

0050

AB-27

PROJECT RIO BLANCO
RESERVOIR REPORT

CER Geonuclear Corporation
Las Vegas, Nevada

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PNE-RA-3

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I. INTRODUCTION

In August 1969, Equity Oil Company engaged CER Geonuclear Corporation to evaluate the prospects for nuclear stimulation of natural gas production in a portion of the Piceance Basin, Colorado. The study area included a block of about nine townships as shown in Figure 1.

In April 1970 a Feasibility Study⁽¹⁾ was issued for Project Rio Blanco as a result of the work done for Equity Oil Company. The resource evaluation narrowed the study down to a detailed examination of the Fort Union Formation and the Upper portion of the Mesaverde Formation, designated as "Mesaverde I."

As recommended in the Feasibility Study, two wells, Fawn Creek Government Number 1 and Scandard Draw Number 1 were selected for recompletion and testing to obtain more detailed information on the reservoir characteristics. In addition to the testing, several logs were run in the wells. Surface studies of the sand outcrop to determine orientation and extent of sand lenses in the Mesaverde and Fort Union formations were made and seismic surveys were run to determine the location of any geologic discontinuities in the area of interest.

This report covers the well testing and recompletion histories on both wells, the evaluation of net gas sand based on the new logs, a report of the outcrop study performed during the summer of 1970, and the seismic survey report from Seismograph Service Corporation.



Road Map of a Portion of N. W. Colorado Showing the Equity Study Area

Figure No. 1

II. CONCLUSIONS

1. The testing program recommended in the Feasibility Study has been completed.
2. Results of the testing show that the permeability to gas is in the range believed amenable to nuclear stimulation and that water in zones of calculated high water saturation should not be a problem in a nuclear stimulation experiment.
3. It is recommended that the initial experiment be conducted in the Fawn Creek area because of the greater in situ permeability and also because a successful experiment at this location would prove up a larger amount of natural gas reserves.
4. Based on the seismic survey lines run in the vicinity of the Fawn Creek Well there does not appear to be any faulting in the area chosen for the nuclear stimulation experiment.
5. Analysis of both the recent Gamma Ray-Neutron logs and Neutron Lifetime logs indicate that the gas in place figures as presented in the Feasibility Study are conservative.
6. The testing results from the Scandard Draw area are inconclusive. Up to data logs and additional testing are recommended for this area before nuclear stimulation is conducted.
7. The outcrop study indicates that Mesaverde and Fort Union depositional environment should lead to sand lenses large enough to provide an effective drainage radius for nuclear stimulation.

III. SUMMARY

A. PICEANCE BASIN

The Piceance Creek Basin is a large structural downwarp. The basin is asymmetric, generally trending northwest with gentle dips in the west and with relatively steep dips on the north and east. High angle normal faults are present in the central part of the basin and along the western edge of the steeply dipping Grand Hogback. The gas accumulation in the Project Rio Blanco area is associated with a faulted east-west trending nose. The gas seems to be in a combination stratigraphic-structural trap.

A stratigraphic cross-section of the Piceance Basin is shown in Figure 2. The zones of primary interest are the Fort Union and Mesaverde formations. The Wasatch, Fort Union, and upper, middle, and upper portion of the lower Mesaverde are fluvial channel fill and point bar sandstones*. This type of deposit has limited continuity, but appears to be of sufficient size to provide a reasonable drainage area. The basal lower Mesaverde contains marine sandstones that are relatively continuous. Based on the geologic studies presented in the Feasibility Study, a unit has been proposed to the USGS as shown in Figure 3.

1. Fort Union Formation

The average thickness of the Fort Union interval is approximately 800 feet in the proposed unit area. This interval contains gross thicknesses of sandstone on the order of 300 feet based upon analysis of SP logs from wells within the unit boundary. Depth to top of the interval was found to vary between a minimum of approximately 3700 feet in the South Sulphur area to a maximum of approximately 6600 feet in the Black Sulphur Creek area. The Fort Union generally dips at a rate of approximately 500 feet per mile throughout the major portion of the area. Based on log analysis and core data from the wells in the area, a median porosity of 13.5% and water saturation of 60% is believed to be representative of the Fort Union pay sands in this area of the basin. (1)

*The stratigraphy of the Fort Union and Mesaverde formations and the geometry of the sandstone bodies are discussed in detail in "The Outcrop Study" presented in Appendix I.

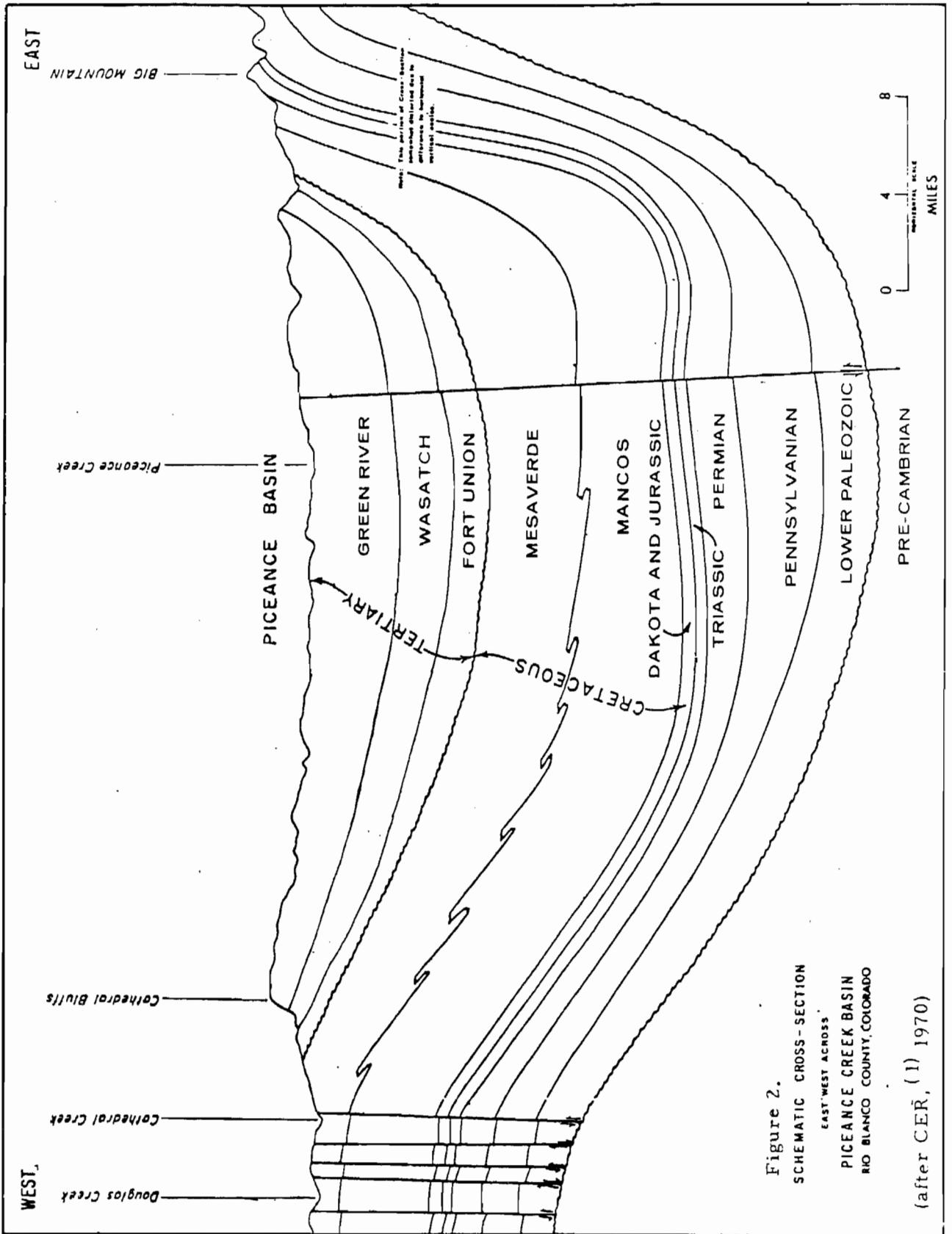


Figure No. 2

R 99 W

R 98 W

R 97 W

R 96 W

R 95 W

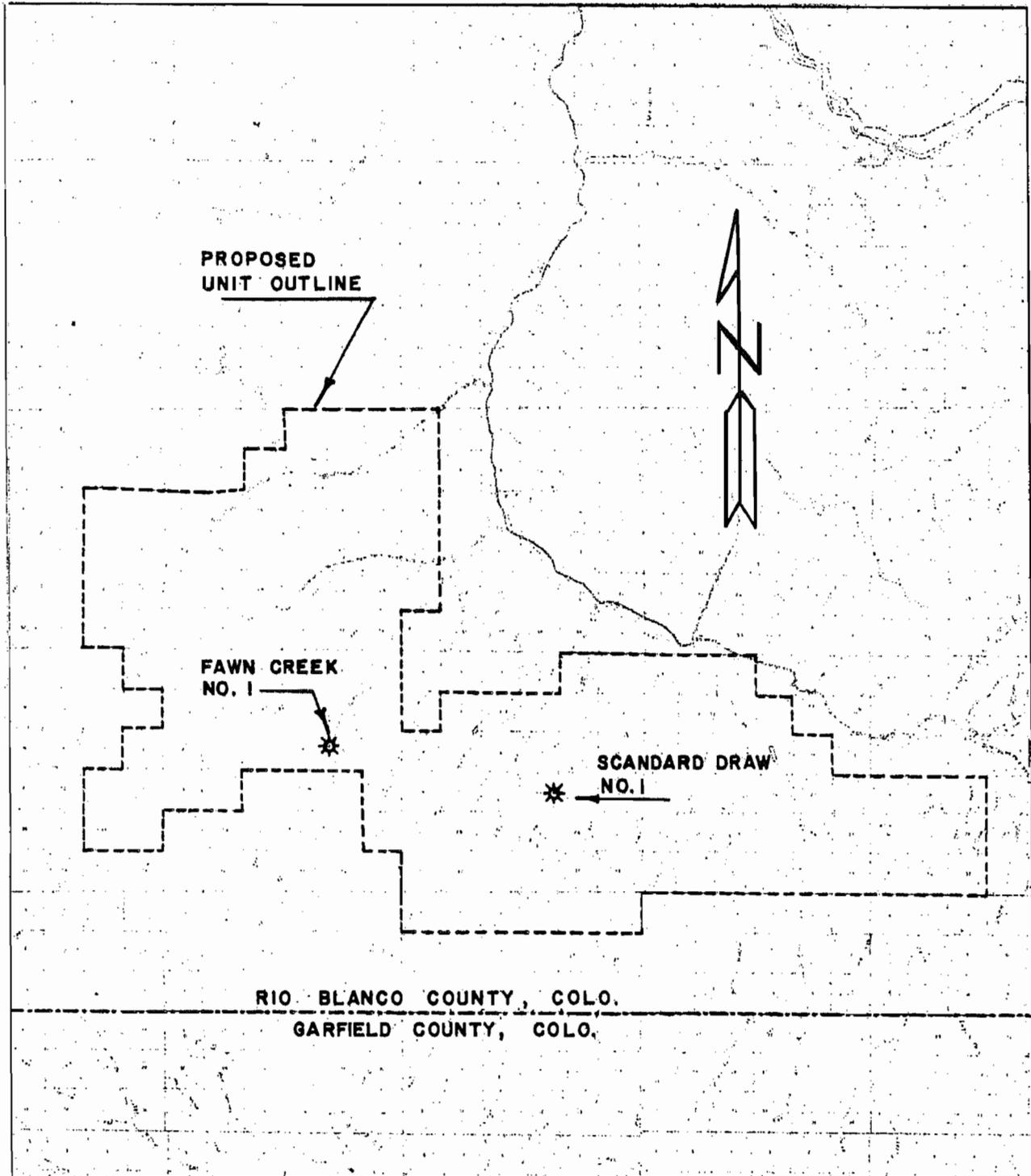
T 1 N

T 1 S

T 2 S

T 3 S

T 4 S



PROPOSED RIO BLANCO UNIT
RIO BLANCO COUNTY, COLORADO

Figure No. 3

2. Mesaverde I Formation

This interval averages about 1200 feet in thickness. Gross composite thicknesses of sandstone lenses average about 350 feet in the proposed unit area. Depth to the top of the interval varies between 4400 feet and 7400 feet.

Log analysis and core data from wells in the area indicate that a porosity value of 10.5% and water saturations of 60% are reasonably conservative values for the Mesaverde I pay sands. In general, core data indicated slightly higher values of porosity than was calculated from log data. (1)

3. Mesaverde II Formation

Although the Feasibility Study only covered the gas in place for the Fort Union and Mesaverde I, it should be mentioned that the deeper Mesaverde II Formation has considerable gas saturated sand and in future field development would probably be considered for stimulation. While detailed testing and recent log analysis have not been conducted on the deeper Mesaverde, the data from earlier completions, mud log data, and IES logs indicate that the deeper zones are gas saturated and the early production tests indicate good gas permeability. However, because of the greater depth, the longer total vertical section involved, and the additional expense due to the greater depth, inclusion of the Mesaverde II reserves at this time would be premature.

It is anticipated that when successful stimulation of the Fort Union and upper Mesaverde is proven technically feasible, that nuclear stimulation of the entire Fort Union-Mesaverde formations will prove attractive.

4. Net Gas Sand

An apparent discrepancy in the amount of net gas sand exists between that calculated from the old IES and Micrologs and the net sand determined from the more recent logging techniques.

This first became apparent during the Feasibility Study when the more modern* logs from Stuarco Sulphur Creek Number 1 computed a much higher ratio of net pay to gross SP ratio than other wells in the area where only the older IES logs were available. The net pay to gross SP ratio for the 34 wells in the study area average 22.9% while the Stuarco Well averaged 40.3%.

*Dual Induction Laterolog, Borehole Compensated Density Log, Borehole Compensated Sonic Log.

A Neutron Lifetime Log was run on the Fawn Creek Government Number 1 Well during the testing and recompletion work. The well was logged over the entire Fort Union and the top 350 feet of the Mesaverde I. A bridge plug at 6430 prevented deeper logging. Table I shows the reservoir parameters and also the gas in place calculated from the more recent logs run on the Fawn Creek Well. A significant increase in net pay can be seen in both the Fort Union and Mesaverde I intervals. The amount calculated during the earlier feasibility study was 54 BSCF/Section compared to nearly 90 BSCF/Section using the later logging techniques. This suggests that there is considerably more gas in place in the unit than was indicated in the feasibility study using the older IES/Microlog analysis.

B. RIO BLANCO OUTCROP INVESTIGATION

The Fort Union-Mesaverde section that will be stimulated in Project Rio Blanco is a fluvial facies. The reservoir rock consists of a complex of channel fill and point bar sandstone lenses. There appears to be a weak preferential orientation of long axes of sand bodies in a northeasterly/southwesterly direction. The average geometric ratios of the channel fill sands are: length/width/thickness, 140/14/1, and the point bar ratios are: length/width/thickness, 190/80/1.

The channel fill sandstones probably have widths in the order of 350 feet and lengths that generally would be more than 1000 feet. The point bar type sandstones would be expected to have lengths in the order of 3000+ feet and widths in the order of 1200 feet. It is significant that more than 25% of the sand lenses, with a thickness of 10 feet or more, had lengths greater than 1000 feet. This augurs for some optimism on average drainage radius for nuclear stimulation in this area.

The above generalizations are the results of a study of the Fort Union and Mesaverde sandstones in outcrops along the Douglas Creek Arch and the Grand Hogback. The complete outcrop study is given in Appendix I of this report.

C. SEISMIC SURVEY REPORT

Because there was some question of possible faulting across the southern portion of Section 14 from earlier seismic surveys, another more detailed seismic survey in the Fawn Creek area was run by Seismic Service Company for CER during the fall of 1970. The improved data recording and data processing now available indicate that this area is clear of faulting. The seismic maps and report by SSC can be found in Appendix II.

TABLE I

FAWN CREEK GOVERNMENT NUMBER 1
SUMMARY OF RESERVOIR PARAMETERS

	<u>Fort Union</u>	<u>Mesaverde I</u>
Depth (KB)	5260' - 6080'	6080' - 7252'
Gross Interval	820 feet	1172 feet
Net Pay	208 feet*	170 feet**
Porosity	12.2 %	11.5 %
Water Saturation	52.6 %	53.2 %
Average Pressure	2400 psia	2750 psia
Z	.93	.90
Formation Temperature	190°F	210°F
B _g	140 scf/ft ³	161 scf/ft ³
Gas in place/Section	47.0 BSCF/Section	41.1 BSCF/Section
Total Gas in place, Fort Union and Mesaverde I*** - 88.1 BSCF/Section		

*From Gamma Ray-Neutron and Neutron Lifetime Log analysis.

**Neutron Lifetime Log only run to 6400 feet - remaining interval estimated from IES Log.

***The Neutron Lifetime Log was run from 5200 feet to 6400 feet. Total pay in the logged interval is 304 feet, which is equivalent to 70.2 BSCF/Section.

D. WELL TESTING

Following the recommendations made in the Project Rio Blanco Feasibility Study, two wells in Equity's Piceance Creek properties were selected, recompleted and tested to determine certain reservoir parameters in the prospective area. The two wells selected were Fawn Creek Government Number 1 (Section 14, Township 3 South, Range 98 West) and Scandard Draw Number 1 (Section 22, Township 3 South, Range 97 West) Rio Blanco County, Colorado. The selected wells are shown on Figure 3.

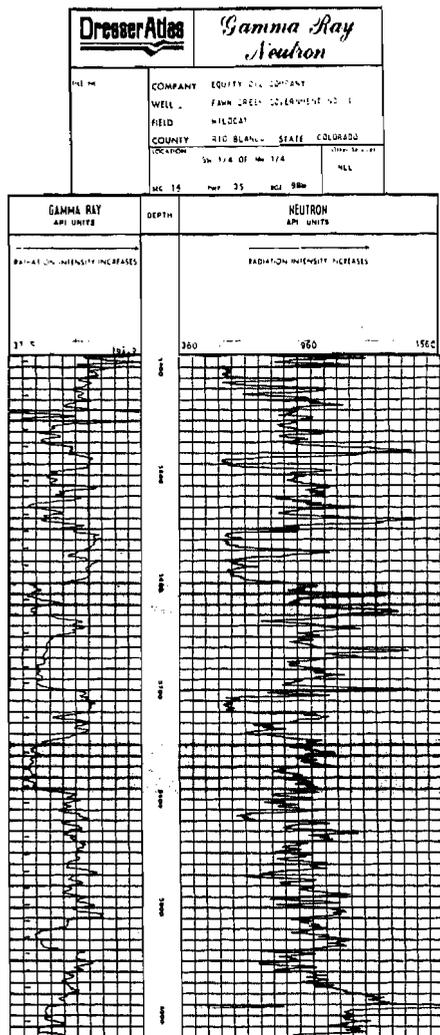
The primary purpose of the testing was to determine the permeability to gas in the Fort Union and upper Mesaverde sand zones. The secondary purposes of the testing were to determine if mobile water was present in the high water saturated zones as calculated from the logs and also to determine reservoir pressures in this area of the basin.

The technique used for the recompleting and testing of the wells was to kill the wells with 2% KCl water, set a bridge plug above the top of the old perforated section, then run a cement bond log and Gamma Ray-Neutron Log over the interval of interest in the selected wells. The Gamma Ray-Neutron Log of the intervals tested is shown in Figure 4.

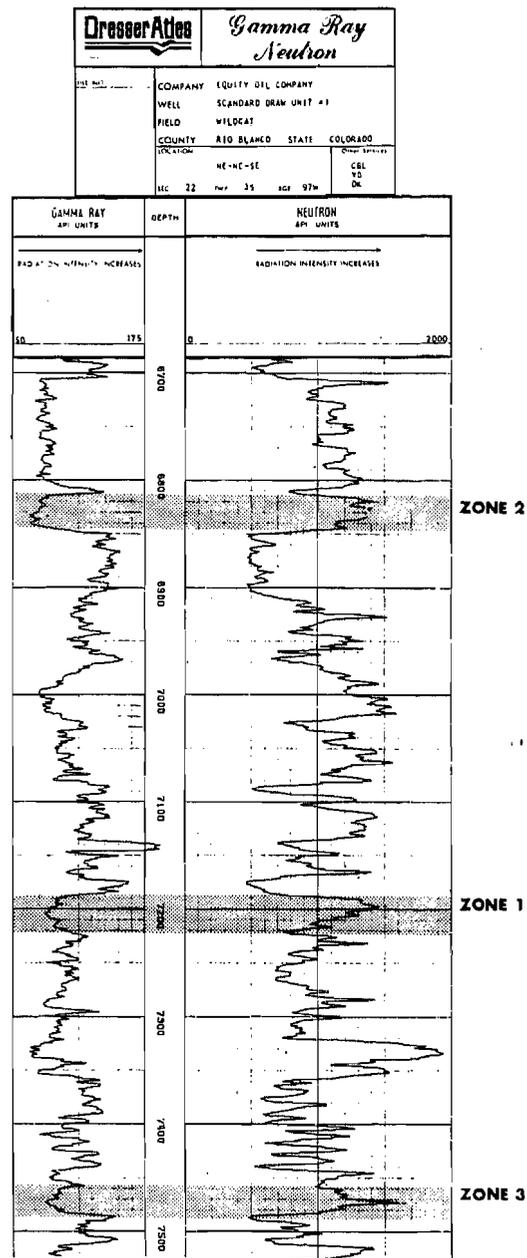
If the cement bonding appeared satisfactory around the zone to be tested, the zone was perforated with 10 to 15 jet shots and a dual packer and dual tubing string run in the well. After setting the packer, a small volume sand fracture treatment was performed on the zone. The complete recompletion data for each zone is given in Appendix III.

The dual string completion technique was used in order to insure that the gas zone could be tested without water production killing the well. A 3/4 inch to 5/8 inch tapered rod string and bottom hole pump was run in the 2-1/16 inch O.D. tubing. The 1-1/2 inch string was used for flowing the gas and also running a bottom hole surface recorder pressure gauge. Figures 5 and 6 are schematic drawings of the well test completion and the surface testing hookup. This technique was used for both wells.

Figures 7 through 10 are graphic chronological histories of the recompletion and testing conducted on the two wells. The test data from each well zone analysis is in Appendix III-C and III-D. The drawdown portion of the tests could not be analyzed because of the rapid fluctuations in pressure due to pumping the water off of the formation. However, the buildup portions of the tests were analyzed using several techniques^(2, 3, 4, 5, 6) with good agreement between the different methods of analysis. Because of the excellent agreement, only the pressure versus time method is usually presented. Table II summarizes the zones tested, the number of tests conducted on each zone, and the results of the testing.



FAWN CREEK #1



STANDARD DRAW #1

The shaded intervals are the zones tested. The depths on this small scale log are in error, the correct depths are given in the text.

TESTED INTERVALS - GAMMA RAY NEUTRON LOG SECTIONS

Figure No. 4

TYPICAL DOWNHOLE COMPLETION USED FOR TESTING

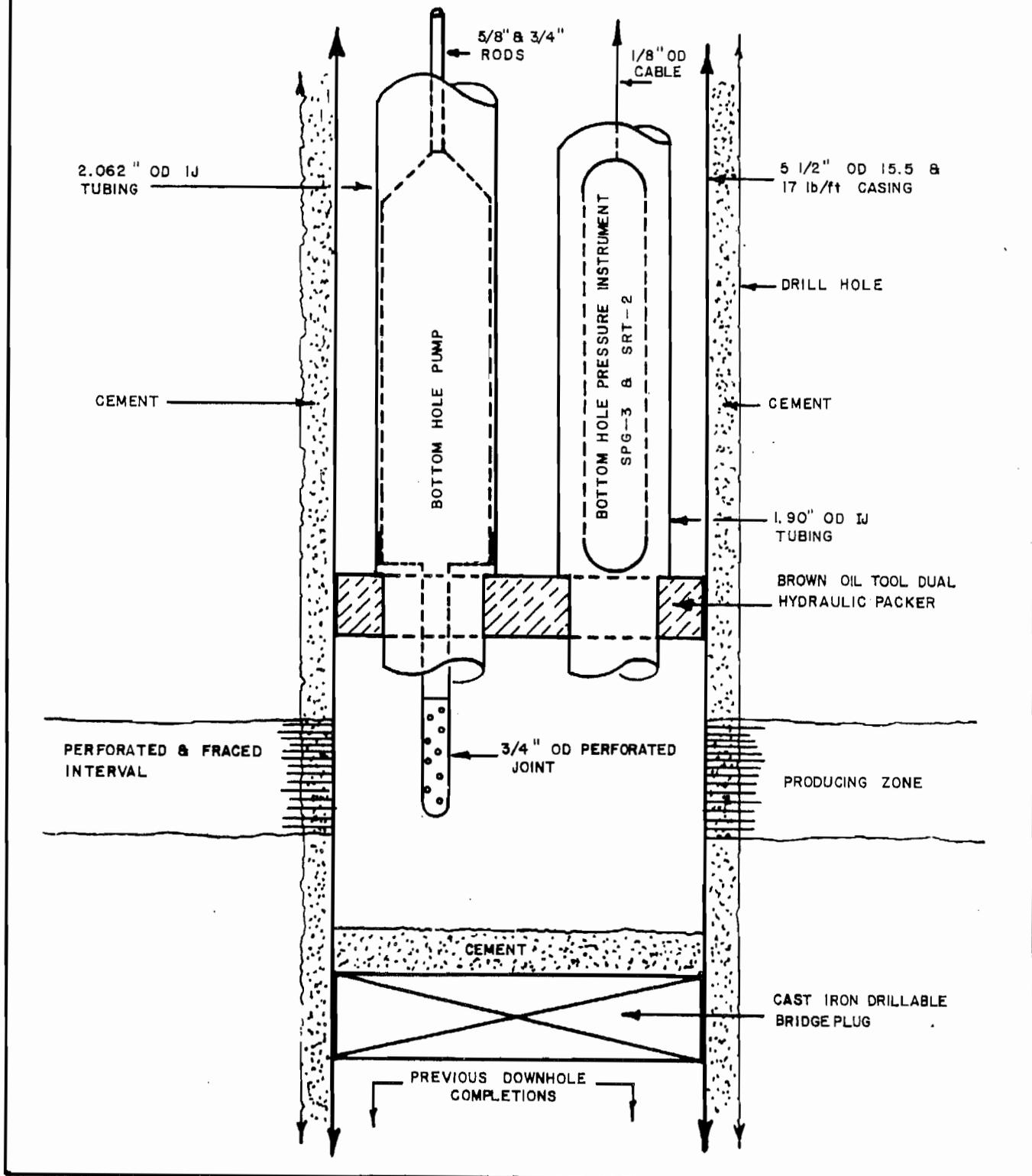
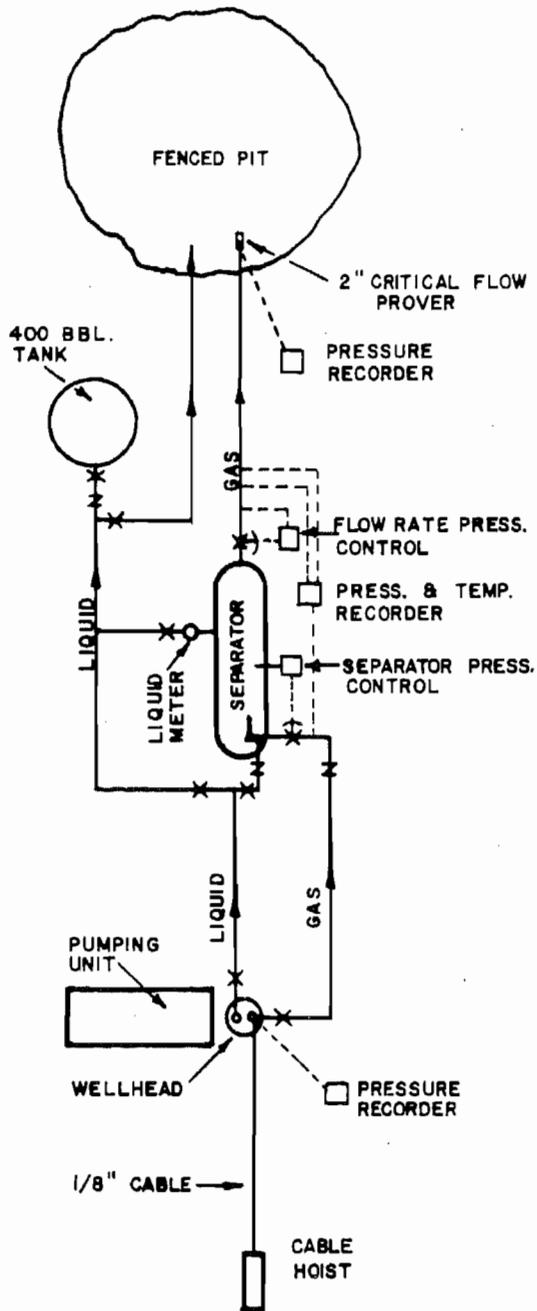


Figure No. 5

TYPICAL FLOW SYSTEM FOR TESTING



TYPICAL WELLHEAD USED FOR TESTING

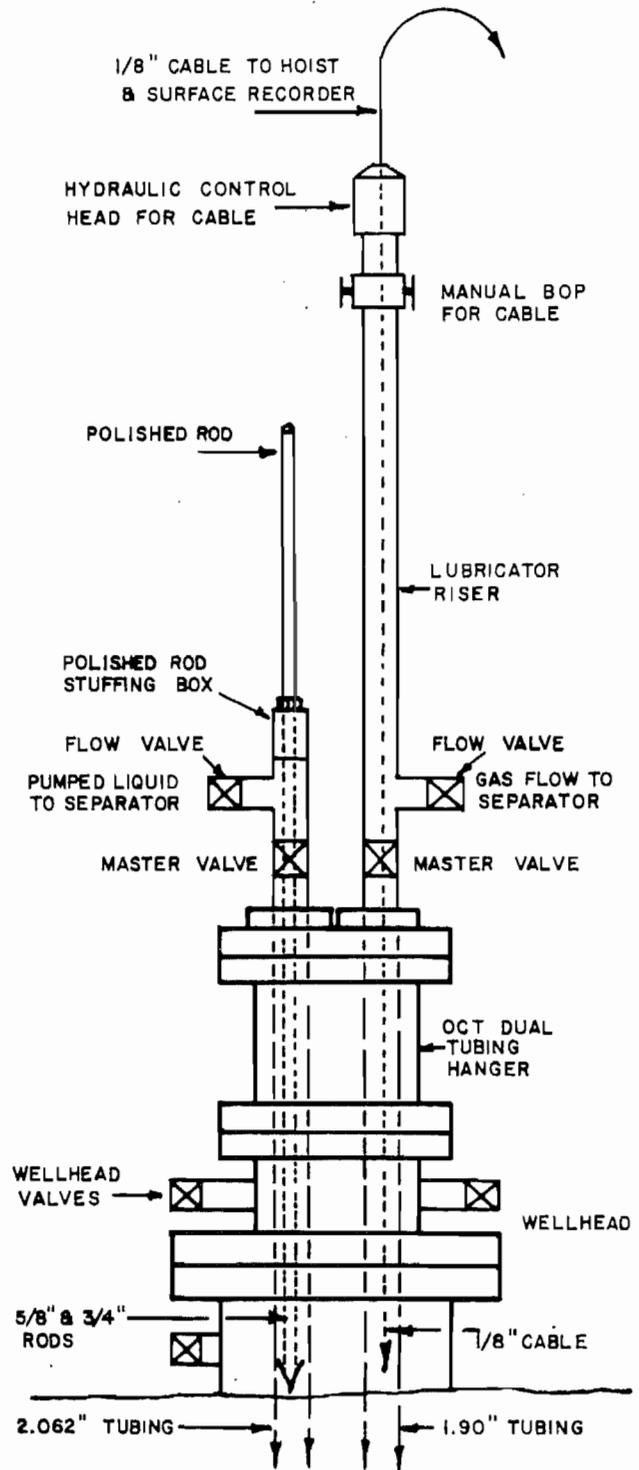
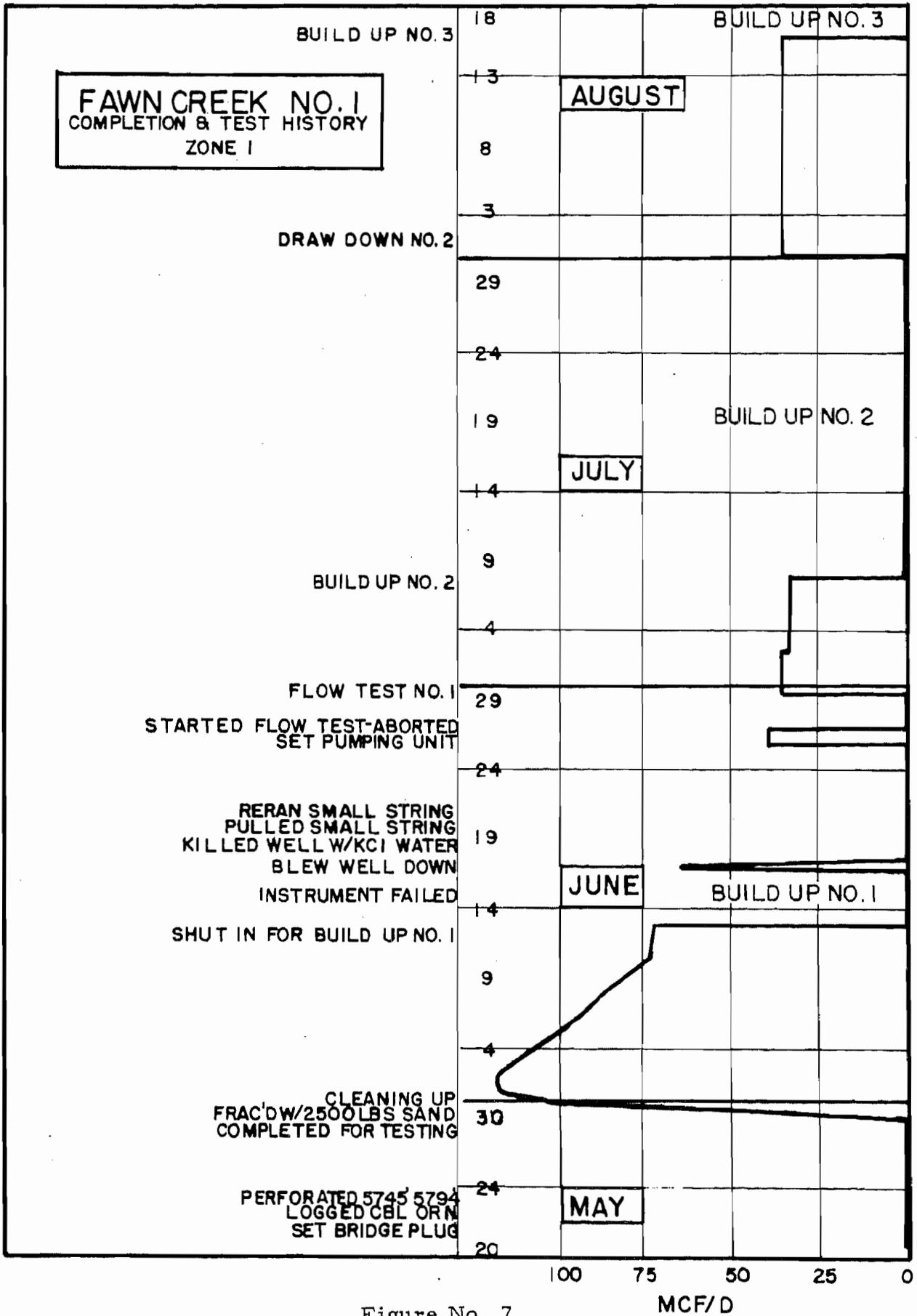


Figure No. 6



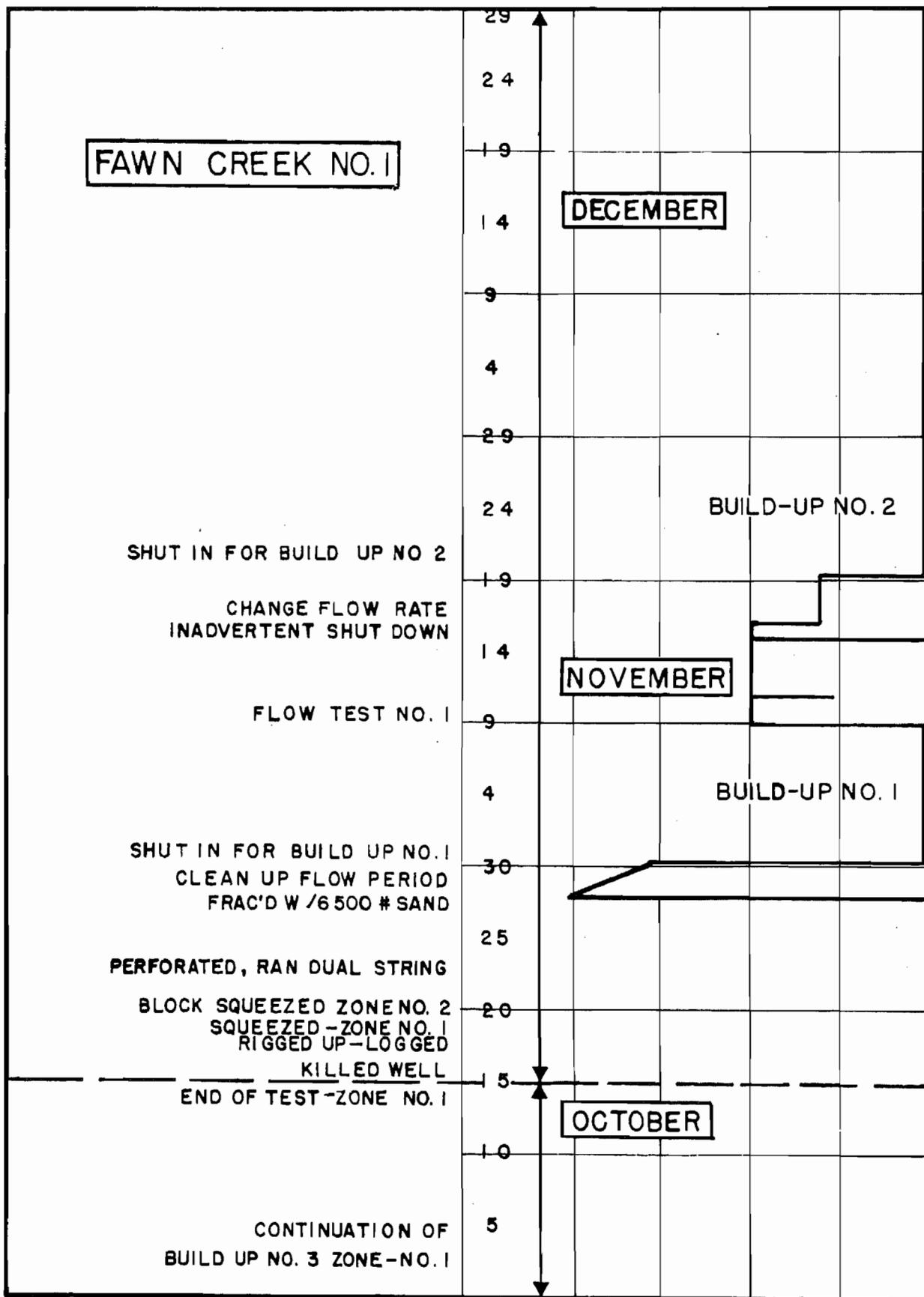


Figure No. 8

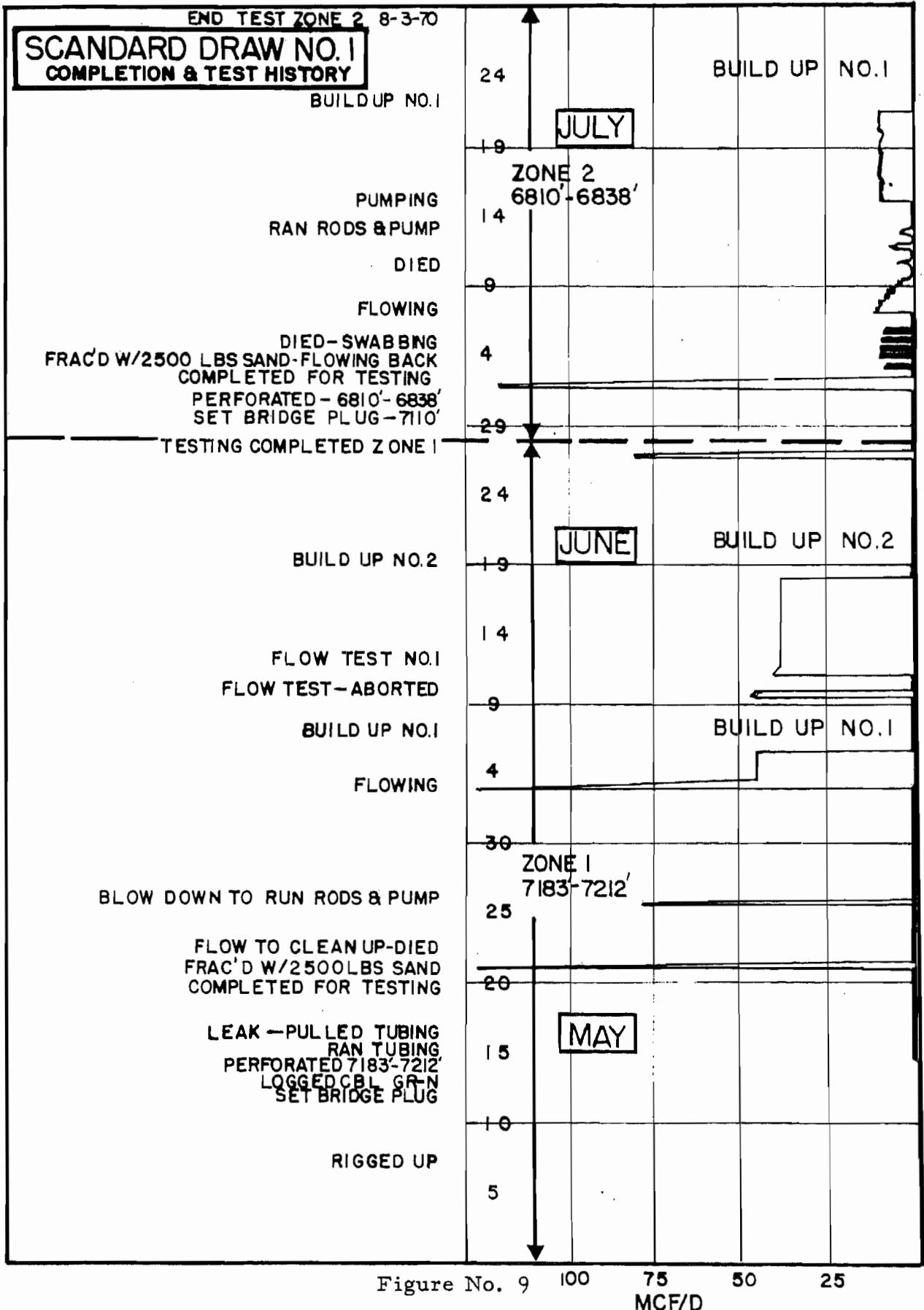
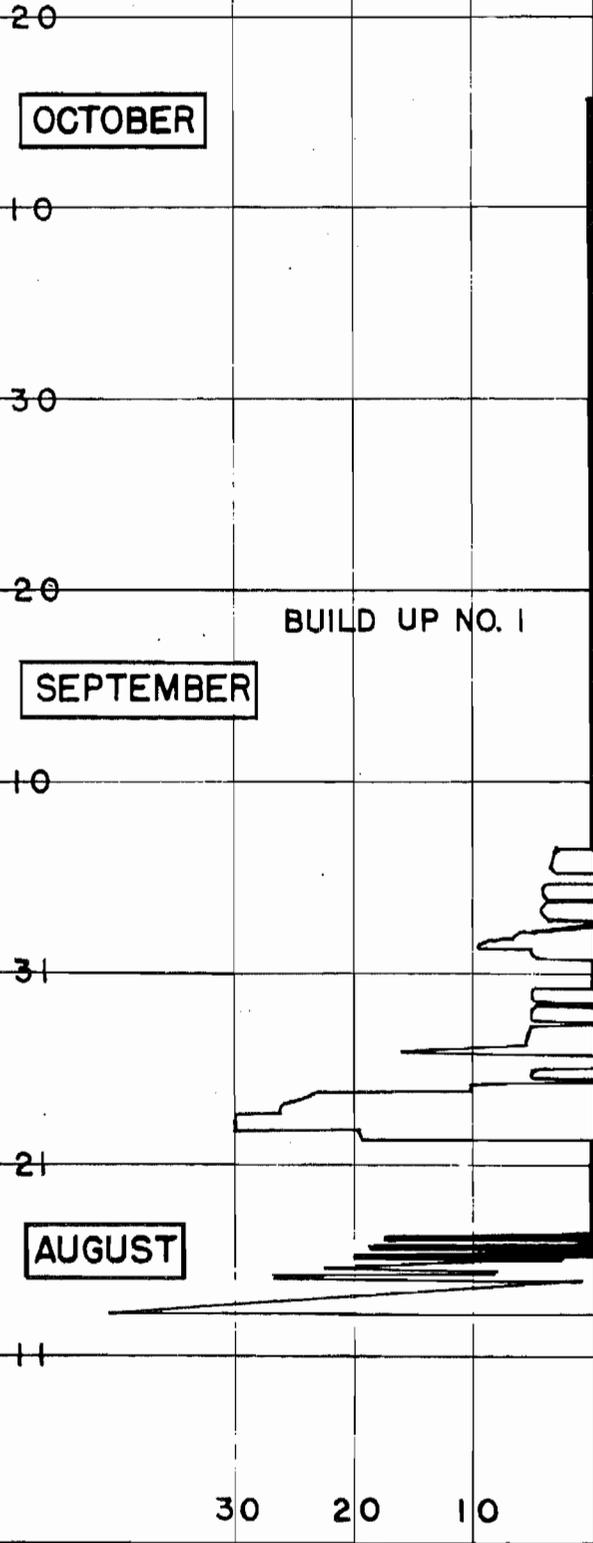


Figure No. 9 100 75 50 25
MCF/D

SCANDARD DRAW NO. 1

WELL SHUT IN
 ENSTALLED ORIGINAL EQUIPMENT
 KILLED WELL-PULLED TUBING
 END OF BUILD-UP TEST
 RIGGED UP TO KILL WELL



SHUT IN WELL FOR BUILD UP NO.1

PUMPING & FLOWING
 WELL DIED

PUMPING & FLOWING WELL
 RIGGING UP TO RUN PUMP & RODS
 WELL DIED
 WELL HEADING
 CLEAN UP FLOW PERIOD
 FRAC'D ZONE 3 W/6800# OF SAND
 RAN DUAL STRING

PERFORATED ZONE 3-7454'-76KB
 CLEANED OUT TO 7520' KB
 SQUEEZE CEMENTED--ZONE 2
 TRACER SURVEY
 END OF TEST--ZONE 2-KILLED WELL
 BUILD-UP NO.1 ZONE 2

30 20 10

Figure No. 10

MCF/D

TABLE II

SUMMARY OF TESTING RESULTS

Well and Zone	Perforated Interval	Gross Sand (ft)	Net Pay (ft)	Capacity kh (md ft)	Permeability k (md)	Formation Pressure P _i (psig)	Remarks
<u>Fawn Creek Government Number 1</u>							
Zone 1	5747' to 5792'						
Buildup No. 1		47	35	.84	.024		
Buildup No. 2		47	35	.64	.018		
Buildup No. 3		47	35	.69	.020	>2095	
Zone 2	5600' to 5630'						
Buildup No. 1		34	20	1.19	.059		
Buildup No. 2		34	20	.94	.047	>2150	
<u>Standard Draw Number 1</u>							
Zone 1	7183' to 7210'						
Buildup No. 1		31	15	.24	.016	2986	
Buildup No. 2		31	15	.24	.016	2990	
Zone 2	6810' to 6838'						
Buildup No. 1		28	16	.054	.003	2490	Questionable Test
Zone 3	7454' to 7476'						
Buildup No. 1		23	1	.008	.008	>2470	Extremely Tight

IV. DISCUSSION OF TESTING RESULTS

A. FAWN CREEK GOVERNMENT NUMBER 1 - ZONE 1, 5745 to 5792

1. Buildup Number 1

The initial buildup was conducted after cleanup of the frac job. The well was flowed for thirteen days prior to shut-in for buildup. A Ball Brothers Slim Sentry was run in the 1-1/2 inch tubing prior to shutting in the well. The instrument lodged in the tubing at 5715 feet and could not be retrieved.

A short buildup of approximately 90 hours was obtained before the instrument failed. Figure 11 is a Horner plot of the data obtained from the test. The straight line portion from 30 hours to 90 hours was used to calculate formation permeability. The portion of the slope prior to 30 hours was masked by after-flow and consequently not used in the evaluation. A flow capacity of .84 md feet was calculated as follows:

$$kh = \frac{162.6 \mu q B}{m}$$

where: μ = Viscosity (cp) from Table III-C-1, Appendix III-C
B = Gas volume factor (Bbls/MSCF)
q = Stabilized flow rate at shut in (MCF/D)
m = Slope from Horner plot (psi/cycle) - Figure 11

$$kh = \frac{162.6 \times .0156 \times 73 \times 2.13}{470} = .84 \text{ md ft}$$

The permeability to gas calculated from the net effective pay determined from the logs in the perforated interval is:

$$k = \frac{.84 \text{ md ft}}{35 \text{ ft}} = .024 \text{ md}$$

The preliminary reports assumed all of the perforated interval to be pay and consequently a conservative value of $k = .018 \text{ md}$ was shown.

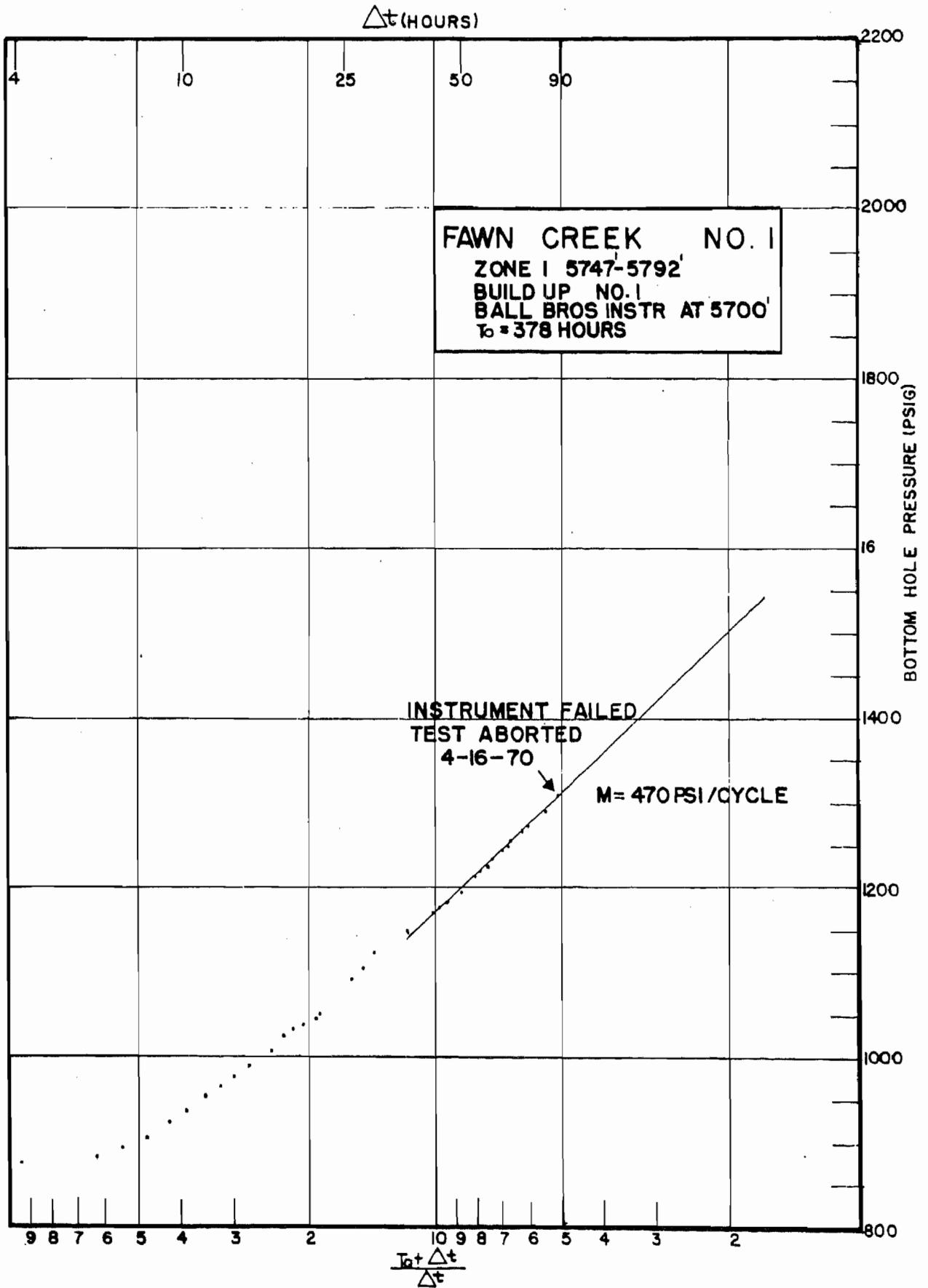


Figure No. 11

2. Buildup Number 2

In order to retrieve the Ball Brothers instrument, the well was killed with 2% KCl water and the tubing pulled. After retrieving the instrument the well was flowed from June 30 to July 8, 1970 and then shut in for buildup number 2.

Buildup number 2 was conducted from July 8 to August 1, 1970. Failure of the Amerada SPG-3 downhole instrument and leaks in the wire-line control head caused several fluctuations in the buildup data. Figure 12 is a Horner plot of the data from which the calculated permeability is:

$$kh = \frac{162.6 \mu q B}{m} = \frac{162.6 \times .0156 \times 36 \times 2.13}{304} = .64 \text{ md ft}$$

$$k = \frac{.64 \text{ md ft}}{35 \text{ ft}} = .018 \text{ md}$$

It was interesting to note on this buildup that the later data points showed an increasing slope with time. There are several explanations for this type behavior, if in fact, what is being seen is a phenomenon of the formation and not just instrument and leakage problems. The edge of the sand lense, decreasing formation permeability with distance, or faulting, all would cause the upward bending of the buildup curve.

3. Buildup Number 3

In order to confirm the curvature at late buildup times, a third buildup test was run with the following results: (Figure 13)

$$kh = \frac{162.6 \mu q B}{m} = \frac{162.6 \times .0156 \times 35.5 \times 2.13}{280} = .69 \text{ md ft}$$

$$k = \frac{.69 \text{ md ft}}{35 \text{ ft}} = .020 \text{ md}$$

This test was run for 1341 hours. At the conclusion of the test, the buildup was still curving upwards as before, confirming a boundary or boundaries near the well bore.

Because the curve was still increasing, the initial pressure from extrapolation could not be confirmed, one can only say that the formation pressure in this zone was at least as great as 2095 psig. (Figure 13).

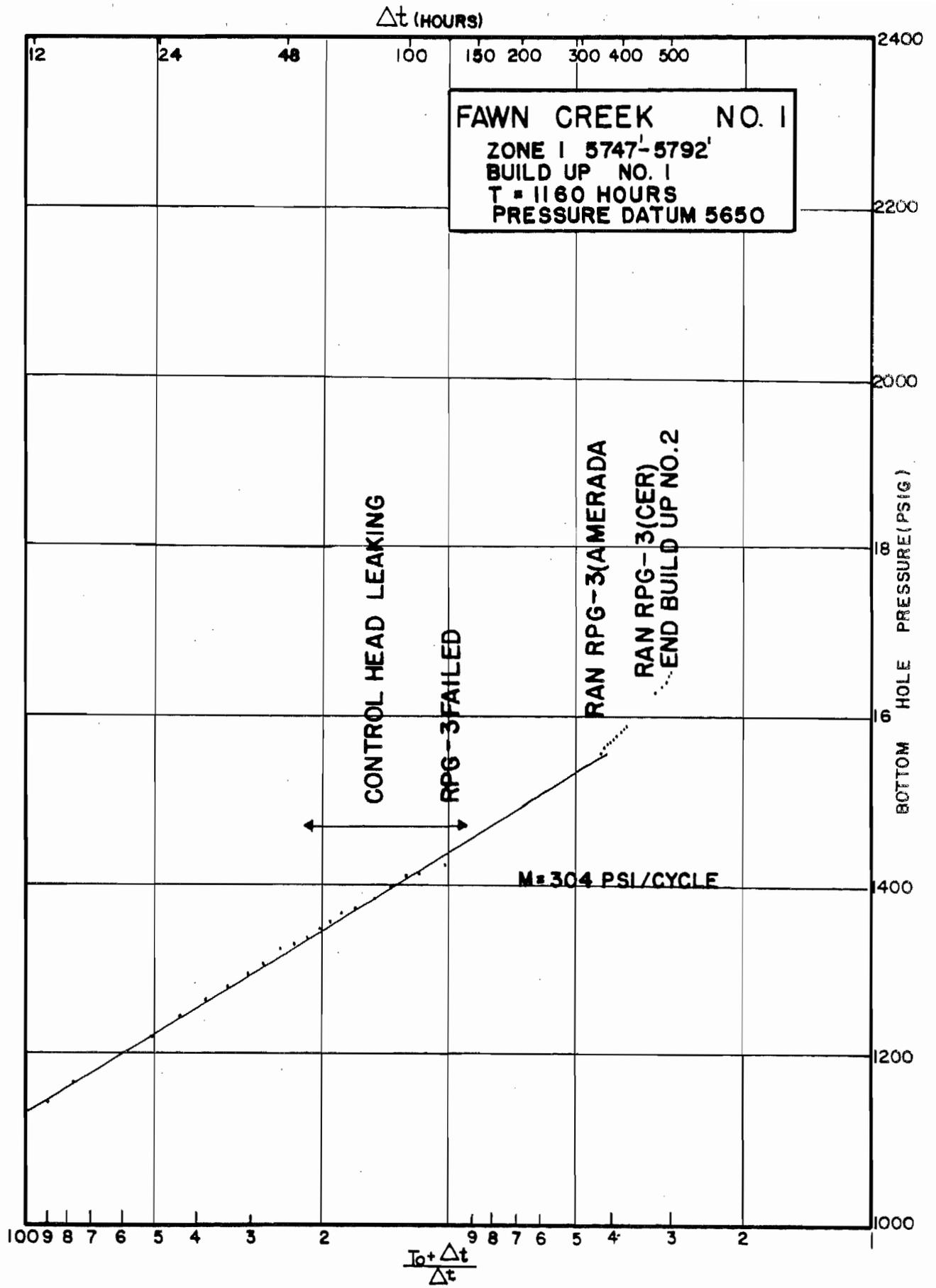


Figure No. 12

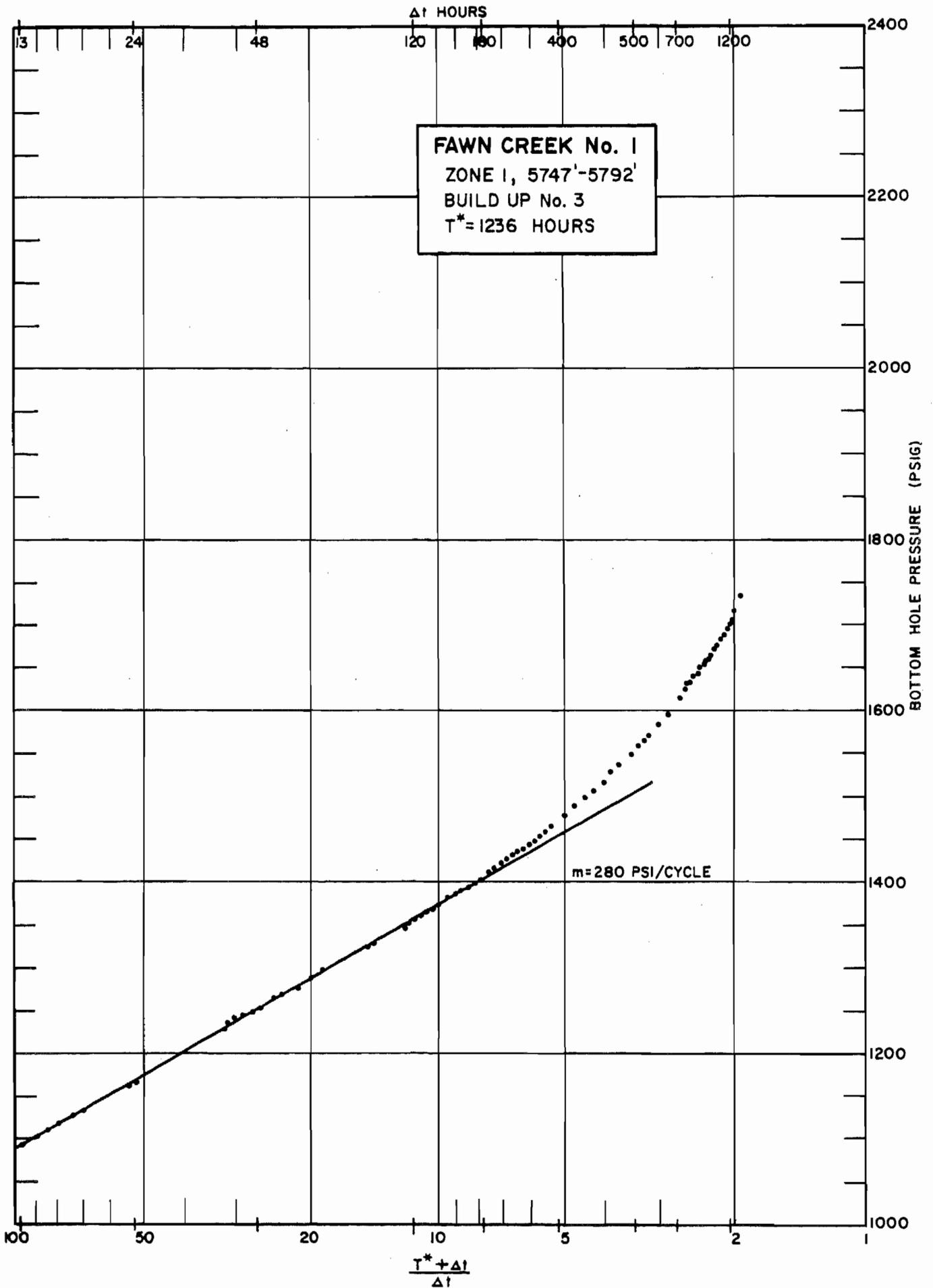


Figure No. 13

At the conclusion of this buildup, the well was killed with 2% KCl water and zone 1 squeezed with cement. The cement bond log indicated poor bonding in the region of zone 2, consequently the zone was isolated by cement squeezing prior to recompleting for testing.

B. FAWN CREEK GOVERNMENT NUMBER 1 - ZONE 2, 5598 to 5632

1. Buildup Number 1

In order to achieve an early buildup, the well was flowed for two days to clean up after the small sand frac and then shut in for buildup number 1.

From Figure 14, a slope of $m = 1030$ psi/cycle is calculated:

$$kh = \frac{162.6 \mu q B}{m} = \frac{162.6 \times .0168 \times 307 \times 1.47}{1030} = 1.19 \text{ md ft}$$

From the logs it was determined that only 20 feet of the 34 foot total interval can be considered as pay. The gas permeability then is:

$$k = \frac{1.19 \text{ md ft}}{20 \text{ ft}} = .059 \text{ md}$$

Although it is academic for nuclear stimulation, the curve was evaluated at early time for an estimate of the effectiveness of the small volume fracture treatment.

$$\text{Skin } S = 1.151 \left[\frac{P_1 H_r - P_f}{m} - \text{Log} \left(\frac{k}{\phi \mu_c r_w^2} \right) + 3.23 \right] =$$

$$1.151 \left[\frac{335-435}{1030} - \text{Log} \frac{.059}{.10 \times .0168 \times 5.13 \times 10^4 \times .3^2} + 3.23 \right] = -3.16$$

The skin value of -3.16 indicates that the small volume fracture treatment was effective in removing a damage near the well bore.

Following the short initial buildup, the well was flowed for 10 days to condition the well for the final buildup.

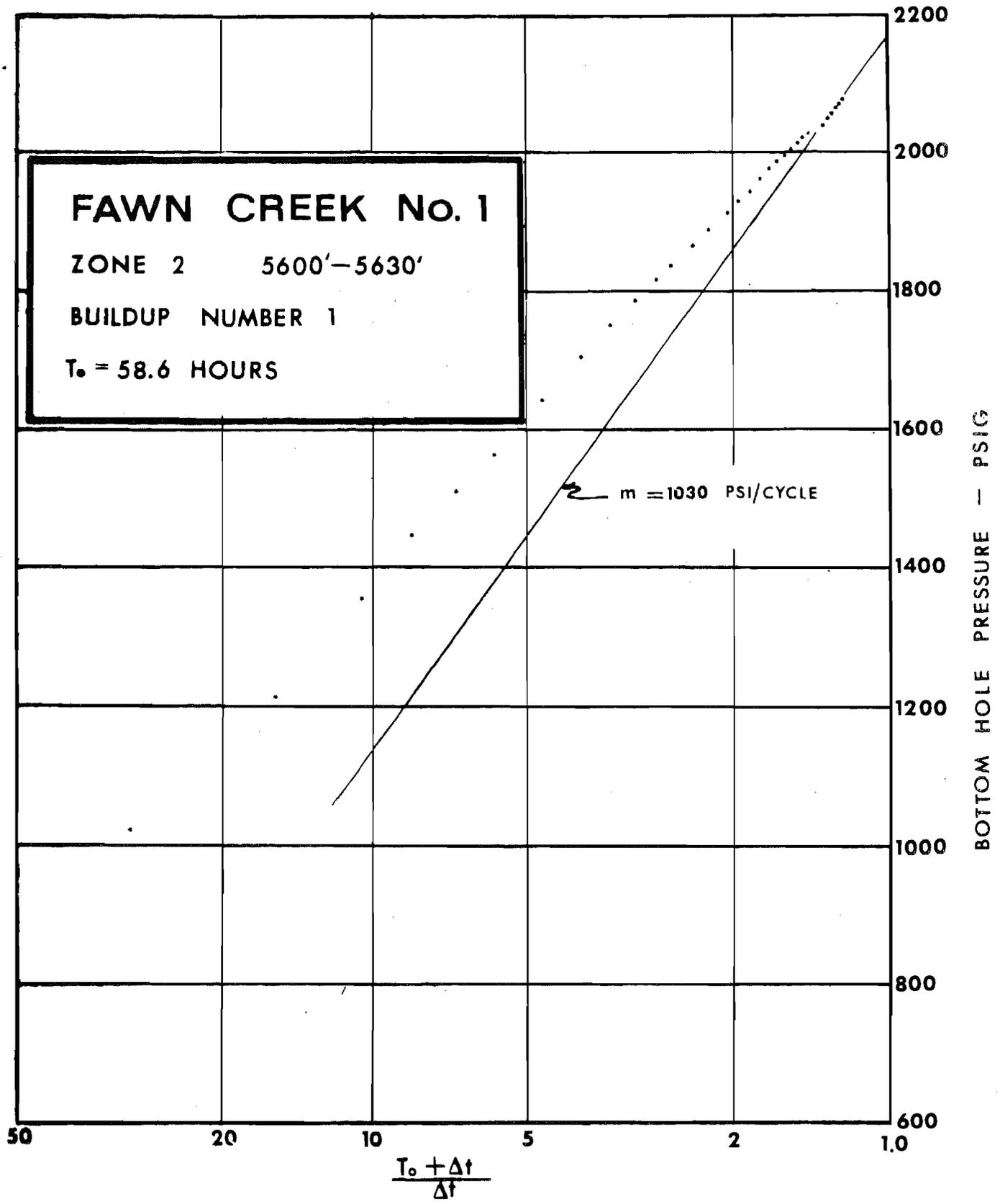


Figure No. 14

2. Buildup Number 2

This buildup is shown as a conventional Horner plot in Figure 15 and also as a p^2 plot in Figure 16. The upward curvature of the buildup is seen in both of these plots. The same analysis can be applied here as was applied to the zone 1 buildup. The curvature can be a result of decreasing permeability with distance from the well bore; however, it seems more likely because of the lenticularity of the sand zones that we are seeing the edge of a lense. A simple fault would not show a continually increasing slope with time but would straighten out with a slope of twice the original. In addition, the seismic reflection survey* run in the area of Fawn Creek by SSC does not indicate any faulting in the vicinity of the well.

From Figure 15 --

$$kh = \frac{162.6 \mu q B}{m} = \frac{162.6 \times .0164 \times 121.9 \times 1.64}{550} = .940 \text{ md ft}$$

$$k = \frac{.940 \text{ md ft}}{20 \text{ ft}} = .047 \text{ md}$$

Good agreement was noted on the test between the p and p^2 methods of analysis. The calculated permeability from the p^2 analysis is: (Figure 16)

$$kh = \frac{325.2 \mu q B P}{m} = \frac{325.2 \times .0164 \times 121.9 \times 1.64 \times 1800}{2.02 \times 10^6} = .950 \text{ md ft}$$

$$k = \frac{.950 \text{ md ft}}{20 \text{ ft}} = .0475 \text{ md}$$

Zone 2, buildup number 2 is still in progress. Data points are being taken every week to ten days. It is anticipated that the pressure will continue to build back to about 2400 psig (hydrostatic).

*The SSC Study is included in this report as Appendix II.

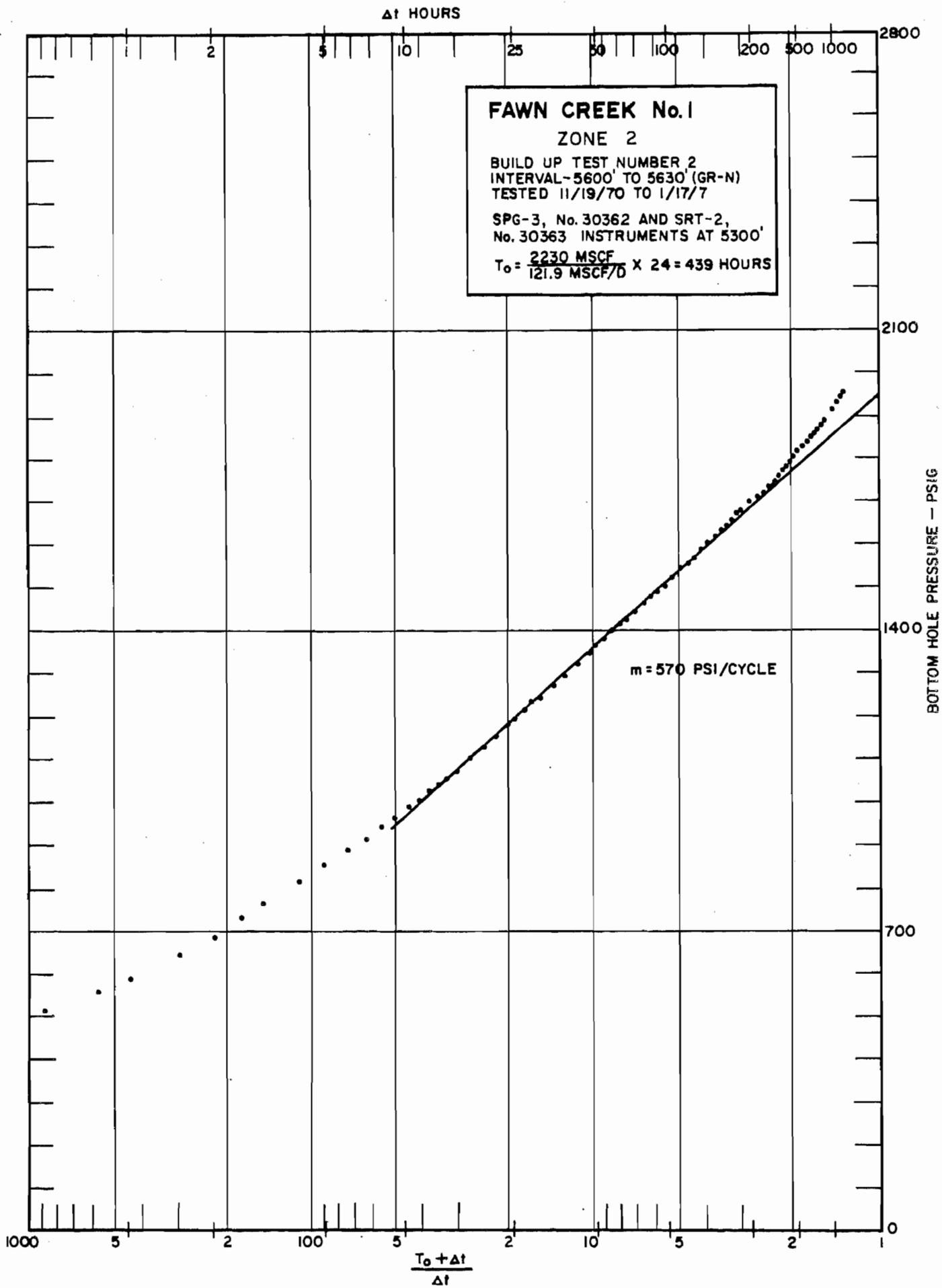


Figure No. 15

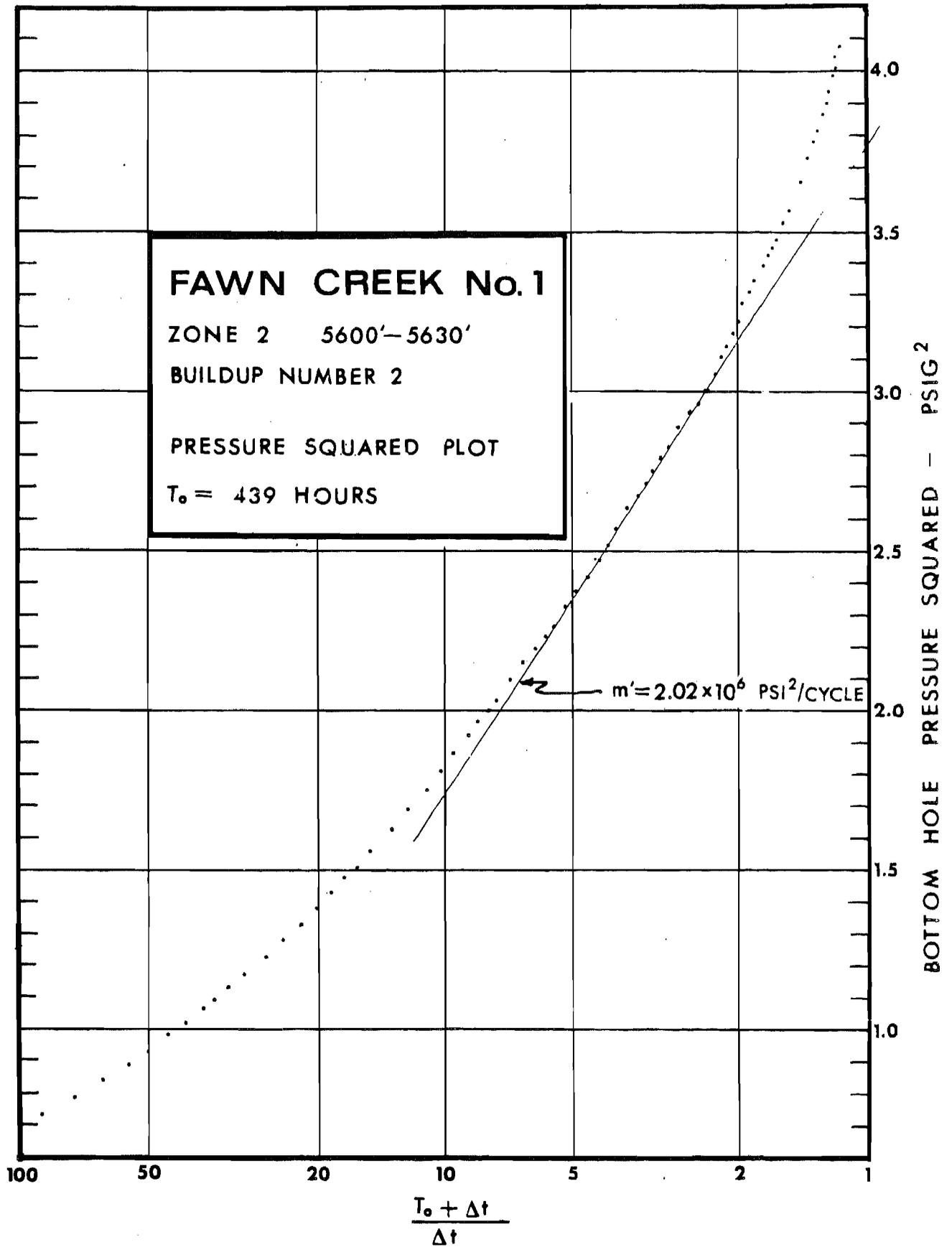


Figure No. 16

C. SCANDARD DRAW NUMBER 1 - ZONE 1, 7181 to 7212

In layered shaly formations such as the Wasatch, Fort Union, and Mesa-verde formations of the Piceance Basin, accurate log analysis is difficult. This is even more true when dealing with older wells, and consequently older logs. Unless a more recent up-to-date logging program is available, there is some question as to the exact amount of net pay and the water saturation in the sandy intervals.

Zone 1, the first interval tested, was selected in order to establish the formation permeability and also to determine if the calculated highly water saturated sands contained mobile water or connate water only.

An attempt was made to reevaluate zone 1 using the Gamma Ray-Neutron Log that was obtained during the recompletion for testing. While this technique is not commonly used, the method did indicate a lower water saturation than was calculated from the IES Log. However, the Gamma Ray-Neutron Log still indicated that slightly over 50% of the 31 foot interval still had a water saturation greater than 70%, compared to the earlier IES calculation that indicated about 90% of the zone had a water saturation in excess of 70%.

1. Buildup Number 1

The 31 foot interval was perforated, sand fractured, and then flowed to the pit to clean up prior to running the initial buildup.

While the entire section had high water saturations, there was about 15 feet that calculated less than 70% S_w and only 2 feet less than 50% S_w .

The initial buildup was run to determine capacity and initial pressure in the interval. Water production was measured during the first drawdown test. Figure 17 is the Horner plot of this initial buildup.

$$kh = \frac{162.6 \times \mu q B}{m} = \frac{162.6 \times .0179 \times 38 \times 1.27}{590} = .24 \text{ md ft}$$

$$\text{for } h = 15 \text{ ft} \quad k = \frac{.24 \text{ md ft}}{15 \text{ ft}} = .016 \text{ md}$$

The reservoir pressure from extrapolation of the buildup curve was 2986 psig.

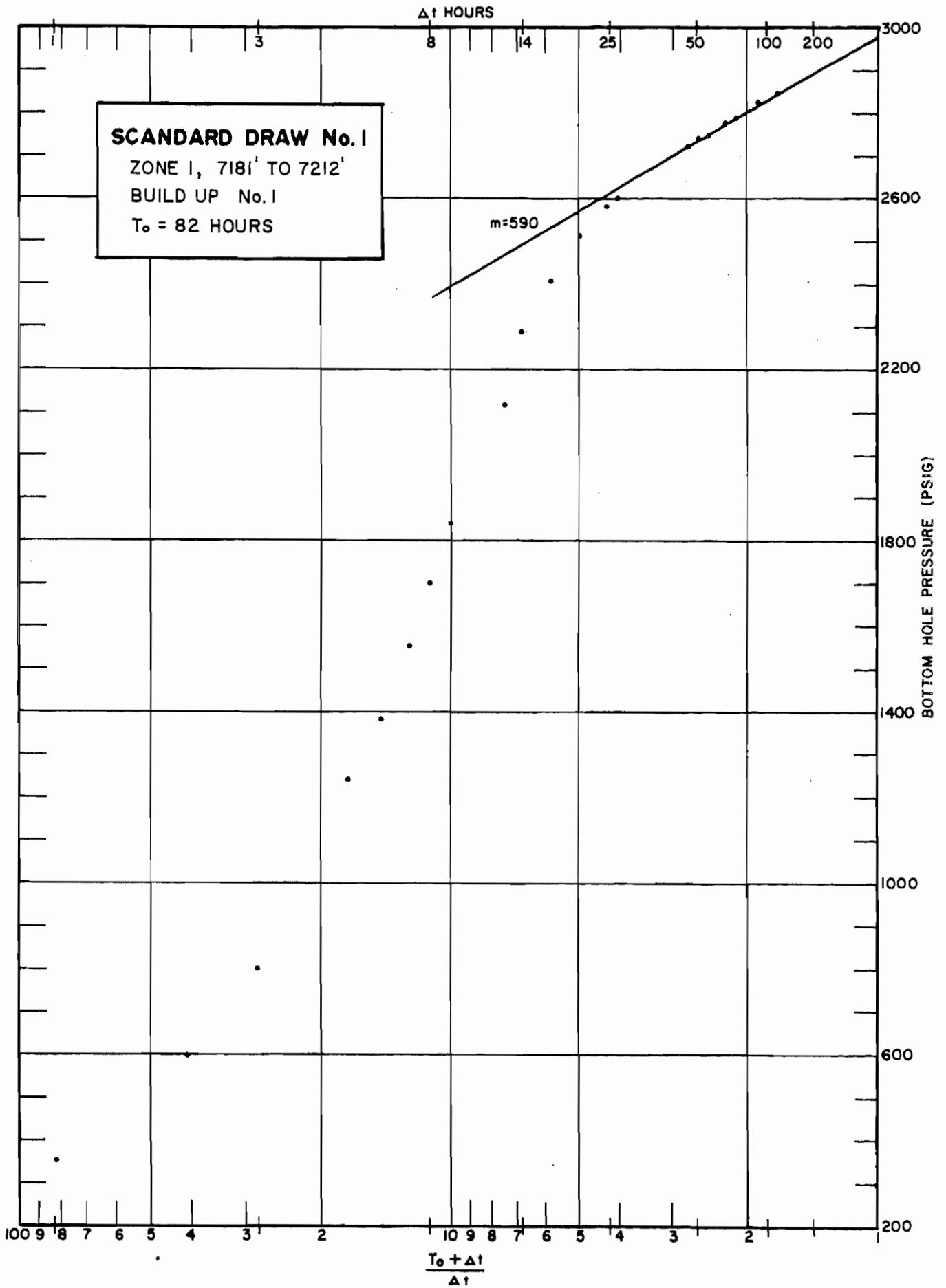


Figure No. 17

2. Drawdown Number 1

In order to determine if the zone was water productive, the water produced during the drawdown test was carefully measured by both a meter on the separator and also by actual tank gauging. Figure 18 is the water produced during the drawdown test. The water production rate had dropped off to less than two barrels of water per day and was still declining with about 100 barrels of frac load water still remaining to be recovered.

Samples of the frac water were obtained and sent in for chemical analysis along with samples of produced water during the production tests. The analyses are included in Appendix III-E but are not felt to be conclusive because of the effects of dilution with the formation connate water, and also because of the ion exchange phenomenon with the formation shales and clays.

Until a better suite of logs are obtained in the Scandard Draw area, the real values of water saturation can only be estimated with the realization that more data will be required.

It is concluded from this test that even though the zone contains sands with high water saturation, the water appears to be primarily connate and should therefore not create production problems when producing the gas.

3. Buildup Number 2

After the seven-day drawdown test, the well was shut in for 172 hours buildup. Excellent agreement was found between buildup number 1 and number 2. Figure 19 is the Horner plot of buildup number 2.

$$kh = \frac{162.6 \times .0179 \times 33.4 \times 1.27}{505} = .244 \text{ md ft}$$

$$k = \frac{.244 \text{ md ft}}{15 \text{ ft}} = .016 \text{ md}$$

The reservoir pressure from extrapolation of the buildup is 2990 psig. Because of the excellent agreement from the two buildup tests, the well was then recompleted to Zone 2.

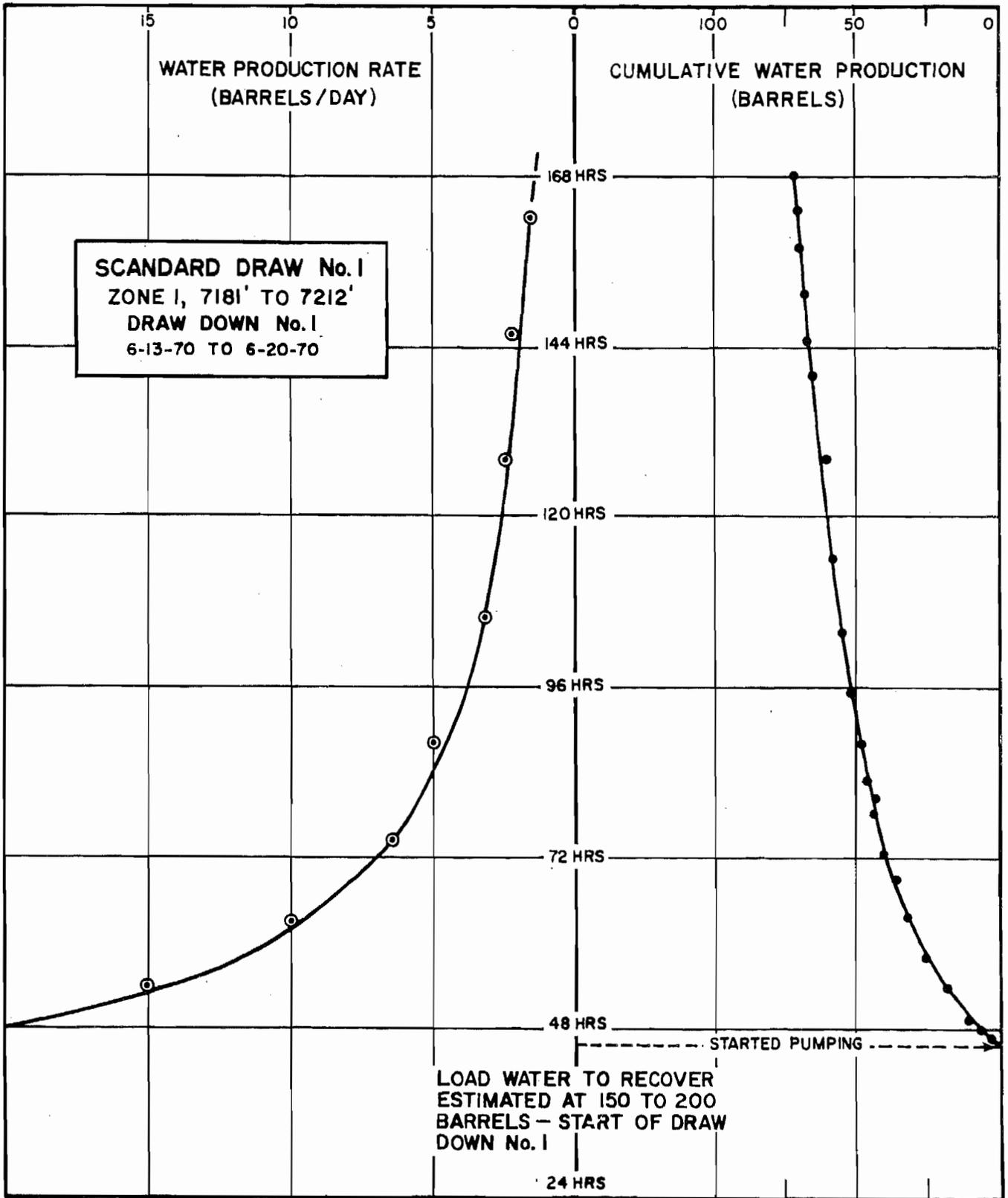


Figure No. 18

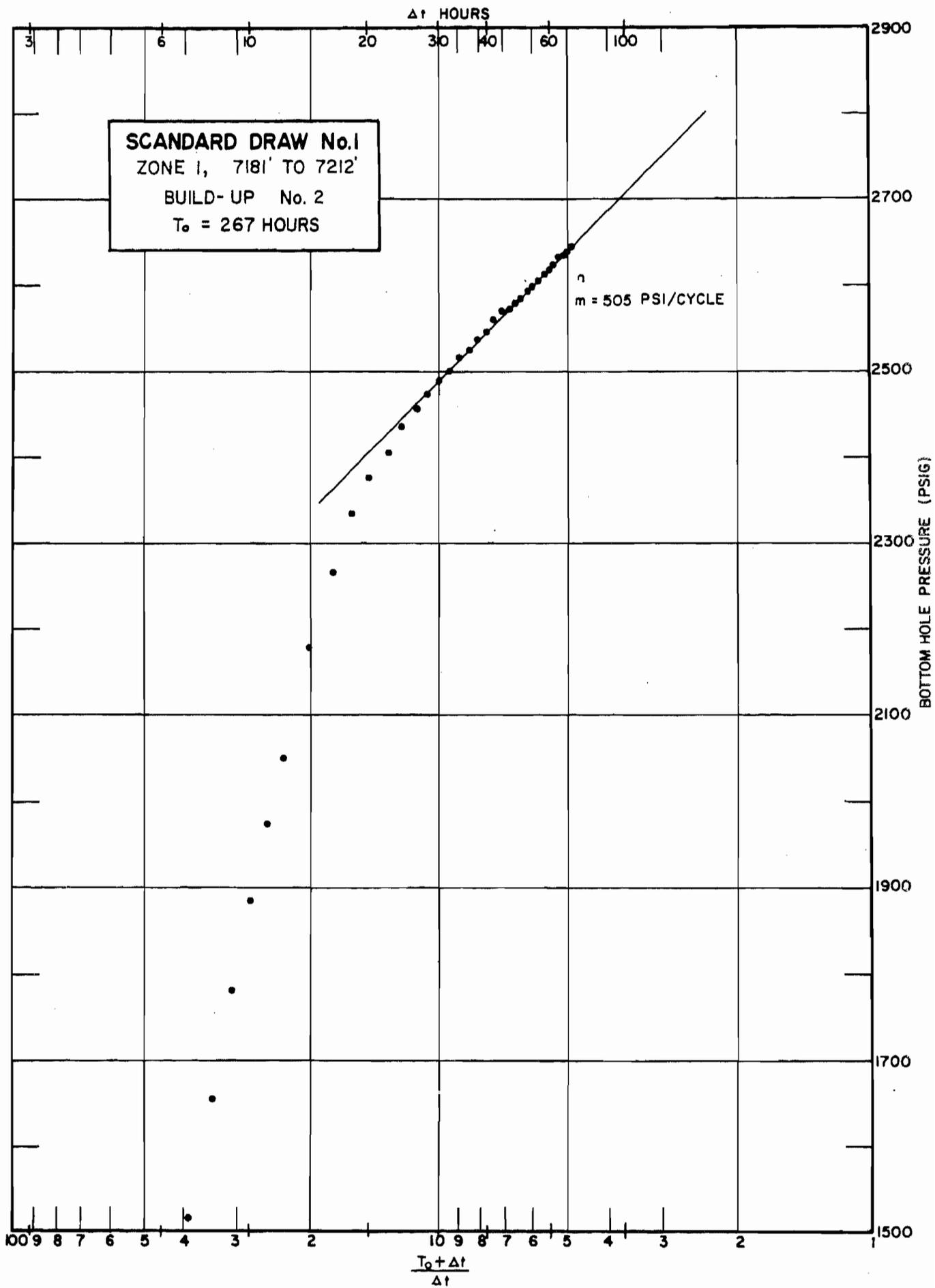


Figure No. 19

D. SCANDARD DRAW NUMBER 1 - ZONE 2, 6810 to 6838

1. Buildup Number 1

The test results from zone 2 were disappointing. The zone appears to have a good pay section based on the logs; however, the test results indicate that the zone may not have been properly completed for testing. The zone was perforated, given a small volume fracture treatment and then opened up to flow to the pit. The well died and was swabbed for several days without success. A bottom hole pump was run and the well pumped and flowed in order to condition the well for buildup number 1. Sixteen feet of pay were calculated from log data in the perforated interval. However, test results indicate that the capacity (kh) is extremely low. (Figure 20)

$$kh = \frac{162.2 \times .0166 \times 10 \times 1.63}{820} = .054 \text{ md ft}$$

$$\text{if } h = 16 \text{ ft then } k = .003 \text{ md}$$

Comparing this permeability with the core analysis obtained while drilling, this section appears to confirm the fact that the frac treatment may have channelled behind the pipe. The average permeability of 11 core samples taken in this interval was .24 md. This is almost two orders of magnitude greater than that determined from the test data. Normally, core permeability is about one order of magnitude greater than that derived from in situ testing.

In addition, radioactive tracer was injected into the perforated zone and then logged with a Gamma Ray tool. While not conclusive, it did appear from the logs that the tracer was not going into the interval being tested.

For the above reasons it is felt that the test results for the zone from 6810 to 6838 are highly suspect and consequently the test is not considered a valid investigation of the zone in question.

E. SCANDARD DRAW NUMBER 1 - ZONE 3, 7454 to 7476

1. Buildup Number 1

Following the test in zone 2, the well was recompleted to the Mesa-verde and given a small volume frac treatment.

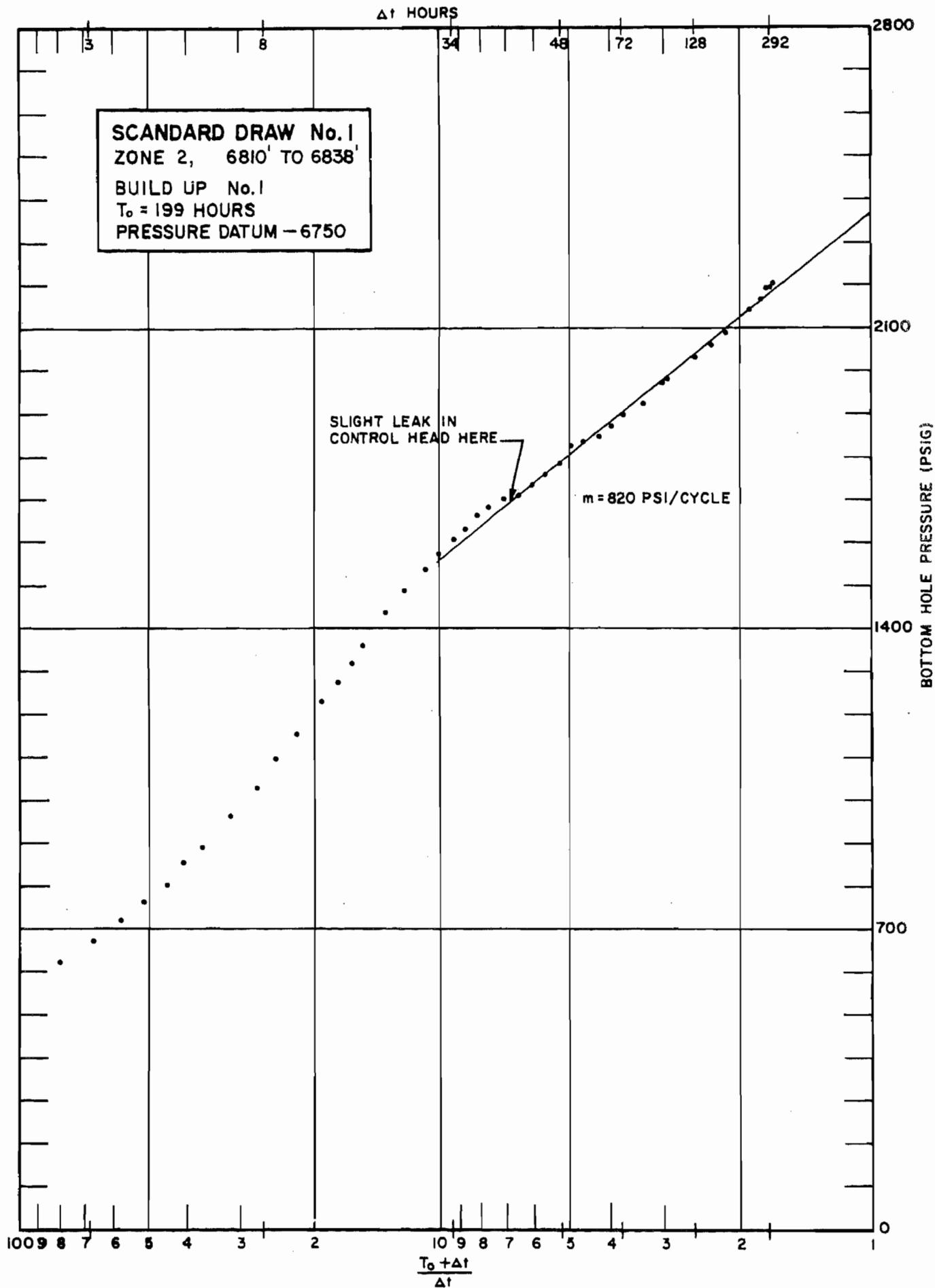


Figure No. 20

The zone was selected from an earlier IES Log analysis which indicated about ten foot of net pay sand. However, when data from the Gamma Ray-Neutron Logs were analyzed in conjunction with the IES logs it indicated that this interval has essentially no pay. The flow rates and subsequent buildup confirmed this fact. A flow rate of 3 MCF/D was the final rate prior to buildup.

A leak in the cable connection to the instrument created erroneous readings during the early buildup period. Only the portion of the buildup that occurs after 200 hours could be used for analysis. Bottom hole pressures were calculated from surface measurements for the early buildup portion. The calculated pressures are also shown on Figure 21. The calculations are based on the following equation:⁽⁷⁾

$$P_{BH} = P_{WH} e^{\frac{.01877 GD}{Z_a T_a}}$$

where:

- P_{BH} = Bottom hole pressure (psia)
- P_{WH} = Wellhead pressure (psia)
- G = Gas gravity (air = 1.0)
- D = Depth (ft)
- Z_a = Average compressibility factor
- T_a = Average gas column temperature (°R)

Figures 21 and 22 both show that a change in slope occurs at about 400 hours. Even though the earlier, more optimistic, slope appears to be the correct slope, the calculated capacity is still very low. The calculated flow capacity (kh) for the zone is:

$$kh = \frac{162.6 \times .0168 \times 3 \times 1.73}{1600} = .008 \text{ md ft}$$

A kh value in this range is still far too low to consider that this zone has any commercial value.

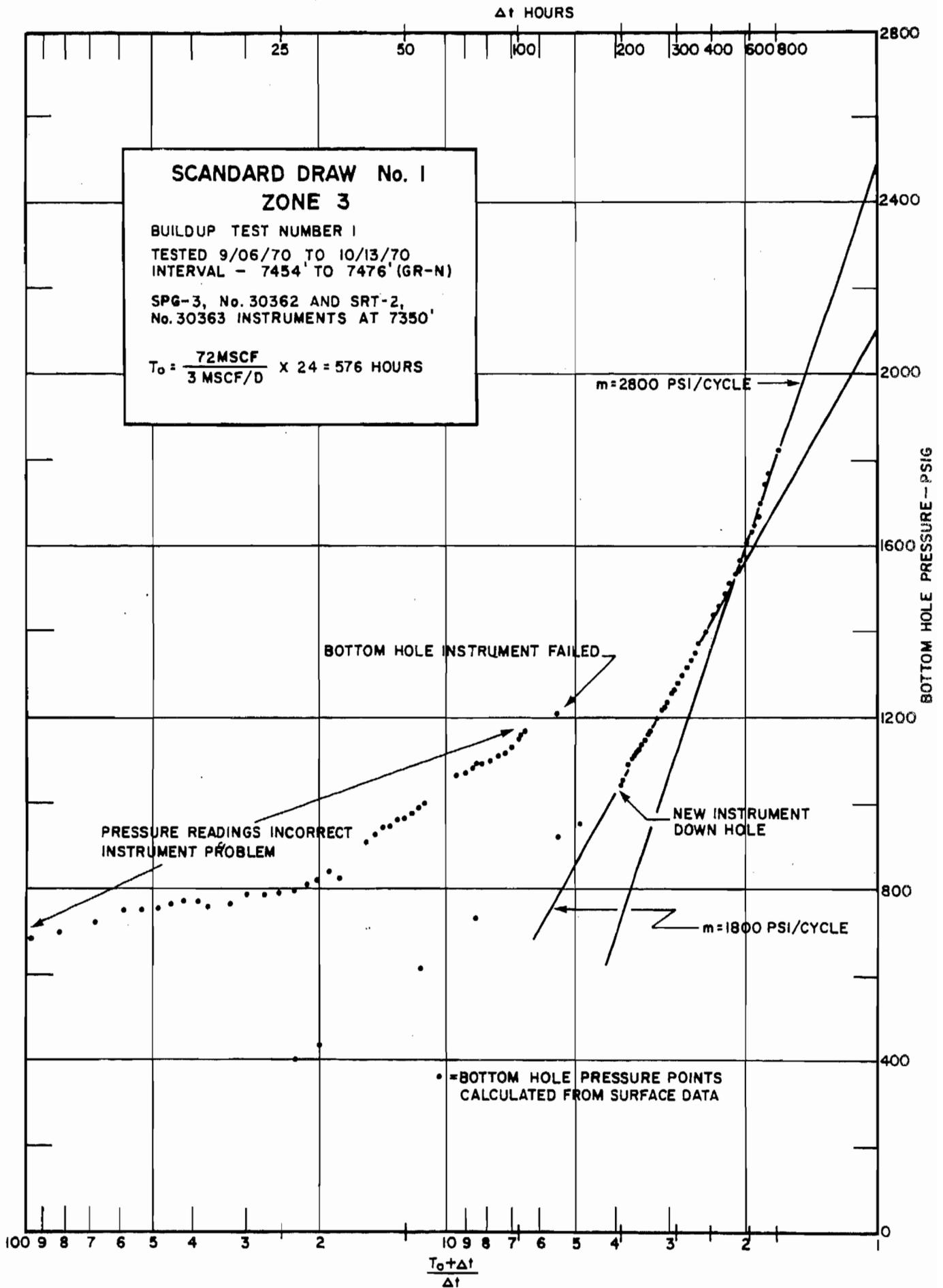


Figure No. 21

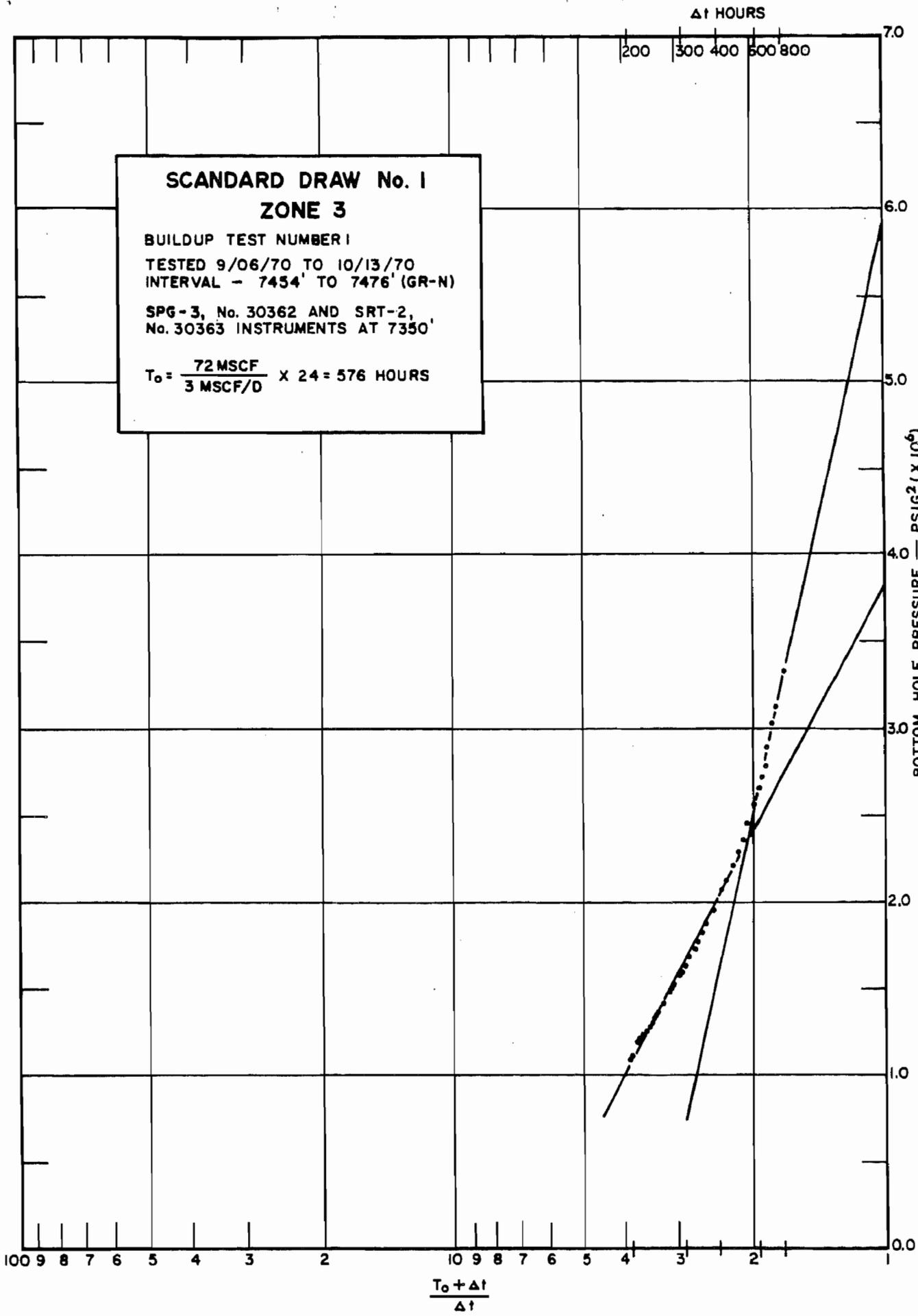


Figure No. 22

ABBREVIATIONS

B	Gas volume factor, Bbls/MSCF
Bbl	Barrels
B _g	Gas formation volume factor, scf/ft ³
BOP	Blow out preventer
BSCF/Section	Billion standard cubic feet per section
c	Compressibility, psi ⁻¹
CBL	Cement Bond Log
cp	Centipoise
D	Depth, feet
ft	Feet
G	Gas gravity (air = 1.0)
GR-N	Gamma Ray-Neutron
hr	Hour
IES	Induction Electrical Survey Log
IJ	Integral Joint
k	Permeability, millidarcies
KB	Kelly Bushing
KCl	Potassium Chloride
kh	Flow capacity, permeability times height, millidarcy feet
Lb	Pound

ABBREVIATIONS

m	Slope from Horner plot
MCF/D	Thousand cubic feet per day
md	Millidarcy
OCT	Oil Center Tool Company
OD	Outside diameter
p	Pressure
P_{BH}	Bottom hole pressure, psia
P_f	Flowing Pressure
$P_{1 Hr}$	Pressure one hour after shut in
P_i	Initial pressure
psi	Pounds per square inch
psia	Pounds per square inch absolute
psig	Pounds per square inch gauge
P_{WH}	Wellhead pressure, psia
q	Stabilized flow rate at shut in
R	Range
r_w	Wellbore radius, feet
S	South
SCF	Standard Cubic Feet

ABBREVIATIONS

Skin S	Skin Factor
SP	Self Potential Log
SSC	Seismograph Service Corporation
S_w	Water saturation, percent
T	Township
T	Temperature, °F
T_a	Average gas column temperature
T_o	Time
Δt	Shut in time, hours
USGS	United States Geological Survey
W	West
Z	Compressibility factor
Z_a	Average compressibility factor
>	More than
μ	Viscosity, centipoise
ϕ	Porosity, fractional

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APPENDIX II

SEISMIC SURVEY REPORT

REPORT
ON A SEISMOGRAPH SURVEY
CONDUCTED IN
RIO BLANCO COUNTY, COLORADO

PICEANCE CREEK PROSPECT

FOR

CER GEONUCLEAR CORPORATION
LAS VEGAS, NEVADA



Seismograph Service Corporation

A SUBSIDIARY OF RAYTHEON COMPANY
P.O. BOX 1590 TULSA, OKLAHOMA

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INTRODUCTION

A seismograph survey utilizing digital magnetic recording was conducted in Township 3 South, Range 98 West, in south central Rio Blanco County, Colorado, during October 1970, for CER Geonuclear Corporation. The purpose was to determine if subsurface faulting was present over the Piceance Creek Prospect.

DISCUSSION OF RESULTS

General

Two subsurface structural maps are submitted with this report. They are designated as:

Unidentified Tertiary
Unidentified Cretaceous - Near Dakota

The depth values presented on these maps should be considered estimated and were derived by applying an estimated constant average velocity for each horizon to time values obtained from the processed cross sections. The quality of the reflected data is considered poor to fair for the Unidentified Tertiary horizon and questionable to fair for the Unidentified Cretaceous horizon. Good seismic well ties were obtained on Line 2, at the Equity Oil Company No. 1 Government Fawn Creek test in Section 14 and at the Equity Oil Company No. 1 Boies test in Section 22, T 3 S, R 98 W, for the Unidentified Tertiary horizon, but the wells were too shallow to provide a tie for the Unidentified Cretaceous horizon.



An attempt to improve the quality of the stacked data was made on Line 2, by applying fiducialized trim static corrections derived from common depth point trace gather displays. This resulted in improving the Unidentified Tertiary reflection considerably and the Unidentified Cretaceous reflection to where a more reliable interpretation of the data could be presented.

The analog magnetic tapes for Line 27 were digitized and digitally processed for 100% conventional coverage in an attempt to provide better data than the original analog processed data. The results showed no significant improvement, therefore, the original interpretation was used and the depth values adjusted to the present control.

Reduced prints of both structural maps are submitted as pages 5 and 6 of this report.

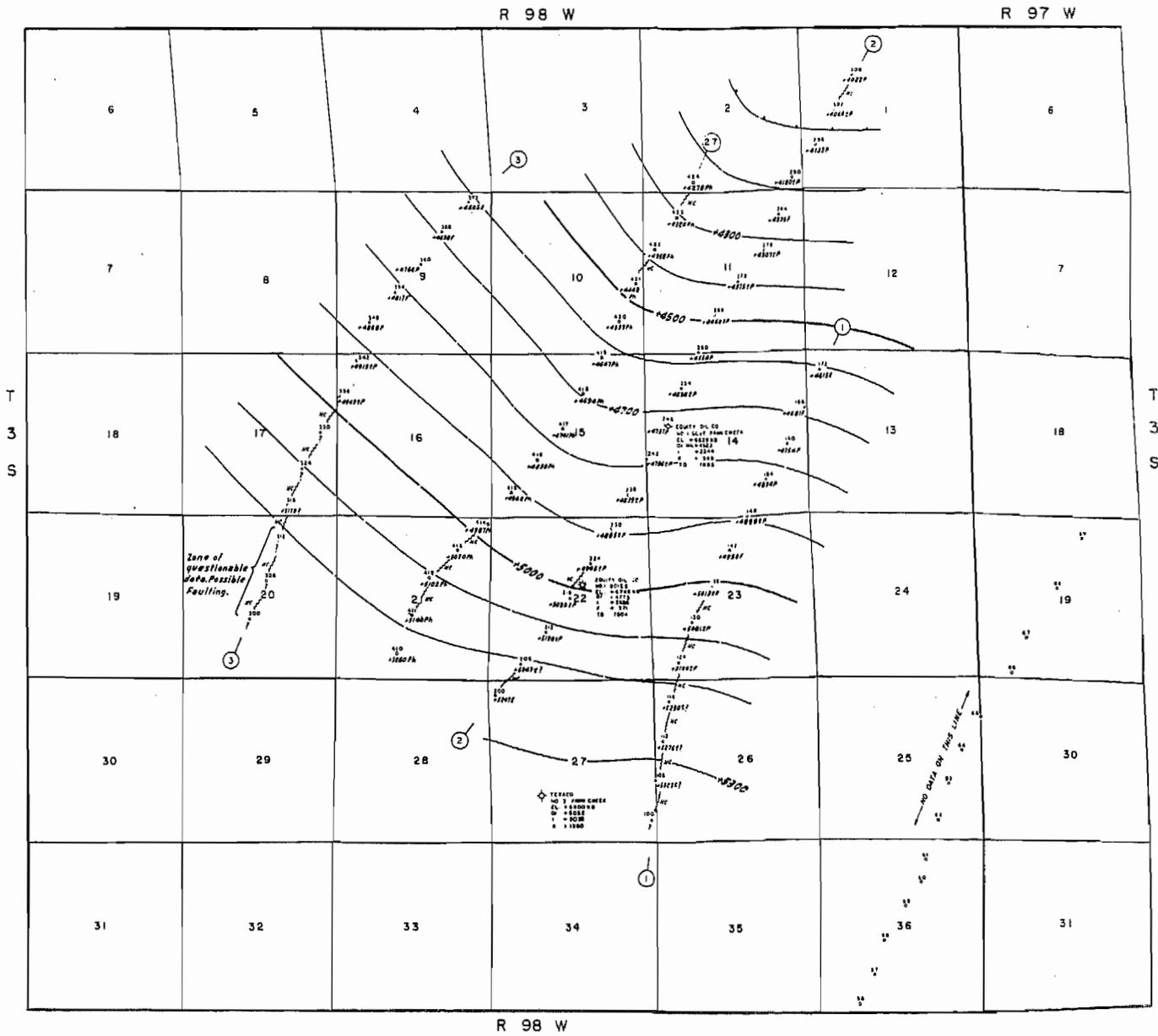
Detailed Discussion

Unidentified Tertiary

The event associated with the Tertiary appears to originate approximately 200 feet above the Or. Marker zone identified in the tests in Sections 14 and 22.

The contour interpretation shows regional dip to the northeast at the rate of about 300 feet per mile. The possibility of faulting at this level appears to be limited to the southwest portion





- SYMBOLS**
- Shotpoint
 - Depth Point
 - Oil Well
 - Gas Well
 - Dry Hole
 - Drilling Well
 - Well Location
 - Abandoned Oil Well
 - Abandoned Gas Well
 - Direction of Dip
 - Two-dimensional displaced depth point with or without third dimension estimated
 - Three-dimensional displaced depth point
 - Contoured depression or interval thickening
 - Established section or survey corner (when designated)
 - Established section or survey line (when designated)

- CLASSIFICATION OF DATA**
- G Good or positive
 - F Fair or reliable
 - P Poor or possible
 - E Estimated
 - Q Questionable
 - Continuity questionable
 - No continuity
 - RA Reflection absent in zone being mapped
 - NR No reflections of any time level
 - ± Accuracy not precise

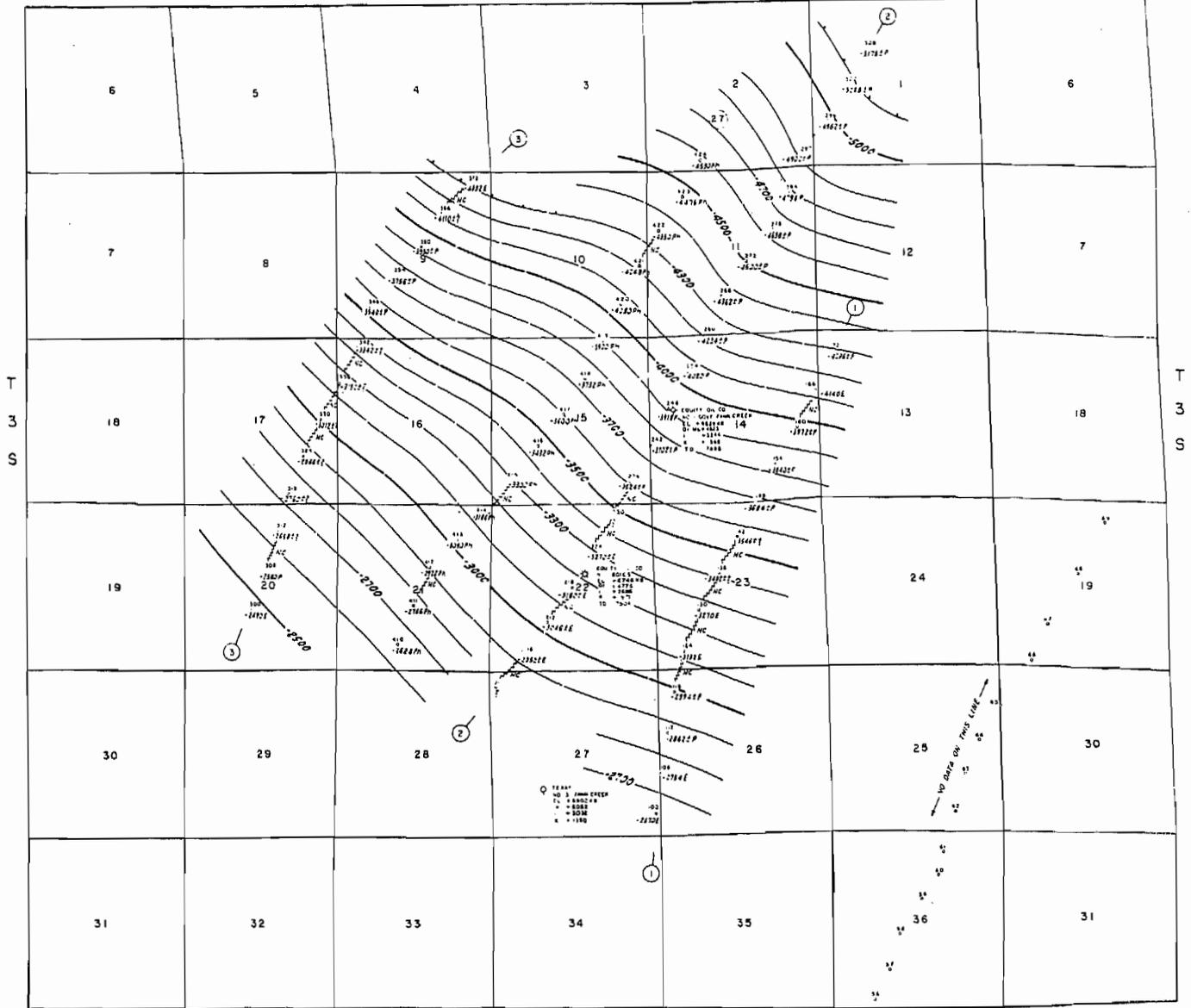
CER GEONUCLEAR CORPORATION
 SEISMIC MAP
 PREPARED BY
 Geomorph Inertec Corporation
 PICEANCE CREEK PROSPECT
 RIO BLANCO COUNTY, COLORADO
 UNIDENTIFIED TERTIARY

Contour Interval: 100 Feet
 Reference Datum: Sea Level
 Elevation Datum: +8900 Feet
 Elevation Velocity: 1500 Ft/Sec.
 Average Velocity: 8500 Ft/Sec.

Final Report Date: February 8, 1971
 Contract Number: 2441-1
 Party Chief: J.B. Stout
 Supervisor: G.E. Randolph
 Checked By: J.B. Jackson

R 98 W

R 97 W



R 98 W

- SYMBOLS**
- o Shotpoint
 - Depth Point
 - Oil Well
 - Gas Well
 - Dry Hole
 - Drilling Well
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 - Abandoned Oil Well
 - Abandoned Gas Well
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- CLASSIFICATION OF DATA**
- G Good or positive
 - F Fair or reliable
 - P Poor or possible
 - E Estimated
 - Q Questionable
 - ? - No continuity
 - RA Reflection absent in zone being mapped
 - NR No reflection at - or time level
 - ± Accuracy not precise

CER GEONUCLEAR CORPORATION

SEISMIC MAP

PREPARED BY



Geophysical Services Corporation
Tulsa, Oklahoma, U.S.A.

PICEANCE CREEK PROSPECT
RIO BLANCO COUNTY, COLORADO

UNIDENTIFIED CRETACEOUS-NEAR DAKOTA

Contour Interval: 100 Feet
Reference Datum: Sea Level
Elevation Datum: +6500 Feet
Elevation Velocity: 1500 Ft/Sec.
Average Velocity: 12,000 Ft/Sec.

Final Report Date: February 8, 1951
Contract Number: 2441-1
Party Chief: J. B. Stout
Supervisor: G. E. Randolph
Checked By: J. H. Jackson

of Line 3 in Section 20. The other areas of no continuity depicted on this horizon are believed to be caused by weak reflected data and/or poor control for the static corrections used in these areas.

Unidentified Cretaceous - Near Dakota

The Unidentified Cretaceous event is believed to be associated with the Dakota horizon and is of much poorer quality and weaker definition than the shallower horizon mapped; therefore, the interpretation presented is considered to be somewhat questionable.

Regional dip at the rate of about 550 feet per mile to the northeast appears reliably established at this level. Although faulting is a possibility in the areas of no continuity, it is believed that the lack of good static correction control and generally weak reflected data are the dominant reasons for these questionable areas. The presence of faulting is suggested on that portion of Line 3 located in Sections 17 and 20, but is not reliably defined because of the poor seismic data.

CONCLUSIONS AND RECOMMENDATIONS

The presence of regional dip varying from about 300 feet per mile on the Unidentified Tertiary horizon to about 550 feet per mile at the Unidentified Cretaceous level seems reliably established by the seismic data.



An indication of possible faulting is suggested on Line 3 in Sections 17 and 20, T 3 S, R 98 W, at both levels mapped. Further definition of the suspected faulting is questionable with the present control and poor data quality in this immediate area.

It is believed that the other questionable and no continuity areas depicted on both horizons are the result of very weak reflected data, poor control for static corrections, and an abundance of low frequency interference. It is recommended that if additional seismic exploration is undertaken in this area that at least 600% common depth point coverage be obtained, and that use of the "VIBROSEIS"* method be considered in an attempt to reduce the amount of interference generated by shotholes.

Respectfully submitted,

SEISMOGRAPH SERVICE CORPORATION

By: J. B. Stout, Party Chief

By: G. E. Randolph, Supervisor

/ho
February 8, 1971

Checked by:


J. G. Jackson, Senior Geophysicist

2441-1

* Trademark of Continental Oil Company



APPENDIX II

PHYSIOGRAPHY

Topography:	Hilly uplands
Population:	Sparsely populated
Culture:	80% pastureland, 20% timber
Drainage:	Intermittent drainage in a north-easterly direction, furnished by Fawn Creek, a tributary to Piceance Creek
Soil:	Brown, clay, sandy, sandy clay
Weather:	Generally fair, mild
Roads:	75% trails, 25% none
Access to area from headquarters:	Via Colorado Highway No. 64 and Colorado Highway No. 13, an average distance of about 35 miles from headquarters
Traverse difficulties:	Rugged terrain, timber. Bulldozer used to clear trails in timber.



APPENDIX III

GEOLOGY

Near-surface formation: Green River formation of Tertiary age

Subsurface log: Equity Oil Company No. 1 Government Fawn Creek, SW NW Section 14
T 3 S, R 98 W
Rio Blanco County, Colorado

Dry hole Elevation: 6629 ft. (K.B.)
Or. Marker +4523
I. Marker +2344
Top of Cretaceous +549
T.D. 7895 ft.

Major unconformities: Between Tertiary and Cretaceous

Regional dip: Approximately northeasterly

Potential producing horizons: Sands and limes of Tertiary age
Sands and limes of Cretaceous age

Type structures expected: Folded structures: domes, anticlines; fault traps, stratigraphic traps

Well control: Tied to: Equity Oil No. 1 Government Fawn Creek
Equity Oil No. 1 Boies



APPENDIX IV

OPERATION METHODS

Method used:	Continuous profiling, common depth point 400% coverage
Spreads used:	Straddle
Normal length:	5280-0-5280 feet
Distance between shotpoints:	1320 feet
Distance from shothole to close geophone stations:	220 feet
Number of geophone stations adjacent to hole:	2
Geophone station spacing:	220 feet
Geophones used:	HS-J, 14 Hz, .7 damping factor
Number per trace:	18
Connection:	Series
Spacing in group:	12 feet
Arrangement in group:	Straddling station, in line
Instrumentation:	
Type amplifiers:	TI DFS III
Number of channels:	48
Filter settings:	
Monitor and tape:	12 to 124 Hz
Field playback:	12 to 124 Hz
Processed sections:	TVBP 0 to 1.6 = 12-18-35-40 Hz 1.4 to 4.0 = 5-10-25-30 Hz
Type mixing:	None
Type camera:	48 trace



APPENDIX IV (Contd.)

OPERATION METHODS (Contd.)

Shothole data:

Type drilling:	Rotary with water and air
Special equipment used:	Portable pits, prefabricated hole plugs
Shothole depths:	
Normal:	140 feet
Number of holes used per location:	1
Formations encountered:	Sand, gravel, shale, sandstone
Best shooting depth:	117 feet
Dynamite charges:	
Normal:	75 pounds
Range:	50 to 75 pounds, holes preloaded

Elevation survey:

Based on USGS bench marks. All seismic locations on closed elevation traverses tied within a maximum horizontal error of 200 feet, and a maximum vertical error of 2.3 feet.

Operational difficulties:

Inaccessibility of prospect: had to use bulldozer to open trails in timbered areas.



STATION AND SHOT HOLE ARRANGEMENT



LEGEND

- Shot Hole Under Test ⊙
- Adjoining Shot Hole ○
- Station Number 18
- Line of Traverse ---
- Geophones per Station 18
- Geophone Spacing 12'

APPENDIX V

OPERATING STATISTICS

Basic crew:

Crew headquarters:	Meeker, Colorado
Starting date:	October 11, 1970
Completion date:	October 16, 1970
Number of holes shot:	48
Linear miles covered:	10,958
Dynamite used:	3550 pounds
Type:	Hi-velocity
Number of caps used:	50
Normal length leads:	150 feet

Drilling:

Number of drills used:	1
Total drill hours:	Drills on footage basis
Number of holes drilled:	48
Total footage drilled:	6720 feet
Average length water hauls:	1/2 to 1 hour
Number of sets bit blades used:	10
Type:	4-3/4 inserted
Mud used:	1250 pounds
Type:	Quick Gel

Bulldozer time:	25.0 hours
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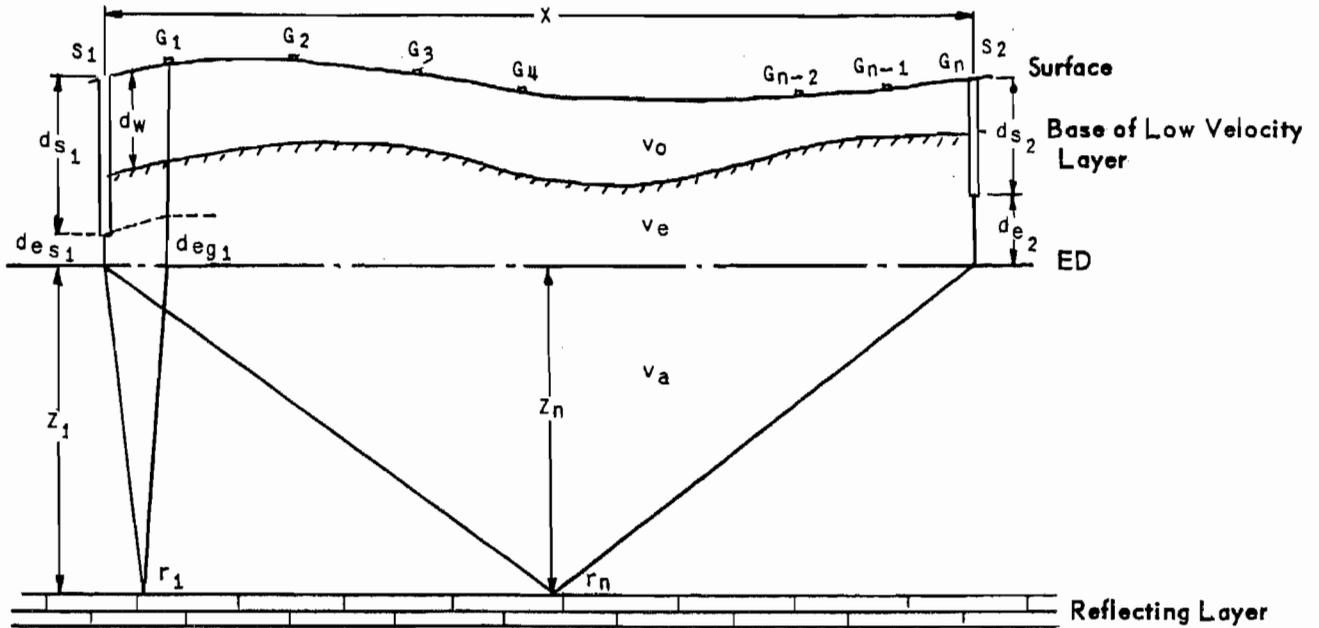
APPENDIX VI

CALCULATION AND INTERPRETATION METHODS

Record quality:	Fair to NR, low frequency
Type correction used for final data:	Normal uphole
Other corrections calculated:	Summation
Individual trace corrections used for replay sections:	Summation, adjusted to normal uphole correction
Spread correction:	Used; applied to individual traces on replay sections
Time reference datum:	6900 feet above sea level
Weathering velocity, v_0 :	2500 feet per second
Elevation velocity, v_e :	7500 feet per second
Type replay cross sections prepared:	Galvo-area combination
Final data normally obtained from:	400% stacked sections
Horizons mapped:	
Unidentified Tertiary	
Time range:	371 to 677 milliseconds
Depth range:	+5323 to +4022 feet
Velocity, v_a :	8500 E feet per second
Unidentified Cretaceous - Near Dakota	
Time range:	1565 E to 2013 milliseconds
Depth range:	-2490 to -5178 feet
Velocity, v_a :	12,000 E feet per second



DEPTH DETERMINATION FOR CONTINUOUS PROFILING
Using Normal Uphole Corrections



LEGEND

- | | | | | | |
|-------|---|--|----------|---|---|
| S | = | Shotpoint Location | t_e | = | de/v_e |
| G | = | Geophone Location | t_w | = | dw/v_o |
| X | = | Surface Distance | E_s | = | Elevation of Shotpoint |
| d_s | = | Depth of Charge | E_g | = | Elevation of Geophone |
| d_w | = | Thickness of Low Velocity Layer | E_m | = | $\frac{1}{2} (E_s + E_g)$ |
| t_s | = | Uphole Time | E'_m | = | $E_m - d_s = \frac{1}{2} (E'_s + E'_g)$ |
| ED | = | Elevation or Reference Datum | E'_s | = | $E_s - d_s$ |
| Z | = | Depth below ED | E'_g | = | $E_g - d_s$ |
| t_r | = | Recorded Reflection Time | de_s | = | $E'_s - ED$ |
| t_c | = | Corrected Reflection Time | de_g | = | $E'_g - ED$ |
| t_x | = | Normal Moveout Correction | t_x | = | $\frac{X^2}{2v_a^2 t_c}$ |
| v_o | = | Average Velocity in Low Velocity Layer | t_{c1} | = | $t_{r1} - t_{es1} - t_{eg1} - t_{s1}$ |
| v_e | = | Elevation Correction Velocity | | = | $t_{r1} - 1/v_e (E'_m - ED) - t_{s1}$ |
| v_a | = | Average Velocity to Reflecting Horizon | t_{cn} | = | $t_{rn} - t_{es1} - t_{egn} - t_{s2}$ |
| | | | Z_n | = | $\frac{1}{2} v_a (t_{cn} - t_{xn})$ |
| Z_1 | = | $\frac{1}{2} v_a t_{c1}$ | | | |

APPENDIX VII

MATERIAL SUBMITTED SEPARATELY

Base shotpoint tracing
Sepias with data
All records for the survey - monitor and playbacks
Magnetic tapes
Plane table sheets
Surveyor's field notes
Driller's reports
Replay sections:
 Variable area-variable amplitude
 Films from which above sections were taken
Calculation book containing:
 Calculation and interpretation methods
 Time-depth conversion tables
 Weathering graph sheets
 Fiducial correction calculations
 Replay instructions
 Observer's reports
 Shooter's reports





APPENDIX III-A

FAWN CREEK DAILY REPORTS

Tuesday, June 30, 1970

Ran Amerada sentry - made stops at surface, 1000, 2000, 3000 feet - reading obtained at 3000 feet indicates problem in sentry or connection. Left sentry at 3000 feet - started pumping and flowing well. Pumping H₂O at rate of 2 BWPH. (Loyd Snow watching 24 hours per day.) Making approximately 40 MCF/D of gas with 200 to 400 pounds back pressure on well.

Wednesday, July 1, 1970

Purchased Amerada sentry (by CER), arrived with other equipment, recorder, etc. Checked out with new recorder, still indicates problem down hole. Pulled sentry, made new rope socket and let sealing compound set overnight. Pumped and flowed well, making approximately 2 BWPH, approximately 40 MCF/D gas with 200 to 400 psig back pressure.

Thursday, July 2, 1970

Pumping and flowing well, checked out operation of rental pressure element, would not function. Installed CER pressure element with rental temperature element. Ran to 5700 feet KB with gradient stops at 1000, 2000, 3000, 4000, 4500, 5000, 5500 and 5700 feet. Well pumping and flowing gas to pit through separator, making approximately 1-1/2 BWPH and approximately 40 MCF/D gas. Pressure sentry working okay. Owen Coats sent rental pressure to Tulsa for repair.

Friday, July 3, 1970

Pumping and flowing at approximately 1 to 1-1/2 BWPH and approximately 40 MCF/D gas. Pressure sentry working okay.

Saturday, July 4, 1970

Pumping and flowing Fawn Creek. Water rate dropped to 8-10 BWPD, gas rate constant at 40 MCF/D. Repacked rubbers on stuffing box. Pumping well intermittently, both surface recorders sent back to Indel for repair. New recorder had a bad transformer. Old recorder not working right. Indel sending out manual recorder. Will shut well in for initial buildup when recorder arrives.

Sunday, July 5, 1970

Pump and flow well, rate at approximately 36 MCF/D. Liquid produced at approximately 10 BPD. Cumulative water reading at 386 = 223 barrels.

Monday, July 6, 1970

Pump and flow well, pump morning and night only. Rate at approximately 36 MCF/D. Liquid rate at approximately 10 BWPD. Cumulative water reading at 394 bbls = 231 bbls.

Tuesday, July 7, 1970

Pump and flow well. Rate at approximately 36 MCF/D. Liquid rate at approximately 10 BWPD. Pumping morning and night only -- pumps off in approximately 2 hours, will pump approximately 4 to 5 barrels and pump off. Wellhead pressure is rising at rate of 36 MCF/D. Indel SPR-4 arrived, checked on instrument, no reading, pulled instrument from hole - took off temperature element, reinstalled pressure element only in lubricator. Got pressure okay, left well flow overnight with sentry in lubricator.

Wednesday, July 8, 1970

Flowing well 8:00 a.m. to 1:00 p.m. Ran GRC-SPE-3, SN 30362, to 5700 feet KB. Range 0 to 4200 psig, checked sentry against surface before run to T.D., checked out okay. Flowed well until 1:00 p.m., shut in for buildup. Cumulative gas produced since recompletion is 1619 MCF. Total liquid produced this pump test = 243 barrels. Cumulative meter reading = 406 barrels on separator.

Thursday, July 9, 1970

Shut in for bottom hole pressure buildup.

Friday, July 10, 1970

Shut in for bottom hole pressure buildup.

Saturday, July 11, 1970

Shut in for bottom hole pressure buildup.

Sunday, July 12, 1970

Shut in for bottom hole pressure buildup. (Small leak in stuff box during day.)

Monday, July 13, 1970

Shut in for bottom hole pressure buildup. (Small leak in stuff box during day.)

Tuesday, July 14, 1970

Shut in for bottom hole pressure buildup. Small leak also short in cable at surface while clamping off cable, cut cable - 5700 feet left in hole - lost 3300 feet.

Wednesday, July 15, 1970

Shut in for bottom hole pressure buildup. Small leak - recorder stopped.

Thursday, July 16, 1970

Shut in for bottom hole pressure buildup. Small leak in stuffing box. Manual recorder will not balance out - problems downhole or in cable or in surface instrument.

Friday, July 17, 1970

Shut in for bottom hole pressure buildup - pulled bottom hole pressure sentry into lubricator. Some gas leak from Bowen head while removing sentry. Blowdown lubricator, master valve shut in.

Saturday, July 18, 1970

Shut in for bottom hole pressure buildup - gauge in lubricator, master valve shut.

Sunday, July 19, 1970

Laid down Amerada (CER) gauge. Ran Marshall wireline service 3500 psig pressure element to 5650 feet GL. Deadweighted gauge in lubricator and wellhead pressure tested at 1335 psig. Ran with 72 hour clock - on bottom at 1:15 p.m. Plan to pull gauge July 22, 1970.

Monday, July 20, 1970

Well shut in for bottom hole pressure buildup.

Tuesday, July 21, 1970

Well shut in for BHP buildup.

Wednesday, July 22, 1970

Pulled Amerada pressure element - 72 hour clock had stopped after approximately 2 hours. No data, ran same sentry in with 3 hour clock, obtained the following information.

<u>Depth -GL</u>	<u>Pressure psig</u>	<u>Gradient #/ft</u>
Surface	1364.8	
1000 ft	1405.6	.041
1000	1439.3	.034
3000	1472.9	.033
4000	1505.3	.033
4500	1521.3	.032
5000	1537.2	.032
5500	1553.2	.032
5650	1558.5	.033

The maximum recorded temperature was 192°F at 5650 feet GL. The pressure element was on bottom (5650 feet) at 1:30 p.m. The pressure element was run back in the hole with a 120 hour clock to 5650 feet GL for a three-day buildup. Pressure element at 5650 feet at 2:30 p.m.

Thursday, July 23, 1970

Well shut in for BHP buildup.

Friday, July 24, 1970

Well shut in for BHP buildup.

Saturday, July 25, 1970

Pulled pressure element with 120 hour clock. Installed 3 hour clock. Deadweight tested pressure element in lubricator. Deadweight pressure was 1397.0 psig. Pressure element was 1394.5 psig. Pressure element pulled from bottom at 1:30 p.m. Due to the high costs of the pressure surveys by Marshall it was decided to obtain an RPG-3 for CER. The well was left shut in for further BHP buildup.

Sunday, July 26, 1970

Well shut in for BHP buildup. Arranged to borrow wireline unit from Dowell, Vernal, Utah.

Monday, July 27, 1970

Well shut in for BHP buildup. Ordered Amerada RPG-3 4000 psig element from Indel - air freight.

Tuesday, July 28, 1970

Well shut in for BHP buildup. Waiting for pressure sentry.

Wednesday, July 29, 1970

Well shut in for BHP buildup. Ran Amerada RPG-3 SN 30167N w/3 hr clock, 4000 psig element - calibrated 7/16/70. Deadweighted pressure element in lubricator at surface prior to running in hole. The deadweight pressure was 1430 psig. Pressure element indicated 1425.6 psig. Following is the data obtained on the first run with the three hour clock.

<u>Depth KB</u>	<u>Time</u>	<u>Ext.</u>	<u>Pressure psig</u>	<u>Gradient</u>
Surface	2:40 pm	.662	1425.6	
1000 ft	2:52	.682	1468.6	.0430
2000	3:02	.698	1503.1	.0345
3000	3:10	.715	1539.7	.0366
4000	3:18	.731	1574.1	.0344
5000	3:26	.747	1608.6	.0345
5650	3:35	.757	1630.1	.0330

Total depth that the instrument was run was 5650 feet KB. The pressure element was rerun to TD of 5650 feet with a 72 hour clock. The element was on bottom at 4:30 p.m.

Thursday, July 30, 1970

Well shut in for BHP buildup.

Friday, July 31, 1970

Well shut in for BHP buildup.

Saturday, August 1, 1970

Pulled Amerada RPG-3 at 12:00 noon, chart readings as follows:

<u>Date</u>	<u>Time</u>	<u>Hours</u>	<u>Extension</u>	<u>BHP psig</u>
7/29	4:30 p.m.	0	.754	1623.6
7/30	4:30 p.m.	24	.759	1634.4
7/31	4:30 p.m.	48	.762	1640.9
8/01	12:00 noon	67.5	.766	1649.5

Ran RPG-3 to 5650 feet KB with 72 hour clock, on bottom at 3:00 p.m. Started well to flowing at 4:35 p.m. 1/8 inch plate 2 inch critical flow prover, flowing gas only, not pumping well, rate at approximately 36 MCF/D.

Sunday, August 2, 1970

Flowing well at approximately 36 MCF/D. Surface pressure declining slowly.

Monday, August 3, 1970

Flowing well at approximately 36 MCF/D

Tuesday, August 4, 1970

Flowing well at approximately 36 MCF/D. Pulled pressure element at 1:53 p.m. Installed new chart, element back on bottom at 2:45 p.m. 8/4/70. Shut down well for approximately 30 minutes.

Wednesday, August 5, 1970

Well flowing at approximately 36 MCF/D.

Thursday, August 6, 1970

Well flowing at approximately 36 MCF/D.

Friday, August 7, 1970

Well flowing at approximately 36 MCF/D. Pulled Amerada RPG-3, back on bottom at 11:30 a.m. Started up pumping unit at 12:30 p.m.

Saturday, August 8, 1970

Pumping and flowing well at approximately 36 MCF/D.

Sunday, August 9, 1970

Pumping and flowing well at approximately 36 MCF/D.

Monday, August 10, 1970

Pumping and flowing well at approximately 36 MCF/D.

Tuesday, August 11, 1970

Pumping and flowing well at approximately 36 MCF/D. Pulled Amerada RPG-3 at 6:00 p.m. Made up lubricator for Amerade SPG-3. Installed in lubricator and checked out SPG-3. Left overnight in lubricator and running.

Wednesday, August 12, 1970

Pumping and flowing well at approximately 36 MCF/D. Ran Amerada SPG-3 to 5650 feet KB.

Thursday, August 13, 1970

Pumping and flowing well at approximately 36 MCF/D.

Friday, August 14, 1970

Pumped and flowed well at approximately 36 MCF/D. Having problems with well pumping off and ruining stuffing box rubbers.

Saturday, August 15, 1970

Pumped and flowed well at approximately 36 MCF/D until 12:00 noon. Caught two gas samples from 1-1/2 inch string. Sample pressure 450 psig, temperature 70°F, deadweight tested Barton recorder on 1-1/2 inch string.

DWT pressure psig

Barton Recorder psig

250	255
500	505
1000	1005
1500	1505
2000	2005

Saturday, August 15, 1970 (Continued)

Shut in well at 12:00 noon for BHP buildup. Left pumping string open to separator to bleed off gas to replace packing in stuffing box. Bled off. Pulled brass follower and well started flowing water and gas. Waited for well to blow down again. Would not, opened up 1-1/2 inch string to separator to get well to stop blowing through 2-1/16 inch string. Also, bled off small amount of gas to atmosphere from 1-1/2 inch string. (Estimated at 2 MCF). Replaced packing at 4:00 p.m. Let well flow gas only from 4:00 p.m. to 7:30 p.m. Started up pumping unit, aborted buildup test #3, will stabilize well and shut in for buildup test.

Sunday, August 16, 1970

Pumped and flowed well until 6:00 p.m. Shut in for BHP buildup.

Monday, August 17, 1970

Shut in for BHP buildup.

Tuesday, August 18, 1970

Shut in for BHP buildup.

Wednesday, August 19, 1970

Shut in for BHP buildup.

Thursday, August 20, 1970

Shut in for BHP buildup.

Friday, August 21, 1970

Shut in for BHP buildup.

Saturday, August 22, 1970

Shut in for BHP buildup.

Sunday, August 23, 1970

Shut in for BHP buildup.

Monday, August 24, 1970

Shut in for BHP buildup.

Tuesday, August 25, 1970

Shut in for BHP buildup.

Wednesday, August 26, 1970

Shut in for BHP buildup.

Thursday, August 27, 1970

Shut in for BHP buildup.

Friday, August 28, 1970

Shut in for BHP buildup.

Saturday, August 29, 1970

Shut in for BHP buildup.

Sunday, August 30, 1970

Shut in for BHP buildup.

Monday, August 31, 1970

Shut in for BHP buildup.

Tuesday, September 1, 1970

Shut in for BHP buildup.

Wednesday, September 2, 1970

Shut in for BHP buildup.

Thursday, September 3, 1970

Shut in for BHP buildup.

Friday, September 4, 1970

Shut in for BHP buildup.

Saturday, September 5, 1970

Shut in for BHP buildup.

Sunday, September 6, 1970

Shut in for BHP buildup.

Monday, September 7, 1970

Shut in for BHP buildup.

Tuesday, September 8, 1970

Well shut in for bottom hole pressure buildup.

Wednesday, September 9, 1970

Well shut in for bottom hole pressure buildup.

Thursday, September 10, 1970

Well shut in for bottom hole pressure buildup.

Friday, September 11, 1970

Well shut in for bottom hole pressure buildup.

Saturday, September 12, 1970

Well shut in for bottom hole pressure buildup.

Sunday, September 13, 1970

Well shut in for bottom hole pressure buildup.

Monday, September 14, 1970

Well shut in for bottom hole pressure buildup.

Tuesday, September 15, 1970

Well shut in for bottom hole pressure buildup.

Wednesday, September 16, 1970

Well shut in for bottom hole pressure buildup.

Thursday, September 17, 1970

Well shut in for bottom hole pressure buildup. A very very small leak was noted around the line coming out of the stuffing box.

Friday, September 18, 1970

Well shut in for BHP buildup

Saturday, September 19, 1970

Well shut in for BHP buildup

Sunday, September 20, 1970

Well shut in for BHP buildup

Monday, September 21, 1970

Well shut in for BHP buildup

Tuesday, September 22, 1970

Well shut in for BHP buildup

Wednesday, September 23, 1970

Well shut in for BHP buildup

Thursday, September 24, 1970

Well shut in for BHP buildup

Friday, September 25, 1970

Well shut in for BHP buildup

Saturday, September 26, 1970

Well shut in for BHP buildup

Sunday, September 27, 1970

Well shut in for BHP buildup

Monday, September 28, 1970

Well shut in for BHP buildup

Tuesday, September 29, 1970

Well shut in for BHP buildup

Wednesday, September 30, 1970

Well shut in for BHP buildup

Thursday, October 1, 1970

Well shut in for BHP buildup

Friday, October 2, 1970

Well shut in for BHP buildup

Saturday, October 3, 1970

Well shut in for BHP buildup

Sunday, October 4, 1970

Well shut in for BHP buildup

Monday, October 5, 1970

Well shut in for BHP buildup

Tuesday, October 6, 1970

Well shut in for BHP buildup

Wednesday, October 7, 1970

Well shut in for BHP buildup.

Thursday, October 8, 1970

Well shut in for BHP buildup.

Friday, October 9, 1970

Well shut in for BHP buildup.

Saturday, October 10, 1970

Well shut in for BHP buildup.

Sunday, October 11, 1970

Well shut in for BHP buildup.

Monday, October 12, 1970

Well shut in for BHP buildup.

Tuesday, October 13, 1970

Ended BHP buildup. Started spooling line on wireline unit, started moving on equipment for workover. Well shut in.

Wednesday, October 14, 1970

Well shut in. Pulled Amerada SPG-3 from hole. Laid down lubricator and gin pole. Moving on equipment for workover.

Thursday, October 15, 1970

Well shut in, moving on equipment for workover.

Friday, October 16, 1970

Well shut in, moving on equipment for workover.

Saturday, October 17, 1970

Rigged up Barker rig, mixed 200 gallons 2% KCl water. Flowed well to pit for four hours. Killed well with 100 barrels 2% KCl water. Pulled and laid down rods and pump. Installed hydraulic double gate BOP on head.

Sunday, October 18, 1970

Pulled 1.90 O. D. IJ tubing. Released packer and pulled 2.062 O. D. IJ tubing and packer. Rigged up to log with Dresser Atlas. Ran Dresser Atlas Neutron Lifetime Log from 6421 feet to 4421 feet KB and Gamma Ray Neutron from 6425 feet to 4425 feet KB.

Monday, October 19, 1970

Laid down Dresser Atlas tools, ran Halliburton RTTS packer on 174 joints 2-3/8 inch EUE tubing, landed packer at 5494 feet KB. Set packer, filled annulus and pressured to 800 psig. Pumped down tubing at 5 BPM at 1900 psig with 20 barrels water. Mixed and pumped in 50 sacks class G cement, followed with 150 sacks class G with 1-1/4% CFR-2. Displaced cement with 23 barrels of water. Staged and squeezed in 2-1/2 barrels cement over 2-1/2 hours. Final pressure 3500 psig. Released packer, reversed out cement to 5700 feet KB. Pulled out of hole, WOC.

Tuesday, October 20, 1970

WOC 14 hours. Perforated with Dresser Atlas at following intervals with jet shots: 5565, 5570, 5585, and 5590 feet KB. Ran Halliburton RTTS packer to 5630 feet. Tested bottom squeeze to 3500 psig, okay. Pulled packer to 5583 feet KB. Spotted 200 gallon 15% MCA at 5583 feet, pulled packer up hole to 5304 feet and set. Pressured annulus to 600 psig. Pumped in acid at 2 BPM. Formation broke down at 2100 psig. Displaced acid with 5 barrels water. Let acid set for 15 minutes. Pumped in 10 barrels H₂O. Mixed and pumped in 100 sacks class G cement with 1-1/4% CFR-2. Displaced with 22 barrels H₂O. Staged and squeezed in 2-1/2 barrels over 4 hours. Final pressure 3500 psig. Pulled out of hole, WOC.

Wednesday, October 21, 1970

WOC 14 hours. Rigged up to drill out cement. Ran 4-3/4 inch bit, four 3-3/8 inch D.C. on 2-3/8 inch EUE tubing. Tagged top of plug at 5410 feet KB, drilled and cleaned out hole to 5682 feet K. B. Circulated hole with 2% KCl water. Pulled out of hole. Pressure tested to 1000 psig for 15 minutes. Held okay. Perforated with Dresser Atlas NCF II jet shots from 5600 to 5630 feet KB, 3 foot intervals, total of 11 holes. Ran in hole with 4-3/4 inch bit and casing scraper, tagged TD at 5682 feet KB. Started out of hole with 2-3/8 inch, laying down.

Thursday, October 22, 1970

Finished laying down 2-3/8 inch tubing, drill collars and kelly. Ran Brown Oil tool dual hydraulic husky packer in hole with 171 joints 2.062 O. D. IJ tubing. Packer element landed at 5553 feet KB. Seated nipple at 5545 feet KB. Ran 172 joints 1.90 OD IJ tubing and 1-10 foot sub. Latched into packer with 3000 pounds down. Removed BOP. Installed dual head valve flange. Pressure tested head flange to 4000 psig. Held okay. Set packer with 3800 psig. Tested annulus to 1000 psig for 15 minutes, held okay. Started mixing 2% KCl water for frac and tearing down rig.

Friday, October 23, 1970

Mixing 2% KCl water and tearing down and moving out rig.

Saturday, October 24, 1970

Well shut in. Finished moving out rig. Unable to move on CO₂ transport storage, transport stuck in mud at Red Wash, Utah; waiting on CO₂.

Sunday, October 25, 1970

Well shut in - waiting on CO₂.

Monday, October 26, 1970

Moved on CO₂ storage, started hauling CO₂. Well shut in.

Tuesday, October 27, 1970

Well shut in. Hauling CO₂ for fracture treatment.

Wednesday, October 28, 1970

Fraced with Dowell. Pressured annulus to 1000 psig, spot 1000 gallon 15% HCl down 1.90 O. D. tubing and up 2.062 tubing and balanced levels. Pressure tested to 6000 psig. Pumped down both strings of tubing. Displaced acid with 24 barrels 2% KCl water mixed with 20#/1000 gallon J-133, pumped in at 12.5 BPM at 5400 psig. Shut down, let acid set for 15 minutes. Surface pressure at end of 15 minutes was 800 psig. Started frac, pumped in 80 barrel pad of 2% KCl water mixed with 20#/1000 gal J-133 and 16#/1000 gal J-84 and 1200 scf/bbl CO₂, followed with 60 barrels at 1/2#/gal of 20/40 sand, followed with 90 barrels at 1#/gal of 20/40, pumped in 36 barrels with 1#/gal of 10/20 sand, flushed with 30 barrels 2% KCl water.

Started in RA sand (iridium 192) at 186 barrels cum (approximately 1/2 way through 1#/gal of 20/40). Continued RA sand throughout 1#/gal 10/20, CO₂ throughout job at 1200 scf/bbl. Used 25 tons total CO₂. Frac liquid 2% KCl water mixed with 20#/1000 gal J-133 and 16#/1000 gal J-84. Flushed with only J-133 additive in 2% KCl water. Used total of 5000 pounds 20/40 sand and 1500 pounds 10/20 sand. Cum H₂O including acid job was 326 barrels. Average pressure 5800 psig, average rate 12.5 BPM (Sand and water), HHP 1777, instant shut in 1500 psig. Started flowing well back to pit in 5 minutes after end of frac.

Thursday, October 29, 1970

Well flowing gas and water, good constant blow. Estimated rate 150 + MCF/D, estimated water recovered at 100 barrels.

Friday, October 30, 1970

Well flowing gas and water mist to pit, connected 2 inch Merla critical flow prover, 1/4 inch plate; let well flow for two hours through prover. Rate last 1-1/2 hours at 301 MCF/D. Estimated cum H₂O recovered at 125 barrels. Ran RPG-3 pressure sentry to 5300 feet KB, unable to get below 5369 feet KB due to restriction in 1.90 tubing. Let well flow for 1/2 hour with pressure sentry at 5300 feet KB and shut in flow at 2:00 p.m., October 30, 1970. Estimated cum natural gas flowed at 400 MCF. Caught water sample 2-2 at 125 barrels recovered water. Sample 2-1 is 2% KCl water used for frac. 72 hour clock is in RPG-3. Well shut in for BHP buildup. A slight brown oil scum or film was noted on the water in the pit.

Saturday, October 31, 1970

Well shut in for BHP buildup (very small leak in union on lubricator).

Sunday, November 1, 1970

Well shut in for BHP buildup (very small leak in union on lubricator).

Monday, November 2, 1970

Well shut in for BHP buildup. Pulled RPG-3 off bottom at 11:00 a.m., out of hole at 11:30 a.m. Reran sentry to 5300 feet KB with 72 hour clock. Sentry on bottom at 1:30 p.m., November 2, 1970. Well shut in for BHP buildup.

Tuesday, November 3, 1970

Well shut in for BHP buildup.

Wednesday, November 4, 1970

Well shut in for BHP buildup.

Thursday, November 5, 1970

Pulled RPG-3 off bottom at 10:00 a.m. Run #2 with 72 hour clock at 5300 feet KB. Well left shut in. Spotted CER wireline unit - made up rope socket for SPG-3.

Friday, November 6, 1970

Well shut in for BHP buildup. Checked operation of pressure and temperature elements and surface recording instrument, checks okay. Ran pressure and temperature sentry to 1000 feet KB. Bled some gas to get down hole. Pressure at 1000 feet is 1836.9, temperature not on scale. Ran sentry to 2000 feet KB, pressure 1872.6. Temperature not on scale. Line froze up in stuffing box - let set for one hour. Ran sentry to 5300 feet KB and closed in head on stuffing box and wireline BOP and packed off with grease. No leaks. Pressure at 5:00 p. m. at 5300 feet is 2038.0 psig, temperature at 5:00 p. m. at 5300 feet is 189.8°F. Left instrument recording, well shut in. Pressure at 10:00 p. m. is 2042.5 psig.

Saturday, November 7, 1970

Well shut in, monitoring BHP buildup and operation of pressure equipment.

Sunday, November 8, 1970

Well shut in, monitoring BHP buildup and operation of pressure equipment.

Monday, November 9, 1970

Well shut in until 3:40 p. m. ; monitoring BHP buildup and operation of pressure equipment. Pressure tested flow lines from 3:40 p. m. to 4:00 p. m. with wellhead gas. Started flow test number 1, zone 2 at 4:00 p. m.

Tuesday, November 10, 1970

Flow test number 1, zone 2.

Wednesday, November 11, 1970

Flow test number 1, zone 2.

Thursday, November 12, 1970

Flow Test number 1, zone 2.

Friday, November 13, 1970

Flow Test number 1, zone 2.

Saturday, November 14, 1970

Conducting flow test number 1, zone 2.

Sunday, November 15, 1970

Conducting flow test number 1, zone 2.

Monday, November 16, 1970

Conducting flow test number 1, zone 2.

Tuesday, November 17, 1970

Conducting flow test number 1, zone 2.

Wednesday, November 18, 1970

Conducting flow test number 1, zone 2.

Thursday, November 19, 1970

End flow test number 1, zone 2, well shut in at 0500 11/19/70 for BHP buildup number 2.

Friday, November 20, 1970

Well shut in for BHP buildup number 2.

Saturday, November 21, 1970

Well shut in for BHP buildup number 2.

Sunday, November 22, 1970

Well shut in for BHP buildup number 2.

Monday, November 23, 1970

Well shut in for BHP buildup number 2.

Tuesday, November 24, 1970

Well shut in for BHP buildup number 2.

Wednesday, November 25, 1970

Well shut in for BHP buildup number 2.

Thursday, November 26, 1970

Well shut in for BHP buildup number 2.

Friday, November 27, 1970

Well shut in for BHP buildup number 2.

Saturday, November 28, 1970

Well shut in for BHP buildup number 2.

Sunday, November 29, 1970

Well shut in for BHP buildup number 2.

Monday, November 30, 1970

Well shut in for BHP buildup number 2.

Tuesday, December 1, 1970

Well shut in for BHP buildup number 2.

Wednesday, December 2, 1970

Well shut in for BHP buildup number 2.

Thursday, December 3, 1970

Well shut in for BHP buildup number 2.

Friday, December 4, 1970

Well shut in for BHP buildup number 2.

Saturday, December 5, 1970

Well shut in for BHP buildup number 2.

Sunday, December 6, 1970

Well shut in for BHP buildup number 2.

Monday, December 7, 1970

Well shut in for BHP buildup number 2.

Tuesday, December 8, 1970

Well shut in for BHP buildup number 2.

Wednesday, December 9, 1970

Well shut in for BHP buildup number 2.

Thursday, December 10, 1970

Well shut in for BHP buildup number 2.

Friday, December 11, 1970

Well shut in for BHP buildup number 2.

Saturday, December 12, 1970

Well shut in for BHP buildup number 2.

Sunday, December 13, 1970

Well shut in for BHP buildup number 2.

Monday, December 14, 1970

Well shut in for BHP buildup number 2.

Tuesday, December 15, 1970

Well shut in for BHP buildup number 2.

Wednesday, December 16, 1970

Well shut in for BHP buildup number 2.

Thursday, December 17, 1970

Well shut in for BHP buildup number 2.

Friday, December 18, 1970

Well shut in for BHP buildup number 2.

Saturday, December 19, 1970

Well shut in for BHP buildup number 2.

Sunday, December 20, 1970

Well shut in for BHP buildup number 2.

Monday, December 21, 1970

Well shut in for BHP buildup number 2.

Tuesday, December 22, 1970

Well shut in for BHP buildup number 2.

Wednesday, December 23, 1970

Well shut in for BHP buildup number 2.

Thursday, December 24, 1970

Well shut in for BHP buildup number 2.

Friday, December 25, 1970

Well shut in for BHP buildup number 2.

Saturday, December 26, 1970

Well shut in for BHP buildup number 2.

Sunday, December 27, 1970

Well shut in for BHP buildup number 2.

Monday, December 28, 1970

Well shut in for BHP buildup number 2.

Tuesday, December 29, 1970

Well shut in for BHP buildup number 2.

Wednesday, December 30, 1970

Well shut in for BHP buildup number 2.

Thursday, December 31, 1970

Well shut in for BHP buildup number 2.

Friday, January 1, 1971

Well shut in for BHP buildup number 2.

Saturday, January 2, 1971

Well shut in for BHP buildup number 2.

Sunday, January 3, 1971

Well shut in for BHP buildup number 2.

Monday, January 4, 1971

Well shut in for BHP buildup number 2.

Tuesday, January 5, 1971

Well shut in for BHP buildup number 2.

Wednesday, January 6, 1971

Well shut in for BHP buildup number 2.

Thursday, January 7, 1971

Well shut in for BHP buildup number 2.

Friday, January 8, 1971

Well shut in for BHP buildup number 2.

Saturday, January 9, 1971

Well shut in for BHP buildup number 2.

Sunday, January 10, 1971

Well shut in for BHP buildup number 2.

Monday, January 11, 1971

Well shut in for BHP buildup number 2.

Tuesday, January 12, 1971

Well shut in for BHP buildup number 2.

Wednesday, January 13, 1971

Well shut in for BHP buildup number 2.

Thursday, January 14, 1971

Well shut in for BHP buildup number 2.

Friday, January 15, 1971

Well shut in for BHP buildup number 2.

Saturday, January 16, 1971

Well shut in for BHP buildup number 2.

Sunday, January 17, 1971

Well shut in for BHP buildup number 2.

Monday, January 18, 1971

Well shut in for BHP buildup number 2.

Tuesday, January 19, 1971

Well shut in for BHP buildup number 2.

Wednesday, January 20, 1971

Well shut in for BHP buildup number 2.

Thursday, January 21, 1971

Well shut in for BHP buildup number 2.

Friday, January 22, 1971

Well shut in for BHP buildup number 2.

Saturday, January 23, 1971

Well shut in for BHP buildup number 2.

Sunday, January 24, 1971

Well shut in for BHP buildup number 2.

Monday, January 25, 1971

Well shut in for BHP buildup number 2.

Tuesday, January 26, 1971

Well shut in for BHP buildup number 2.

Wednesday, January 27, 1971

Well shut in for BHP buildup number 2.

Thursday, January 28, 1971

Well shut in for BHP buildup number 2.

Friday, January 29, 1971

Well shut in for BHP buildup number 2.

Saturday, January 30, 1971

Well shut in for BHP buildup number 2.

Sunday, January 31, 1971

Well shut in for BHP buildup number 2.

Monday, February 1, 1971

Well shut in for BHP buildup number 2.

Tuesday, February 2, 1971

Well shut in for BHP buildup number 2.

Wednesday, February 3, 1971

Well shut in for BHP buildup number 2.

Thursday, February 4, 1971

Well shut in for BHP buildup number 2.

Friday, February 5, 1971

Well shut in for BHP buildup number 2.

Saturday, February 6, 1971

Well shut in for BHP buildup number 2.

Sunday, February 7, 1971

Well shut in for BHP buildup number 2.

Monday, February 8, 1971

Well shut in for BHP buildup number 2.

Tuesday, February 9, 1971

Well shut in for BHP buildup number 2.

APPENDIX III-B

SCANDARD DRAW DAILY REPORTS

SCANDARD DRAW DAILY REPORTS

Friday, May 8, 1970

Rigged up to blow well down. One choke on casing; one choke on tubing. Put gauge on each. Tubing pressure 4100 psig, casing pressure 4200 psig. Unable to open stuck wing valve on casing. Opened tubing valve to pit. Lighted flare. Pressure in both tubing and casing going down by blowing tubing with maximum of 100 to 150 psi differential throughout blowdown. Started blowing well at 2:00 pm. Most of rig on location. 2-1/16 inch tubing arrived at Equity Yard. Two Barker construction crews, one piping Scandard Draw and one unloading pipe at Fawn Creek. One Rippy Backhoe to dig through dikes at Scandard Draw and Fawn Creek to put tubing through the dike and then backfill. Olman Heath delivered separator to well.

Saturday, May 9, 1970

8:00 am. -- Blowing tubing, pressure 100 psig, casing pressure 250 psig. 3/4 inch choke wide open. Choke sanded up at 3:00 am. Shut-in approximately 15 minutes to clean out choke. Pressure built to 1000 psig. Calculated flow rate 1620 MCF per day. Making a fine condensate spray. Barker watching well 24 hours per day.

Sunday, May 10, 1970

Flowing tubing pressure 75 psig, casing pressure 125 psig. 3/4 inch choke wide open. Some fine spray water and condensate. Flow rate calculated at 1260 MCF per day. Barker watching well 24 hours per day.

Monday, May 11, 1970

Rigged up. Laid lines. Moved in 400 bbl tank. Barker 10 inch Series 900 BOP did not fit under substructure. Will use Acme 6 inch Series 1500 BOP. Smith Chemical delivered 10,000 pound KCl. Mixed and circulated 500 bbls of KCl water at 12 lb-KCl per bbl. Raised rig substructure in order to install BOP and stripper head. Rods and 1.9 inch OD tubing arrived Equity Yard.

Tuesday, May 12, 1970

Finished mixing KCl water. Rigged up lines to kill well down tubing. Acme BOP arrived early A.M. No hand wheels. Barker closing unit did not operate correctly. Ordered Acme closing unit and repairman for the Barker unit. Have two 3-5/8 inch drill collars, casing scraper, float and 4-3/4 inch bit on location. Killed and

Tuesday, May 12, 1970 ---continued

circulated well with approximately 200 bbls KCl water. Pumped approximately 40 bbls into formation. Maximum pressure 400 psig. Circulated hole slowly, losing water. Waited on Barker 1-1/2 hours for wrench to take off 6 inch series 1500 flange. Took off flange, installed BOP. Screwed into donut, pulled loose at 55,000 pounds. Halliburton Tool hand released packer. Keeping hole full. Laid down donut joint. Acme hand corrected malfunction of Barker closing unit. Sent in Acme closing unit. Have 350 bbls water in hole at 9:00 pm. Slowly circulating through annulus to keep hole full. Losing some KCl water. Pulled tubing and laid down packer. The rubbers were gone, drag strip broken off. Pipe pulled wet. Laid down joint above and below packer. Total joints in hole 299, Equity well inventory showed 306.

Wednesday, May 13, 1970

Tallied tubing back in hole. Ran in with 4-3/4 inch bit, casing scraper, 3-3/8 inch casing collars, and 136 stands of 2-3/8 inch tubing. 12 stands left in the rack plus 3 single laid down. Broke circulation at 5038 feet, 6860 and 8624. Ran scraper to T.D. of 8624 KB. Circulated at 8624 to get gas and air out of water. Waited on Dresser Atlas to get on location, approximately one hour. Pulled out of hole, rigged up Dresser Atlas. Ran Baker Model "N" cast iron Mercury series wireline bridge plug set at 8608 KB (McCullough Collar Log). Pressure tested casing and bridge plug to 1000 psig with water using rig pump. Pressure held okay. Mixed and circulated 300 bbl 2% KCl water for frac job at 7 pound per bbl. Ran Gamma Ray-Neutron Log from bridge plug to 4600 feet KB. Ran Cement Bond Log with variable density from bridge plug to 5000 feet. Bonding looks good from bridge plug (8608) to 6900 feet. Cement top at approximately 5750 with bonding fair to poor from 6900 to 5750.

Thursday, May 14, 1970

Ran wireline bridge plug set at 7550 KB (Dresser Atlas GR-N) Dump bailed two sacks Class "A" neat cement on top of bridge plug with glass bottom bailer. Plug is a Baker Model "N" cast iron bridge plug. Rigged down Dresser Atlas while WOC. Ran 2-3/8 inch tubing in hole. Came out laying down. Laid down two 3-3/8 inch drill collars. 2-3/8 inch tubing collars were very tight. Mashed some joints breaking connections to lay down. Removed BOP, installed tubing head. Reinstalled BOP, pressure testing BOP, casing, and bridge plug with water using rig pump. Pressure tested at 1500 psig, held okay. Moved in 2.062 O.D. integral joint tubing and 1.900 inch O.D. integral joint tubing while laying down 2-3/8 inch tubing. Perforated with Dresser Atlas NCF-2 jets on 3 foot spacing. Bottom shot 7210 at KB, top shot at 7183, ten 3/8 inch holes. On trip out of hole with gun, pulled into something at 900 feet, gun pulled loose from rope socket. Going in hole to locate gun.

Friday, May 15, 1970

Ran gauge ring on wireline to 2000 feet. Gun apparently went to bottom. Pulled out of hole, put on overshot, went in, caught fish at 7099. Gun was on bottom. Pulled out of hole. Released Dresser Atlas, rigged up to run 2-1/16 inch tubing J and L JCW-55 IJ ten round tubing. Picked up Brown Oil Tool dual hydraulic H-2 husky packer with USI seating nipple on top of packer. Ran in hole on 220 joints of 2-1/16 inch IJ tubing. Landed tubing in OCT dual head. Packer element at 7143 KB. Seating nipple at 7138 KB, rigged up to run 1-1/2 Nominal, 1.900 O.D., JCW-55, IJ tubing. Rigged up offset spool and stripper head. Ran Brown Oil Tool J-Latch stinger seal assembly on bottom with 211 joints of 1.9 inch IJ tubing. One 4 foot sub and one changeover sub 1.9 IJ x 2.062 into hanger. CO₂ truck arrived on location.

Saturday, May 16, 1970

Landed tubing in head and J-Latched into packer with tubing in hanger. Removed BOP, stripper head, and offset spool, flanged up head, tested flange to 4000 psig. Moved out substructure, rigged up to set packer and frac. Dropped ball down 2-1/16 inch tubing to set packer. Pumped down 2-1/16 inch at 5 BPM at 3000 pound. Ball did not seat to set packer. Reversed out to recover ball and clean out 2-1/16 inch tubing. Ball did not return. Water was gas cut on return. Waited 30 minutes, pumped down 2-1/16 inch again. Ball did not seat to set packer. Ran 1-1/4 inch O.D. 10# sinker bar on wireline to push ball into seat. Pulled sinker bar. The bar was covered with heavy paraffin. Pumped down 2-1/16. Pumped up to 3500 psig and water communicated to annulus. No pressure on 1-1/2 IJ tubing, indicating packer had set and a hole was in the 2-1/16 inch tubing. Released Dowell, CO₂ truck left on location. Started circulating down 1-1/2 inch and up 2-1/16 inch to remove gas. Circulated out gas. Removed OCT tree, installed BOP, rigged up substructure.

Sunday, May 17, 1970

Rigged up to pull 1-1/2 inch IJ tubing. Released 1-1/2 inch from packer, pulled out of hole, rigged up to pull 2-1/16 inch. Could not release packer. Removed BOP to pull dual head to work with less weight on packer.

Monday, May 18, 1970

Continued working on 2-1/16 inch. After working 22-1/2 hours, packer apparently came loose. Coming out of hole with 2-1/16 inch and packer. Pulled 2-1/16 inch IJ tubing and Brown packer. Several joints of tubing were mashed by slips. There was one noticeable leak in the tubing. Ordered out hydrotesters to pressure test

Monday, May 18, 1970

tubing and another dual hydraulic packer. Tested 30 stands of tubing, found several damaged joints, no leaks other than one visually located. Tester ran out of cups for their tool. Waiting on new cups and packer.

Tuesday, May 19, 1970

Barker crew rigged up lines to flow Fawn Creek Well, blew well down. Moved additional 2-1/16 inch tubing from Equity Yard to Scandard Well. Fenced pit. Testers cups arrived, started testing 2-1/16 inch - waiting on Brown Packer.

Wednesday, May 20, 1970

Brown Oil Tool Packer arrived, finished hydrotesting tubing. Laid out 32 bad joints with leaks and mashed sections where slips had set. Picked up Brown Oil Tool DS9-2H packer, ran in hole with 54 stands and packer set, pulled out of hole, shear ring had sheared, apparently from accumulation of paraffin on packer. Picked up Brown H-2 husky ran in hole with 2-1/16 inch IJ tubing, total of 220 joints. Seating nipple one joint above packer. Seating nipple is a Harbison Fisher 495E81. Packer is set at 7142 feet KB. Seating nipple at 7107 feet KB.

Thursday, May 21, 1970

Ran Brown Oil Tool Latch in seal assembly on bottom of 221 joints of 1.9 OD, IJ tubing, one 1 foot sub and one 1.90 OD by 2.062 OD IJ tubing swage to hanger. Latched into packer and landed donut. Installed OCT head and pressure tested to 4500 psig. Held okay. Set packer. Dowell spotted 200 gallons 15% HCl on perfs, displaced acid into perfs at 1/2 BPM, 1200 psig. Waited on acid 45 minutes. Fraced with 3000# 20/40 sand, liquid CO₂ at 1000 scf/bbl of treating liquid. Treating liquid 2% KCl water mixed, 16#/1000 gal J-84 and 20#/1000 gal J-133, total liquid 250 bbls. Pumped in 100 bbls of pad with 1000 scf/bbl CO₂, tubing pressure 6,000 psig, backed up casing at 1000 psig with rig pump. Pumped in 60 bbls with 1/2#/gal 20/40 and 350 scf/bbl, pumped 40 bbls with 1#/gal 20/40 and no CO₂, pumped in flush of 4700 bbls with 1000 scf/bbl CO₂. Average pressure 5600 psi, maximum pressure 6300 psig, average rate 12.5 BPM (sand and water). Instant shut-in pressure 1400 psig - rigged down Dowell, connected line to pit, well flowed back good for approximately 3 hours and died. Estimate flowback at 150 bbls water. Released Barker rig at 6:00 am, May 22, 1970 moving to Fawn Creek Number 1.

Friday, May 22, 1970

Moved off Barker rig.

Saturday, May 23, 1970

Casada Construction started laying lines to separator and tank, installing tie downs for pumping unit and gin pole. Set base for pumping unit. Casada attempted to set pumping unit - truck too small to handle. Barker set 400 bbl tank and separator.

Sunday, May 24, 1970

No action.

Monday, May 25, 1970

Casada set pumping unit, finished hold downs for pumping unit and gin pole. Some piping done.

Tuesday, May 26, 1970

Set propane tank, generator, and some piping done. Moved on R & R pulling unit, connected well to pit, let flow overnight.

Wednesday, May 27, 1970

Well kicking some gas and H₂O circulated well with 60 bbls 2% KCl water. Ran pump and rods and spaced out. Structurally braced pumping unit base, fixed horses head for slim hole pumping.

Thursday, May 28, 1970

Finished bracing on base for pumping unit, hung off rods, adjusted beam and horses head, let well pump up, released R & R pulling unit. Let well pump to separator, liquid level dump did not function correctly. Water in fuel and instrument supply lines. Had problems starting pumping unit engine.

Friday, May 29, 1970

Lengthened gin pole, stood in air, tied and adjusted guy lines. Made up lubricator and BOP, fabricated stand for oil, Pamco mechanic repaired engine to unit. Finished piping to wellhead.

Saturday, May 30, 1970

Finished gin pole for Fawn Creek Well. Spool wireline through Bowen equipment, ready to make up Amerada pressure and temperature sentry and run in hole.

Sunday, May 31, 1970

Connected Amerada pressure-temperature sentry to 1/8 inch cable, made up lubricator assembly. Put sentry in lubricator and pressured up. Pressure element works okay. Temperature element does not respond. Had to overhaul wireline BOP. Had some leaks. Shutdown to call Indel about temperature sentry before running in hole.

Monday, June 1, 1970

Corrected function of temperature element. Finished overhaul of wireline BOP. Ran pressure element to 7142 feet KB, unable to get out packer. Suspect heavy tar in tubing. Took pressure and temperature readings at various points while running to TD. Landed element at 7100 feet KB. Attempted to pump and flow well through separator. Problems with separator include - water meter does not register, level control does not respond, ordered out parts and serviceman. Left sentry recording pressure.

Tuesday, June 2, 1970

Installed bypass on pumping string to bypass separator as required. BHP at 11:30 a.m. was 2896.1 psig. Temperature was 215.7°F. Pressure buildup from 6:15 p.m., June 1, 1970 to 11:30 a.m., June 2, 1970, was from 1914.6 psig to 2896.1 psig in 17 hours 15 minutes. BHP at 2:45 p.m. was 2909.5 psig.

Wednesday, June 3, 1970

BHP at 8:15 a.m. was 2927.4 psig, BHT was 214.6°F at 8:20 a.m. Changed out separator dump valve trim from 1/8 inch to 3/8 inch, repaired level controller. Installed new water meter, installed filters and drip pots ahead of instrument supply gas. Started well pumping and flowing at 10:00 a.m. Pumping unit at 10 SPM x 54 inches stroke. Pump has 1-1/4 inch plunger. Well rapidly declined from 2927.4 psig to 675 psig at 1:30 p.m. Gas flow rate started at 126 MCF/D, declined to approximately 38 MCF/D after 14 hours and appeared to stabilize at that rate. Gas flow being measured by Merla 2 inch critical flow prover, 1/8 inch (.125 inch) plate. H₂O samples taken at 25 bbls produced at 12:30 p.m. and at 50 bbls produced at 1:00 a.m., June 4, 1970.

Thursday, June 4, 1970

Well appears stabilized at 100 psig on prover. 125 psig BHP and 209°F BHT. Pumping unit changed to 12 SPM x 54 inch stroke at 2:00 p.m.

Friday, June 5, 1970

BHP remaining at 120 to 125 psig, flow rate at approximately 38 MCF/D. Produced H₂O at approximately 3/4 BWPH.

Saturday, June 6, 1970

BHP remaining at 120 to 125 psig. Flow rate at approximately 38 MCF/D. Produced H₂O at approximately 1/2 BWPH. Water samples caught at 87 bbls indicate small cut of heavy black oil (estimated 10%). Shut-in well at 1:00 p.m. June 6, 1970. F BHP at SI was 115.6 psig. Separator pressure was 100 psig and pressure on prover plate was 97 psig. Water samples were caught as follows:

<u>Date</u>	<u>Time</u>	<u>Bbls Produced</u>	<u>Estimated Oil Cut</u>
6/3/70	12:30 p.m.	25	1%
6/4/70	1:00 a.m.	50	2%
6/5/70	11:30 a.m.	74.5	4%
6/6/70	1:00 p.m.	87	10%

Following are some of the pressures observed on the buildup.

<u>Date</u>	<u>Time</u>	<u>BHP psig at 7100 feet KB</u>
6/6/70	1:00 pm	116
6/6/70	1:04	120
6/6/70	1:10	147
6/6/70	1:30	231
6/6/70	2:00	351
6/6/70	3:00	596
6/6/70	4:00	800
6/6/70	6:00	1240 ?
6/6/70	7:00	1377
6/6/70	8:00	1555
6/6/70	9:00	1698
6/6/70	10:00	1838
6/6/70	12:00 Midnight	2117

Some problems were encountered between 4:00 p.m. and 6:00 p.m. with the surface recorder.

Sunday, June 7, 1970

Well shut-in - readings as follows:

<u>Date</u>	<u>Time</u>	<u>BHP psig at 7100 feet KB</u>
6/7/70	3:00 a.m.	2288
6/7/70	6:00 a.m.	2413
6/7/70	10:00 a.m.	2520
6/7/70	2:00 p.m.	2583
6/7/70	4:00 p.m.	2601

Shortly after 4:00 p.m. generator engine went down.

Monday, June 8, 1970

Well SI for buildup to static - started up generator engine.

<u>Date</u>	<u>Time</u>	<u>BHP, psig at 7100 feet KB</u>
6/8/70	12:00 Noon	2726
6/8/70	5:00 p.m.	2740
6/8/70	10:00 p.m.	2753

Tuesday, June 9, 1970

Well shut-in.

<u>Date</u>	<u>Time</u>	<u>BHP, psig at 7100 feet KB</u>
6/9/70	8:00 a.m.	2775
6/9/70	2:00 p.m.	2789

Wednesday, June 10, 1970

Well shut in for buildup. 10:00 a.m. - 2824 psig. Raining, roads in bad shape.

Thursday, June 11, 1970

Well shut in for buildup. 10:00 a.m. - 2849 psig. Started flowing well at 1415. Choke on separator acting up. Could not control pressure on separator so shut well in to repair choke at 2200.

Friday, June 12, 1970

Well shut in, getting new choke equipment for separator.

Saturday, June 13, 1970

Commenced drawdown test #1 at 1700 hours, BHP at 1700 - 2867 psig. Separator operating pressure had to be controlled manually using manual choke ahead of separator. Automatic choke could not control with the high wellhead pressure. Bottom hole pressure erratic because of manual adjustments to separator. Gas flow rate 36.2 MCF/D.

Sunday, June 14, 1970

Drawdown test #1.

Monday, June 15, 1970

Started pumping unit at 1530. Bottom hole pressure dropped from 2045 psig to approximately 150 psig in 24 hours. Produced 40 barrels of water, gas rate constant at 36.2 MCF/D.

Tuesday, June 16, 1970

Gas rate dropped to 33 MCF/D for short period but back up to 36.2 MCF/D. Bottom hole pressure dropped to 107 psig, dropped gas rate to 33 MCF/D.

Wednesday, June 17, 1970

Bottom hole pressure 130 psig, gas rate 33 MCF/D. Total produced fluids at 1700 hours 52 barrels H₂O - 3 barrels condensate.

Thursday, June 18, 1970

Pumping well intermittently.

Friday, June 19, 1970

Dropped separator pressure to install new packing rubbers in stuffing box. Down 2 hours.

Saturday, June 20, 1970

Shut in well for buildup at 1600 hours. Total produced liquids, 72.5 barrels water; 3 barrels condensate. Bottom hole pressure at 1600 hours - 120 psig. Water production rate gradually decreasing. Averaging 2.5 BWPD during final 30 hours of test. Obtained water samples every ten barrels for chemical analysis. Average gas production rate during drawdown was 33.4 MCF/D.

Sunday, June 21, 1970

Shut in for buildup #2. BHP at 1600 hours - 2436 psig.

Monday, June 22, 1970

Shut in for buildup. BHP at 1600 hours - 2579 psig.

Tuesday, June 23, 1970

Well shut in for buildup. Some problems with packoff leaking small volume of gas, got stopped for awhile, started again next morning, June 24.

Wednesday, June 24, 1970

Well shut in for buildup. Wellhead stuffing box leaking, changed out rubbers in control head. Held for approximately 1 hour and started leaking again. Old rubbers looked okay, attempted several times to bleed off between BOP and control head and packoff again to stop leak. Would only hold for short intervals and start leaking again. Had Barker crew take up flow lines, prepare pumping unit for moving to Fawn Creek. Separator ready also. Waiting on trucks to move equipment. Drained 400-barrel water tank to pit, gauged at 7 feet 10 inches before draining to pit. Drained down to zero feet 6 inches and started getting some dark oil and condensate. Separator water gauge indicates 164 barrels liquid. Tank gauge indicates 156.7 barrels.

Thursday, June 25, 1970

Well shut in for buildup. Moved off pump unit from base. Moved unit substructure, separator, fittings, propane tank to Fawn Creek. Would not let Casada move unit. Truck had high fifth wheel, Casada hand hurt putting up poles - sent into town with Barkers driller (Theo), 6 hours Theo's time charged to Casada plus mileage in and out. Had some problems with packing leak again, appeared to start approximately 4:00 p.m. Tried to repackoff at 6:00 p.m. Will move pump unit with Barker truck.

Friday, June 26, 1970

Well shut in for buildup. Had leak on stuffing box again in afternoon. Barker truck moved pump unit to Fawn Creek. Returned to well approximately 9:00 p.m., found that as sun went down that stuffing box quit leaking, about 8:30 p.m., could be temperature problem. Barker moved on some pieces of rig. Casada moved 15 joints 2-3/8 inch tubing and 2 joints that were cut off previously to Fawn Creek well for flow lines. Casada moved off 30 joints 2-1/16 inch junk to Equity yard. Plotted data using Horner technique. Buildup data prior to start of leaks sufficient for extrapolation. Corrected data during leak period and corrected plot also extrapolates to the same point. Buildup No. 1 and No. 2 both extrapolate to within 5 psig. No. 1 - 3000 psig, No. 2 - 2995 psig.

Saturday, June 27, 1970

Well shut in for buildup, small leak on stuffing box. Also, small leak on control head. Barker generator engine quit, cannot start. Barker moved on most of rig. Completed buildup test No. 2 on zone #1 from 7181 to 7212 at 8:00 p.m. Barker moving in rig and rigging up. Mixing KCl water (2%). Rigging lines to blow well down.

Sunday, June 28, 1970

Blew well down to pit. Pulled sentry and moved it to Fawn Creek. Killed well with KCl water after unseating pump. Well not kicking or presenting problems.

Monday, June 29, 1970

Pulled rods and pump. Opened annulus valve before unlatching 1-1/2 inch tubing. Gas pressure on annulus, blew to atmosphere for 15 minutes, shut in and rigged line to pit. Pressure on annulus 1100 psi - bleed off to pit - filled annulus with KCl water, estimated 40-50 barrels for filling. Pressure tested to 500 psi, would bleed off in 10-12 minutes. Tested several times, same result. Tubing valves open, no flow from tubing.

Tuesday, June 30, 1970

Pulled 1-1/2 tubing and 2-1/16 inch tubing with packer, no problems. Ran McCullough casing inspection and casing gauge from 7100 feet to surface. No apparent holes detected from log. Ran Baker Model N castiron bridge plug and set at 7110 feet. Dump bailed 2 sacks class A cement on bridge plug. Pressure tested BP and casing to 1000 psig. Pressure held okay for 1 hour. Rigging up to perforate.

Wednesday, July 1, 1970

Perforated gas zone from 6810 to 6838 (GR-N) with 12 jet shots. Used McCullough 19 gram charges in 4 inch steel carrier. Ran in BOT H-2 husky packer on 2-1/16 inch tubing. Ran in 209 joints with 1 double pin sub and seating nipple. KB depth to packer sealing element - 6773.43. Seating nipple at 6740.95 feet. Ran total of 210 joints of 1.9 inch IJ tubing plus one 4 foot 1-1/2 inch sub and one 1 foot 1-1/2 inch sub and change over swage from 1-1/2 inch tubing to 2-1/16 inch tubing thread to hanger. Landed 1-1/2 inch string with 4000 pounds on packer and latched in. Moved out substructure, installed dual head and pressure tested to 4000 psig for 30 minutes, held okay. Circulated down 1-1/2 inch and up 2-1/16 inch for 45 minutes, dropped ball down 2-1/16 inch to set packer. Pressured up 2-1/16 inch to 3800 psig. Set packer and sheared out ring. Pressure tested annulus to 1000 psig. Started leaking small stream out both tubing.

Thursday, July 2, 1970

Continued testing with 1000 to 1200 psig on annulus. 2-1/16 inch quit leaking and 1-1/2 inch kept bleeding small stream. Pressure on annulus would not bleed fast, indicating small leak in 1-1/2 inch. 2-1/16 inch string would leak small amount when 1-1/2 inch valve was closed. Pumped 1-7/16 inch ball (Bakelite) down 1-1/2 inch string to seat on top of latch-in assembly, pressured to 1500 psig, small leak indicated. Rigged up to pull 1-1/2 inch string. Pulled 1-1/2 inch tubing and checked. Could find no splits or breaks. Checked latch assembly, okay. Ran in tubing, made up every joint going in hole. Found few loose in middle of stands.

Friday, July 3, 1970

Finished running 1-1/2 inch IJ tubing back in hole (210 joints) latched into packer, set with 6000 pounds on packer. Made up head, tested head to 4600 psig, held okay. Pressured annulus to 1500 psig, held okay for 1 hour. No leaks out 2-1/16 inch or 1-1/2 inch. Waiting on Dowell to frac. Rigged up Dowell, acidized formation with 200 gallons 15% inhibited HCl at 1/2 barrel per minute. Pressure 1000 psig. No noticeable break-back in pressure. Shut down and let acid soak for 15 minutes. Rigged wellhead for frac job. Pumped 70 barrels spearhead at 13 to 13-1/2 BPM frac fluid plus 1000 SCF CO₂ per barrel. Initial pressure was 5500 psi. Pressure broke back to 4900-5000 psi. Started sand in at 1/2# per gallon - CO₂ 1000 SCF per barrel frac fluid, pump rate 13 to 13-1/2 BPM at 4900-5000 psi. Pumped 60 barrels at 1/2# per gallon, increased concentration of 20-40 sand to 1# per gallon, pump rate 13-1/2 BPM at 4900 psi. Pumped total of 2500 pounds 20-40 sand in total of 220 barrels frac fluid, including overflush. Increased CO₂ concentration to 1200-1300 SCF per barrel at tail end. Released Dowell, opened up 1-1/2 inch string to pit to flow back through choke. Flowed to pit until 4:00 a.m., then died. Rigged up 2-1/16 inch string and flowed to pit. Died at 6:00 a.m. Rigging up to swab 2-1/16 inch string.

Saturday, July 4, 1970

Swabbed 2-1/16 inch to 5:00 p.m. Estimated swabbed 20-25 barrels fluid and some gas in 21 swab runs, flowed back 70 barrels during previous night, still have 100-150 barrels to recover. Ran swab from 6650 feet several times with very little recovery of water or gas. Pressure on 1-1/2 inch string, rigged up and flowed to pit. Died in 15 minutes but the presence of pressure on 1-1/2 inch and swabbed dry 2-1/16 inch string looks suspicious. Rigged up to circulate both strings. Circulated down 1-1/2 inch and up 2-1/16 inch. Very gassy at first, quit after 20 minutes at 1 BPM. Circulated 45 minutes, then rigged up to swab 2-1/16 inch. Did not see any pressure breaks that would indicate plugging. Circulated at 800 psi.

Sunday, July 5, 1970

Swabbed well down, began unloading after run to bottom. Flowed from 5:00 a.m. to 8:00 a.m. then died. Swabbing from 6650.

Monday, July 6, 1970

Released rig at 7:00 a.m. Rigged down - stacked on location. Left well with 1-1/2 inch shut in and 2-1/16 inch open to pit. Very small gas well, estimated 10 MCF/D.

Tuesday, July 7, 1970

Well open to pit from 2-1/16 inch. 1-1/2 inch shut in.

Wednesday, July 8, 1970

Well open to pit from 2-1/16 inch. 1-1/2 inch shut in.

Thursday, July 9, 1970

Well open to pit from 2-1/16 inch. 1-1/2 inch shut in. 1-1/2 inch pressure at 1700 psig. Very small gas blow estimated at 1 MCF/D. Dropped 3 Dowell foamer sticks down 2-1/16 inch. Left 2-1/16 inch shut in for four hours, built up to 150 psig - opened to pit for 1 hour. Would not unload, shut in overnight.

Friday, July 10, 1970

Opened up well to pit from 2-1/16 inch, would not unload - 1800 psig on 1-1/2 inch string.

Saturday, July 11, 1970

Well open to pit - will not unload.

Sunday, July 12, 1970

Well open to pit through 2-1/16 inch - will not unload.

Monday, July 13, 1970

Well open to pit through 2-1/16 inch - will not unload. Moved on Barker rig - ran 1-1/2 inch x 1-1/4 inch x 16 foot H & F bottom hold down pump. Moved on pumping unit and set, landed and spaced out pump. Well tried to flow while running rods.

Tuesday, July 14, 1970

Rigged up flow lines, trailer, wireline trailer, seated pump, aligned unit, tied in propane to unit engine and rigged down Barker.

Wednesday, July 15, 1970

Continued rigging up flow lines.

Thursday, July 16, 1970

Started up pump unit - well did not pump up in four hours. Started flowing gas out 1-1/2 inch string through Merla critical flow prover - 3/32 inch plate - well heads up and flows some water out 1-1/2 inch string. Did not pump up.

Friday, July 17, 1970

Pumped well approximately 6 hours - did not pump up. Well flows by heads out 1-1/2 inch string - brings some water out prover plate.

Saturday, July 18, 1970

Pumped well approximately 6 hours - did not pump up. Flows by heads up 1-1/2 inch string.

Sunday, July 19, 1970

Pumped well approximately 2 hours - did not pump up. Well continues to blow by heads up 1-1/2 inch string. Rigged up to run Amerada pressure element - found partial short in instrument head - repaired - pump started blowing and sucking while stroking.

Monday, July 20, 1970

Pumped well after bumping bottom with pump. Well pumped or flowed small stream of gas cut water after respacing pump. Does not appear to be pump displacement on strokes - appears to be continuous flow of small stream of water - may still have to pull pump.

Pumped well after bumping bottom with pump - well pumped up in approximately 2 hours after respacing pump. Pumping or flowing small stream of water. Let well pump for approximately three hours. Put Amerada (CER) pressure sentry in lubricator at 4:00 p.m. Read .030 = 82.3 psig. Deadweighted at 85.0 psig. Shut pumping unit down, well flowing gas to pit when ready to start in hole with sentry. Following are pressures obtained while going in hole.

<u>Time</u>	<u>Depth</u>	<u>Flowing Pressure</u>
4:15 p.m.	Surface	73.1 psig
4:30	1000 ft	73.1
4:37	2000 ft	64.0
4:43	3000 ft	64.0
4:50	4000 ft	64.0
4:57	5000 ft	64.0
5:05	6000 ft	123.4
5:15	6650 ft KB	196.6 psig

Pressure sentry landed at 6650 feet KB. Started up pumping unit at 5:15 p.m. Left well flowing gas to pit, let well pump for 20 minutes, bottom hole pressure increased to 224 psig at 5:45 p.m. No liquid to surface through pumping string. Appears to blow and suck each stroke of pump. Shut down pumping unit, left gas flowing to pit overnight. Sentry at 6650 feet KB.

Tuesday, July 21, 1970

Gas flow had stabilized at 9 to 10 MCF/D overnight for a period of 12 hours. Surface gas pressure at 35 psig DWT. Started up pumping unit at 11:40 a.m. Pumped water in 10 minutes. Bottom hole pressure declined. Surface pressure remained at 35 psig until 2:00 p.m., then started to increase. A manual choke was used to control flow rate at approximately 9 to 10 MCF/D. At 3:00 p.m. DWT surface pressure had increased to 177 psig. BHP was at 644.6 psig. Following are some data points taken during the pump down and flow.

<u>Date & Time</u>	<u>Wellhead DW Surface Pressure</u>	<u>BHP</u>
7/21 3:00 p.m.	177 psig	644.6 psig
3:15	189	608.0
3:30	214	598.9
3:45	227	598.9
4:00	242	589.7
4:30	268	557.7
5:00	292	493.7
5:30	308	411.4
6:00	310	361.1
7:00	333	384.0
8:00	347	400.0
10:00	345	400.0
7/22 6:00 a.m.	360	420.6

Water samples were caught at 1:40 p.m. and at 5:00 p.m. on July 21. It should be noted that in the previous pumping data that water production initially was at approximately 1 BWPH at 11:40 a.m., July 21, and had declined to approximately 1/2 BWPH at 10:00 p.m. July 21. At 6:00 a.m. July 22, no water was being pumped. The well was shut in at 6:30 a.m. July 22, 1970.

Wednesday, July 22, 1970

Shut in well for BHP buildup on July 22 at 6:30 a.m. The flow rate had been relatively constant at 9 to 10 MCF/D for a period of 36 hours prior to shut in. Cumulative produced gas since the frac was calculated at 83 MCF. T hours calculated by slide rule is at 200. Following are some of the data points observed on the buildup.

(Attached sheet shows Zone 2, Drawdown Number 1 - 6810 feet to 6828 feet GR-N Log for 7/21/70 to 7/22/70)

BHP Gauge Set at 6650 feet

6810 - 6838 (GR-N)

Date & Time

7/21 11:30 a.m. Found BHP at 196.6 psig - Gas rate had leveled off to 9 MCF/D for approximately 12 previous hours. Surface pressure and pressure on 3/32 inch plate was 35 psig. Started up pumping unit at 11:40 a.m. Let well continue to flow at 35 psig on plate. Well pumped up in 10 minutes - BHP started declining. Surface pressure remained at 35 psig until 2:00 p.m. then started to increase. Well had previously pumped for short periods then quit for short periods. When wellhead (1-1/2 inch) started to increase it was attempted to control flow rate at 9 MCF/D by a manual adjustable choke to maintain 35 psig on the 3/32 inch plate.

3:00 p.m. Deadweight surface pressure up stream of choke was 177 psig. 3/32 inch plate pressure was at 40 psig. BHP was 644.6 psig. Closed choke, very small amount.

3:15 p.m. Deadweight surface pressure at 189 psig. BHP at 608.0. Well pumping water.

3:30 p.m. Deadweight surface pressure at 214 psig. BHP at 598.9 psig. Rate at 39 psig on 3/32 inch plate. Well pumping small stream of water. Adjusted choke back - very small amount.

3:45 p.m. Deadweight surface pressure at 227 psig. BHP at 598.9 psig. Rate at 39 psig on 3/32 inch plate. Well pumping small stream water. Adjusted back choke - very small amount.

4:00 p.m. Deadweight surface pressure at 242 psig. BHP at 589.7 psig. Rate at 39 psig on 3/32 inch plate. Well pumping small stream of water. Adjusted choke back - very small amount. Pump rate over last hour estimated at 1/2 to 1 BWPH.

4:15 p.m. Deadweight surface pressure at 256 psig. BHP at 576.0. Rate at 36 psig on 3/32 inch plate. Did not adjust choke. Pumping small stream of water.

4:30 p.m. Deadweight surface pressure at 268 psig. BHP at 557.7. Rate at 36 psig on 3/32 inch plate. Well pumping small stream of water. Did not adjust choke.

4:45 p.m. Deadweight surface pressure at 282 psig. BHP at 530.3. Rate at 36 psig on 3/32 inch plate. Well pumping small stream of water. Did not adjust choke.

Standard Draw Number 1
Second Zone Drawdown Number 1

Date & Time

7/21 5:00 p. m. Deadweight surface pressure at 292. BHP at 493.7. Rate at 36 psig on 3/32 inch plate. Pumping small stream of water. No adjustment to choke. Took water sample.

5:15 p. m. Deadweight surface pressure at 299. BHP at 457.1. Rate at 36 psig on 3/32 inch plate. Pumping small stream of water. No adjustment made.

5:30 p. m. Deadweight surface pressure at 308 psig. BHP at 411.4 psig. Rate at 38 psig on 3/32 inch plate. Pumping small stream of water. Adjusted choke small amount.

5:45 p. m. Deadweight surface pressure at 314 psig. BHP at 384.0. Rate at 38 psig on 3/32 inch plate. Pumping water - very foamy. No adjustment.

6:00 p. m. Deadweight surface pressure at 310 psig. BHP at 361.1. Rate at 38 psig on plate. No adjustment. Pumping very very small stream foamy water. Shutdown generator to add oil at 6:02. Start up generator at 6:04.

6:15 p. m. Deadweight surface pressure at 320 psig. BHP at 370.3. Rate at 37 psig on plate. Approximate water being pumped is 1/4 BWPH - very foamy with soap.

6:30 p. m. Deadweight surface pressure at 323 psig. BHP at 374.9 psig. Rate at 36 psig on 3/32 inch plate. Very very small amount foamy water being pumped approximately 1/4 BWPH.

6:35 p. m. Deadweight surface pressure at 329 psig. BHP at 384.0. Rate at 35 psig on 3/32 inch plate. Approximately 1/4 BWPH. Changed chart drive to 3"/hr from 15"/hr.

7:00 p. m. . Deadweight surface pressure at 333. BHP at 384.0. Rate at 37 psig on 3/32 inch plate. Approximately 1/4 (less) BWPH.

7:15 p. m. Deadweight surface pressure at 335 psig. BHP at 386.3. Rate at 33 psig on 3/32 inch plate. Less than 1/4 BWPH.

7:30 p. m. Deadweight surface pressure at 342 psig. BHP at 393.1. Rate at 32 psig on 3/32 inch plate. Water increased to approximately 1/2 BWPH.

Standard Draw Number 1
Second Zone Drawdown Number 1

Date & Time

7/21	8:00 p.m.	Deadweight surface pressure at 347. BHP at 400.0. Rate at 31 psig on 3/32 inch plate. Water at approximately 1/2 BWPH. Adjusted rate up with choke.
	8:15 p.m.	Deadweight surface pressure at 348. BHP at 400.0. Rate at 38 on 3/32 inch plate. Water at approximately 1/2 BWPH. Gauged water at this rate - very foamy.
	10:00 p.m.	Deadweight surface pressure at 345. BHP at 402.3. Rate at 40 psig on 3/32 inch plate. Water at approximately 1/2 to 3/4 BWPH. Decided to let pump overnight to see if well will clean up and flow improve.
7/22	6:00 a.m.	Deadweight surface pressure at 360. BHP at 420.6. Rate at 50 psig on 3/32 inch plate. Not pumping any water at surface at time of check.
	6:30 a.m.	Well shut in.

Wednesday, July 22, 1970 (Continued)

<u>Date & Time</u>	<u>DW Surface Pressure</u>	<u>BHP psig</u>	<u>Δt</u>
7/22 6:30 a.m.	360 psig	416.0 psig - shut in	
7:00	388	448.0	0.5
7:30	420	484.6	1.0
8:00	450	521.1	1.5
8:30	486	571.4	2.0
9:00	513	621.7	2.5
9:30	545	672.0	3.0
10:00	574	717.7	3.5
10:30	600	758.9	4.0
11:00	629	804.5	4.5
11:30	655	849.2	5.0
12:00 Noon	-	889.4	5.5
1:00 p.m.	-	960.9	6.5
2:00	-	1027.9	7.5
3:00	825	1095.0	8.5
4:00 p.m.	855 psig	1153.1 psig	9.5
5:30	-	1229.1	11.0
6:30	935	1273.7	12.0
7:30	970	1322.9	13
8:30	1000	1358.7	14
10:30	1050	1434.6	16
7/23 12:30 a.m.	-	1492.7	18
2:30	-	1537.4	20
4:30	-	1573.2	22
6:30	-	1608.9	24
8:30	1218	1635.8	26
10:30	1238	1662.6	28
12:30 p.m.	1255	1680.4	30
*3:30	1279	1707.3	33
*6:30	1286	1716.2	36
9:30	1305	1738.5	39
7/24 1:30 a.m.	-	1765.4	43
5:30	1370	1796.6	47
**9:30	1393	1823.5	51
**1:30 p.m.	1395	1832.4	55
**7:30	1390	1845.8	61

*Note: A small leak around the cable existed during these readings. After the sun went down the leak was a very very small blow of gas.

**Note: A small leak started at approximately 12:00 Noon and existed until approximately 8:00 p.m. at which time it receded to a very very small blow.

Saturday, July 25, 1970

<u>Date & Time</u>	<u>DW Surface Pressure</u>	<u>BHP psig</u>	<u>Δt</u>
7/25 1:30 a.m.	1420 psig	1872.6 psig	67
7:30	1447	1899.4	73
7:30 p.m.	-	1926.3	85

Approximately 1 gallon of Marfak II grease was pumped into the control head to seal off small leak. Helped but did not completely seal off. Very small leak remains - decreases after sun goes down.

Sunday, July 26, 1970

<u>Date & Time</u>	<u>DW Surface Pressure</u>	<u>BHP psig</u>	<u>Δt</u>
7/26 7:30 a.m.	-	1970.9 psig	97
11:30	1518 psig	1979.9	101

Install CER SPR-1 in place of rental surface recorder. Worked okay - reads .002 less than rental instrument. Pumped in approximately 1 quart of grease into control head.

Monday, July 27, 1970

<u>Date & Time</u>	<u>DW Surface Pressure</u>	<u>BHP psig</u>	<u>Δt</u>
7/27 2:30 p.m.	1610 psig	2033.5 psig	128

Found CER SPR-1 had functioned okay for approximately 3 hours and then went "Kaput" - noted were the following:

- (1) At 3"/hr on selector chart runs at 6"/hr.
- (2) Auto chart full scale indicator sweeps during indications.
- (3) Jumped from expanded scale to full scale and remained there for approximately 4 hours.
- (4) Reads .002 less than rental recorder.
- (5) Electronics package loose in case.
- (6) Door will not latch correctly.

The rental instrument was reinstalled and CER's recorder sent back for repair.

Tuesday, July 28, 1970

Well shut in for BHP buildup - mixed graphite with grease. Pumped into control head. Still very very small leak.

Wednesday, July 29, 1970

Well shut in for BHP buildup.

Thursday, July 30, 1970

Well shut in for BHP buildup.

Friday, July 31, 1970

Well shut in for BHP Buildup.

Saturday, August 1, 1970

Well shut in for BHP buildup.

Sunday, August 2, 1970

Well shut in for BHP buildup. Still very very small leak around 1/8 inch cable in control head.

Monday, August 3, 1970

Ended BHP buildup at 10:30 a.m. Deadweight tested surface pressure at 1776 psig. Pulled pressure sentry. Rigged up Barker rig. Mixed 200 bbls 2% KCl water. Unseated pump - pumped down 1-1/2 inch string up 2-1/16 inch, circulated for 1-1/2 hours. Rigged up to pull rods. Pulled and laid down rods and pump. Took off dual valves. Installed BOP and tested. Moved on substructure. Rigged up to pull 1-1/2 inch tubing string.

Tuesday, August 4, 1970

Released 1-1/2 inch from packer. Pulled 1-1/2 inch, released packer, pulled 2-1/16 inch and packer. Mixed 200 bbls 2% KCl water. Moved 2-3/8 inch onto pipe racks. Rigged up McCullough to run tracer survey. Started in hole with tools.

Wednesday, August 5, 1970

Had problems with McCullough Gamma tools. Three defective tools. Ran log and tracer survey with Colbalt 60. Appears that hole is taking liquid throughout 6810 - 6838 perforated interval. Injected tracer at 6797 feet. Checked location of R. A. material. Ran tool to 6840 feet. Pumped in water at 1/2 BPM. Ran profile surveys to check entry of R. A. material into perms. Repeated this interval and also injected at 6828 feet and ran profile from 6870 feet up. Indicates apparent entry of R. A. material into lower perms also. Pumped into formation with 2% KCl water to clean up zone. Ran Base Gamma log after cleaned up. Appears to correlate with initial log except for minor differences and a peak at 6830 feet. Rigged down McCullough. Picked up Dowell Model 6 - 5-1/2 inch packer ran in hole on 2-3/8 inch EUE tubing. Hydrotested tubing into hole. Found one bad joint. Set packer at 6620 feet KB. Tested to 1000 psig on annulus, held okay. Top perf at 6810 feet. Pumped in 10 bbls fresh water at 3 BPM at 2400 psig. Followed with 50 sacks Class G cement, followed by 100 sacks Class G with 3/10 of 1% D-13 and 1.3% Flak D-60. Well started taking cement on vacuum, then slowly started to build pressure when top of cement was near bottom of tubing. Pumped to clear tubing at 1/2 BPM, when tubing cleared shut down pump.

Thursday, August 6, 1970

Staged in 3 bbls over 3 hours. Pressured to 3000 # max., held okay. Ended squeeze. Rigged down Dowell - WOC 12 hours. Pulled packer and tubing while WOC. While coming out of hole small allen bolt dropped out of power tongs. Packer pulled by bolt. Laid down packer, nipples up to drill out cement. Picked up ten 3-5/8 inch drill collars, 4-3/4 inch bit, ran in hole on 2-3/8 inch tubing. Tagged top of soft cement at 6680 feet. After 12 hours WOC started drilling out cement. Small bolt gave very little problems. Cement became hard at 6750 feet. Drilled and cleaned out to 6900 feet. Circulated 45 minutes. Pressure tested squeeze to 1500 psig, surface pressure for 15 minutes, held okay.

Friday, August 7, 1970

Drilled and cleaned out to bridge plug at 7110 feet. Started drilling on bridge plug at 2:30 p.m. Worked on plug until 9:00 p.m. Pulled bit, found several teeth broken, probably from small bolt in hole. Ran bit #2 (Williams W-2) 4-3/4 inch. Drilled on plug for 1 hour and plug dropped out. Closed rams on BOP - Pumped 30 bbls 2% KCl water into perms below at 1/2 BPM at 1100 psig. Opened back to tank. Flowed back 10 bbls in 10 minutes. Circulated gas to pit for 2 hours at 1/2 BPM - Pumped 10 bbls at 1/2 BPM and 1100psig into perms at 7210 to 7183 feet. Did not flow back. Ran bit to 7520 feet.

Fawn Creek Government Number 1
Zone 2 - 5600 feet to 5630 feet

TABLE III-C-2
GAS PROPERTIES

Pressure psia	Z	Viscosity cp	Compressibility psi ⁻¹	B Bbls/MCF	M(p) psi ² /cp
100	.996	.0139	1.01 x 10 ⁻²	32.59	.72 x 10 ⁶
200	.987	.0140	5.09 x 10 ⁻³	16.14	2.89 "
300	.978	.0141	3.42 "	10.66	6.52 "
400	.970	.0141	2.58 "	7.93	1.16 x 10 ⁷
500	.962	.0142	2.08 "	6.29	1.82 "
600	.954	.0144	1.74 "	5.20	2.62 "
700	.947	.0145	1.50 "	4.43	3.57 "
800	.941	.0146	1.32 "	3.85	4.66 "
900	.935	.0148	1.17 "	3.40	5.90 "
1000	.929	.0149	1.06 "	3.04	7.27 "
1100	.924	.0151	9.63 x 10 ⁻⁴	2.75	8.79 "
1200	.919	.0152	8.82 "	2.51	10.43 "
1300	.915	.0154	8.14 "	2.30	12.22 "
1400	.911	.0156	7.54 "	2.13	14.13 "
1500	.908	.0158	7.02 "	1.98	16.16 "
1600	.905	.0160	6.56 "	1.85	18.32 "
1700	.902	.0162	6.14 "	1.74	20.59 "
1800	.900	.0164	5.77 "	1.64	22.98 "
1900	.898	.0166	5.44 "	1.55	25.48 "
2000	.897	.0168	5.13 "	1.47	28.08 "
2100	.896	.0170	4.85 "	1.40	30.79 "
2200	.895	.0173	4.59 "	1.33	33.59 "
2300	.895	.0175	4.35 "	1.27	36.48 "
2400	.895	.0177	4.13 "	1.22	39.46 "
2500	.896	.0180	3.92 "	1.17	42.52 "
2600	.897	.0182	3.73 "	1.13	45.66 "
2700	.898	.0185	3.55 "	1.09	48.87 "
2800	.900	.0188	3.38 "	1.05	52.16 "
2900	.901	.0190	3.22 "	1.02	55.51 "
3000	.904	.0193	3.07 "	.99	58.92 "
3100	.906	.0196	2.93 "	.96	62.39 "
3200	.909	.0198		.93	65.92 "

Gas Gravity = .62
Crit. Temp. = 360 R
Bottom Hole Temp. = 190°F
Crit. Pres. = 672.5 psia
Barometric Pres. = 11 psia

Molecular Weight = 17.31
Reduced Temp. = 1.81
Base Temp. = 520 R
Initial Pres. = 3000 psig
Base Pres. = 14.7 psia

CHEMICAL & GEOLOGICAL LABORATORIES

C5

P. O. Box 2794
Casper, Wyoming

GAS ANALYSIS REPORT

Company C.E.R. Geonuclear Date November 30, 1970 Lab. No. 4764
 Well No. Unit #1 Location _____
 Field Fawn Creek Formation Fort Union (Zone 2) 5598 to 5632
 County Rio Blanco Depth _____
 State Colorado Sampling point Separator
 Line pressure 270 psig; Sample pressure 110 psig; Temperature 80 ° F; Container number 40M
 Remarks _____

Component	Mole % or Volume %	Gallons per MCF
Oxygen	0	
Nitrogen	0.20	
Carbon dioxide	0.93	
Hydrogen sulfide	0	
Methane	93.40	
Ethane	3.47	0.192
Propane	0.70	0.055
Iso-butane	0.17	0.060
N-butane	0.19	0.029
Iso-pentane	0.08	0.025
N-pentane	0.07	0.364
Hexanes & higher	0.79	
Total	100.00	0.725

GPM of pentanes & higher fraction 0.418
 Gross btu/cu. ft. @ 60° F. & 14.7 psia (dry basis) 1085
 Specific gravity (calculated from analysis) 0.618
 Specific gravity (measured) 0.621

Remarks: _____

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 1

Buildup Test From 6/12/70 to 6/16/70
 Ball Bros. MK-9P SS
 Element at 5715 feet KB

$$T_o = \frac{1150 \text{ MSCF}}{73 \text{ MSCF/D}} \times 24 = 378 \text{ Hours}$$

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks
6/12/70	1700	372				
	1707	376			3333.	
	1715	390			1493.	
	1730	456			756.	
	1745	522			505.	
	1800	570			378.	
	1830	642			252.	
	1900	708			189.	
	2000	-			126.	
	2100	876			95.	
	2200	876			77.	
	2300	882			63.7	
	2400	894			55.0	
	0100	906			48.3	
	0200	924			43.0	
	0300	936			38.8	
	0400	954			35.3	
	0500	966			32.4	
	0600	978			30.0	
	0700	990			27.9	

6/13

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 1
 Page Two

Date & Time	Δt hours	Bottom		ΔP Difference psi	$\frac{\text{Tot } \Delta t}{\Delta t}$	Remarks
		Hole Pressure psig	Wellhead Pressure psig			
6/13/70	0800	15.0	1002		26.2	
	0900	16.0	1008		24.6	
	1000	17.0	1026		23.2	Hard to Read
	1100	18.0	1032		22.0	
	1200	19.0	1038		20.9	
	1315	20.25	1038		19.65	
	1330	20.50	1044		19.42	
	1400	21.0	1050		19.01	
	1600	23.0	-		17.4	
	1800	25.0	1092		16.12	
	2000	27.0	1104		15.0	
	2200	29.0	1122		14.2	
	2400	31.0	1080 ?		13.2	
	0200	33.0	-		12.45	
6/14	0400	35.0	1146		11.78	
	0600	37.0	-		11.21	
	0800	39.0	-		10.7	
	1000	41.0	1170		10.2	
	1200	43.0	1176		9.8	
	1400	45	1182		9.43	
	1800	49	1194		8.77	
	2200	53	1212		8.13	
	2400	55	1218		7.87	
	0200	57	1224		7.64	
	0400	59	1236		7.41	
	0800	63	1242		7.00	
	1000	65	1248		6.80	
	1120	66.3	1254		6.71	
1135	66.6	1254		6.66		
6/15						

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 1
 Page Three

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	$\frac{\text{Tot } \Delta t}{\Delta t}$	Remarks
		Pressure psig	Wellhead Pressure psig			
6/15/70	1200	1254			6.64	
	1400	1260			6.48	
	1600	1266			6.32	
	2000	1272			6.05	
	2200	1278				
6/16	2400	1284			5.78	
	0200	1290				
	0400	1290			5.55	
	0800	1302			5.35	
	1000	1308				
	1045	1308			5.20	

From 6/16 to 6/30/70 the well was worked on to recover instrument and then cleaned up for drawdown test 1 and buildup number 2 -- details are furnished in daily reports.

Fawn Creek Government Number 1
Drawdown Number 1

The Fawn Creek Well was flowed at a constant gas flow rate of 36 MCF/D from 1530 on 6/30/70 to 1300 on 7/08/70. No downhole pressure data is available due to failure of downhole recorders. Cumulative production to 7/08/70 is estimated at 1619 MSCF. Water produced this test was 157 barrels from meter reading on separator. Water production at end of test averaging less than 6 barrels per day.

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 2

Buildup Test From 7/8/70 to 8/1/70
 Instrument GRC-SPG-3, #30362
 Element at 5700 feet KB

$$T_o = \frac{1619 \text{ MSCF}}{36 \text{ MSCF/D}} \times 24 = 1160 \text{ Hours}$$

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	$\frac{I_o + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Pressure psi				
7/08/70 1300	0	653.7		425	229		
1330	.5	772.6		535	238	2321	Shut well in. SPG-3 pressure element at 5700 feet KB.
1400	1.0	822.3		580	242	1161	
1430	1.5	858.1		640	218	774	
1500	2.0	884.9		675	210	581	
1600	3	925.1		740	185	388	
1700	4	956.4		785	171	291	
1800	5	983.2		825	158	233	
1900	6	1010.1		865	145	194	
2000	7	1036.9		905	132	167	
2100	8	1063.7		940	124	146	
2200	9	1086.0		955	131	130	
2400	11	1117.3		980	137	106.5	
7/09/70 0200	13	1144.1		1005	139	90.2	
0400	15	1166.5		1025	141	78.3	
0800	19	1197.8		1055	143	62.0	
1200	23	1220.1		1080	140	51.4	
1600	27	1242.5		1110	132	44.0	
2000	31	1264.8		1130	135	38.4	
2400	35	1282.7		1145	138	34.1	

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 2
 Page Two

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{T + \Delta t}{\Delta t}$	Remarks
7/10/70 0400	39	1296.1	1155	141	30.7	
0800	43	1309.5	1165	144	28.0	
1200	47	1322.9	1170	153	25.7	
1600	51	1331.8	1180	152	23.7	Leaking
2000	55	1340.8	1190	150	22.1	Leaking
2400	59	1349.7	1195	155	20.7	Okay
7/11/70 0400	63	1358.7	1200	159	19.4	
0800	67	1367.6	1205	163	18.3	
1400	73	1374.0	1210	164	16.9	
2200	81	1385.5	1215	170	15.3	
7/12/70 0600	89	1398.9	1220	179	14.0	
1400	97	1412.3	1230	182	12.9	
2200	105	1413	1235	178	12.0	Leaking
7/13/70 1700	124	1425.7			10.4	Worked on control head -
1900	126	1439.1	1250	189	10.2	still leaking
Rubbers in control head leaking since 2200 hours 7/12/70, leak stopped at 2030 hours 7/13/70						
7/13/70 2200	129	1439.1			10.0	No Leak
7/14/70 0200	133	1461.5			9.72	No Leak
0700	138	1470.4	1265	205	9.41	No Leak
1200	143	1479.3	1270	209	9.11	No Leak
1400	145	1483.8			9.00	Leak - short in cable at
1600	147	1501.7			8.89	wellhead where safety
1800	149	1497.2			8.79	clamped off
2000	151	1492.7			8.68	
2100	152	1497.2			8.63	Leak stopped
2400	155	1501.7			8.48	

Short in cable from safety clamp - cut cable at wellhead and repaired short. Lost 3300 feet 1/8 inch cable.
 Leaking gas at wellhead all afternoon - stopped when cooled off at 9:00 p.m.

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 2
 Page Three

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	Tot Δt Δt	Remarks
		Pressure psig	Wellhead Pressure psig			
7/15/70 0600	161	1515.1			8.20	
1000	165	1524.0			8.03	
1600	171	1533.0			7.78	
7/16/70 1000	189	1649.2			7.14	recorder stopped - 18 hours Another fault?
1400	193	1658.1			7.01	Small gas leak
1700						Suspect instrument error - both manual and recording
(Manual recorder pressure fall off at wellhead)						
7/17/70 1000						
1100						Blowdown some gas.
7/18/70						Gage in wellhead all day, master valve shut in - well building up.
7/19/70						Recovered SPG-3 gage. Surface recorder not functioning. Deadweighted the Marshall 3500 psi RPG-3 in the lubricator - 72 hour clock pressure gage at 12:35. DWT pressure 1335 psig. Waited 10 minutes, DWT same at 1335 psig. On bottom with Marshall gage at 1315, 5650 feet G.L.
7/20/70						Well shut in
7/21/70						Well shut in
7/22/70 1330	336.5	1558.5			4.45	No fluid level to 5650 feet GL Marshall survey
1430	337.5	1559.9			4.44	Marshall pressure element using 175°F, 1800 psig calibration curve. 5650 ft GL
7/23/70 1930	342.5	1561.7			4.39	
0030	347.5	1565.3			4.34	
0530	352.5	1567.0			4.29	
1030	357.5	1568.8			4.24	
1530	362.5	1570.6			4.20	
2030	367.5	1572.4			4.16	

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 2
 Page Four

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	$\frac{\text{To+ } \Delta t}{\Delta t}$	Remarks
		Pressure psig	Hole Pressure psig				
7/24/70 0130	372.5	1574.1	1574.1			4.11	
0630	377.5	1575.9	1575.9			4.07	
1130	382.5	1577.7	1577.7			4.03	
1630	387.5	1579.5	1579.5			3.99	
2130	392.5	1583.0	1583.0			3.96	
7/25/70 0230	397.5	1584.8	1584.8			3.92	
0730	402.5	1586.6	1586.6			3.88	
1230	407.5	1588.4	1588.4			3.85	Deadweight test of Marshall gauge in lubricator. DWT = 1397 psig Marshall gauge = 1394.5 psig
7/26/70	Well shut in						
7/27/70	Well shut in						
7/28/70	Well shut in						
7/29/70 1440							
1535	506.5	1630.1	1630.1			3.29	Deadweight test of CER RPG-3 in lubricator. DWT = 1430 psig CER gauge = 1425.6 CER wellbore survey to 5650 ft KB, no fluid level.
1630	507.5	1624.0	1624.0			3.29	CER gauge rerun with 72 hr clock 5650 ft KB
7/30/70 1630	531.5	1634.0	1634.0			3.18	
7/31/70 1630	555.5	1641.0	1641.0			3.09	
8/01/70 1200	575.0	1650.0	1650.0			3.02	CER gauge pulled to read
1630	579.5	1653.0	1653.0			3.00	CER gauge rerun for start of flow period 72 hour clock.

Well open to flow at 1635 on 8/01/70

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 Drawdown Test Number 2

Test From 8/1/70 to 8/16/70

RPG-3 #30167N, bottom hole pressure gauge
 used from 8/01/70 to 8/11/70 then changed
 out and SPG-3 #30362 used from 8/12/70 to
 end of test.

All instruments landed at 5650 feet KB.

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter		Remarks
		Pressure psig	Reading bbls					Cum. Water bbls		
8/1/70										
1635	0	1653	1460	193	95	34.1	406	0		
1700	.5	1632	1460	172	97	34.7	"	"		
1800	1.5	1627	1445	182	97	34.7	"	"		
1900	2.5	1617	1435	182	97	35.2	"	"		
2000	3.5	1608	1420	188	96	35.5	"	"		
2100	4.5	1600	1410	190	96	35.7	"	"		
2200	5.5	1594	1400	194	96	35.7	"	"		
2300	6.5	1587	1390	197	96	35.7	"	"		
2400	7.5	1581	1385	196	97	35.8	"	"		
8/2/70										
0100	8.5	1574	1380	194	97	35.9	406	0		
0200	9.5	1569	1375	194	97	35.9	"	"		
0400	11.5	1559	1370	189	97	35.8	"	"		
0600	13.5	1553	1360	193	97	35.9	"	"		
0800	15.5	1543	1360	183	97	35.6	"	"		
1000	17.5	1538	1360	178	97	35.7	"	"		
1200	19.5	1531	1360	171	98	35.4	"	"		

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 Drawdown Test Number 2
 Page Two

Date & Time	Δt hours	Bottom Hole Pressure		ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
		psi	psi						
8/2/70									
1400	21.5	1525	1355	170	98	35.4	406	0	
1600	23.5	1518	1350	168	98	35.2	"	"	
1800	25.5	1510	1330	180	97	35.6	"	"	
2000	27.5	1501	1320	181	96	35.8	"	"	
2200	29.5	1496	1310	186	96	35.7	"	"	
2400	31.5	1488	1305	183	96	35.7	"	"	
8/3/70									
0200	33.5	1482	1295	187	96	35.7	406	0	
0400	35.5	1475	1280	195	96	35.7	"	"	
0600	37.5	1470	1275	195	96	35.6	"	"	
0800	39.5	1463	1270	193	96	35.4	"	"	
1000	41.5	1459	1280	179	97.5	35.6	"	"	
1200	43.5	1452	1295	157	98	35.4	"	"	
1400	45.5	1447	1285	162	97.5	35.4	"	"	
1600	47.5	1442	1280	162	97	35.3	"	"	
1800	49.5	1435	1280	155	97.5	35.3	"	"	
2000	51.5	1426	1260	166	97	35.6	"	"	
2200	53.5	1418	1250	168	97	35.5	"	"	
2400	55.5	1410	1245	165	97	35.7	"	"	
8/4/70									
0200	57.5	1405	1240	165	97	35.8	406	0	
0400	59.5	1400	1230	170	97	35.6	"	"	
0600	61.5	1393	1225	168	97.5	35.4	"	"	
0800	63.5	1387	1220	167	97	35.6	"	"	
1000	65.5	1382	1230	152	97	35.6	"	"	
1200	67.5	1376	1220	156	97.5	35.6	"	"	
1400	69.5	1374	1220	154	97.5	35.5	"	"	

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 Drawdown Test Number 2
 Page Three

Date & Time	Δt hours	Bottom Hole Pressure		Wellhead Pressure	ΔP psi	Flow Prover Pressure	Rate MCF/D	Water Meter		Remarks
		psig	psig					Reading bbls	Cum. Water bbls	
RPG-3 bottom hole gauge with 72 hour clock off bottom at 1:53 p. m. Back on bottom at 2:45 p. m. with new chart. Well shut in approximately 20 minutes. Pressure in lines and lubricator kept flow prover constant except for 5 minutes. Flow prover decreased from 97.5 to 30 psig and increased to 102.5 over 5 minute period. Remained at 102.5 psig for 22 minutes with separator corrected. Prover pressure went to 97.5 psig again. Similar response shown on separator chart, eg., 96 to 29.5 to 102.6 in 5 minutes and 102.6 psig for 23 minutes.										
8/4/70										
1425	70.25	1365								
1600	71.5	1367	1215	152	97.5	35.4	406	0		
2000	75.5	1352	1190	162	97.5	35.6	"	"		
2400	79.5	1337	1180	157	97.0	35.5	"	"		
8/5/70										
0400	83.5	1322	1160	162	97.5	35.5	406	0		
0800	87.5	1305	1140	165	97.5	35.4	"	"		
1200	91.5	1288	1135	153	97.0	35.5	"	"		
1600	95.5	1286	1090	196	97.0	35.3	"	"		
2000	99.5	1271	1020	251	96.0	35.5	"	"		
2400	103.5	1260	940	320	96.0	35.6	"	"		
8/6/70										
0400	107.5	1245	860	385	96.0	35.6	406	0		
0800	111.5	1230	780	450	97.5	35.8	"	"		
1200	115.5	1206	700	506	97.5	35.4	411	5		
1600	119.5	1195	570	625	96.0	35.2	"	"		
2000	123.5	1159	370*	789	96.0	35.9	"	"		
2400	127.5	1122	350	772	96.0	35.8	"	"		

*BHP chart shows water by small pulses in pressure

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 Drawdown Test Number 2
 Page Four

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
		Pressure psig	Hole Pressure psig							
8/7/70										
0400	131.5	1096	350	746	96.0	35.9				
0800	135.5	1072	335	737	97.5	36.4				
1015*	137.75	1070								
*Amerada RPG off bottom at 1010 8/7/70 with 72 hour clock from 8/4/70. Well shut in at 1055. Amerada back on bottom at 1130 hours.										
8/08/70										
1200	139.5	1199	475	724	95	35.5	414.5	7.5		Started pumping at 1230 8/07/70
1600	143.5	866	625	241	95	35.5	419.0	13		
2000	147.5	967	850	117	95	35.5	425.0	19		
8/08/70										
0000	151.5	1042	840	202	95	35.5	-			
0400	155.5	1053	775	278	95	35.5	-			
0800	159.5	1053	675	378	95	35.5	-			
1200	163.5	926	700	226	95	35.5	425.1	19.1		
1600	167.5	825	750	75	95	35.5	432.3	26.3		
2000	171.5	978	760	218	95	35.5	-			
8/09/70										
0000	175.5	997	710	287	95	35.5	-			
0400	179.5	988	610	378	95	35.5	-			
0800	183.5	978	475	503	95	35.5	-			
1200	187.5	1042	580	462	95	35.5	432.5	26.5		
1600	191.5	734	675	59	95	35.5	438.0	32.0		
2000	195.5	881	725	156	95	35.5	441.8	35.8		

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 Drawdown Test Number 2
 Page Five

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
		Pressure psig	Pressure psig							
8/10/70										
0000	199.5	930	675	255	95	35.5	-	-		
0400	203.5	941	610	331	95	35.5	-	-		
0800	207.5	937	500	437	95	35.5	-	-		
1200	211.5		480		95	35.5	441.9	35.9		Pumping
1600	215.5		600		95	35.5	449.5	43.5		Pumping
2000	219.5		670		95	35.5	-	-		
8/11/70										
0000	223.5		625		95	35.5	-	-		Pulled RPG-3
0400	227.5		540		95	35.5	-	-		Changed Lubricator
0800	231.5		425		95	35.5	-	-		to run SPG-3 on
1200	235.5		340		95	35.5	-	-		1/8" cable
1600	239.5		260		95	35.5	-	-		
2000	243.5		375		95	35.5	-	-		
8/12/70										
0000	247.5		540		95	35.5	451.5	45.5		Running SPG-3
0400	251.5		420		95	35.5	-	-		
0800	255.5		350		95	35.5	-	-		
1200	259.5		240		95	35.5	-	-		
1600	263.5	791.1	175	616	95	35.5	452.0	46.0		Bottom hole gauge in
2000	267.5	511.1	350	161	95	35.5	-	-		operation
8/13/70										
0000	271.5	688.9	475	214	95	35.5	460.6	54.6		
0400	275.5	764.4	450	314	95	35.5	-	-		
0800	279.5	786.7	425	362	95	35.5	-	-		
1200	283.5	520.0	460	60	95	35.5	462.1	56.1		
1600	287.5	697.8	510	188	95	35.5	-	-		
2000	291.5	760.0	480	280	95	35.5	-	-		

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 Drawdown Test Number 2
 Page Six

Date & Time	Δt hours	Bottom Hole Pressure		Wellhead Pressure	ΔP Difference	Flow Prover Pressure	Rate MCF/D	Water Meter Reading	Cum. Water	Remarks
		psig	psig							
8/14/70										
0000	295.5	777.8	425	353	95	39.5	-	-		
0400	299.5	768.9	325	444	95	39.5				
0800	303.5	764.4	250	514	95	39.5	468.6	162.6		
1200	307.5	511.1	200	311	95	39.5				
1600	311.5	391.1			95	39.5	478.0	72.0		Pumping
2000	315.5	471.1			95	39.5				
8/15/70										
0000	319.5	493.3			95	39.5				
0400	323.5	537.8			95	39.5				
0800	327.5	537.8			95	39.5	497.0	91.0		Installed new packing
1200	331.5	524.4	450	74	95	39.5				
2000		520.0			95	35.5	500.0	94.0		
Well shut in @ 1200 for 6 hours - reopened to flow at 1800 8/15/70										
8/16/70										
0000	335.5	324.4			95	35.5				
0400	339.5	364.4			95	35.5				
0800	343.5	413.3			95	35.5	501.5	95.5		
1200	347.5	488.9			95	35.5	504.5	98.5		
1600	351.5	546.7			95	35.5				
1800	353.5	577.8	500	78	95	35.5	510.0	104.0		Shut in for buildup at 1800 8/16/70 End of Test

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 3

Buildup Test From 8/16/70 to 10/13/70
 Rental SPG-3 at 5650 feet KB

$$T_o = \frac{2153 \text{ MSCF}}{35.5 \text{ MSCF/D}} \times 24 = 1457 \text{ Hours (Horner)}$$

T* = 1236 Hours (ODEH)

Date & Time	Δt hours	Bottom Hole Pressure		ΔP Difference psi	Remarks
		psig	psig		
8/16/70	0	578	500	78	
	.5	680.0	600	80	2473
	1	728.9	650	79	1237
	2	813.3	720	93	619
	3	866.7	760	107	413
	4	911.1	800	111	310
8/17/70	5	946.7	840	107	248
	6	973.3	860	113	207
	7	1000.0	880	120	177.6
	8	1022.2	900	122	155.5
	9	1035.6	915	121	138.3
	10	1053.3	925	128	124.6
	11	1066.7	940	127	113.4
	12	1080.0	950	130	104.0
	13	1093.3	960	133	96.08
	14	1102.3	965	137	89.29
	15	1111.1	975	136	83.40
	16	1120.0	985	135	78.25
	17	1128.9	1000	129	73.71
	18	1133.3	1010	123	69.67
19	1164.4	1025		54.74	
20	1168.9			52.50	

Power Off
 Power Off

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 3
 Page Two

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	$\frac{T_0 + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Wellhead Pressure psig			
8/18/70	0900	1226.7	1075	152	32.69	
	1000	1235.6	1080	156	31.90	
	1200	1240.0			30.43	
	1400	1244.4	1100	144	29.09	
	1600	1248.9			27.87	
	1800	1253.3	1105	148	26.75	
	2200	1262.2	1105	157	24.77	
	0200	1269.0	1110	159	23.07	
8/19/70	0600	1275.6	1115	160	21.60	
	1000	1284.4	1125	160	20.31	
	1500	1297.8	1140	158	18.9	Generator Out
	1300	1324.4	1160	164	14.58	Standby
1530	1328.9	1170	159	14.22	Generator Out	
8/21/70	1130	1346.4	1185	162	11.89	
	1800	1355.6	1190	166	11.30	
	2200	1360.0	1190	160	10.97	
	0200	1364.4	1190	164	10.66	
8/22/70	0600	1366.6	1190	166	10.36	
	1000	1368.9	1200	169	10.09	
	1400	1373.3	1210	163	9.83	
	2000	1382.2	1210	172	9.47	
8/23/70	0200	1386.7	1215	172	9.13	
	0800	1391.1	1215	171	8.82	
	1400	1393.4	1225	168	8.54	
	2200	1397.8	1225	173	8.19	
8/24/70	0600	1404.4	1225	179	7.86	
	1400	1410.1	1245	165	7.57	
	2200	1417.8	1245	177	7.31	

Fawn Creek Government Number 1
 Zone 1 - 5747 feet to 5792 feet (GR-N Log)
 BHP Buildup Number 3
 Page Three

Date & Time	Δt hours	Bottom		ΔP Difference psi	Wellhead Pressure psig	$\frac{\text{Tot } \Delta t}{\Delta t}$	Remarks
		Hole Pressure psig	Pressure psig				
8/25/70	0600	1422.2	1245	177	1245	7.06	
	1300	1426.7	1255	172	1255	6.86	
	2200	1431.1	1255	176	1255	6.62	
8/26/70	0600	1435.6	1255	181	1255	6.42	
	1400	1437.8	1265	173	1265	6.24	
	2200	1442.2	1265	177	1265	6.07	
8/27/70	0600	1446.6	1265	182	1265	5.90	
	1400	1453.3	1290	163	1290	5.75	
8/28/70	0200	1457.8	1295	183	1295	5.54	
	1400	1466.7	1300	167	1300	5.35	
8/29/70	1400	1480.0	1310	170	1310	5.01	
8/30/70	1400	1488.9	1320	169	1320	4.72	
8/31/70	1400	1497.8	1325	173	1325	4.47	
9/01/70	1400	1506.7	1325	183	1325	4.25	
9/02/70	1400	1515.6	1340	176	1340	4.05	
9/03/70	1130	1529.0	1350	179	1350	3.90	
9/04/70	1400	1537.8	1350	188	1350	3.73	
9/06/70	1400	1548.9	1355	194	1355	3.47	
9/07/70	1230	1557.8	1370	188	1370	3.36	
9/08/70	1300	1564.4	1380	184	1380	3.26	
9/09/70	1400	1671.1	1390	281	1390	3.16	
9/11/70	1200	1584.5	1405	180	1405	3.00	
9/13/70	1600	1595.6	1410	186	1410	2.84	
9/14/70	1330	1602.3	1410	192	1410	2.78	
9/16/70	1200	1615.7	1425	191	1425	2.67	
9/17/70	1645	1624.7	1440	185	1440	2.61	
9/18/70	1545	1631.5	1450	182	1450	2.57	
9/19/70	1530	1634.2	1450	184	1450	2.52	
9/20/70	1530	1640.4	1450	190	1450	2.48	
9/21/70	1430	1642.7	1450	193	1450	2.44	

Fawn Creek Government Number 1
 Zone 1 - 5747 Feet to 5797 Feet (GR-N Log)
 BHP Buildup Number 3
 Page Four

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{Tot \Delta t}{\Delta t}$	Remarks
9/22/70	1500	1649.4	1450	199	2.40	
9/23/70	1500	1653.9	1450	204	2.36	
9/24/70	1530	1658.4	1450	208	2.32	
9/25/70	1500	1658.4	1450	208	2.29	
9/26/70	1500	1662.9	1460	203	2.26	
9/27/70	1930	1671.9	1470	202	2.23	
9/28/70	1700	1676.4	1470	206	2.20	
9/30/70	1500	1683.2	1480	203	2.15	
10/01/70	1600	1685.4	1485	200	2.12	
10/02/70	1500	1689.9	1490	200	2.10	
10/03/70	1630	1694.4	1490	204	2.07	
10/05/70	1500	1701.1	1500	201	2.05	
10/07/70	1300	1707.9	1500	208	2.03	
10/09/70	1400	1716.9	1500	217	1.99	
10/13/70	1500	1732.5	1525	208	1.92	

End of Test -
 ReCompleting to Zone II

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 BHP Buildup Number 1

Buildup Test From 10/30/70 to 11/09/70
 Amerada Pressure Sentry #30167N at 5300 feet KB

$$T_o = \frac{750 \text{ MSCF}}{307 \text{ MSCF/D}} \times 24 = 58.6 \text{ Hours}$$

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	Remarks
		Pressure psig	Pressure psig		
10/30/70 1330	-	435	NOT RECORDED	-	Flowing BHP @ 307 MCF/D
1400	0	435		-	Well shut in
1500	1	900		59.63	Well shut in
1600	2	1042		30.32	Well shut in
1800	4	1232		15.66	Well shut in
2000	6	1354		10.77	Well shut in
2200	8	1445		8.33	Well shut in
2400	10	1510		6.86	Well shut in
10/31/70 0200	12	1559		5.89	Well shut in
0600	16	1641		4.66	Well shut in
1000	20	1705		3.93	Well shut in
1400	24	1751		3.44	Well shut in
1800	28	1787		3.09	Well shut in
2200	32	1813		2.83	Well shut in
11/01/70 0200	36	1837		2.63	Well shut in
0800	42	1867		2.40	Well shut in
1400	48	1889		2.22	Well shut in
2200	56	1914		2.05	Well shut in
11/02/70 0600	64	1934		1.92	Well shut in
1100	69	1942		1.85	Well shut in
1900	77	1966		1.76	Well shut in
					Pulled Sentry
					Ran SPG-3 #30362, landed

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 BHP Buildup Number 1
 Page Two

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{T_{ot} \Delta t}{\Delta t}$	Remarks
11/03/70 0300	85	1977	NOT RECORDED		1.69	at 5300'
1100	93	1988			1.63	Continued buildup
1900	101	1996			1.58	
11/04/70 0300	109	2005			1.54	
1100	117	2013			1.50	
1900	125	2020			1.47	
11/05/70 0300	133	2024			1.44	
1000	140	2029			1.42	
11/06/70 1700	171	2038			1.34	
2200	176	2042.5			1.33	
11/07/70 0600	184	2046.9			1.32	
1400	192	2051.4			1.31	
2200	200	2055.9			1.29	
11/08/70 0600	208	2060.3			1.28	
1400	216	2064.8			1.27	
2200	224	2067.0			1.26	
11/09/70 0600	232	2069.3			1.25	
1100	237	2069.3			1.25	
1500	241	2073.7			1.24	

End of initial buildup - 1600
 11/09/70

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 Drawdown Number 1

Test From 11/09/70 to 11/19/70
 Amerada SPC-3, #30362
 SRT-2, #30363
 Pressure Element at 5600 feet KB
 Water Tank Capacity 20 barrels/ft.

Date & Time	Δt hours	Bottom Hole		Wellhead		Flow Prover		Water Meter		Remarks
		Pressure psig	Pressure psig	Pressure psig	Pressure psig	Rate MCF/D	Reading bbls	Cum. Water bbls		
11/09/70										
1600	0	2060.3	1800	260	50	195.7	188.5	0	0.6' Tank Gauge	
1700	1	2006.7	1735	272	50	195.7	188.5			
1800	2	1970.9	1700	271	50	195.7	188.5			
1900	3	1944.1	1680	264	50	195.7	188.5			
2000	4	1921.8	1665	257	50	195.7	188.5			
2200	6	1886.0	1640	246	50	195.7	188.5			
2400	8	1854.7	1615	240	50	195.7	188.5			
11/10/70										
0200	10	1827.9	1590	238	50	195.7	188.5			
0400	12	1805.6	1560	246	50	195.7	188.5			
0600	14	1778.8	1545	234	50	195.7	188.5			
0800	16	1756.4	1525	231	50	195.7	188.5			
1000	18	1738.5	1505	234	50	195.7	188.5			
1200	20	1716.2	1490	226	50	195.7	188.5			
1400	22	1693.9	1475	219	50	195.7	188.5			

At 1500 hours separator dumped small amount of liquid (methanol and condensate) to tank, dump valve did not completely close. Bleeding very small amount of gas through water meter. Liquid production should be determined from tank gauging.

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 Drawdown Test Number 1
 Page Two

Date & Time	At hours	Bottom Hole Pressure		Wellhead Pressure	Δ P Difference	Flow Prover Pressure	Rate MCF/D	Water Meter		Remarks
		psig	psig					Reading bbls	Cum. Water bbls	
1600	24	1671.5	1450	222	50	195.7	188.5	0	0.6' Tank Gauge	
2000	28	1604.5	1375	230	50	195.7	188.5			
2400	32	1564.2	1100	464	50	195.7	188.5			
At 0100 hours flow rate dropped immediately from 195.7 MCF/D to 109 MCF/D and remained there until 0350 hours. Liquid carry over into gas line, probably heavy oil - and set up. Raised pressure on gas line and corrected level control problem at 0350 hours. Atms. temp. at 0330 hours 14°F - @ 0730 12°F.										
11/11/70										
0100	33	1546.4	1075	471	23	109	188.5		Rate declined	
0200	34	1600.0	1120	480	23	109	188.5		Rate declined	
0300	35	1617.9	1140	478	23	109	188.5		Rate declined	
0400	36	1622.3	1125	497	50	195.7	188.5			
0500	37	1564.2	980	584	50	195.7	188.5			
0530	37.5	-	-	-	-	-	200			
0600	38	1524.0	1010	514	50	195.7	203		Rate declined	
0800	40	1492.7	1030	463	50	195.7	206		Rate declined	
1000	42	1474.9	970	505	50	195.7	209		Rate declined	
1200	44	1448.0	1025	423	50	195.7	212			
1400	46	1430.2	950	480	50	195.7	215	14	1.3' Tank Gauge	
1600	48	1403.4	920	483	50	195.7	219			
1800	50	1381.0	900	481	50	195.7	221			
2000	52	1354.2	915	439	50	195.7	224			
2400	56	1322.9	870	453	50	195.7	230			
11/12/70										
0400	60	1269.3	825	444	50	195.7	236			
0800	64	1233.5	835	399	50	195.7	243			
1000	66	1220.1	850	370	50	195.7	245			
1200	68	1202.2	810	392	50	195.7	248			
1400	70	1184.4	790	394	50	195.7	250	28	2.0' Tank Gauge	
1600	72	1166.5	765	402	50	195.7	254			

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 Drawdown Test Number 1

Page Three

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
		Pressure psig	Difference							
1800	74	1139.7		760 ?	380	50	195.7	256		
2000	76	1117.3		760 ?	357	50	195.7	259		
2400	80	1068.2		755 ?	313	50	195.7	264		
11/13/70										
0400	84	1027.9		750 ?	278	50	195.7	270		
0800	88	992.2		740 ?	252	50	195.7	276		
1000	90	965.4		740 ?	225	50	195.7	279		
? Found tubing line to Barton frozen up - found pressure (Surface) to be 640 psig at 1030 hours after thawing out line, as a result ? symbols have been placed by pressures that may be in doubt.										
1200	92	947.5		625	323	50	195.7	282		
1400	94	929.6		610	320	50	195.7	284		
1600	96	911.7		590	322	50	195.7	287		
1800	98	880.4		550	330	50	195.7	290		
2000	100	867.0		530	337	50	195.7	293		
2400	104	804.5		520*	285	50	195.7	299		*Surface recorder line probably froze up
11/14/70										
0400	108	768.0		520*	248	50	195.7	304		
0800	112	726.9		500*	227	50	195.7	308		
1000	114	704.0		420	284	50	195.7	312		
1200	116	681.1		410	271	50	195.7	315		
1400	118	662.9		375	288	50	195.7	318	66	3.9' Tank Gauge
1600	120	635.4		350	285	50	195.7	321		
1800	122	617.1		340	277	50	195.7	324		
2000	124	576.0		300	276	50	195.7	327		
2400	128	512.0		275	237	50	195.7	333		
11/15/70										
0400	132	461.7		200	262	50	195.7	338		
0600	134	425.1		180	245	50	195.7	339		
0800	136	420.6		175	246	50	195.7	340		

Well inadvertently shut in for 4½ hours

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 Drawdown Test Number 1
 Page Four

Date & Time	Δt hours	Bottom Hole		Wellhead		ΔP psi	Flow Prover		Rate MCF/D	Water		Remarks
		Pressure psig	Pressure psig	Pressure psig	Pressure psig		Prover Pressure psig	Reading bbls		Meter Reading bbls	Cum. Water bbls	
0900	137	740.6	500	241								Shut in
1000	138	858.1	625	233								Shut in
1100	139	925.1	750	175								Shut in
1200	140	978.8	850	129								Shut in
1230	140.5	992.2	890	102						340		Shut in
Started flowing again at 195.7 MCF/D @ 1230 hours												
1300	141	925.1	825	100		50	195.7	340				Shut in
1400	142	844.7	750	95		50	195.7	340			84	4. 8' Tank Gauge
1500	143	795.4	700	95		50	195.7	340				
1600	144	758.9	600	159		50	195.7	340				
1700	145	717.7	450	268		50	195.7	340				
1800	146	667.4	400	267		50	195.7	342				
1900	147	630.9	350	281		50	195.7	344				
2000	148	589.7	310	280		50	195.7	345				
2200	150	516.6	260	257		50	195.7	349				Started making H ₂ O at 1715 hours
2300	151	493.7	220	274		50	195.7	351				
2400	152	461.7	190	272		50	195.7	352				
11/16/70												
0100	153	429.7	175	255		50	195.7	353				
0200	154	411.4	160	251		50	195.7	355				
0300	155	402.3	160	242		50	195.7	356				
0500	157	393.1	160	233		45	180	358				Rate falling off
0700	159	384.0	150	234		40	165	360				Rate falling off
0800	160	384.0	145	239		39	161	361				Rate falling off
0900	161	379.4	145	234		39	161	362				Rate falling off
Shut in from 0900 to 0930 to change orifice plate and work on pressure controller - installed 1/4" plate												
0930	161.5	544.0	350	194		72	121.9	362				New rate 121.9
1000	162	525.7	325	201		72	121.9	362				
1100	163	548.6	330	219		72	121.9	362				

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 Drawdown Test Number 1
 Page Six

Date & Time	Δt hours	Bottom Hole Pressure		ΔP Difference	ΔP Difference	Flow Prover		Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
		psig	psig			psig	psig				
11/19/70											
0400	228	393.1	170	223	223	70	119	410			
0500	229	361.1	145	216	216	70	119	411		117	6.45' Tank Gauge

Shut in well at 0500 11/19 for BHP buildup Number 2 - Two barrels of methanol pumped into cum water.

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 BHP Buildup Number 2
 Page Two

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	$\frac{\text{Tot } \Delta t}{\Delta t}$	Remarks	
		Pressure psig						
11/19/70	1400	965.4		875	90	49.78		
	1500	992.2		890	102	44.90		
	1600	1010.1		905	105	40.91		
	1700	1032.4		920	112	37.58		
	1800	1045.8		935	111	34.77		
	1900	1063.7		945	119	32.36		
	2000	1081.6		955	127	30.27		
	2200	1108.4		980	128	26.82		
	2400	1130.7		1005	126	24.11		
	11/20/70	0200	1153.1		1020	133	21.90	
		0400	1175.4		1040	135	20.09	
		0600	1197.8		1055	143	18.56	
		0800	1215.6		1070	146	17.26	
		1000	1233.5		1090	144	16.14	
		1200	1246.9		1110	137	15.16	
		1600	1273.7		1135	139	13.54	
		2000	1300.6		1155	146	12.26	
2400		1322.9		1175	148	11.21		
0400		1345.3		1190	155	10.34		
11/21/70	0800	1367.6		1205	163	9.61		
	1200	1385.5		1225	161	8.98		
	1600	1398.9		1240	159	8.44		
	2000	1412.3		1250	162	7.97		
	2400	1425.7		1260	166	7.55		
	0600	1448.0		1280	168	7.01		
	1200	1465.9		1295	171	6.56		
11/22/70	0600							
	1200							

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 BHP Buildup Number 2
 Page Three

Date & Time	Δt hours	Bottom			ΔP Difference psi	$\frac{To + \Delta t}{\Delta t}$	Remarks
		Hole Pressure psig	Wellhead Pressure psig				
11/22/70	85	1479.3	1305	174	6.16		
	91	1492.7	1320	173	5.82		
11/23/70	97	1506.1	1335	171	5.53		
	104	1524.0	1350	174	5.22		
	113	1541.9	1360	182	4.88		
11/24/70	121	1555.3	1370	185	4.63		
	131	1568.7	1390	179	4.35		
	141	1586.6	1405	182	4.11		
11/25/70	151	1604.5	1420	185	3.91		
	163	1622.3	1430	192	3.69		
	175	1631.3	1435	196	3.51		
11/26/70	187	1644.7	1440	205	3.35		
	198	1658.1	1450	208	3.22		
11/27/70	211	1671.5	1460	212	3.08		
	223	1680.4	1470	210	2.97		
11/28/70	247	1698.3	1480	218	2.78		
	270	1711.7	1490	222	2.63		
12/01/70	294	1720.7	1515	206	2.49		
12/02/70	317	1734.1	1525	209	2.38		
12/03/70	342	1747.5	1545	203	2.28		
12/04/70	366	1760.9	1555	206	2.20		
12/05/60	390	1772.0	1570	202	2.13		
12/06/70	414	1783.2	1575	208	2.06		
12/07/70	438	1794.4	1580	214	2.00		
12/08/70	469	1807.8	1585	223	1.94		
12/09/70	498	1819.0	1595	224	1.88		
12/11/70	536	1830.1	1610	220	1.82		
12/13/70	584	1841.3	1635	206	1.75		
12/15/70	632	1850.3	1645	205	1.69		

Fawn Creek Government Number 1
 Zone 2 - 5600 feet to 5630 feet (GR-N Log)
 BHP Buildup Number 2
 Page Four

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	$\frac{T_b + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Pressure psig				
12/16/70	1500	1856.9	1650	1650	207	1.67	
12/18/70	1200	1863.7	1655	1655	209	1.62	
12/21/70	1200	1877.1	1670	1670	207	1.57	
12/24/70	1100	1888.2	1680	1680	208	1.52	
12/30/70	1200	1912.8	1695	1695	217	1.44	
1/07/71	1700	1930.7	1700	1700	231	1.37	
1/11/71	1500	1944.1	1700	1700	244	1.34	
1/17/71	1800	1953.1	1725	1725	228	1.31	

APPENDIX III-D

SCANDARD DRAW TEST DATA

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Standard Draw Number 1
Zone 3 - 7454 feet to 7476 feet

SPG-3, #30362
SRT-2, #30363

PRESSURE AND TEMPERATURE SURVEY

Survey Run on August 26, 1970

<u>Depth (KB)</u> <u>feet</u>	<u>Temperature</u> <u>°F</u>	<u>Pressure</u> <u>psig</u>
0	-	429.7
1000	-	425.1
2000	-	420.6
3000	137.6	416.0
4000	159.2	411.4
5000	177.0	416.0
6000	199.6	429.7
6500	208.8	512.0
7000	214.4	608.0
7350	216.1	658.3

SRT-2 Temperature range 111 to 300°F

Standard Draw Number 1

TABLE III-D-1

GAS PROPERTIES

Pressure psia	Z	Viscosity cp	Compressibility psi ⁻¹	B Bbls/MCF	M(p) psi ² /cp
100	.996	.0139	1.01 x 10 ⁻²	33.89	0.72 x 10 ⁶
200	.987	.0140	5.09 x 10 ⁻³	16.79	2.89 "
300	.978	.0140	3.42 "	11.09	6.52 "
400	.970	.0141	2.58 "	8.25	1.16 x 10 ⁷
500	.962	.0142	2.08 "	6.55	1.82 "
600	.955	.0144	1.74 "	5.42	2.62 "
700	.948	.0145	1.50 "	4.61	3.57 "
800	.942	.0146	1.32 "	4.01	4.66 "
900	.936	.0148	1.17 "	3.54	5.89 "
1000	.931	.0149	1.06 "	3.17	7.27 "
1100	.926	.0151	9.61 x 10 ⁻⁴	2.86	8.78 "
1200	.921	.0152	8.80 "	2.61	10.42 "
1300	.917	.0154	8.12 "	2.40	12.20 "
1400	.913	.0156	7.52 "	2.22	14.10 "
1500	.910	.0158	7.00 "	2.06	16.13 "
1600	.907	.0160	6.54 "	1.93	18.27 "
1700	.905	.0162	6.13 "	1.81	20.54 "
1800	.903	.0164	5.76 "	1.71	22.91 "
1900	.901	.0166	5.42 "	1.61	25.39 "
2000	.900	.0169	5.12 "	1.53	27.98 "
2100	.899	.0171	4.83 "	1.46	30.67 "
2200	.898	.0173	4.58 "	1.39	33.44 "
2300	.898	.0176	4.36 "	1.33	36.31 "
2400	.899	.0178	4.12 "	1.27	39.27 "
2500	.899	.0181	3.91 "	1.22	42.30 "
2600	.900	.0183	3.72 "	1.18	45.41 "
2700	.901	.0186	3.54 "	1.14	48.60 "
2800	.903	.0189	3.37 "	1.10	51.85 "
2900	.905	.0192	3.21 "	1.06	55.16 "
3000	.908	.0194	3.06 "	1.03	58.54 "
3100	.910	.0197	2.92 "	1.00	61.97 "

Gas Gravity = .65

Crit. Temp. = 371.9 R

Bottom Hole Temp. = 216^oF

Crit. Press. = 669.3 psia

Barometric Pres. = 11 psia

Molecular Weight = 18.75

Reduced Temp. = 1.82

Base Temp. = 520 R

Initial Pres. = 3000 psig

Base Pres. = 14.7 psia

Standard Draw Number 1

Zone 1 - 7181 feet to 7212 feet (GR-N Log)

Buildup Test Number 1

Tested From 6/06/70 to 6/13/70

Cumulative gas produced = 130 MCF, Average rate = 38 MCF/D

Rental SPG-3 Pressure and Temperature Element at 7100 feet KB

$$T_o = \frac{130 \text{ MSCF}}{38 \text{ MSCF/D}} \times 24 = 82 \text{ Hours}$$

Date & Time	At hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	Tot Δt Δt	Remarks
6/06/70	1300	115.6			1172	Well shut in after this FBHP reading 6/06/70
	1304	120.0			483	
	1310	146.7			165	
	1330	231.1			83	
	1400	351.1			42	
	1500	595.6			28.33	
	1600	800.0			17.40	
	1800	1240?			14.67	
	1900	1377			12.71	
	2000	1555			11.25	
	2100	1698			10.11	
	2200	1838			8.45	
	2400	2117			6.86	
6/07/70	0300	2288			5.82	
	0600	2413			4.90	
	1000	2520			4.28	
	1400	2583			4.04	
	1600	2601	2110	491		

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 1
 Page Two

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	$\frac{T_0 + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Pressure psig				
6/08/70	47	2726	2726	NOT RECORDED		2.74	Chart drive stopped. Gen. engine stopped.
	52	2740	2740			2.58	
	57	2753	2753			2.44	
6/09/70	67	2775	2775			2.22	
	73	2789	2789			2.12	
6/10/70	93	2824	2824			1.88	
6/11/70	117	2849	2849			1.70	T = 216°F
	121.25	2851.4	2851.4			1.68	
Started flowing well - could not control pressure							
1420		Shut in - rate ~ 150 MCF/D during blowdown at separator (1415-1420) installing manual choke					
1532		Started drawdown at 25 MCF/D					
1840		Shut in briefly to rig bypass around manual choke					
1932		Opened well up to flow again at 25 MCF/D, could not keep choke on bypass from freezing off.					
2140		Shut well in, terminated first flow test, froze off at 2140, total gas this test = 6.7 MCF					
2140	0	2686	2686	NOT RECORDED			Cum gas prod 136.7
2200	.33	2704	2704				This buildup not analyzed because flow rate not stable at shut in.
2300	1.33	2753.1	2753.1				
2400	2.33	2775.4	2775.4				
6/12/70	3.33	2793.3	2793.3				
	5.33	2806.7	2806.7				
	7.33	2820.1	2820.1				
	10.33	2829.1	2829.1				
	11.33	2833.5	2833.5				
	13.33	2835	2835				
	15.33	2842.5	2842.5				
	17.33	2846.9	2846.9				
	19.33	2851.4	2851.4				
	24.33	2851.4	2851.4				

Standard Draw Number 1

Zone 1 - 7181 feet to 7212 feet (GR-N Log)

Buildup Test Number 1

Page Three

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	$\frac{\text{Tot } \Delta t}{\Delta t}$	Remarks
		Pressure psig	Pressure psig			
6/13/70 0700	33.33	2880.3	2880.3	NOT RECORDED		Temp 215.2°F
0900	35.33	2880.3	2880.3			
1200	38.33	2864.8	2864.8			
1530	41.83	2867	2867			
1700		2867				
1702						

Started drawdown test, flow rate ~ 35 MCF/D. Meter reading (Sep liquids) start at 87 barrels.

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1

Tested From 6/13/70 to 6/20/70
 Rental SPG-3 and SRT-2 instruments
 at 7100 feet KB

Date & Time	Δt hours	Bottom Hole		ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water		Remarks
		Pressure psig	Wellhead Pressure psig				Meter Reading bbls	Cum. Water bbls	
6/13/70 1700	0	2864.8	2400	465	100	37.2	88.0		
Separator operating pressure had to be controlled manually using manual choke ahead of separator. Bottom hole pressure erratic because of manual adjustments to separator.									
1730	0.5	2784.4			100	37.2			
1800	1	2762.0	2385	377	100	37.2			
1900	2	2721.8			100	37.2			
2000	3	2690.5	2350	341	100	37.2			
2100	4	2668.2			100	37.2			
2200	5	2645.8	2300	346	100	37.2	88.5		
2300	6	2632.4			100	37.2			
2400	7	2619.0	2275	344	100	37.2			
6/14/70 0100	8	2601.1			100	37.2			
0200	9	2587.7	2215	373	100	37.2			
0300	10	2578.8			100	37.2			
0400	11	2569.8	2185	385	100	37.2			
0500	12	2560.9			100	37.2			
0600	13	2552.0	2115	437	100	37.2			

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Two

Date & Time	Bottom Hole		Wellhead Pressure psig	ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
	At hours	Pressure psig							
6/14/70									
0700	14	2538.5			100	37.2			
0800	15	2534.1	2100	434	100	37.2			
0900	16	2529.6			100	37.2			
1000	17	2525.1	2065	460	100	37.2			
1100	18	2511.7			100	37.2			
1200	19	2502.8	2050	453	100	37.2			
1300	20	2498.3			100	37.2			
1400	21	2489.4	2000	489	100	37.2	89.0		
1500	22	2480.4			100	37.2			
1600	23	2476.0	1975	501	100	37.2			
1700	24	2467.0			100	37.2	90.0		
1800	25	2458.1	1935	523	100	37.2			
1900	26	2440.2			100	37.2		3.0	
2000	27	2422.3	1875	547	100	37.2			
2100	28	2408.9			100	37.2			
2200	29	2391.0	1835	556	100	37.2			
2300	30	2373.0			100	37.2			
2400	31	2355.1	1750	605	100	37.2			
6/15/70									
0100	32	2337.1			100	37.2			
0200	33	2319.1	1675	644	100	37.2			
0300	34	2292.1			100	37.2			
0400	35	2274.2	1600	674	100	37.2			
0500	36	2251.7			100	37.2			
0600	37	2229.2	1500	729	100	37.2			
0700	38	2206.7			100	37.2			
0800	39	2184.3	1400	784	100	37.2			

BHT - 214.6°F

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Three

Date & Time	Bottom Hole		Wellhead Pressure	ΔP	Flow Prover Pressure	Rate	Water		Remarks
	At hours	Pressure psig					Pressure psig	Reading bbls	
6/15/70									
0900	40	2170.8			100	37.2			
1000	41	2152.8	1300	853	100	37.2			
1100	42	2134.8			100	37.2			
1200	43	2116.9	1200	917	100	37.2			
1300	44	2098.4			100	37.2			
1400	45	2071.9	1015	1057	100	37.2			
1500	46	2044.9			100	37.2	91.0		
	Started pumping unit at 1530, 6/15/70.								
1600	47	1878.7	900	979	100	37.2	94.1	3.1	*#10
1700	48	1627.0			100	37.2	98.2	7.2	
1730					100	37.2	100.0		*#11
1800	49	1413.3	600	813	100	37.2	102.1	11.1	Obtaining water samples every 10 barrels.
1900	50	1288.9			100	37.2	105.0		
2000	51	1213.3	550	663	100	37.2	106.0		
2100	52	1124.4			100	37.2	107.2		
2200	53	1035.6	340	696	100	37.2	108.5		
2300	54	960.0			100	37.2	110.0	19.0	*#12
2400	55	888.9	320	569	100	37.2	111.5		
6/16/70									
0100	56	813.3			100	37.2			
0200	57	737.8	290	448	100	37.2	113.5		
0300	58	675.6			100	37.2	117.0	26.0	
0400	59	608.9	275	334	100	37.2			
0500	60	537.8			100	37.2	119.5		*#13
0600	61	471.1	245	226	100	37.2			

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Four

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
6/16/70									
0700	62	413.3			100	37.2	122.4		
0800	63	373.3	220	153	100	37.2	123.5		
0900	64	346.7			100	37.2	124.2	33.2	
1000	65	315.6	205	111	100	37.2	125.0		
1100	66	284.4			100	37.2	125.9		
1200	67	253.3	195	58	100	37.2	126.5		
1300	68	235.6			100	37.2	127.3		
1400	69	200.0	180	20	100	37.2	129.0	38.0	
1500	70	191.1			100	37.2	129.6		*#14
1600	71	182.2	165	17	100	37.2	130.0		
1700	72	168.9			100	37.2	130.5	39.5	
1800	73	155.6	140	16	100	37.2	131.3	40.3	
1900	74	142.2			100	37.2	132.0		
2000	75	124.4	110	14	100	37.2	132.4		
2100	76	111.1			96	36.2	133.1		
2200	77	106.7	95	12	90	34.1	134.5		
2300	78	106.7			84	34.1	135.3	44.3	
2400	79	106.7	90	17	84	34.1			
6/17/70									
0100	80	111.1			84	34.1	136.3	45.3	
0200	81	118.0	90	28	80	32.1			
0300	82	124.4			80	32.1			
0400	83	128.9	85	44	80	32.1	137.6	46.6	
0500	84								Recorder Out
0600	85	133.3	85	48	80	32.1	138.6		
0700	86	137.8			80	32.1	139.1		

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Five

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
6/17/70									
0800	87	137.8	85	53	80	32.1	139.8		*#15
0900	88	142.2			84	34.1	140.1	49.1	
1000	89	137.8	90	48	84	34.1	140.4		
1100	90	137.8			84	34.1	141.0	50.0	
1200	91								
1300	92								
1400	93	120.0	90	30	84	34.1	142.0	51.0	
1500	94	133.3			84	34.1	142.5		
1600	95	137.8	90	48	84	34.1	142.9	51.9	
1700	96	142.2			84	34.1			
1800	97	137.8	90	48	84	34.1			
1900	98	137.8			84	34.1	144.0	53.0	
2000	99	142.2	90	52	80	32.1			
2100	100	142.2			80	32.1	144.6		
2200	101	142.2	85	57	80	32.1	145.0	54.0	
2300	102	146.7			80	32.1			
2400	103	146.7	85	62	80	32.1			
6/18/70									
0100	104	146.7			80	32.1	146.0	55.0	
0200	105	151.1	80	71	80	32.1			
0300	106	151.1			80	32.1	146.9		
0400	107	155.6	80	76	80	32.1		56.0	
0500	108	160.0			80	32.1			
0600	109	160.0	80	80	80	32.1	147.5		
0700	110	164.4			80	32.1			
0800	111	168.9	80	89	80	32.1	148.0	57.0	
0900	112	182.2			80	32.1	148.1		
1000	113	182.2	85	97	80	32.1			Pump gas locked

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Six

Date & Time	Bottom			Wellhead Pressure psig	ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
	Δt hours	Hole Pressure psig	Pressure psig							
6/18/70										
1100	114	155.6	80	32.1	149.9	58.5				*#16 Broke gas lock
1200	115	111.1	80	32.1						
1300	116	102.2	80	32.1						
1400	117	102.2	80	32.1						
1500	118	102.2	80	32.1						
1600	119	100.0	80	32.1	151.5	60.5				
1630	Packing on pumping tee stuffing box leaking, will only pump off when BHP starts up.									
1700	120	102.2	80	32.1	151.7	60.7				
1800	121	111.1	80	32.1	151.9					
1900	122	128.9	80	32.1	152.0	61.0				
2000	123	137.8	80	32.1						
2100	124	124.4	80	32.1	152.2					
2200	125	137.8	80	30.1	152.5	61.5				
2300	126	142.2	72	30.1						
2400	127		72							No readings on recorder
6/19/70										"
0100	128									
0200	129	146.7	80	30.1	153.0	62.0				
0300	130	151.1	72	30.1						
0400	131	173.3	72	30.1						
0500	132	177.8	72	30.1						
0600	133	177.8	72	30.1	154.0	63.0				
0700	134	204.4	72	30.1						
0800	135	137.8	80	32.1	155.5	64.5				
0900	136	111.1	80	32.1						
1000	137	120.0	80	32.1						
1040	Dropped separator pressure and installed 1/2" plate so we could install new packing in stuffing box, repacked stuffing box.									

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Seven

Date & Time	Bottom Hole		Wellhead		ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
	Δt hours	Pressure psig	Pressure psig	Difference psi						
6/19/70	138	102.2				22	31.0	156.0	65.0	Coefficient of 1/4" orifice = 25.86 at 20 psig.
1100										
1150										
1200	139	111.1	30	81	22	22	31.0	156.2	65.2	
1300	140	115.6			22	22	31.0			
1400	141	120.0	60	60	22	22	31.0			
1500	142	128.9			22	22	31.0	156.7	65.7	
1600	143	120.0	35	85	22	22	31.0	157.0	66.0	
1700	144	66.7			22	22	31.0	157.9	66.9	
1800	145	66.7	35	32	22	22	31.9	158.0	67.0	
1900	146	84.4			22	22	31.9	158.2		
2000	147	71.1	30	41	22	22	31.9	158.5	67.5	
2100	148	80.0			22	22	31.9	158.9	67.9	
2200	149	84.4			22	22	31.9			
2300	150	84.4			22	22	31.9			
2400	151	84.4	25	59	22	22	31.9	159.6	68.6	*#17
6/20/70										
0100	152	128.9			24	24	33.3			
0200	153	151.1	70	81	24	24	33.3			
0300	154	173.3			24	24	33.3	159.9	68.9	
0400	155	151.1	30	121	24	24	33.3			
0500	156	182.2			24	24	33.3			
0600	157	240.0	40	200	24	24	33.3			
0700	158	275.6			24	24	33.3	160.0	69.0	

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Drawdown Test Number 1
 Page Eight

Date & Time	Δt hours	Bottom Hole		ΔP psi	Flow Prover Pressure psig	Rate MCF/D	Water Meter Reading bbls	Cum. Water bbls	Remarks
		Pressure psig	Wellhead Pressure psig						
6/20/70									
0800	159	177.8	55	123	24	33.3			
0900	160	204.4			24	33.3			
1000	161	244.4	60	184	24	33.3			
1100	162	280.0			24	33.3			
1200	163	315.6	65	251	24	33.3	161.0	70.0	
1300	164	262.2			24	33.3			
1400	165	111.1	30	81	24	33.3	163.1	72.1	
1500	166	106.7			24	33.3			
1600	167	120.0	25	95	24	33.3	163.5	72.5	Well shut in for buildup

Total liquids produced - 156 barrels water (Tank Gauge), 3 barrels condensate

*Numbers 10 to 17 indicate water samples obtained for chemical analysis.

This completes drawdown test number 1.

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2

Tested From 6/20/70 to 6/27/70
 Instrument at 7100 feet KB

$$T_o = \frac{371 \text{ MSCF}}{33.4 \text{ MSCF/D}} \times 24 = 267 \text{ Hours}$$

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{T_{ot} \Delta t}{\Delta t}$	Remarks
6/20/70	1600	120.0	25	95		
	1700	377.8	240	138	268	
	1800	617.8	425	193	134.5	
	1900	817.8	590	228	90	
	2000	986.7	735	252	68	
	2100	1160.0	880	280	54.4	
	2200	1328.9	1020	309	45.5	
	2300	1515.6			39.1	
	2400	1653.9			34.4	
	0100	1779.8			30.7	
	0200	1883.1			27.7	
	0300	1973.0			25.3	
	0400	2049.4			23.2	
	0500	2121.3			21.5	
	0600	2179.8			20.1	
	0700	2229.2			18.8	
0800	2265.2		1700	565	17.7	
6/21/70						

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2
 Page Two

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	Remarks
		Pressure psig	Wellhead Pressure psig		
6/21/70	17	2305.6			$\frac{T_{0+} \Delta t}{\Delta t}$ 16.7
	18	2332.6	1775	558	15.8
	19	2355.1			15.1
	20	2373.0	1825	448	14.4
	21	2391.0			13.7
	22	2404.5	1875	530	13.1
	23	2419.0			12.6
	24	2435.8	1890	546	12.1
	25	2447			11.7
	26	2453.6	1905	549	11.3
	27	2462.6			10.9
	28	2471.5	1950	522	10.5
	29	2480.4			10.2
	30	2489.4	1950	539	9.90
6/22/70	31	2498.3			9.61
	32	2502.8	1960	543	9.34
	33	2511.7			9.09
	34	2516.2	1980	536	8.85
	35	2520.7			8.63
	36	2525.1	1995	530	8.42
	37	2532			8.22
	38	2538.5	2000	539	8.03
	39	2543.0			7.85
	40	2547.5	2015	533	7.68
	41	2552.0			7.51
	42	2560.9	2090	471	7.36
	43	2565.4			7.21
	44	2569.8	2105	465	7.07

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2
 Page Three

Date & Time	Δt hours	Bottom Hole			ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks	
		Pressure psig	Wellhead Pressure psig	Pressure psig				
6/22/70	45	2569.8				6.93		
1400	46	2574.3	2110	464		6.80		
1500	47	2578.8				6.68		
1600	48	2578.8	2110	469		6.56		
1700	49	2583.2				6.45		
1800	50	2583.2	2110	473		6.34		
1900	51	2587.7				6.24		
2000	52	2592.2	2110	482		6.13		
2100	53	2596.6				6.04		
2200	54	2596.6	2110	487		5.94		
2300	55	2601.1				5.85		
2400	56	2603.4				5.77		
6/23/70	57	2610.1				5.68		
0100	58	2614.5				5.60		
0200	59	2616.8				5.53		
0300	60	2619.0	2120	499		5.45		
0400	61	2619.0				5.38		
0500	62	2627.9				5.31		
0600	63	2627.9				5.24		
0700	64	2632.4	2130	502		5.17		
0800	65	2632.4				5.11		
0900	66	2636.9				5.05		
1000	67	2636.9				4.99		
1100	68	2641.3	2200	441		4.93		
1200	69	2641.3				4.87		
1300	70	2636.9				4.81	Leak	
1400	71	2614.5				4.76	"	
1500	72	2605.6	2180	426		4.71	"	
1600	Control head started leaking at 1350 6/23/70, stopped leak at 1730							Leak
1700	73	2592.2				4.66	Leak	

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2
 Page Four

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	$\frac{T_{ot} \Delta t}{\Delta t}$	Remarks
		Pressure psig	Wellhead Pressure psig			
6/23/70	74	2592.2			4.61	
	75	2614.5			4.56	
	2000	2623.5	2180	444	4.51	
	2100	2632.4			4.47	
	2200	2641.3			4.42	
	2300	2641.3			4.38	
	2400	2645.8			4.34	
	0100	2650.3			4.29	
	0200	2654.7	2180	475	4.26	
	0300	2659.2			4.22	
6/24/70	0400	2659.2			4.18	
	0500	2663.7			4.14	
	0600	2663.7	2190	474	4.10	
	0700	2668.2			4.07	
	0800	2668.2			4.03	
	0900	2672.6			4.00	
	1000	2672.6	2200	473	3.97	
	1100	2672.6			3.93	Leak
	1200	2650.3			3.90	"
	1300	2637.4			3.87	"
	1400	2614.5	2200	415	3.84	"
1500	2565.4			3.81	"	
1600	2596.6	2180	417	3.78	"	
1700	2592.2			3.75	"	
1800	2569.2			3.72	"	
1900	2601.1			3.70	"	
2000	2610.1			2.67	"	
2100	2614.5			3.64	Leak	

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2
 Page Five

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Wellhead Pressure psig			
6/24/70	2200	2632.4	2180	452	3.62	
	2300	2641.3			3.59	
	2400	2650.3			3.57	
6/25/70	0100	2654.7			3.54	
	0200	2659.2	2190	469	3.52	
	0300	2663.7			3.50	
	0400	2663.7			3.47	
	0500	2668.2			3.45	
	0600	2668.2	2180	488	3.43	
	0700	2672.6			3.41	
	0800	2677.1			3.38	
	0900	2677.1			3.36	
	1000	2677.1			3.34	
	1100	2681			3.32	
	1200	2681			3.30	
	1300	2681			3.28	
	1400	2681			3.26	Small Leak
	1500	2681			3.24	" "
	1600	2681			3.22	" "
	1700	2654.7			3.21	" "
	1800	2641.3			3.19	" "
	1900	2632.4			3.17	Small Leak
	2000	2654.7			3.15	
	2100	2663.7			3.14	
	2200	2668.2			3.12	
	2300	2677.1			3.10	
	2400	2681.6			3.09	

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2
 Page Six

Date & Time	Δt hours	Bottom		ΔP Difference psi	$\frac{To + \Delta t}{\Delta t}$	Remarks
		Hole Pressure psig	Wellhead Pressure psig			
6/26/70	0100	2686.0			3.07	
	0200	2690.5			3.05	
	0300	2690.5			3.04	
	0400	2695.0			3.02	
	0500	2695.0			3.01	
	0600	2695.0			2.99	
	0700	2695.0			2.98	
	0800	2699			2.96	
	0900	2699			2.95	
	1000	2699			2.93	
	1100	2699			2.92	
	1200	2699			2.91	
	1300	2699			2.89	
	1400	2681.6			2.88	
	1500	2663.7			2.87	
	1600	2680.3			2.85	
	1700	2641.3			2.84	
	1800	2632.4			2.83	
	1900	2627.9			2.82	
	2000	2627.9			2.80	
	2100	2641.3			2.79	
	2200	2659.2			2.78	
	2300	2668.2			2.77	
	2400	2677.1			2.76	

Leak
Leak

Standard Draw Number 1
 Zone 1 - 7181 feet to 7212 feet (GR-N Log)
 Buildup Test Number 2
 Page Seven

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Wellhead Pressure psig			
6/27/70 0100	153	2686.0			2.75	
0200	154	2690.5			2.73	
0300	155	2690.5			2.72	
0400	156	2695.0			2.71	
0500	157	2695.0			2.70	
0600	158	2699.4			2.69	
0700	159	2699.4			2.68	
0800	160	2699.4			2.67	
0900	161	2703.9			2.66	
1000	162	2703.9			2.65	
1100	163	2703.9			2.64	
1200	164	2703.9			2.63	
1300	165	2703.9			2.62	
1400	166	2677.1			2.61	Leak
1500	167	2663.7			2.60	
1600	168	2654.7			2.59	
1700	169	2645.8			2.58	
1800	170	2645.8			2.57	
1900	171	2641.3			2.56	
2000	172	2636.9			2.55	

End of buildup test number 2.

Standard Draw Number 1
 Zone 2 - 6810 feet to 6838 feet (GR-N Log)
 Buildup Test Number 1

Tested From 7/22/70 to 8/03/70
 SPG-3, #30362 landed at 6650 feet KB

$T_o = \frac{83 \text{ MSCF}}{10 \text{ MSCF/D}} \times 24 = 199 \text{ Hours}$

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks
7/22/70 0630	0	416.0	360	56	-	
0700	.5	448.0	388	60	399	
0730	1.0	484.6	420	65	200	
0800	1.5	521.1	450	71	133.7	
0830	2.0	571.4	486	85	100.5	
0900	2.5	621.7	513	109	80.6	
0930	3.0	672.0	545	127	67.3	
1000	3.5	717.7	574	144	57.9	
1030	4.0	758.9	600	159	50.8	
1100	4.5	804.5	629	176	45.2	
1130	5.0	849.2	655	194	40.8	
1200	5.5	889.4			37.2	
1300	6.5	960.9			31.6	
1400	7.5	1027.9			27.5	
1500	8.5	1095.0	825	270	24.4	
1600	9.5	1153.1	855	298	21.9	
1730	11.0	1229.1			19.09	
1830	12.0	1273.7	935	348	17.58	
1930	13.0	1322.9	970	353	16.31	

Standard Draw Number 1
 Zone 2 - 6810 feet to 6838 feet (GR-N Log)
 Build Test Number 1
 Page Two

Date & Time	Δt hours	Bottom Hole			ΔP Difference psi	$\frac{I_0 + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Wellhead Pressure psig	Pressure psig			
7/22/70	2030	1358.7	1000	359	15.21		
	2230	1434.6	1050	385	13.44		
7/23/70	0030	1492.7			12.06		
	0230	1537.4			10.95		
	0430	1573.2			10.05		
	0630	1608.9			9.29		
	0830	1635.8	1218	418	8.65		
	1030	1662.5	1238	425	8.11		
	1230	1680.4	1255	426	7.63		
	1530	1707.3	1279	429	7.03		
	1830	1716.2	1286	430	6.53		
	2130	1738.5	1305	433	6.10		
7/24/70	0130	1765.4			5.63		
	0530	1796.6	1370	426	5.23		
	0930	1823.5	1393	430	4.90		
	1330	1832.4	1395	437	4.62		
	1930	1845.8	1390	456	4.26		
7/25/70	0130	1872.6	1420	453	3.97		
	0730	1899.4	1447	452	3.73		
	1930	1926.3			3.34		
7/26/70	0730	1970.9			3.05		
	1130	1979.9	1518	462	2.97		
7/27/70	1430	2033.5	1610	424	2.55		
7/28/70	1100	2064.8	1620	445	2.34		
7/29/70	1030	2091.6	1650	442	2.16		
7/31/70	1100	2145.3			1.90		
8/01/70	1100	2172.1			1.81		
8/02/70	0930	2194.4			1.75		
	2200	2196.5			1.71		
8/03/70	0930	2203.4			1.68		
	1030	2203.4	1776	427	1.68		

NOTE TO READER:

Data taken during flow periods prior to Buildup Test Number 1 (Zone 3 - 7454 feet to 7476 feet)

is given on pages S24 through S26 of Appendix III-B - Scandard Draw Daily Reports

Standard Draw Number 1
 Zone 3 - 7454 feet to 7476 feet (GR-N Log)
 Buildup Test Number 1

Tested From 9/06/70 to 10/13/70
 SPG-3, #30362 and SRT-2, #30363 instruments
 at 7350 feet

$$T_o = \frac{72 \text{ MSCF}}{3 \text{ MSCF/D}} \times 24 = 576 \text{ Hours}$$

Date & Time	Δt hours	Bottom Hole Pressure psig	Wellhead Pressure psig	ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks
9/06/70 0600	0	242.3	33	209		
0630	.5	530.3			1151	
0700	1.0	608.0			576	
0730	1.5	608.0			385	
0800	2.0	630.9			288.5	
0830	2.5	649.1			231	
0900	3.0	644.6			192.7	
1000	4	667.4	105	562	144.8	
1100	5	676.6	120	557	116.0	
1200	6	688.0	134	554	96.8	
1300	7	694.9	145	550	83.1	
1430	8.5	722.3	167	555	68.7	
1600	10	754.3	184	570	58.5	
1700	11	749.7	193	557	53.3	
1800	12	754.3	205	549	48.9	
1900	13	763.4	215	548	45.2	
2000	14	772.6			42.1	
2100	15	768.0	232	536	39.3	
2200	16	758.9			36.9	
2400	18	763.4			32.9	

Standard Draw Number 1
 Zone 3 - 7454 feet to 7476 feet (GR-N Log)
 Buildup Test Number 1
 Page Two

Date & Time	Δt hours	Bottom			ΔP Difference psi	$\frac{To+ \Delta t}{\Delta t}$	Remarks	
		Hole Pressure psig	Wellhead Pressure psig					
9/07/70	0200	786.3				29.8		
	0400	786.3				27.1		
	0600	790.9				24.96		
	0800	797.7	330		468	23.11		
	1000	811.2	342		469	21.53		
	1200	822.3	356		466	20.17		
	1400	840.2				18.97		
	1600	826.8				17.91		
	2200	911.7				15.38		
	2400	929.6				14.69		
	9/08/70	0200	943.0				14.07	
		0400	947.5				13.50	
		0600	960.9				12.98	
		0800	965.4				12.50	
1000		978.8	496		483	12.06		
1200		992.2	504		488	11.65		
1400		1001.1				11.27		
9/09/70		0200	1063.7				9.46	
		0600	1068.2				8.99	
		1000	1081.6				8.57	
	1100	1086.0	604		482	8.47		
	1300	1095.0	612		483	8.29		
	1800	1099.4				7.85		
	2200	1108.4				7.53		
	0200	1117.3				7.25		
9/10/70	0600	1130.7				6.99		
	1000	1153.1				6.75		
	1200	1162.0	686		476	6.64		
	1400	1166.5	691		476	6.53		

Standard Draw Number 1
 Zone 3 - 7454 feet to 7476 feet (GR-N Log)
 Buildup Test Number 1
 Page Three

Date & Time	Δt hours	Bottom Hole		Wellhead Pressure psig	ΔP Difference psi	$\frac{T_o + \Delta t}{\Delta t}$	Remarks
		Pressure psig	Pressure psig				
9/11/70	128	1211.2		753	458	5.49	
9/12/70	149.5			781		4.85	Pull instr. sent in for repair
9/13/70	172.0			843		4.34	
	177.0			852		4.25	
9/14/70	196.0			889		3.93	
	199.0	1045.8		850	196	3.89	
	200.5	1054.7		861	194	3.87	
	210	1095.0				3.74	
9/15/70	214	1106.1				3.69	
	218	1112.8				3.64	
	220	1117.3		908	109	3.61	
	224	1124.0		916	208	3.57	
	230	1135.2				3.50	
9/16/70	236	1153.1				3.44	
	242	1162.0				3.38	
	245	1170.9		951	220	3.35	
	258	1197.8				3.23	
9/17/70	270	1220.1				3.13	
	273.5	1224.6		992	233	3.10	
9/18/70	282	1238.0				3.04	
	290	1260.0				2.98	
	295.5	1262.5		1023	240	2.95	
9/19/70	306.0	1282.7				2.88	
	318.5	1300.6		1052	249	2.81	
9/20/70	330.0	1318.4				2.74	
	341.0	1336.3		1078	258	2.69	
9/21/70	354.0	1352				2.62	
	366.0	1372.1		1108	264	2.57	

Standard Draw Number 1
 Zone 3 - 7454 feet to 7476 feet (GR-N Log)
 Buildup Test Number 1
 Page Four

Date & Time	Δt hours	Bottom Hole		ΔP Difference psi	Tot Δt Δt	Remarks
		Pressure psig	Wellhead Pressure psig			
9/22/70	1300	1398.9	1133	266	2.47	
9/23/70	1300	1442.4	1159	283	2.38	
9/24/70	1330	1461.5	1182	280	2.31	
9/25/70	1400	1490.5	1203	288	2.24	
9/26/70	1230	1517.4	1220	297	2.18	
9/27/70	1430	1537.4	1240	297	2.12	
9/28/70	1600	1568.7	1260	309	2.07	
9/30/70	1400	1613.4	1291	322	1.98	
10/01/70	1430	1633.6	1312	322	1.94	
10/02/70	1400	1653.6	1322	332	1.91	
10/03/70	1530	1667.0	1337	330	1.87	
10/05/70	1400	1702.8	1370	331	1.85	
10/07/70	1200	1743.0	1400	343	1.82	
10/09/70	1200	1769.8	1420	350	1.77	
10/13/70	1000	1823.5	1465	359	1.68	

End of Test - Well Shut in.

APPENDIX III-E

WATER ANALYSIS

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SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 1 - 7181 feet to 7212 feet

Sample No.	1	2	3	4
Date Sampled	5/21/70	5/21/70	6/03/70	6/04/70
Remarks	Frac Water	Frac Fluid	25 bbls produced water	50 bbls produced water
Potassium (K) ppm	10,400	10,400	3,200	1,560
Sodium (Na) ppm	1,755	1,820	435	3,670
Calcium (Ca) ppm	168	103	99	398
Magnesium (Mg) ppm	72	95	67	244
Chloride (Cl) ppm	12,225	12,320	3,680	8,452
Carbonate (CO ₃) ppm	0	0	245	0
Bicarbonate (HCO ₃) ppm	403	313	0	33
Iron (Fe) ppm	2.0	14.0	3.0	40.0
Total Solids ppm	26,516	27,356	7,536	15,940
Conductivity (mmhos)	45,000	43,000	13,800	13,800
ph	7.5	5.4	6.7	6.9

SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 1 - 7181 feet to 7212 feet

Sample No.	5	6	10	11
Date Sampled	6/05/70	6/06/70	6/15/70	6/15/70
Remarks	75 bbls produced water	87 bbls produced water	94 bbls produced water	100 bbls produced water
Potassium (K) ppm	1,500	1,230	1,180	1,150
Sodium (Na) ppm	4,424	4,444	4,728	4,746
Calcium (Ca) ppm	187	286	262	225
Magnesium (mg) ppm	105	85	159	118
Chloride (Cl) ppm	8,477	8,428	8,836	8,836
Sulfate (SO ₄) ppm			50	20
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	554	484	644	436
Iron (Fe) ppm	43.0	50.0	40	7.5
Total Solids ppm	15,212	15,300	16,140	16,050
Conductivity (mmhos)	23,500	23,600	17,800	18,800
ph	6.8	6.6	6.6	6.7

SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 1 - 7181 feet to 7212 feet

Sample No.	12	13	14	15
Date Sampled	6/15/70	6/16/70	6/16/70	6/17/70
Remarks	110 bbls produced water	120 bbls produced water	130 bbls produced water	130 bbls produced water
Potassium (K) ppm	1, 180	1, 130	1, 440	2, 000
Sodium (Na) ppm	4, 581	4, 635	4, 345	3, 821
Calcium (Ca) ppm	234	206	309	262
Magnesium (mg) ppm	205	149	118	143
Chloride (Cl) ppm	8, 836	8, 688	8, 492	8, 099
Sulfate (SO ₄) ppm	20	24	29	150
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	507	455	659	649
Iron (Fe) ppm	8.0	30	14	25
Total Solids ppm	16, 920	16, 016	15, 986	15, 820
Conductivity (mmhos)	18, 800	18, 000	18, 200	18, 500
ph	6.7	6.7	6.8	6.8

SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 1 - 7181 feet to 7212 feet

Sample No.	16.	17
Date Sampled	6/18/70	6/19/70
Remarks	150 bbls produced water	160 bbls produced water
Potassium (K) ppm	1,060	1,260
Sodium (Na) ppm	3,896	4,497
Calcium (Ca) ppm	234	215
Magnesium (mg) ppm	138	133
Chloride (Cl) ppm	8,198	8,295
Sulfate (SO ₄) ppm	125	30
Carbonate (CO ₃) ppm	0	0
Bicarbonate (HCO ₃) ppm	649	739
Iron (Fe) ppm	14	24
Total Solids ppm	16,160	15,374
Conductivity (mmhos)	18,400	17,800
ph	6.8	6.75

SCANDARD DRAW NUMBER 1
WATER ANALYSIS

Zone 2 - 6810 feet to 6838 feet

Sample No:	SD2-1	SD2-2
Date Sampled	7/21/70	7/21/70
Remarks	Produced Water	Produced Water
Potassium (K) ppm	1,000	1,000
Sodium (Na) ppm	2,175	1,125
Calcium (Ca) ppm	345	345
Magnesium (mg) ppm	100	90
Chloride (Cl) ppm	7,498	7,341
Sulfate (SO ₄) ppm	15.6	15.0
Carbonate (CO ₃) ppm	0	0
Bicarbonate (HCO ₃) ppm	956	956
Iron (Fe) ppm	74	65
Total Solids ppm	14,188	14,016
Conductivity (mmhos)	19,500	19,000
ph	6.9	6.85

SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 3 - 7454 feet to 7476 feet

Sample No.	3-1	3-2	3-3	3-4
Date Sampled	8/12/70	8/14/70	8/23/70	8/23/70
Remarks	Frac water	150 bbls produced water	207 bbls produced water	224 bbls produced water
Potassium (K) ppm	8,138	1,008	2,490	1,357
Sodium (Na) ppm	420	6,620	3,453	6,287
Calcium (Ca) ppm	125	302	232	211
Magnesium (mg) ppm	78	98	114	89
Chloride (Cl) ppm	7,739	7,546	7,498	6,970
Sulfate (SO ₄) ppm	660	27	62	28
Carbonate (CO ₃) ppm	29	0	0	0
Bicarbonate (HCO ₃) ppm	425	1,557	1,341	1,505
Iron (Fe) ppm	72	36	36	20
Total Solids ppm	17,700	12,656	13,786	12,140
Conductivity (mmhos)	22,000	22,400	24,600	22,000
ph	7.4	6.7	6.5	6.7

SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 3 - 7454 feet to 7476 feet

Sample No.	3-5	3-6	3-7	3-8
Date Sampled	8/24/70	8/24/70	8/25/70	8/27/70
Remarks	245 bbls produced water	267 bbls produced water	287 bbls produced water	302 bbls produced water
Potassium (K) ppm	1,033	1,705	821	792
Sodium (Na) ppm	3,870	3,429	3,618	3,390
Calcium (Ca) ppm	172	168	148	142
Magnesium (mg) ppm	107	107	107	74
Chloride (Cl) ppm	6,729	6,825	6,297	6,249
Sulfate (SO ₄) ppm	18	45	22	23
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	1,336	1,001	1,001	1,242
Iron (Fe) ppm	16	12	18	64
Total Solids ppm	11,986	13,154	10,860	10,900
Conductivity (mmhos)	19,800	19,600	19,500	17,900
ph	6.8	6.7	7.8	

SCANDARD DRAW NUMBER 1
 WATER ANALYSIS
 Zone 3 - 7454 feet to 7476 feet

Sample No.	3-9	3-10	3-11
Date Sampled	9/01/70	9/04/70	9/06/70
Remarks	341 bbls produced water	365 bbls produced water	382 bbls produced water
Potassium (K) ppm	805	1,000	655
Sodium (Na) ppm	3,300	3,500	3,400
Calcium (Ca) ppm	137.9	155	137.9
Magnesium (mg) ppm	62.7	64.9	67.2
Chloride (Cl) ppm	5,912	6,297	5,287
Sulfate (SO ₄) ppm	40	42	27
Carbonate (CO ₃) ppm	0	0	0
Bicarbonate (HCO ₃) ppm	1,116	1,158	1,256
Iron (Fe) ppm	60	95	110
Total Solids ppm	10,920	11,192	11,210
Conductivity (mmhos)	16,000	16,100	16,000
ph	6.8	6.75	6.8

FAWN CREEK GOVERNMENT NUMBER 1
WATER ANALYSIS
Zone 1 - 5745 feet to 5792 feet

Sample No.	FC-1	FC-2	FC-3	FC-4
Date Sampled	5/30/70	5/30/70	6/12/70	6/20/70
Remarks	Frac water	Frac water	Est. 100 bbls produced water after frac	Water used to kill well
Potassium (K) ppm	9,140	9,140	750	11,525
Sodium (Na) ppm	1,565	718	4,600	750
Calcium (Ca) ppm	136	126	167	141
Magnesium (mg) ppm	77	83	87	57
Chloride (Cl) ppm	10,695	9,480	8,280	11,468
Sulfate (SO ₄) ppm				180
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	357	261	640	375
Iron (Fe) ppm	1.0	8.0	40.5	0.9
Total Solids ppm	22,330	21,950	12,880	24,678
Conductivity (mmhos)	30,200	29,000	21,100	37,000
ph	7.3	6.2	6.4	7.3

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 1 - 5745 feet to 5792 feet

Sample No.	FC-5	FC-6	FC-7	FC-8
Date Sampled	6/28/70	6/28/70	6/30/70	7/01/70
Remarks	216 bbls produced water	228 bbls produced water	250 bbls produced water	300 bbls produced water
Potassium (K) ppm	5,250	5,000	4,375	2,180
Sodium (Na) ppm	3,300	3,500	3,875	4,589
Calcium (Ca) ppm	150	145	168	281
Magnesium (mg) ppm	90	88	81	77
Chloride (Cl) ppm	9,900	9,900	10,000	9,507
Sulfate (SO ₄) ppm	192	196	128	95
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	586	633	633	398
Iron (Fe) ppm	25	47	16	1.3
Total Solids ppm	19,498	19,428	15,700	16,450
Conductivity (mmhos)	30,000	33,500	35,000	28,000
ph	6.5	6.4	6.6	6.8

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 1 - 5745 feet to 5792 feet

Sample No.	FC-9	FC-10	FC-11	FC-12
Date Sampled	7/02/70	8/07/70	8/08/70	8/09/70
Remarks	325 bbls produced water	416 bbls produced water	426 bbls produced water	436 bbls produced water
Potassium (K) ppm	2,000	2,789	2,017	1,880
Sodium (Na) ppm	4,726	4,585	4,342	4,449
Calcium (Ca) ppm	281	120	163	193
Magnesium (mg) ppm	77	56	89	81
Chloride (Cl) ppm	9,556	9,806	8,796	8,796
Sulfate (SO ₄) ppm	95	150	85	78
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	398	94	361	492
Iron (Fe) ppm	1.7	200	80	36
Total Solids ppm	16,800	17,140	15,930	15,898
Conductivity (mmhos)	29,000	25,500	25,000	24,500
ph	7.1	6.2	6.8	6.9

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 1 - 5745 feet to 5792 feet

Sample No.	FC-13	FC-14	FC-15	FC-16
Date Sampled	8/10/70	8/12/70	8/13/70	8/14/70
Remarks	446 bbls produced water	456 bbls produced water	466 bbls produced water	476 bbls produced water
Potassium (K) ppm	1,929	1,920	1,880	1,979
Sodium (Na) ppm	4,386	4,366	4,160	4,233
Calcium (Ca) ppm	224	176	189	198
Magnesium (mg) ppm	63	78	71	94
Chloride (Cl) ppm	8,748	8,652	8,652	8,316
Sulfate (SO ₄) ppm	65	88	62	58
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	506	516	516	431
Iron (Fe) ppm	14	72	30	30
Total Solids ppm	15,450	15,060	13,986	15,228
Conductivity (mmhos)	26,000	25,500	25,000	26,000
ph	6.7	6.9	6.85	6.9

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 1 - 5745 feet to 5792 feet

Sample No.	FC-17	FC-18	FC-19
Date Sampled	8/15/70	8/16/70	8/17/70
Remarks	496 bbls produced water	506 bbls produced water	510 bbls produced water
Potassium (K) ppm	1, 929	1. 842	1, 794
Sodium (Na) ppm	4, 405	4, 461	4, 186
Calcium (Ca) ppm	215	232	198
Magnesium (mg) ppm	36	54	65
Chloride (Cl) ppm	8, 650	8, 700	8, 796
Sulfate (SO ₄) ppm	67	68	68
Carbonate (CO ₃) ppm	0	0	0
Bicarbonate (HCO ₃) ppm	473	460	431
Iron (Fe) ppm	32	50	72
Total Solids ppm	15, 258	14, 650	14, 260
Conductivity (mmhos)	24, 250	25, 800	23, 000
ph	6. 5	6. 8	6. 65

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 2 - 5598 feet to 5632 feet

Sample No.	2-1	2-2	2-3	2-4
Date Sampled	10/28/70	10/30/70	11/11/70	11/12/70
Remarks	Frac water	Est. 125 bbls produced water after frac	139 bbls produced water	153 bbls produced water
Potassium (K) ppm	10,550	1,500	735	685
Sodium (Na) ppm	395	4,900	5,890	5,700
Calcium (Ca) ppm	95	762	284	284
Magnesium (mg) ppm	27	146	67	58
Chloride (Cl) ppm	13,300	10,500	9,133	9,133
Sulfate (SO ₄) ppm	750	375	130	127
Carbonate (CO ₃) ppm	23	0.	0	0
Bicarbonate (HCO ₃) ppm	23	800	1,180	919
Iron (Fe) ppm	0.1	26.5	5.7	5.7
Total Solids ppm	28,720	20,430	17,630	17,000
Conductivity (mmhos)	37,500	26,500	23,000	20,500
ph	9.0	7.0	7.4	7.1

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 2 - 5598 feet to 5632 feet

Sample No.	2-5	2-6	2-7	2-8
Date Sampled	11/13/70	11/14/70	11/15/70	11/16/70
Remarks	173 bbls produced water	191 bbls produced water	209 bbls produced water	222 bbls produced water
Potassium (K) ppm	660	625	610	565
Sodium (Na) ppm	5,890	5,800	5,410	5,590
Calcium (Ca) ppm	293	310	301	284
Magnesium (mg) ppm	67	45	40	98
Chloride (Cl) ppm	9,469	9,325	8,700	8,870
Sulfate (SO ₄) ppm	115	145	220	175
Carbonate (CO ₃) ppm	0	0	0	0
Bicarbonate (HCO ₃) ppm	782	665	695	533
Iron (Fe) ppm	5.7	4.9	6.0	7.0
Total Solids ppm	17,360	17,570	16,180	15,990
Conductivity (mmhos)	21,700	23,500	20,200	21,500
ph	7.25	7.3	7.2	7.3

FAWN CREEK GOVERNMENT NUMBER 1
 WATER ANALYSIS
 Zone 2 - 5598 feet to 5632 feet

Sample No.	2-9	2-10	2-11
Date Sampled	11/17/70	11/18/70	11/19/70
Remarks	229 bbls produced water	237 bbls produced water	242 bbls produced water
Potassium (K) ppm	530	530	530
Sodium (Na) ppm	5,350	5,650	5,700
Calcium (Ca) ppm	232	275	267
Magnesium (mg) ppm	85	76	67
Chloride (Cl) ppm	8,460	8,941	8,989
Sulfate (SO ₄) ppm	120	163	160
Carbonate (CO ₃) ppm	0	0	0
Bicarbonate (HCO ₃) ppm	523	533	502
Iron (Fe) ppm	7.5	7.5	7.0
Total Solids ppm	15,400	15,590	16,400
Conductivity (mmhos)	22,100	21,500	22,100
ph	7.4	7.2	7.3

SULFUR CREEK NUMBER 4
 WATER ANALYSIS
 Wasatch-Fort Union Zone "I" - 4118 feet to 4128 feet

Sample No.	1-1	1-2
Date Sampled	11/20/70	11/20/70
Remarks	Formation water	Formation water
Potassium (K) ppm	59	59
Sodium (Na) ppm	4,620	4,550
Calcium (Ca) ppm	146	137
Magnesium (mg) ppm	81	67
Chloride (Cl) ppm	6,825	6,970
Sulfate (SO ₄) ppm	145	145
Carbonate (CO ₃) ppm	0	0
Bicarbonate (HCO ₃) ppm	543	528
Iron (Fe) ppm	5.2	4.2
Total Solids ppm	12,070	12,100
Conductivity (mmhos)	17,400	17,600
ph	7.7	7.8