks: -

Time Set Packer(s) 3:30 ~~AM~~ P.M. Time Started Off Bottom 7:00 ~~AM~~ P.M. Maximum Temperature 109°

Initial Hydrostatic Pressure (A) 1211 P.S.I.

Initial Flow Period Minutes 30 (B) 167 P.S.I. to (C) 644 P.S.I.

Initial Closed In Period Minutes 60 (D) 941 P.S.I.

Final Flow Period Minutes 60 (E) 649 P.S.I. to (F) 719 P.S.I.

Final Closed In Period Minutes 60 (G) 936 P.S.I.

Final Hydrostatic Pressure (H) 1164 P.S.I.

WESTERN TESTING CO., INC.

Pressure Data

Date 7/16/82 Test Ticket No. 16026
 Recorder No. 10266 Capacity 4775 Location 2551 Ft.
 Clock No. - Elevation 1768 Well Temperature 109 °F

Point	Pressure	Time Given	Time Computed
A Initial Hydrostatic Mud	1211 P.S.I.	3:30P	M
B First Initial Flow Pressure	167 P.S.I.	30	30 Mins.
C First Final Flow Pressure	644 P.S.I.	60	60 Mins.
D Initial Closed-in Pressure	941 P.S.I.	60	60 Mins.
E Second Initial Flow Pressure	649 P.S.I.	60	60 Mins.
F Second Final Flow Pressure	719 P.S.I.	60	60 Mins.
G Final Closed-in Pressure	936 P.S.I.		
H Final Hydrostatic Mud	1164 P.S.I.		

PRESSURE BREAKDOWN

First Flow Pressure Breakdown: <u>6</u> Inc. of <u>5</u> mins. and a final inc. of <u>0</u> Min.		Initial Shut-In Breakdown: <u>20</u> Inc. of <u>3</u> mins. and a final inc. of <u>0</u> Min.		Second Flow Pressure Breakdown: <u>12</u> Inc. of <u>5</u> mins. and a final inc. of <u>0</u> Min.		Final Shut-In Breakdown: <u>20</u> Inc. of <u>3</u> mins. and a final inc. of <u>0</u> Min.	
Point Mins.	Press.	Point Minutes	Press.	Point Minutes	Press.	Point Minutes	Press.
P 1 <u>0</u>	<u>167</u>	<u>0</u>	<u>644</u>	<u>0</u>	<u>649</u>	<u>0</u>	<u>719</u>
P 2 <u>5</u>	<u>252</u>	<u>3</u>	<u>918</u>	<u>5</u>	<u>686</u>	<u>3</u>	<u>912</u>
P 3 <u>10</u>	<u>407</u>	<u>6</u>	<u>927</u>	<u>10</u>	<u>703</u>	<u>6</u>	<u>922</u>
P 4 <u>15</u>	<u>500</u>	<u>9</u>	<u>933</u>	<u>15</u>	<u>699</u>	<u>9</u>	<u>926</u>
P 5 <u>20</u>	<u>571</u>	<u>12</u>	<u>934</u>	<u>20</u>	<u>697</u>	<u>12</u>	<u>927</u>
P 6 <u>25</u>	<u>629</u>	<u>15</u>	<u>935</u>	<u>25</u>	<u>697</u>	<u>15</u>	<u>928</u>
P 7 <u>30</u>	<u>644</u>	<u>18</u>	<u>936</u>	<u>30</u>	<u>698</u>	<u>18</u>	<u>929</u>
P 8 _____		<u>21</u>	<u>937</u>	<u>35</u>	<u>700</u>	<u>21</u>	<u>930</u>
P 9 _____		<u>24</u>	<u>938</u>	<u>40</u>	<u>704</u>	<u>24</u>	<u>932</u>
P10 _____		<u>27</u>	<u>938</u>	<u>45</u>	<u>708</u>	<u>27</u>	<u>934</u>
P11 _____		<u>30</u>	<u>938</u>	<u>50</u>	<u>713</u>	<u>30</u>	<u>934</u>
P12 _____		<u>33</u>	<u>939</u>	<u>55</u>	<u>715</u>	<u>33</u>	<u>934</u>
P13 _____		<u>36</u>	<u>939</u>	<u>60</u>	<u>719</u>	<u>36</u>	<u>934</u>
P14 _____		<u>39</u>	<u>940</u>			<u>39</u>	<u>936</u>
P15 _____		<u>42</u>	<u>940</u>			<u>42</u>	<u>936</u>
P16 _____		<u>45</u>	<u>941</u>			<u>45</u>	<u>936</u>
P17 _____		<u>48</u>	<u>941</u>			<u>48</u>	<u>936</u>
P18 _____		<u>51</u>	<u>941</u>			<u>51</u>	<u>936</u>
P19 _____		<u>54</u>	<u>941</u>			<u>54</u>	<u>936</u>
P20 _____		<u>57</u>	<u>941</u>			<u>57</u>	<u>936</u>
		<u>60</u>	<u>941</u>			<u>60</u>	<u>936</u>

Gas Production

B.T. Gauge Numbers			10266 (2551)	Ticket Number	16026	
Initial Hydrostatic			Pressure 1211	Elevation	1768 KB . ft.	
Final Hydrostatic			1164	Production Initial	2,075 m cu. ft.	
1st Flow	Initial	Time -----	167	Rate	Final	No gauge m cu. ft.
	Final	30	644	Hole Size	7.875 in.	
Initial Closed In Pressure		60	941	Footage Tested	28 (14) ft.	
2nd Flow	Initial	-----	649	Mud Weight	No Report lbs. gal.	
	Final	60	719	Gas Viscosity	cp	
Final Closed In Pressure		60	936	Gas Gravity	.65 —	
Extrapolated Static Pressure		Initial	944-924	Gas Compressibility	—	
		Final	943-921			
Slope Psi ² /cycle		Initial	20.166			
		Final	21.925			

Remarks:

SUMMARY

Product		Equation	Initial	Final	Units
Transmissability		$\frac{Kh}{\mu} = \frac{1637 Q_e ZT}{m}$	4242 1.501		md. ft. cp
Theoretical Flow Capacity		$Kh = \frac{Kh}{\mu} \mu$	763.587		md. ft.
Average Effective Permeability		$K = \frac{Kh}{h}$	54.541		md.
		$K_1 = \frac{Kh}{h_1}$	—		md.
Indicated Flow Capacity		$(Kh)_s = \frac{3200 Q_e \mu ZT \log(0.472 b/r_w)}{P_s^2 - P_r^2}$	210.909		md. ft.
Damage Ratio		$DR = \frac{\text{Theo. Flow Cap}}{\text{Indicated Flow Cap}} \frac{Kh}{(Kh)_s}$	3.620		—
Indicated Flow Rate		$OF_1 = \frac{Q_e}{P_s^2 - P_r^2} P_s^2$	3,881,417		MCFD
			2,837,946		MCFD
Theoretical Potential Rate		$OF_3 = OF_1 DR \quad \text{Max.}$	14,052,460		MCFD
		$OF_4 = OF_2 DR \quad \text{Min.}$	10,274,631		MCFD
Approx. Radius of Investigation		$b \approx \sqrt{Kt} \text{ or } \sqrt{Kt_0}$	40.450		ft.
		$b_1 \approx \sqrt{K_1 t} \text{ or } \sqrt{K_1 t_0}$	—		ft.
Potentiometric Surface *		$\text{Pot.} = (EI - GD) + (2.319 Ps)$	1406.136		ft.

NOTICE:

These calculations are based upon information furnished by you and taken from Drill Stem Tests pressure charts, and are furnished you for your information. In furnishing such calculations and evaluations based thereon, Western Testing Co., Inc., is merely expressing its opinion. You agree that Western Testing Co., Inc., make no warranty express or implied as to the accuracy of such calculations or opinions, and that Western Testing Co., Inc., shall not be liable for any loss or damage, whether due to negligence or otherwise, in connection with such calculations and opinions.

TKT # 16026

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