WATERFLOOD FEASIBILITY STUDY

LEMON RANCH FIELD

SWOPE LIME RESERVOIR

COMANCHE COUNTY, KANSAS

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June 4, 1981

Mr. Alan Townsend, Operations Manager
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Re: Waterflood Feasibility Study
Lemon Ranch Field
Swope Lime Reservoir
Comanche Co., Kansas

Dear Alan:

In accord with your request, we have completed a basic reservoir study of the Swope Lime at Lemon Ranch, with primary emphasis on the feasibility of improving oil recovery by water flooding. Our basic conclusion is that Swope reservoir and fluid characteristics are highly favorable to displacement by water injection.

Results of this study are included in the attached report, along with much of the basic support data. The data are organized in seven Appendices which follow the order of discussion in the report, and which are frequently referenced within each section. Economic projections as of June 1, 1981 using escalated prices and costs are included in both the Waterflooding and Primary Performance sections.

We are pleased to work with you in making this study. Please call if we can be of further service.

Very truly yours,

HENDERSON & COMPANY, INC.

H. W. Stack

H. W. Stack

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CONCLUSIONS

1. The Swope lime reservoir at Lemon Ranch is a continuous porosity development which averages 5 feet in net thickness over a minimum 560-acre area.
2. The reservoir fluid was slightly undersaturated at an original reservoir pressure of 1,825 psig at the average depth of 4,770 feet (3,000 feet subsea).
3. The reservoir produces by liquid expansion and solution gas drive, supplemented by reinjection of approximately 50% of the produced gas. There is no evidence of a mobile water phase.
4. Original oil-in-place ranges from 1.86 million barrels determined volumetrically to 3.44 million barrels from segmented material balance. Based on performance to date, initial oil-in-place is estimated to be approximately 2.5 million barrels.
5. Primary recovery is projected to be 15.87% of initial oil-in-place under straight depletion drive conditions, and 20.7% with reinjection of half the produced gas. Based on 2.5 million barrels initially in place, these are equivalent recoveries of 396,700 barrels and 517,000 barrels, respectively.
6. Cumulative production to June 1, 1981 is approximately 290,000 barrels, with a current production rate of 330 barrels of oil per day, and average gas injection rate of 800 MCF per day.
7. Waterflooding characteristics, as determined by restored state displacement tests on core samples from the Lemon #3 well, are highly favorable.
8. Waterflood recovery is projected to be 36.9% of initial oil-in-place, with an upside potential of 50%. The 36.9% recovery is equivalent to 921,750 barrels, based on 2.5 million barrels in place.

9. Good injection coverage can be attained without additional infill drilling by the selective conversion of current producing wells. Total cost of the project is currently estimated at $571,000. Fifty percent of this cost is for artificial lift equipment, which will be required within a year regardless of operating mode.

10. Incremental recovery by water injection over that expected by continued depletion without gas injection is projected to be 478,546 barrels, or 382,837 barrels net to the 100% working interest (80% net revenue interest). Based on current prices escalated at 8% annually, this would provide incremental net income of $16.855 million undiscounted, or $10.564 million discounted at 15% annually.

RECOMMENDATIONS

1. Begin unitization proceedings immediately.
2. Develop a compatible and sufficient water supply for continuous injection.
3. Convert a well within the configuration suggested in Case 1 and start water injection to evaluate in situ rate and displacement performance (Lemon #9 or Lemon #7).
4. Proceed with full-scale injection unless performance suggests otherwise.

WATERFLOOD PROJECTIONS

A study of Lemon Ranch logs, cores, fluids, and production performance to date indicates favorable conditions for improving oil recovery from the Swope reservoir by waterflooding. These data are discussed in detail in subsequent sections and the Appendices of this report.

The Swope porosity interval appears to be continuous over a minimum 560-acre area, as shown on the isoporosity-thickness map in Exhibit I-1 in Appendix I. Reservoir limits are well defined on the west and south by a loss of porosity development. There could be further extensions to the east and north, but it's not likely these would prove to be very significant. Average net thickness is 5 feet, with average porosity and water saturation values estimated to be 15% each. Absolute permeabilities range up to 300 millidarcies, averaging approximately 43 millidarcies in a horizontal plane, and 26 millidarcies when measured vertically.

The reservoir produces by depletion drive, supplemented by reinjection of part of the solution gas. There is no evidence of water influx, nor of any mobile water within the reservoir.

Restored state water displacement tests run on selected core samples from Lemon #3 indicate excellent recovery characteristics by water displacement. These data are discussed further under Reservoir Characteristics, and in Appendix V.

Effective permeability to water ranged from 37% of absolute in the tighter samples, to 54%, with residual oil saturations ranging from 20.5% to 33% of pore volume. Laboratory recoveries averaged 67% of oil-in-place at 100% conformance and to a 99.9% water cut. Recovery prior to water breakthrough ranged from 25% to 42% of oil-in-place. While these magnitudes of recovery are achievable only under laboratory conditions, they do suggest that conditions are

favorable for efficiently building an oil bank by water displacement, with the upside possibility of recovering 50% of the oil-in-place. A more realistic recovery by waterflooding would be in the range of 35% to 40%.

Volumetric conformance is dependent to a large extent on the mobility ratio, or mobility of displacing phase (water) to displaced phase (oil). Mobility of each phase is further defined as the ratio of effective permeability to viscosity. Lower mobility ratios provide more efficient oil-banking conditions and better recoveries before water breaks through the oil bank. Higher ratios tend to promote more rapid fingering through the oil bank, promoting premature breakthrough to the producing well and poorer overall recoveries. Mobility ratio in the Swope reservoir at Lemon Ranch is considered highly favorable with an average value of 0.346. This is based on relative permeabilities and viscosities of 45% and 0.65 centipoise for water, and 80% and 0.4 centipoise for oil.

A series of waterflood projections were made using the Garrett computer program, considering the reservoir as a single layer because of the relatively thin and uniform porosity development. The Garrett program is essentially a steady-state model in which the reservoir can be described as a series of layers of varying permeabilities, with the areal configuration defined as segments of a recognizable pattern, i.e., line drive, five-spot, nine-spot, etc. As water is injected into the layers, the respective fluid fronts assume different positions as a function of permeability, porosity, and displaceable fluid saturations. Areal sweep versus water cut data is input on the basis of available correlations for a given injection pattern. Copies of these correlations for line drive and and nine-spot patterns are included as Exhibits I-8 and I-9. If multiple layers are described, then the individual layer performance projections are composited into a total pattern projection. As is the case with most reservoir models, analysis of the results in a relative sense is often more important than the

absolute rate and recovery numbers. It's therefore necessary to scale the theoretical results to a more realistic projection expected in the field.

With the current 40-acre development spacing, it should not be necessary to drill additional wells to develop the water injection patterns required to achieve good reservoir coverage. The two configurations shown on Exhibits I-2 and I-3 of Appendix I provided little difference in ultimate recovery, and both provide sufficient injection to production capacity balance. Case 1 would require conversion of Lemon #6, #7, and #9 to water injection wells, along with Rhodes #1. Injection into Lemon 11, the currently shut-in high GOR well, is also a possibility. Lemon #7 and #9 are both current gas injection wells. While there is always some concern about possible channelling in a previous gas injector, this effect should be minimized by a rapid redistribution of fluids away from the wellbore as water is injected. The alternative of displacing towards a gas injection well would result in resaturation of a previously displaced volume, and probable loss of otherwise recoverable oil.

The configuration in Case 2 provides completely enclosed patterns and a higher injector to producer ratio than does Case 1. However, the slightly higher theoretical recoveries resulting from a little better areal coverage would probably be offset by displacing oil toward the gas injection wells, as previously discussed.

Case 1, or a variation thereof, is considered to be the more optimum. In view of the good production performance of Lemon #6, it might be advisable to convert Lemon #5 to injection and leave #6 a producer.

While indications from the core studies indicate good water injection characteristics, actual injectivities cannot be accurately predicted without a field test. In lieu of this, the curves shown on Exhibit I-4 of Appendix I

represent theoretical steady-state injectivities as a function of pressure for a series of permeabilities, and provide a basis for plant design and performance predictions.

Response and subsequent performance to water injection as shown on the graph of Exhibit I-5, Appendix I is generally projected on the basis of results of the Garrett model predictions. Water and oil relative permeability data used were based on the Lemon #3 core work, as discussed subsequently under Reservoir Characteristics and in Appendix V.

Total recovery under the schedule projected is 921,747 barrels, equivalent to 36.9% of the 2.5 million barrels estimated to be in place originally. This amounts to 478,546 barrels over that estimated to be recoverable under continued operation without additional gas or water injection.

An economic projection was made on the basis of starting water injection on September 1, 1981, using the production schedule of Exhibit I-5, and the cost schedule tabulated in Exhibit I-6 of Appendix I. Gas currently being injected was assumed to be sold after June 1, 1981 at an average Btu adjusted price of $3.60 per MCF. The starting oil price was $38 per barrel. Oil and gas prices were escalated at a yearly rate of 8% until oil reached $75 per barrel (9 years) with both prices held constant thereafter. Operating costs were also escalated at 8% yearly for 9 years. Windfall profits taxes were calculated at the rate of 30% on oil revenues exceeding base price levels of $18 per barrel ($20 per barrel for stripper) limited to 90% of net income. These base price levels were also escalated at 8% annually with phase-out of the tax assumed in 1989.

Results of this projection are summarized below, along with the results of the projection under continuation of the current operation with gas injection discontinued after June 1, 1981.

	Water Injection At 9/1/81	No Water Injection	Difference
Gross Oil Reserves (Bbls)	631,747	153,201	478,546
Net Oil to 100% WI (80% NRI)	505,398	122,561	382,837
Net Gas Sales (MCF)	949,208	349,459	599,749
Net Revenue	$23,739,810	$5,679,481	$18,060,329
Net Operating Costs	$ 1,902,396	$ 968,214	$ 934,182
Net Investment	$ 571,000	$ 300,000	$ 271,000
Net Income (Undiscounted)	$21,266,418	$4,411,267	$16,855,151
Net Income (Discounted @ 15%)	$14,220,401	$3,656,226	$10,564,175

Yearly detail of the waterflood projection is shown in Exhibit I-7 of Appendix I, and the projection without waterflooding in Exhibit III-11 of Appendix III.

OIL-IN-PLACE

Original oil-in-place in the Swope reservoir at Lemon Ranch was calculated both volumetrically and by the material balance approach. Plats, tables, and graphs associated with these determinations are included in Appendix II.

Exhibit II-1 shows the iso-porosity x net thickness map based on the log and core data of Appendix V. Area within the current limits defined on this map is approximately 560 acres. Based on the pore volume mapped, coupled with an estimated average initial water saturation of 15% and initial formation volume factor of 1.49 RB/STB, initial oil-in-place is calculated to be 1.86 million stock tank barrels.

Material balance considerations relate pressure-dependent changes in reservoir fluid characteristics to actual fluid withdrawal volumes and resultant pressure changes in the reservoir to calculate original fluid volumes in place. Since rather large changes in certain characteristics can occur with small changes in pressure, it should be recognized that results from material balance calculations are sensitive to the actual production and average reservoir pressure measurements and can therefore be subject to considerable error. Appendix II

shows the basic data and results of the Lemon Ranch material balance approach. Fluid properties shown in Exhibit II-2 are based on the Lemon #3 fluid analysis detailed in Appendix VI.

The Garrett computer program uses the method of Havlena and Odeh in which the apparent oil-in-place is calculated for each survey point for which performance data are given. A dimensionless influx-pressure term is then evaluated for each point, and a least squares straight line fitted to these points. Oil-in-place is then determined as the intercept of the apparent oil-in-place axis.

Net volumes of oil, gas (produced minus injected), and water were estimated for each well through the field-wide bottom hole pressure survey date of July 8, 1980. These production data were then coupled with the July 1980 pressures shown in Exhibit II-3 of Appendix II, and the segmented material balance was run. Results are shown tabulated in Exhibit II-4, with apparent original oil volumes indicated to be associated with each well's drainage area. Total oil in place from this computation is 3.45 million barrels.

An apparent anomaly is noted at one well, Lemon #5, which accounts for 1.292 million barrels, or 37.5% of the total. This is because of the relatively low pressure loss (1,825 psi to 1,659 psi) with the estimated production of 9,800 barrels of oil. Subsequent production tests of the Lemon #5 well suggest that previous allocations to this well may have been too high, and the actual production somewhat lower. This would result in a redistribution of the well volumes shown, and possibly in a lower total volume.

In addition to the more detailed segmented approach, single point material balance calculations were made using the same total field withdrawal schedule, and assuming a series of average reservoir pressures ranging from 1,200 psi to 1,600 psi. These data are plotted in Exhibit II-5, and detailed in Exhibit II-6.

The sensitivity to actual pressure is dramatically indicated on this plot, with oil-in-place numbers ranging from 785,000 barrels to 5.76 million barrels over the 400 psi average pressure range. Nevertheless, this approach does provide a good supplement to the volumetric determination, which in combination, gives a better overall feel for the actual reservoir volume.

Relating the volumetrically determined 1.86 million barrels in place to the above graph in Exhibit II-5 indicates an average July 1980 pressure of 1,430 psi. Reference to the pressure history graph of Exhibit IV-1 in Appendix IV indicates this to be on the low side, although the average should be heavily weighted by the large withdrawals from Lemon #6 and Rhodes #2.

Accounting for the results indicated in the more detailed segmented calculation, coupled with the volumetric determination, original oil-in-place in the Swope at Lemon Ranch is estimated to be 2.5 million barrels.

PRIMARY PERFORMANCE

Since its discovery in December of 1978, the Swope reservoir at Lemon Ranch field has been developed with 14 completed wells, and the limits further defined by four dry holes. Lemon #11 was completed with an extremely high gas-oil ratio, and has remained shut in as an observation well. A development map is shown in Exhibit III-1 of Appendix III.

Approximately 50% of the produced gas has been reinjected into the reservoir since July 1979, in general accord with the schedule shown in Exhibit III-2 of Appendix III. The original gas injectors were Lemon #2X and Lemon #7, with an approximate 20%-80% split between the two wells. Injection was started into Lemon #9 in August 1980 after Lemon #2X would no longer take gas. Injection is under compression at about 1,650 psi.

Production is gauged by lease (Lemon and Rhodes), with allocation to wells based on periodic well tests. These data are tabulated in Exhibit III-3. A plot of total field production and gas injection by month is shown in Exhibit I-5. Similar plots for the Lemon and Rhodes leases are shown in Exhibits III-4 and III-5.

Cumulative production from the Swope reservoir at Lemon Ranch has totalled approximately 290,000 stock tank barrels of oil through May 1981, with a current average rate of 330 barrels per day from ten active producing wells. Total gas reinjected has been approximately 300 million standard cubic feet, with a current average injection rate of 800 MCF per day.

Depletion of the Swope reservoir by solution gas drive was predicted under two conditions using the Tarner method as modified by Tracy, and as programmed by Garrett. The first case assumed no gas injection, and the second was with reinjection of 50% of produced gas. Reservoir fluid properties were as shown in Appendix VI (Lemon #6 fluid analyses), and gas-oil relative permeability data as in Appendix V, Exhibit V-3, page 3 (Lemon #3 restored state analysis).

Results of these predictions are plotted on Exhibit III-7, and projected in Exhibits III-8 and III-9. These results are summarized as follows:

	Projected Recovery	
	% Oil-in-Place	Barrels
Without gas injection	15.87	396,700
With 50% gas reinjection	20.70	517,425

Barrel recoveries shown are based on 2.5 million barrels of oil-in-place, as previously discussed, with depletion to an abandonment pressure of 100 psi.

Economic projections as of June 1, 1981 were made on the basis of (a) continued reinjection of 50% of the produced gas, and (b) termination of gas injection at June 1, 1981, with the gas formerly injected being delivered to a

sales line at a Btu-adjusted price of $3.60 per MCF. There are no gas sales in the former case. As in the waterflood projection described previously, oil and gas prices were escalated at 8% annually to a limit of $75 per barrel (from $38 per barrel over 9 years), and windfall profits taxes calculated at a 30% tax rate. The $300,000 investment in each case represents artificial lift equipment which will probably be required in 1982 regardless of the mode of operation.

Yearly detail for these projections are included in Exhibits III-10 and III-11, with comparative results summarized as follows:

	Case (a) Continued Gas Injection	Case (b) Gas Injection Terminated 6/1/81	Difference
Gross Oil Reserves (Bbls)	227,000	153,201	73,799
Net Oil to 100% WI (80% NRI)	181,600	122,561	59,039
Net Gas Sales (MCF)	0	349,459	(349,459)
Net Revenue	$6,504,880	$5,679,481	$825,399
Net Operating Costs	$1,040,500	$ 968,214	$ 72,286
Net Investment	$ 300,000	$ 300,000	0
Net Income (Undiscounted)	$5,164,380	$4,411,267	$753,113
Net Income (Discounted @ 15%)	$4,098,355	$3,656,226	$442,129

PRESSURE DATA

A graphical representation of the bottom hole pressure history at Lemon Ranch is depicted in IV-1 of Appendix IV. Bottom hole pressures are plotted in the month they were measured, along with cumulative oil produced from the Swope reservoir. Cumulative volumes by well were also estimated from the allocations and noted opposite the well on pressure tests taken after the initial measurement.

Several points are noted from this history:

1. Initial bottom hole pressure in the Swope reservoir was 1,825 psig

at a subsea datum of 3,000 feet, as extrapolated from drill steam test measurements on Lemon #1 in January 1978. This is a gradient of 0.383 per foot of depth.

2. The next series of points through Rhodes #4 in February 1980 show pressures at each of the new locations in the reservoir as initially drill stem tested to average approximately 1,730 psig, or 5.2% less than the original Lemon #1 pressure. The obvious exceptions are noted as Rhodes #1 and Lemon #8, which indicated a high drawdown to approximately 1,500 psig, and Lemon #11 which was at the original level of 1,820 psig. There is some question as to whether some of the lower pressures were fully stabilized. Nevertheless, it does appear that a relatively high degree of pressure loss occurred at Rhodes #1 and Lemon #8 after the withdrawal of approximately 20,000 stock tank barrels from the reservoir.
3. Gas injection was started into Lemon #2X and Lemon #7 in July 1979. The effect of this injection was undoubtedly responsible for some of the higher initial pressure levels noted on wells drilled subsequent to this.
4. A series of bottom hole pressures measured in July 1979 show varying degrees of pressure loss in the wells tested. These ranged from 140 psi in Lemon #11, which has been shut in since completion, to 755 psi at Rhodes #2, which has produced an estimated 22,000 stock tank barrels of oil.
5. The most recent measurements are bottom hole buildup tests run in Rhodes #3 in October 1980, and in Lemon #5 in January 1981. Rhodes #3 recorded 792 psig after 72 hours, and was extrapolated by a Horner

plot to a P^* of 1,118 psig (Exhibits IV-4 and IV-4a of Appendix IV). Lemon #5 recorded 875 psig after 24 hours, and had a P^* Horner extrapolation to 1,634 psig (Exhibits IV-5 and IV-5a).

Also included in Appendix IV are the following:

a. Tabulation of initial drill stem test data (Exhibit IV-2).

b. Tabulation of bottom hole pressures taken in July 1980, and estimated cumulative oil volumes produced through July 1980 (Exhibit IV-3).

c. Pressure buildup analyses and Horner plots from initial drill stem tests on Lemon #1, Lemon #8, and Rhodes #1 (Exhibits IV-6 and IV-6a, IV-7 and IV-7a, and IV-8 and IV-8a).

RESERVOIR AND FLOW CHARACTERISTICS

The reservoir rock at Lemon Ranch field is the relatively thin Swope limestone development occurring at an average depth of 4,770 feet within the Pennsylvanian Lansing-Kansas City formation. The reservoir, as currently defined by well control, appears to be continuous over at least a 560-acre area, with net thickness ranging up to 8 feet. Average characteristics as defined by logs and cores are as follows:

	Logs	Cores
· Net thickness	5 feet	4.5 feet
· Porosity	15.3%	17.4%
· Water Saturation	14.5%	23.5%
· Permeability (horizontal)	-	42.5 Md.
· Permeability (vertical)	-	25.9 Md.

Log porosity calculations are based on density measurements using a grain density of 2.73 grams/cc, and water saturations based on induction resistivities using a formation water resistivity at 125 degrees Fahrenheit of 0.044 ohm-meters and a cementation factor of 2.0. Log data are summarized in Appendix V, Exhibit V-1, along with copies of the density logs.

Core values are based on standard analyses performed on whole core sections. Some limited vertical fracturing was noted in three of the wells (Lemon #2X, Lemon #11, and Rhodes #3). Core data are summarized in Appendix V, Exhibit V-2, along with copies of each coregraph and standard analysis. Exhibit V-3 of Appendix V shows the general relationship between core porosities and water saturations, with permeabilities shown in parentheses beside each point.

A restored-state core analysis was performed on three selected samples taken from Lemon #3 in order to further evaluate flow and displacement characteristics under both gas and water injection.

After extracting all fluids and salt and measuring porosities and air permeabilities, each core plug was saturated with a 91,000 ppm sodium chloride brine. Residual water saturations were then established by centrifuging the samples, and the voided pore space resaturated with a 20 centipoise mineral oil. This permitted measurements of permeability to oil at residual water saturation. Gas-oil relative permeability and displacement characteristics were determined by injecting humidified nitrogen and measuring incremental volumes of oil and gas produced versus time. Results of these tests are shown on pages 2 through 10 of Core Laboratories, Inc.'s report in Exhibit V-4. These results indicate relatively good displacement efficiencies by gas for the 78 Md. and 63 Md. samples, with poorer efficiency in the 8.7 Md. rock.

Pages 11 through 19 of the Core Laboratories' report detail results of the water displacement tests. These were obtained from the same core samples after gas injection. The samples were resaturated with a 1.02 cp. oil, evacuated of all gas, and then dynamically displaced with the oil in order to measure effective permeabilities to oil at residual water saturations. These oil permeabilities ranged from 54% of absolute in the 8.7 Md. sample with the highest residual water saturation of 37.5%, to 95.2% of absolute in the 63 Md. sample with

with residual water of 16.8% of pore volume. The cores were then displaced with a 1.74 cp., 91,000 ppm salt water so as to yield a displaced to displacing viscosity ratio of approximately 0.6. Displacement by water was continued to a 99.9% water cut, permitting the measurement of relative permeabilities to water and fluid recoveries as a function of time and injected volumes.

These tests indicate excellent displacement efficiencies by water, reducing the oil saturations to residual values of 20.5% in the 8.7 Md. sample, and 32.9% in the 78 Md. sample, while recovering 62.4% of 71.0% of the oil-in-place. These recovery values imply 100% conformance, achievable only under laboratory conditions. This can in no way be duplicated in the field, but does nevertheless indicate favorable conditions for water displacement. The water cut curves on pages 17 through 19 of Core Laboratories' report in Appendix V indicates 34.3% to 42% of the total recoverable oil produced prior to water breakthrough for the 78 Md. and 63 Md. samples, reducing to 25.6% for the 8.7 Md. sample.

RESERVOIR FLUID CHARACTERISTICS

Results of a reservoir fluid analysis made by Core Laboratories, Inc. on a subsurface sample taken from Lemon Ranch #6 on May 29, 1979, are included in Exhibit VI-1 of Appendix VI. These data indicate the oil in the Swope reservoir at Lemon Ranch to be slightly undersaturated initially, with a bubble point pressure of 1,695 psig at 125 degrees Fahrenheit. Initial reservoir pressure at the #6 well was measured at 1,762 psig at a depth of 4,777 feet (3,011 feet subsea). Solution gas at the bubble point was 845 standard cubic feet per barrel, and formation volume factor was 1.49 reservoir barrels per stock tank barrel. Residual oil gravity is 43.2 degrees API. Oil viscosity in the reservoir ranged from 0.389 centipoises initially to 0.666 centipoises at 150 psi.

These data were assumed to represent the average fluid characteristics in the Swope reservoir, and were used in all material balance and performance predictions included in this report. A tabulation of the basic data is shown in Exhibit VI-2 of Appendix VI.

WELL COMPLETIONS

Basic Swope completion data are tabulated and summarized for each well in Appendix VII. Wells are completed with 4-1/2" casing cemented through the Swope Lime, perforated with 2 to 4 jet shots per foot of pay, and tubed with 2-3/8" upset tubing set on a packer above the perforations. The perforations are broken down and treated with 2,000 gallons to 5,000 gallons of acid and potentialed as flowing wells. Seating nipples are installed in all tubing strings to facilitate later pumping installations. Initial flowing potentials ranged from 2 to 216 barrels of oil per day.

APPENDIX VII

EXHIBIT VII-1

Lemon Ranch Field
Swope Completion Intervals
and Initial Potentials

Well	Perforations Interval	Feet	Initial Potential BOPD	SCFB	Comments
Lemon #1	4754-4762	8	100	1350	Miss. Perfs
Lemon #2X	4755-4760	5	50	1200	Swope Gas Injection. Miss. Perfs
Lemon #3	4768-4778	10	170	640	
Lemon #5	4782-4787	5	150	800	
Lemon #6	4778-4788	10	180	800	
Lemon #7	4788-4794	6	84	-	Swope Gas Injection. Miss. Perfs
Lemon #8	4776-4782	6	115	1000	Miss. Perfs
Lemon #9	4766-4771	5	216	-	Swope Gas Injection.
Lemon #10	4773-4778	5	192	-	
Lemon #11	4757-4764	7	2	46000	
Rhodes #1	4763-4767	4	48	1000	
Rhodes #2	4754-4763	9	100	1000	
Rhodes #3	4770-4778	8	156	1000	
Rhodes #4	4766-4771	5	172	-	

APPENDIX VII

EXHIBIT VII-2

Lemon Ranch Field Wells
Swope Lime Completion Data

Lemon #1 Perfs 4754-62 w/4 JSPF

Acidized w/500 gals - MCA - IPIP - 1250 psi @ 1/2 BPM
BDP = 800 psi @ 1 BPM ISIP - 450 psi 5" SIP - Vac
Kicked well off flowing 40 BO/1 hr.

Acidized w/1500 gals 15% CRA w/20 ball sealers
IPIP - 500 psi @ 1/2 BPM to 1000 psi @ 4 BPM w/balls on perfs
ISIP - 1200 psi
Well kicked off flowing @ 180-200 BOPD
Initial production - 100 BOPD on 10/64" choke w/FTP-390 psi
and GOR-1350 CFB

Lemon #2X 4755-60 w/2 JSPF

Acidized w/2000 gals 15% HCl NE acid w/8 B.S.
BDP - 1350 IPIP - 14.0 ATP - 1350 ATR - 3.75
ISIP - 1400 2" SIP - 375 1-1/2 hr SIP - 200
Swabbed load. No flow.

Acidized 3000 gals 15% HCl NE Acid @ 3 BPM
IPIP - 1000 ATP - 800 ATR- 3 BPM
Flowing 2 BOPH on 10/64
Initial production - 50 BOPD, 10/64 FTP - 250 GOR - 1200

Lemon #3 4768-78 - 2 JSPF

Acidized w/2000 gals 15% HCl NE acid
IPIP - 1900 @ 1 BPM → 800 @ 3 BPM
ISIP - 500 5" SIP 200 15" = Vac
Well kicked off flowing
Initial production - 170 BOPD 10/64 FTP - 300 GOR - 641 (?)

Lemon #5 4782-87 w/2 JSPF

Acidized w/1500 gals 15% HCl NE acid w/15 B.S.
BDP - 2000 IPIP - 1500 @ 1.5 BPM → 1300
ISIP - 1400 20" SITP - 250
Well kicked off flowing - 6 BOPH in heads.

Reperfed 4782-87
Acidized w/1000 gals 15% HCl NE acid
BDP-1900 IPIP-1500 ATP-1300 → 1400 ATR-3
ISIP-1400 25" = vac
Initial production - flowing - 150 BOPD 10/64"
FTP-325 GOR-800

Lemon #6 4778-88 w/4 JSPF

Acidized w/2000 gals 15% HCl NE BDP - 1600 IPIP-1400 ATP-1000
ATR-3 BPM ISIP-200 3" vac.
Well kicked off flowing - Initial production-180 BOPD 10/64 FTP-410
GOR-800

Lemon #7 4788-94 w/2 JSPF

Acidized w/5000 gals 15% HCl NE acid
BDP-1000 ATP-1800 ATR-4.5 ISIP-450 40" vac
Well kicked off flowing - Initial production-84 BOPD 10/64, FTP-620

Lemon #8 4776-82

Acidized w/5000 gals 15% HCL NE BDP-1800 psi ISIP-650
45" SIP-450
Well kicked off flowing - Initial production-115 BO 10/64"
FTP-340 Est. 115 M/D GOR-1000

Lemon #9 4766-71 w/2 SPF

Acidized w/5000 gals 15% HCl NE acid. Press to 1825 w/balls.
ATP-1750 ATR-5 BPM ISIP-450 1 hr SITP-45
Well kicked off flowing
Initial production 9 BOPH - 216 BOPD 10/64" FTP400

Lemon #10 4773-78 w/2 JSPF

Acidized w/5000 gals 15% HCl NE Treated w/4-3/4 BPM ISIP-950
15" vac
Well kicked off flowing
Initial production - 192 BOPD 10/64"
320# FTP. Subsequently tested at 40 BOPD on 10/64" w/350 psi
w/GOR est. @ 875 CFB.

Lemon #11 4757-64 w/2 JSPF

Acidized w/5000 gals 15% HCl NE acid w/12 B.S.
BDP-1900 ATP-1600 @ 5 BPM inc. to 2100 w/balls on perfs
ISIP-450 6" vac.
Well kicked off flowing
Initial production - 2 BOPD, 920 MCF/D gas 10/64" FTP-1250

Rhodes #1 4763-67 w/4 JSPF

Acidized - 5000 gals 15% HCl NE acid ATP-1400 ATR-3 BPM
ISIP-500 1 hr-200
Initial production - 2 BOPD - 50 BOPD 8/64 FTP-390 GOR-1000

Rhodes #2 4754-63 w/2 JSPF

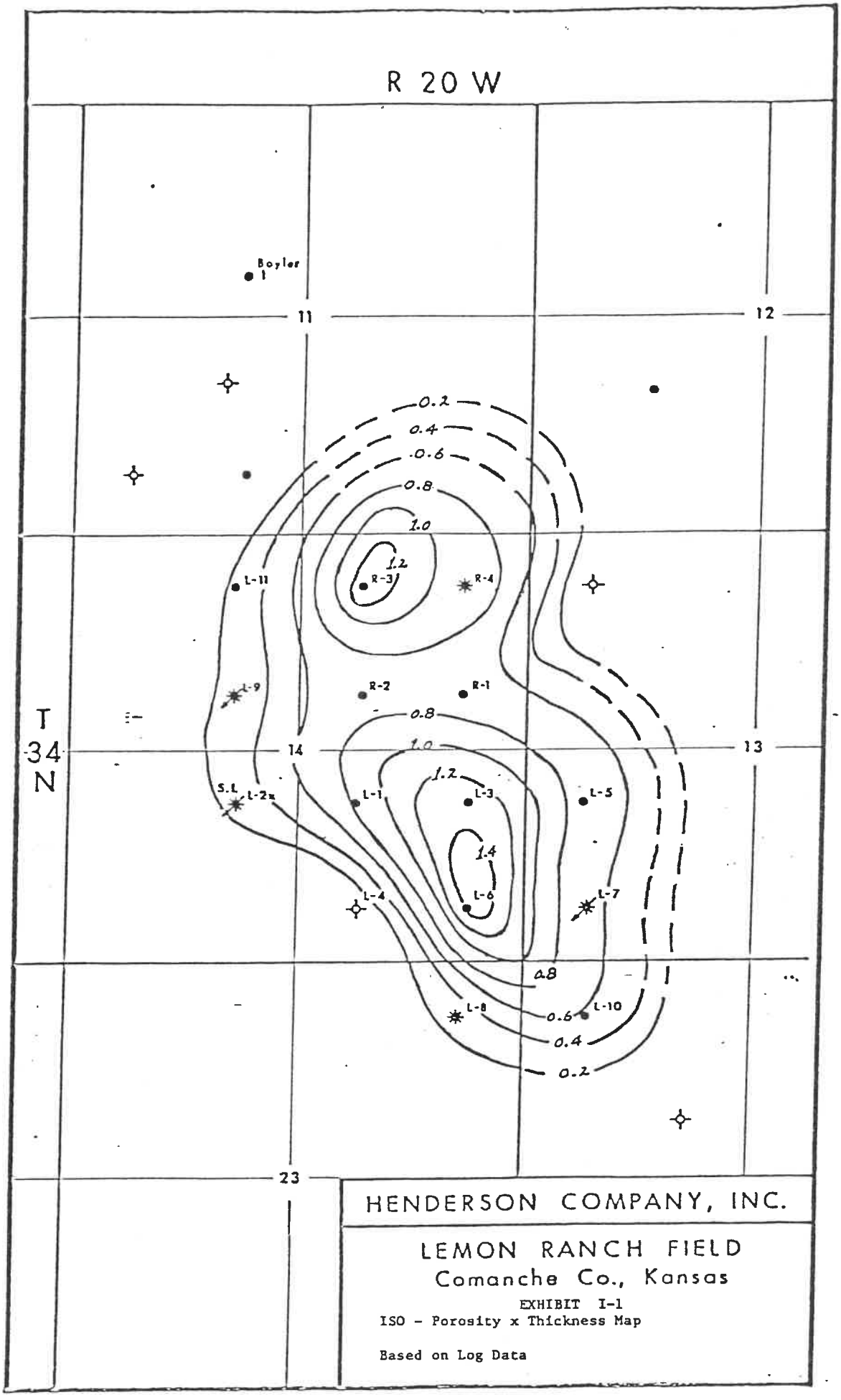
Acidized - 2000 gals 15% HCl NE acid ATP-900 ATR-4.5 BPM
ISIP - vac
Initial production - 100 BOPD 10/64 560# GOR 1000

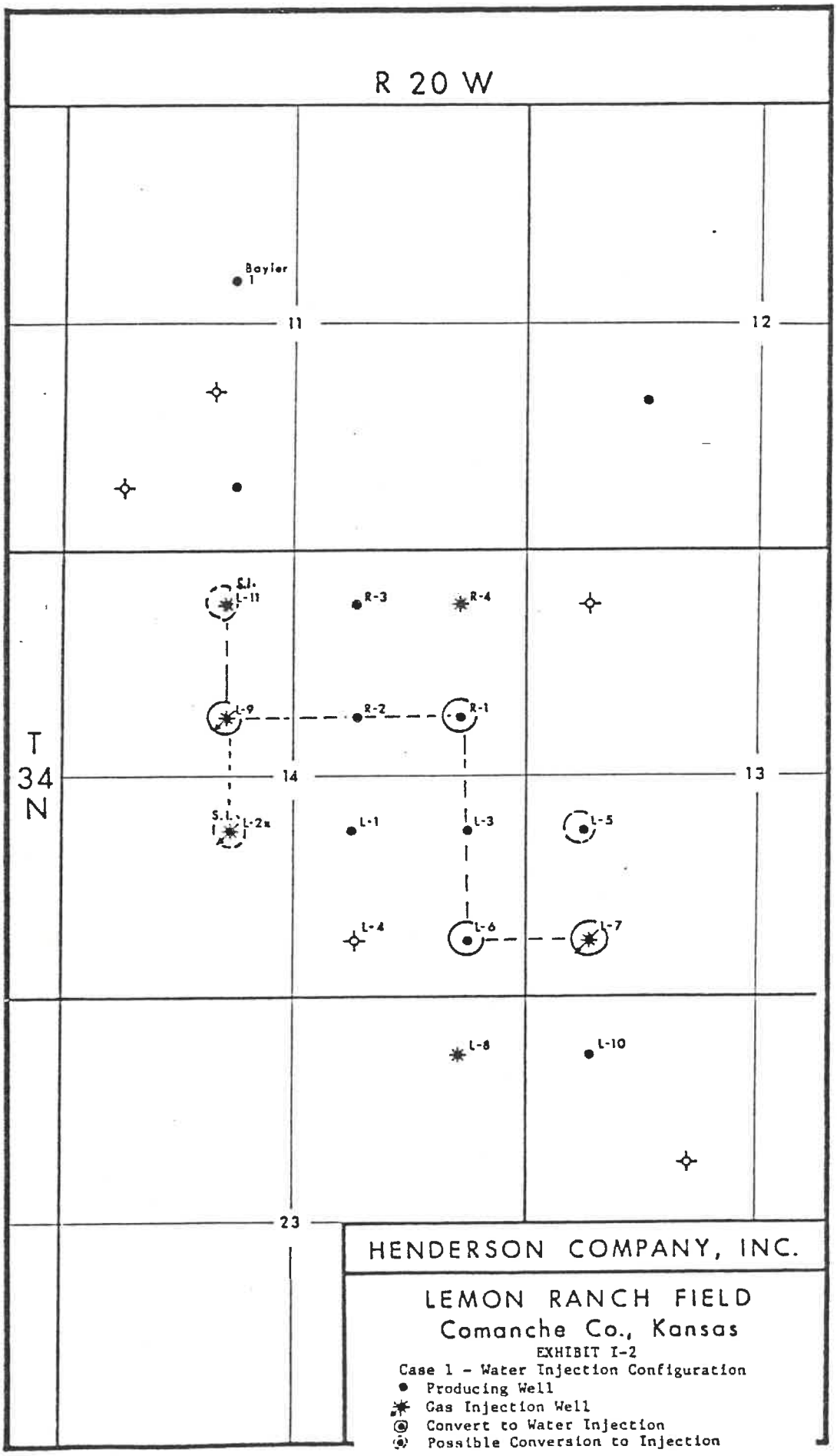
Rhodes #3 4770-78 w/2 JSPF

Acidized - 5000 gals 15% HCl NE acid
ATP-1700 ATR 4.5 B/M ISIP-400 6" - vac
Initial production - 156 BOPD GOR-1000 480#

Rhodes #4 4766-71 w/2 JSPF

Acidized - 5000 gals 15% HCl NE acid
ATP-1300 → 1500 (w/balls) ATR-4 BPM
ISIP-300# 5" - vac
Initial production - 172 BOPD 12/64 FTP 400#


R 20 W
Boyler 1
11
12
0.2
0.4
0.6
0.8
1.0
1.2
L-11
R-3
R-4
L-9
R-2
R-1
T 34 N
14
13
0.8
1.0
1.2
S.L
L-2
L-1
L-3
L-5
1.4
L-4
L-6
L-7
0.8
L-8
0.6
L-10
0.4
0.2
23
HENDERSON COMPANY, INC.
LEMON RANCH FIELD
Comanche Co., Kansas
EXHIBIT I-1
ISO - Porosity x Thickness Map
Based on Log Data


R 20 W
Boyler 1
11
12
S.I. L-11
R-3
R-4
L-9
R-2
R-1
T 34 N
14
13
S.I. L-2R
L-1
L-3
L-5
L-4
L-6
L-7
L-8
L-10
23
HENDERSON COMPANY, INC.
LEMON RANCH FIELD
Comanche Co., Kansas
EXHIBIT I-2
Case 1 - Water Injection Configuration
Producing Well
Gas Injection Well
Convert to Water Injection
Possible Conversion to Injection

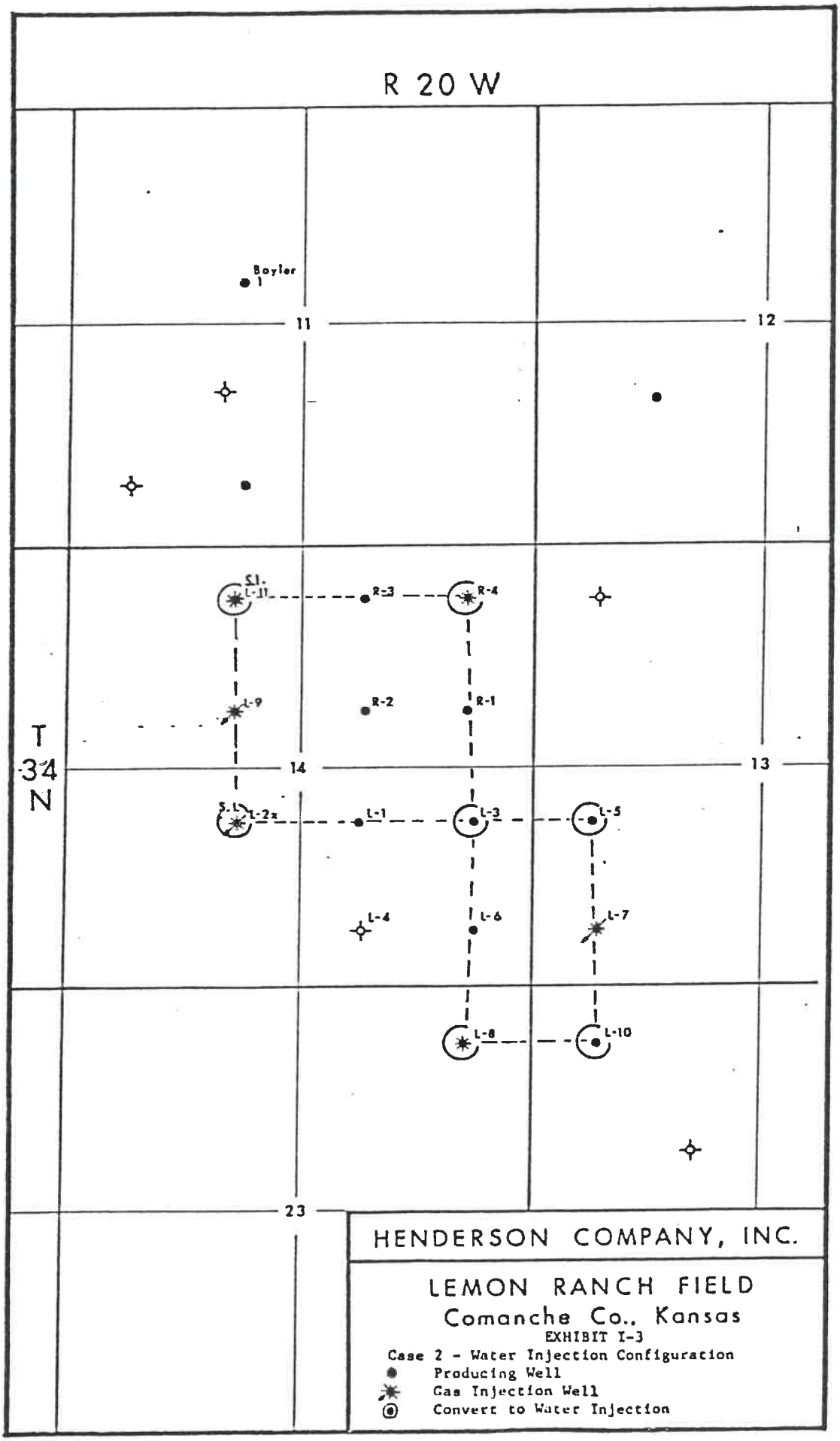
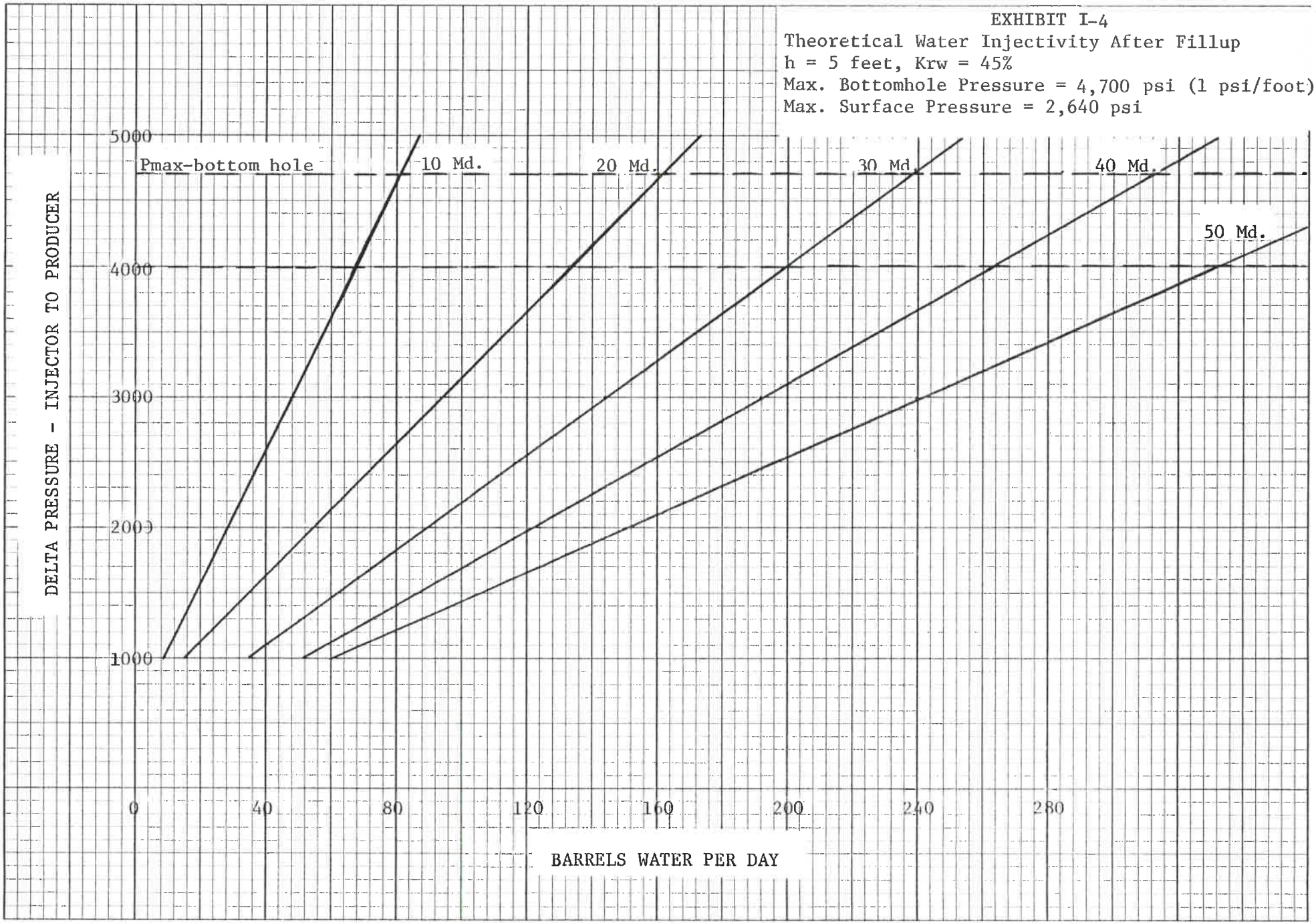
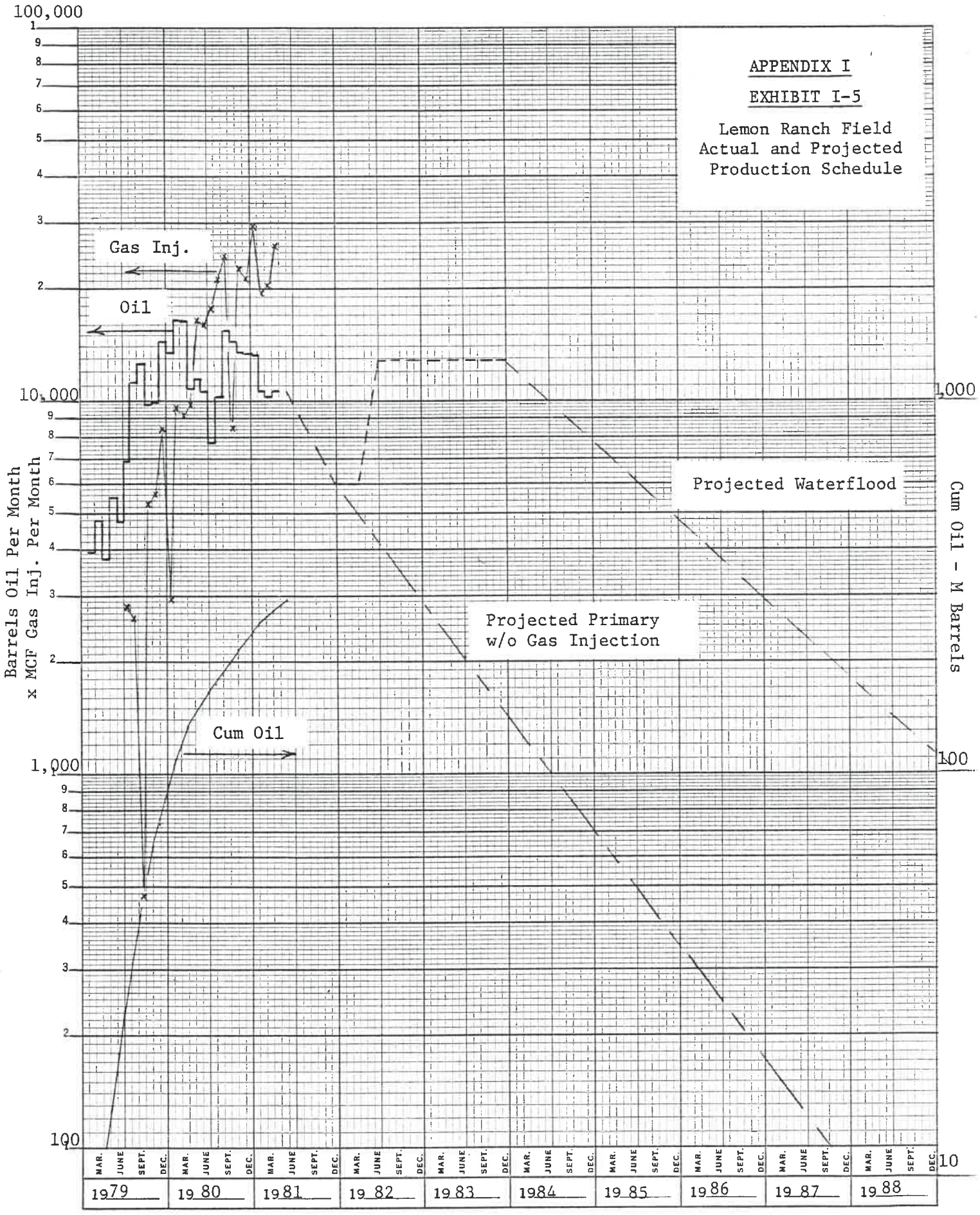

R 20 W
Boyler 1
11
12
S.I. L-11
R-3
R-4
L-9
R-2
R-1
T 34 N
14
13
S.I. L-2x
L-1
L-3
L-5
L-4
L-6
L-7
L-8
L-10
23
HENDERSON COMPANY, INC.
LEMON RANCH FIELD
Comanche Co., Kansas
EXHIBIT I-3
Case 2 - Water Injection Configuration
Producing Well
Gas Injection Well
Convert to Water Injection

EXHIBIT I-4

Theoretical Water Injectivity After Fillup
h = 5 feet, Krw = 45%
Max. Bottomhole Pressure = 4,700 psi (1 psi/foot)
Max. Surface Pressure = 2,640 psi




APPENDIX I
EXHIBIT I-5
Lemon Ranch Field
Actual and Projected
Production Schedule
Gas Inj.
Oil
Cum Oil
Projected Waterflood
Projected Primary
w/o Gas Injection
Barrels Oil Per Month
x MCF Gas Inj. Per Month
Cum Oil - M Barrels
100,000
10,000
1,000
100
1,000
100
10
MAR. JUNE SEPT. DEC.
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988

APPENDIX I

EXHIBIT I-6

Lemon Ranch Waterflood

Summary of Estimated Costs

Injection Plant		$ 50,000
Changes to Tank Batteries		27,100
Water System:		
A. Water Well		15,000
B. Water Tank Dirt Work, etc.		8,000
Distribution System		50,000
Well Conversions		18,000
Pumping Units (Rods, Pumps, Motors, Units)		327,500
	Subtotal	495,600
Contingencies @ 15%		75,000
	Total	$ 570,000

LEMON RANCH FIELD
SWOPE LIME RESERVOIR
COMANCHE CO. KANSAS

APPENDIX I

EXHIBIT I-7

RESERVES AND ECONOMICS
AS OF DATE : 6/ 1/1981

WATERFLOOD PREDICTION
ESCALATED PRICES AND COSTS

-END- MO-YR	GROSS OIL PRODUCTION -----MB-----	GROSS GAS PRODUCTION ----MMF---	OIL TO NET INTEREST -----MB-----	GAS TO NET INTEREST -----MMF---	REVENUE TO INTEREST ----M$---	NET INVESTMENT ----M$----	NET OPER EXPENSES ---M$---	NET INCOME BEFORE FIT ----M$----	CUMULATIVE NET INCOME -----M$----	15.00 PCT CUM DISC NET INCOME -----M$----
12-81	55.253	97.650	44.202	78.120	1700.703	571.000	84.000	1045.703	1045.703	1008.922
12-82	123.022	326.550	98.418	261.240	4304.989	0.000	150.720	4154.269	5199.972	4543.851
12-83	155.125	345.906	124.100	276.725	5644.513	0.000	162.778	5481.735	10681.707	8559.065
12-84	121.565	201.794	97.252	161.435	4531.514	0.000	175.799	4355.715	15037.422	11305.408
12-85	73.300	98.841	58.640	79.073	2864.259	0.000	189.864	2674.395	17711.818	12756.936
12-86	44.423	52.833	35.538	42.266	1845.754	0.000	205.053	1640.701	19352.520	13523.474
12-87	27.056	29.815	21.645	23.852	1206.506	0.000	221.457	985.049	20337.570	13919.631
12-88	16.559	17.419	13.247	13.935	805.302	0.000	239.174	566.128	20903.698	14115.618
12-89	10.183	10.411	8.147	8.329	533.288	0.000	258.308	274.980	21178.678	14197.562
12-90	5.261	5.291	4.209	4.233	302.982	0.000	215.243	87.739	21266.418	14220.401
5 TOT	631.747	1186.510	505.398	949.208	23739.810	571.000	1902.396	21266.418	21266.418	14220.401
AFTER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	21266.418	14220.401
TOTAL	631.747	1186.510	505.398	949.208	23739.810	571.000	1902.396	21266.418	21266.418	14220.401
CUM.	290.000	290.000								
ULT.	921.747	1476.510								

NET OIL REVENUE	19748.972	5 PCT	18460.590
NET GAS REVENUE	3990.840	10 PCT	16145.619
NET PROD REVENUE	-0.002	15 PCT	14220.401
		20 PCT	12605.897
CUM NET PW/INV(1)	24.904	30 PCT	10080.016
LIFE (YEARS)	9.38		
RATE OF RETURN,PCT	100.00		
INITIAL N.I., PCT	80.0000		

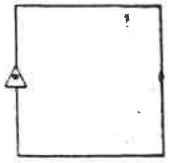
40 PCT	8227.750		
50 PCT	6835.927		
60 PCT	5768.012		
80 PCT	4270.324		
100 PCT	3300.609		

CUM NET INC/INV(1)	37.244
GROSS WELLS	10.
MONTH IN 1ST YEAR	7.
INITIAL W.I., PCT	100.0000

NOLOSS

APPENDIX I

EXHIBIT I-8

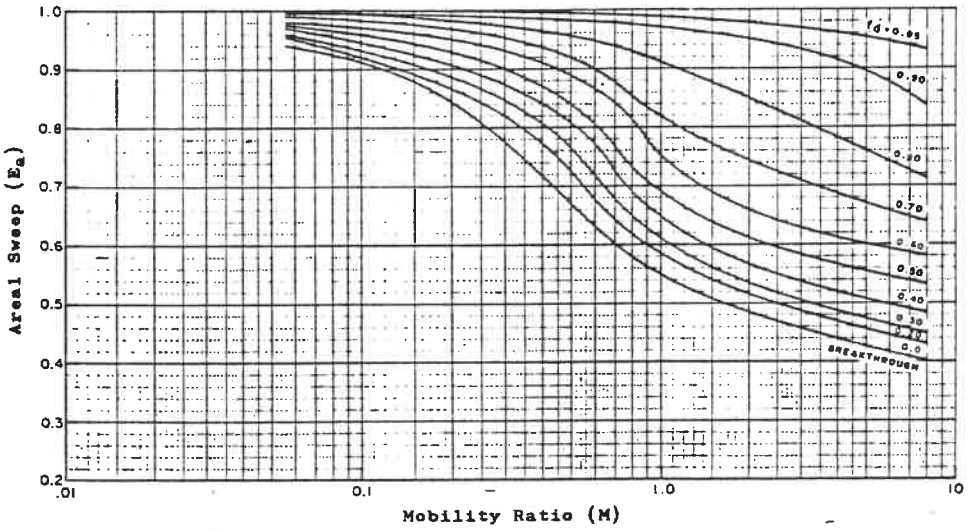


LINE-DRIVE CORRELATION

FOR DIRECT-LINE

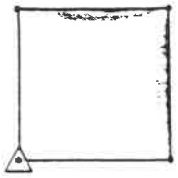
SQUARE PATTERN

(after Dyes, Caudle and Erickson[5])



APPENDIX I

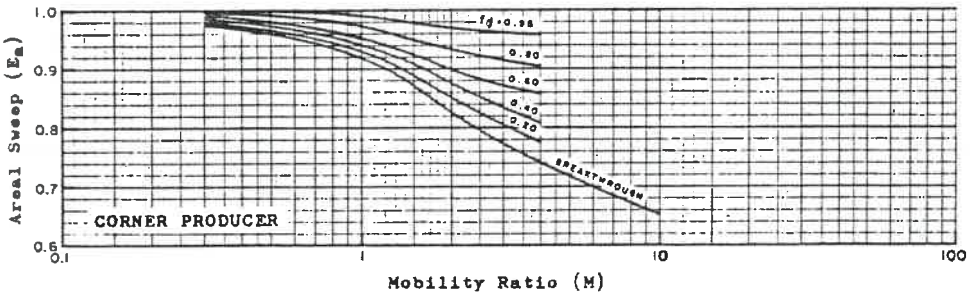
EXHIBIT I-9

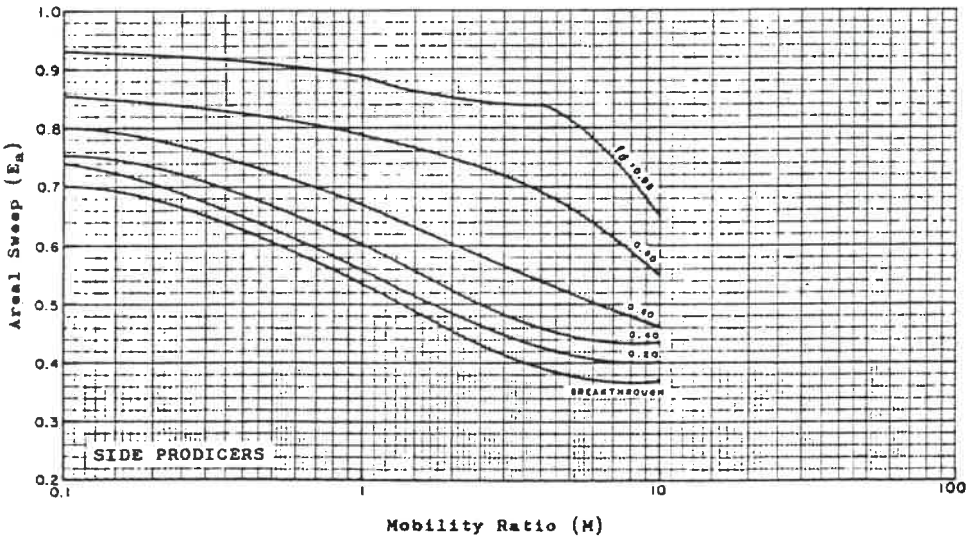


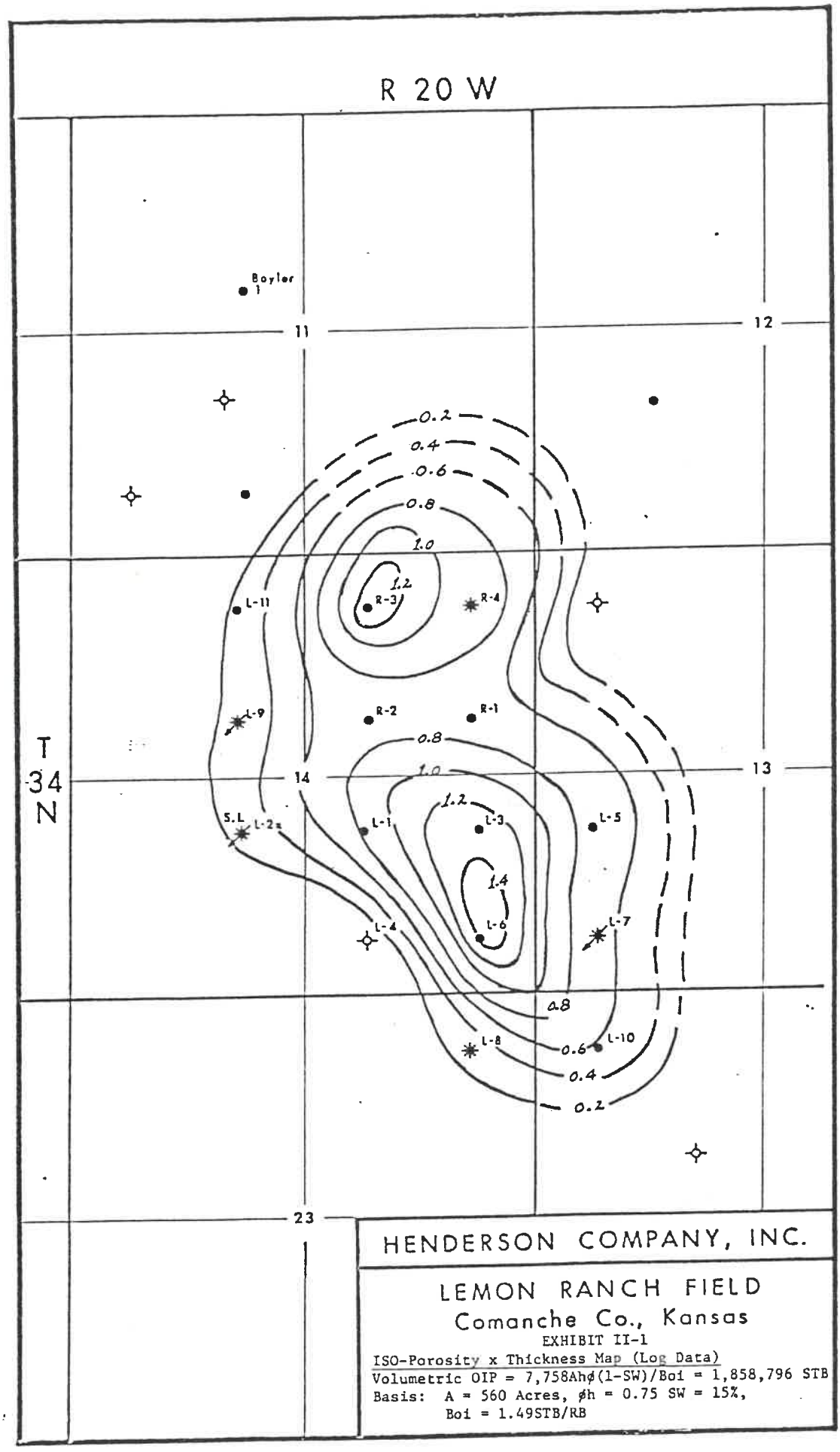
NINE-SPOT CORRELATION

FOR $q_c / q_s = 1.0$

(after Kimbler, Caudle and Cooper[3])







HENDERSON COMPANY, INC.

LEMON RANCH FIELD

Comanche Co., Kansas

EXHIBIT II-1

ISO-Porosity x Thickness Map (Log Data)

Volumetric OIP = $7{,}758Ah\phi(1-SW)/Boi$ = 1,858,796 STB

Basis: A = 560 Acres, ϕh = 0.75 SW = 15%,
Boi = 1.49STB/RB

KRM-LEMON RANCH FIELD
SWOPE LIME RESERVOIR
COMANCHE CO, KANSAS

APPENDIX II

EXHIBIT II-2

R E S E R V O I R F L U I D S T A B L E

PRESSURE PSIG----	DIFFERENTIAL DATA FVF V/B---	GAS SOL F/B----	FLASH FVF V/B---	FLASH GAS SOL F/B----	GAS GRAVITY -------	Z FACTOR ------	GAS FVF B/MCF--
50.	1.1200	110.	1.1200	110.	0.000	1.0000	45.6056
100.	1.1900	205.	1.1900	205.	0.000	0.9950	25.5879
150.	1.2270	259.	1.2270	259.	0.000	0.9770	17.4952
200.	1.2550	320.	1.2550	320.	0.000	0.9590	13.1727
300.	1.2640	331.	1.2640	331.	0.000	0.9350	8.7613
600.	1.3170	446.	1.3170	446.	0.000	0.8980	4.3076
900.	1.3650	555.	1.3650	555.	0.000	0.8680	2.7980
1200.	1.4120	663.	1.4120	663.	0.000	0.8440	2.0487
1400.	1.4420	733.	1.4420	733.	0.000	0.8330	1.7361
1695.	1.4900	845.	1.4900	845.	0.000	0.8150	1.4055

N - MSTB	0.000	SAT PSI	1695.
G/N RATIO - CF/B	000.000	SCW - PCT	15
G - MMCF	0.000	GAS CAP PSI	0.
BW - RVB/STB	1.0100	CW - V/MMV/PSI	2.500
SEP. CF/STB	000.	CO - V/MMV/PSI	13.900
RESVR TEMP - F	125.	CF - V/MMV/PSI	4.000
NITROGEN - PCT	00.00	CARB. DIOX. - PCT	00.00
HYD. SULF. - PCT	00.000		

APPENDIX II

EXHIBIT II-3

Lemon Ranch Field
Pressure and Gas - Oil Ratio Data
July 8, 1980

Well No.	Estimated Test Data	Estimated Bbls Oil/Day	Estimated MCF Gas/Day	GOR-CF/B	SITP-PSI	SIBHP-PSI	Survey Date	Estimated Cumulative Bbls Oil
Lemon #1	6/15/80	62	91	1,468	1,020		7/8/80	30,500
Lemon #3	6/15/80	54	102	1,594	1,250	-	7/8/80	20,600
Lemon #5	6/15/80	94	180	1,915	800	1,659	7/8/80	9,800
Lemon #5	1/26/81	11	30	2,727	-	1,634 1/	1/27/81	
Lemon #6	3/15/80	90	150	1,667	1,200	1,446	7/8/80	26,100
Lemon #8	6/15/80	80	80	1,000	1,450	-	7/8/80	6,900
Lemon #9	6/15/80	25	60	2,400	400	1,619	7/8/80	1,000
Lemon #10	6/15/80	82	100	1,220	800	1,586	7/8/80	13,400
Lemon #11	6/15/80	20	984	49,200	1,500	1,686	7/8/80	0
Rhodes #1	3/15/80	25	50	2,000	680	-	7/8/80	22,300
Rhodes #2	5/30/80	80	395	4,938	1,200	1,069	7/8/80	23,100
Rhodes #3	6/15/80	81	135	1,667	800	-	7/8/80	8,500
Rhodes #3	10/23/80	75	150	2,000	454	1,118 2/	10/24/80	15,600
Rhodes #4	7/1/80	132	132	1,000	1,500	-	7/8/80	2,300

Notes: 1/ Extrapolated to P*. Measured 875 psi max./24 hours.
2/ Extrapolated to P*. Measured 792 psi max./72 hours.

APPENDIX II

EXHIBIT II-4

KRM-Lemon Ranch Field
Swope Lime Reservoir
Comanche County, Kansas

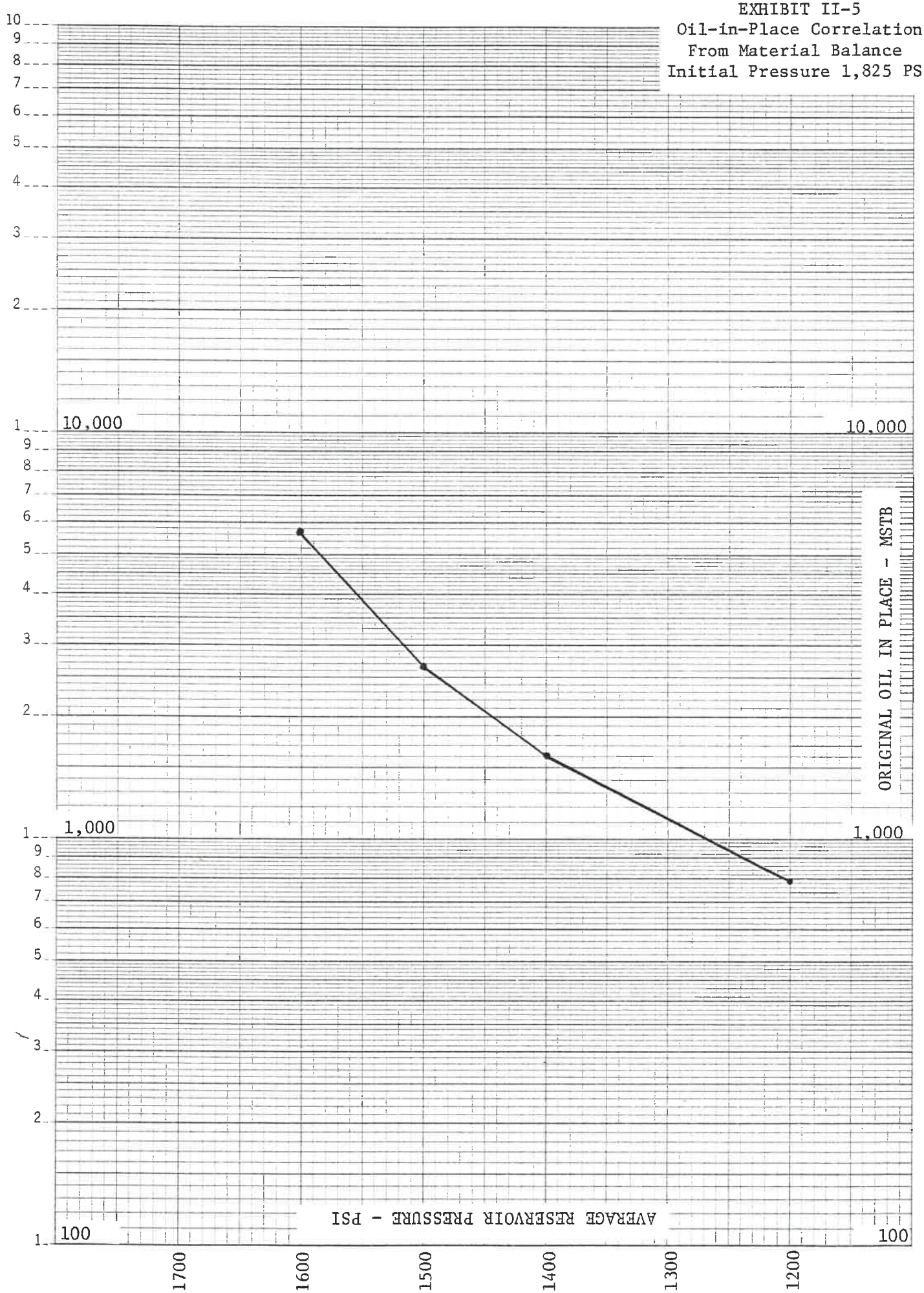
MATERIAL BALANCE RESULTS
Survey Date: 7/8/80

Well No.	Original Pressure	Current Pressure	Cumulative Production Oil MSTB	Gas MMCF	Water MSTB	Oil-in-Place Original MSTB
Lemon #1	1825	1000	30.5	36.0	0	163
Lemon #2*	1825	1600	0.6	-17.0	0	21
Lemon #3	1825	1200	20.6	26.0	0	180
Lemon #5	1825	1659	9.8	14.0	0	1292
Lemon #6	1825	1446	26.1	30.0	0	448
Lemon #7*	1825	1600	3.0	-85.0	0	103
Lemon #8	1825	1590	6.9	6.0	0	228
Lemon #9	1825	1619	1.0	1.0	0	51
Lemon #10	1825	1586	13.4	13.0	0	468
Lemon #11	1825	1686	.0.0	0.0	0	0
Rhodes #1	1825	1050	22.3	30.0	0	150
Rhodes #2	1825	1069	23.1	35.0	0	182
Rhodes #3	1825	1400	8.5	0.0	0	80
Rhodes #4	1825	1600	2.3	2.0	0	84
CAP	0	0	0.0	0.0	0	
TOTALS			168.1	91.0	0	3447

Original Gas Cap Vol. = 0. MMSCF
Total Water Influx Vol. = 0. MBBLS

* Gas Injection Well

APPENDIX II
EXHIBIT II-5
Oil-in-Place Correlation
From Material Balance
Initial Pressure 1,825 PSI



46 5490

SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

APPENDIX II

EXHIBIT II-6

KRM-Lemon Ranch Field
Swope Lime Reservoir
Comanche County, Kansas

MATERIAL BALANCE RESULTS
Survey Date: 7/8/80

Case No.	Original Pressure	Assumed Current Pressure	Cumulative Production			Oil-in-Place Original MSTB
			Oil MSTB	Gas MMCF	Water MSTB	
1	1825	1200	168	91	0	785
2	1825	1400	168	91	0	1590
3	1825	1500	168	91	0	2645
4	1825	1600	168	91	0	5759

APPENDIX III

EXHIBIT III-2

PRODUCED GAS METERED FOR RE-INJECTION
LEMON RANCH FIELD

	Leman Ranch		Rhodes		Total	
	MCF		MCF		MCF	
1979	Month	Cum	Month	Cum	Month	Cum
July (1,2)	1,549	1,549	1,263	1,263	2,812	2,812
August	1,675	3,227	944	2,207	2,622	5,434
September	280	3,507	192	2,399	472	5,906
October	2,521	6,028	2,764	5,163	5,285	11,191
November	2,850	8,878	2,802	7,965	5,652	16,843
December	5,094	13,972	3,338	11,303	8,432	25,275
1980						
January	5,876	19,848	2,076	13,379	2,952	28,227
February	6,113	25,961	3,491	16,890	9,604	38,731
March	7,244	33,205	1,923	18,793	9,167	46,998
April	7,643	40,845	2,212	21,005	9,855	56,853
May	11,603	52,451	4,677	25,682	16,280	73,133
June	12,246	64,697	3,831	29,513	16,077	89,210
July	13,676	78,373	4,138	33,651	17,074	107,024
August (3)	14,526	92,899	6,688	40,339	21,214	128,235
September	15,760	108,659	8,955	49,294	24,715	152,953
October	5,444	114,103	3,049	52,343	8,493	161,446
November	14,499	128,602	8,324	60,667	22,823	184,269
December	14,849	143,451	6,470	67,137	21,319	205,588
1981						
January	20,365	163,816	8,711	75,848	29,076	234,664
February	14,978	178,794	4,694	80,542	19,672	254,336
March	14,063	192,857	6,065	86,607	20,128	274,464
April	14,653	207,510	12,282	98,889	26,938	301,402

Notes:

(1) Injection at average wellhead pressure of 1,650 psi.
(2) Gas injection into Leman #2X and #7.
(3) Leman #2X shut in. Gas injection started in Leman #9.

APPENDIX III

EXHIBIT III-3

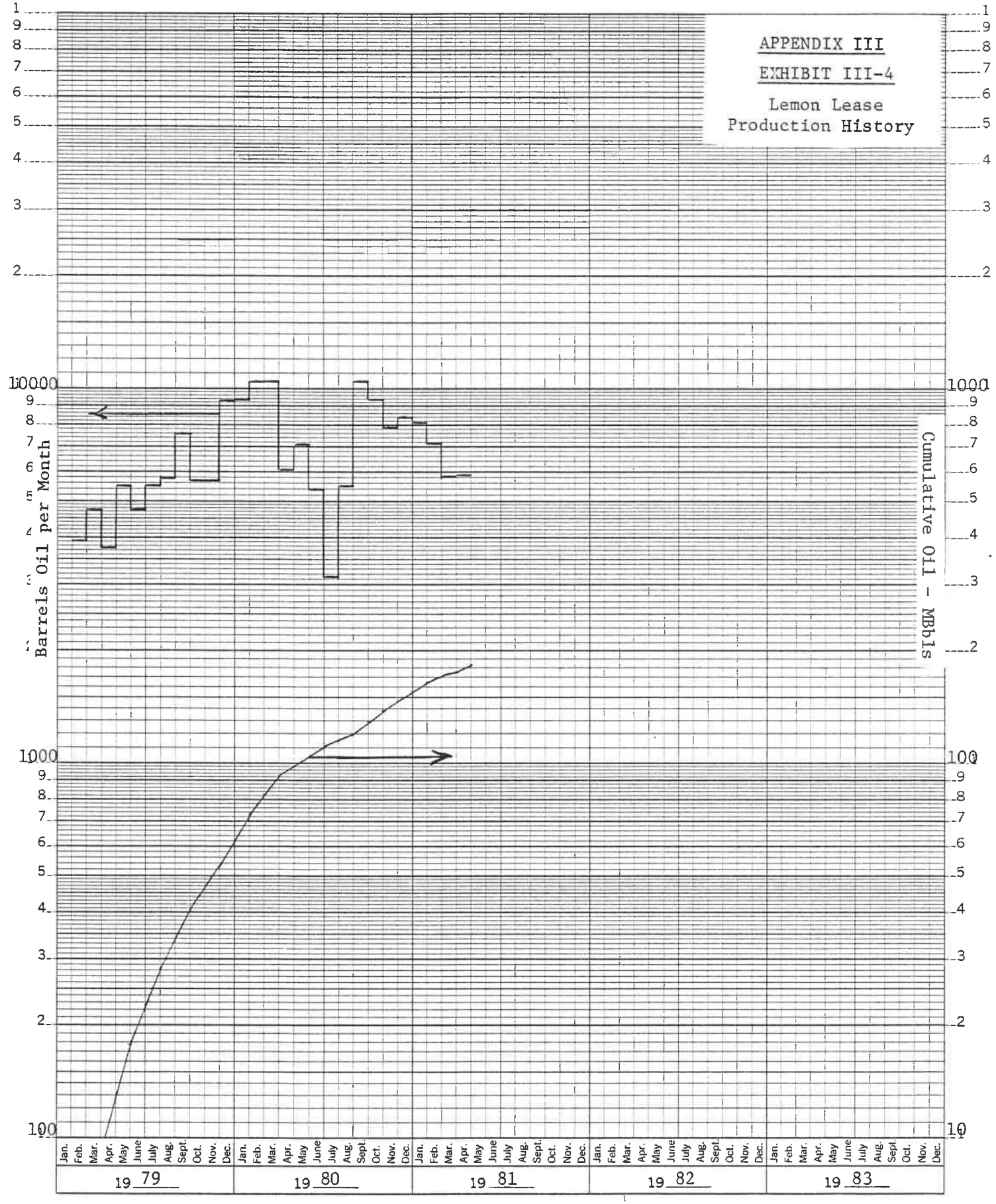
OIL PRODUCTION HISTORY
LEMON RANCH FIELD

	Leman Ranch			Rhodes			Total		
	Active	Barrels		Active	Barrels		Active	Barrels	
1979	Wells	Month	Cum	Wells	Month	Cum	Wells	Month	Cum
February	1	3,960	3,960	-	-	-	1	3,960	3,960
March	1	4,784	8,744	-	-	-	1	4,784	8,744
April	2	3,757	12,501	-	-	-	2	3,757	12,501
May	5	5,454	17,955	-	-	-	5	5,454	17,955
June	5	4,706	22,661	-	-	-	5	4,706	22,661
July	5	5,480	28,141	2	1,394	1,394	7	6,874	29,535
August	6	5,790	33,931	2	5,398	6,792	8	11,188	40,653
September	6	7,584	41,515	2	4,934	11,726	8	12,518	53,171
October	7	5,704	47,219	2	4,067	15,793	9	9,771	62,942
November	4	5,730	52,949	2	4,238	20,031	6	9,968	72,910
December	7	9,247	62,196	2	4,913	24,944	9	14,160	87,070
1980									
January	6	9,416	71,612	2	4,032	28,976	8	13,448	100,518
February	4	10,410	82,022	3	6,022	34,998	7	16,432	116,950
March	7	10,384	92,406	3	6,069	41,067	10	16,453	133,403
April	4	6,120	98,526	3	4,659	45,726	7	10,779	144,182
May	6	7,102	105,628	3	4,339	50,065	9	11,441	155,623
June	4	5,443	111,071	4	5,083	55,148	8	10,526	166,149
July	3	3,190	114,261	2	4,542	59,690	5	7,732	173,887
August	4	5,546	119,807	2	4,467	64,157	6	10,013	183,891
September	7	10,350	130,157	2	4,835	68,992	9	15,185	199,079
October	6	9,366	139,523	3	5,103	74,095	9	14,469	213,548
November	6	7,978	147,501	2	5,388	79,483	8	13,366	226,914
December	6	8,430	155,931	3	4,845	84,328	9	13,275	240,189
1981									
January	6	8,148	164,079	3	4,946	89,274	9	13,094	253,283
February	6	7,136	171,215	4	3,347	92,621	10	10,483	263,766
March	6	5,808	177,023	4	4,238	96,859	10	10,046	273,812
April	6	5,945	182,968	4	4,576	101,435	10	10,521	284,333

APPENDIX III

EXHIBIT III-4

Lemon Lease
Production History



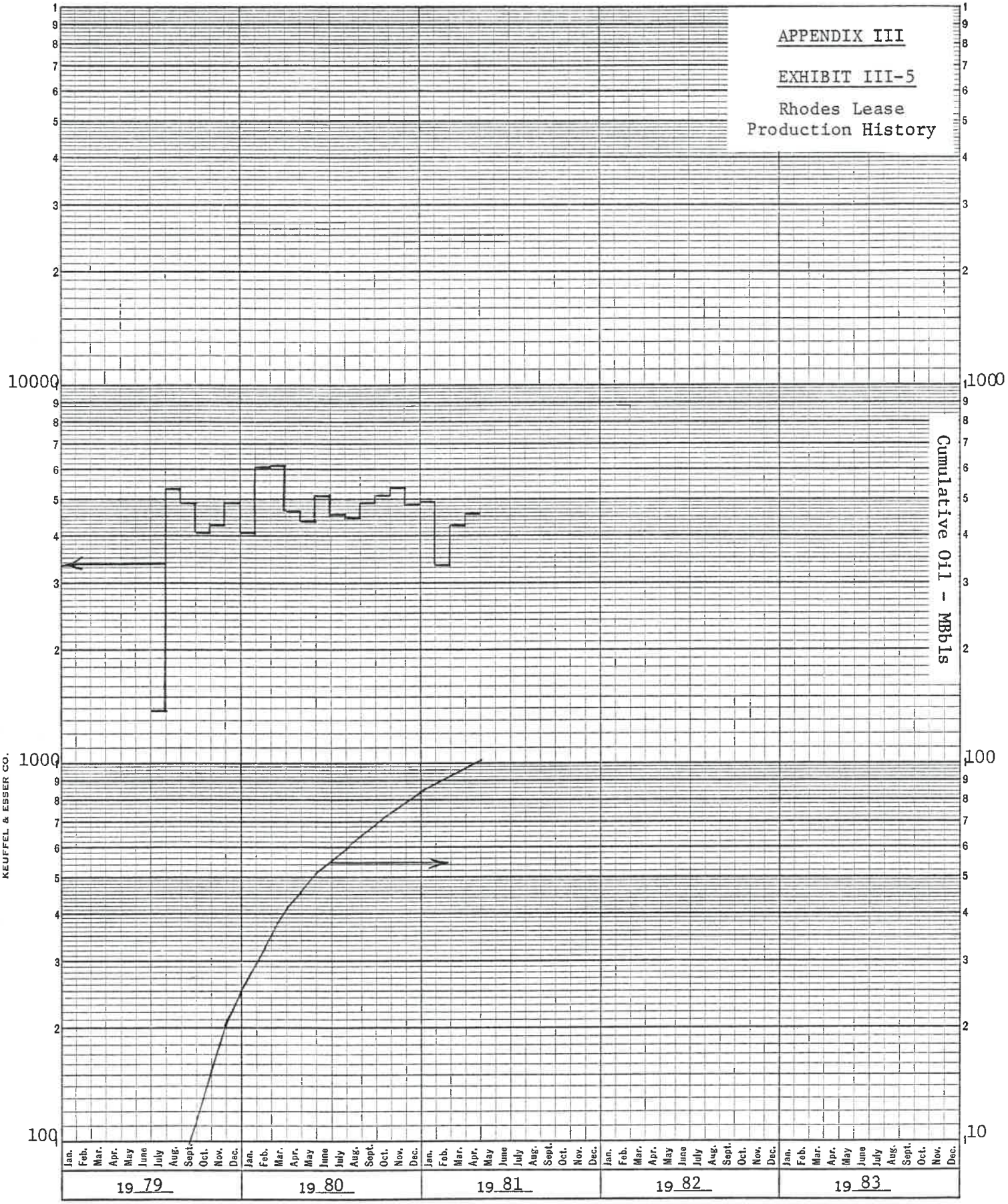
46 6690

K&E 5 YEARS BY MONTHS x 3 LOG CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

APPENDIX III

EXHIBIT III-5

Rhodes Lease
Production History



5 YEARS BY MONTHS
X 3 LOG CYCLES
KEUFFEL & ESSER CO.
MADE IN U.S.A.

KRM-LEMON RANCH FIELD
SWOPE LIME RESERVOIR
COMANCHE CO, KANSAS

APPENDIX III

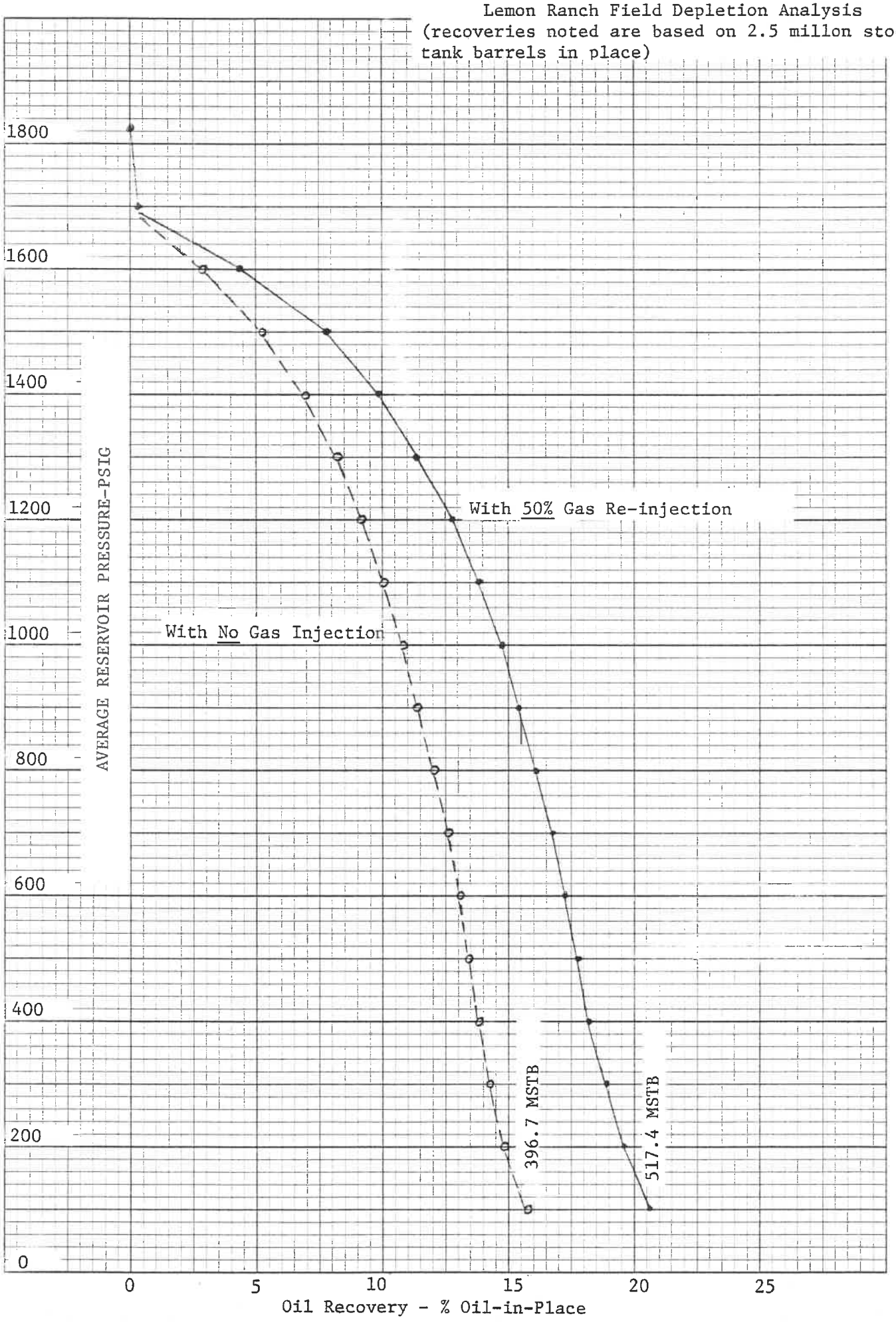
EXHIBIT III-6

R E S E R V O I R F L U I D S T A B L E

PRESSURE PSIG----	DIFFERENTIAL DATA FVF V/B---	GAS SOL F/B----	FLASH FVF V/B---	FLASH GAS SOL F/B----	GAS GRAVITY -------	Z FACTOR ------	GAS FVF B/MCF--
50.	1.1200	110.	1.1200	110.	0.000	1.0000	45.6056
100.	1.1900	205.	1.1900	205.	0.000	0.9950	25.5879
150.	1.2270	259.	1.2270	259.	0.000	0.9770	17.4952
200.	1.2550	320.	1.2550	320.	0.000	0.9590	13.1727
300.	1.2640	331.	1.2640	331.	0.000	0.9350	8.7613
600.	1.3170	446.	1.3170	446.	0.000	0.8980	4.3076
900.	1.3650	555.	1.3650	555.	0.000	0.8680	2.7980
1200.	1.4120	663.	1.4120	663.	0.000	0.8440	2.0487
1400.	1.4420	733.	1.4420	733.	0.000	0.8330	1.7361
1695.	1.4900	845.	1.4900	845.	0.000	0.8150	1.4055

N - MSTB	0.000	SAT PSI	1695.
G/N RATIO - CF/B	000.000	SCW - PCT	15
G - MMCF	0.000	GAS CAP PSI	0.
BW - RVB/STB	1.0100	CW - V/MMV/PSI	2.500
SEP. CF/STB	000.	CO - V/MMV/PSI	13.900
RESVR TEMP - F	125.	CF - V/MMV/PSI	4.000
NITROGEN - PCT	00.00	CARB. DIOX. - PCT	00.00
HYD. SULF. - PCT	00.000		

APPENDIX III
EXHIBIT III-7
Lemon Ranch Field Depletion Analysis
(recoveries noted are based on 2.5 millon stock tank barrels in place)



APPENDIX III

LEMON RANCH RECOVERY ANALYSIS
WITH 50% GAS INJECTION
SWOPE LS-COMANCHE CO, KS

EXHIBIT III-8

I N T E R N A L G A S D R I V E
PRESSURE - PRODUCTION PERFORMANCE
DISPERSED DISPLACEMENT

PRESSURE PSIG	RECOVERY FACTOR %	OIL PROD MSTB	CUM OIL MSTB	CUM GAS--MMSCF TOTAL	CUM GAS--MMSCF NET	GOR SCF/STB	GAS SAT % PV
1825.	0.000	0.00	0.0	0.0	0.0	845.	0.0
1800.	0.048	1.19	1.2	1.0	1.0	820.	0.0
1700.	0.238	4.75	5.9	4.9	4.9	820.	0.0
1695.	0.247	0.24	6.2	5.1	5.1	820.	0.0
1600.	4.401	103.84	110.0	110.0	56.2	1010.	4.4
1500.	7.703	82.53	192.6	247.5	123.9	1666.	8.0
1400.	9.848	53.63	246.2	400.8	199.9	2860.	10.7
1300.	11.446	39.95	286.1	565.2	281.6	4114.	12.7
1200.	12.709	31.55	317.7	732.5	364.9	5303.	14.5
1100.	13.840	28.27	346.0	926.1	461.3	6846.	16.2
1000.	14.718	21.95	367.9	1115.1	555.6	8611.	17.7
900.	15.416	17.44	385.4	1299.2	647.4	10557.	19.0
800.	16.125	17.74	403.1	1521.3	758.2	12519.	20.3
700.	16.708	14.57	417.7	1727.2	861.0	14135.	21.5
600.	17.213	12.61	430.3	1921.5	958.0	15404.	22.6
500.	17.811	14.96	445.2	2159.8	1076.9	15933.	23.9
400.	18.336	13.12	458.3	2372.1	1182.9	16187.	25.1
300.	18.930	14.86	473.2	2608.6	1301.0	15920.	26.4
200.	19.696	19.16	492.4	2881.3	1437.1	14228.	27.4
100.	20.697	25.00	517.4	3284.9	1638.6	16141.	31.0

INITIAL OIL-IN-PLACE (MB) = 2499.8
INITIAL GAS-IN-PLACE, MMF 2112.3

APPENDIX III

EXHIBIT III-9

LEMON RANCH RECOVERY ANALYSIS
WITH NO GAS INJECTION
SWOPE LS-COMANCHE CO, KS

I N T E R N A L G A S D R I V E
PRESSURE - PRODUCTION PERFORMANCE
DISPERSED DISPLACEMENT

PRESSURE PSIG	RECOVERY FACTOR %	OIL PROD MSTB	CUM OIL MSTB	CUM GAS--MMSCF TOTAL	CUM GAS--MMSCF NET	GOR SCF/STB	GAS SAT % PV
1825.	0.000	0.00	0.0	0.0	0.0	845.	0.0
1800.	0.048	1.19	1.2	1.0	1.0	820.	0.0
1700.	0.238	4.75	5.9	4.9	4.9	820.	0.0
1695.	0.247	0.24	6.2	5.1	5.1	820.	0.0
1600.	2.942	67.37	73.5	61.3	61.3	834.	3.1
1500.	5.340	59.94	133.5	130.1	130.1	1148.	6.1
1400.	7.011	41.78	175.3	205.5	205.5	1806.	8.3
1300.	8.237	30.63	205.9	284.8	284.8	2590.	10.1
1200.	9.190	23.83	229.7	366.0	366.0	3408.	11.7
1100.	10.084	22.35	252.1	458.8	458.8	4150.	13.2
1000.	10.829	18.62	270.7	550.5	550.5	4925.	14.6
900.	11.443	15.36	286.0	640.8	640.8	5879.	15.9
800.	12.071	15.70	301.7	747.7	747.7	6810.	17.2
700.	12.589	12.93	314.7	848.4	848.4	7787.	18.4
600.	13.017	10.72	325.4	944.6	944.6	8973.	19.5
500.	13.489	11.78	337.2	1060.5	1060.5	9838.	20.7
400.	13.898	10.23	347.4	1165.7	1165.7	10284.	21.9
300.	14.361	11.57	359.0	1282.1	1282.1	10060.	23.1
200.	14.970	15.24	374.2	1417.6	1417.6	8891.	24.0
100.	15.868	22.44	396.7	1622.6	1622.6	9135.	27.7

INITIAL OIL-IN-PLACE (MB) = 2499.8
INITIAL GAS-IN-PLACE, MMF 2112.3

LEMON RANCH FIELD
SWOPE LIME RESERVOIR
COMANCHE CO. KANSAS

APPENDIX III

EXHIBIT III-10

RESERVES AND ECONOMICS
AS OF DATE : 6/ 1/1981

CONTINUED GAS INJECTION
ESCALATED PRICES AND COSTS

-END- MO-YR	GROSS OIL PRODUCTION ----MB----	GROSS GAS PRODUCTION ----MMF---	OIL TO NET INTEREST ----MB----	GAS TO NET INTEREST ----MMF---	REVENUE TO INTEREST ----M$---	NET INVESTMENT ----M$----	NET OPER EXPENSES ---M$---	NET INCOME BEFORE FIT ----M$----	CUMULATIVE NET INCOME ----M$----	15.00 PCT CUM DISC NET INCOME ----M$----
12-81	60.777	133.373	48.622	106.698	1561.583	0.000	84.000	1477.583	1477.583	1414.830
12-82	70.225	188.229	56.180	150.584	1892.905	300.000	150.720	1442.185	2919.768	2634.482
12-83	42.470	135.206	33.976	108.164	1236.361	0.000	162.778	1073.583	3993.351	3420.851
12-84	25.814	91.209	20.651	72.968	814.924	0.000	175.799	639.125	4632.476	3823.829
12-85	15.767	59.361	12.613	47.488	545.716	0.000	189.864	355.852	4988.328	4016.968
12-86	9.676	37.876	7.741	30.301	361.692	0.000	205.053	156.639	5144.967	4090.150
12-87	2.271	9.052	1.817	7.242	91.699	0.000	72.286	19.413	5164.380	4098.355
12-88										
12-89										
12-90										
S TOT	227.000	654.306	181.600	523.445	6504.880	300.000	1040.500	5164.380	5164.380	4098.355
AFTER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5164.380	4098.355
TOTAL	227.000	654.306	181.600	523.445	6504.880	300.000	1040.500	5164.380	5164.380	4098.355
CUM.	290.000	290.000								
ULT.	517.000	944.306								

NET OIL REVENUE	6504.880		
NET GAS REVENUE	0.000		
NET PROD REVENUE	0.000		
CUM NET INC/INV(1)	0.000	CUM NET PW/INV(1)	0.000
GROSS WELLS	10.	LIFE (YEARS)	5.91
MONTH IN 1ST YEAR	7.	RATE OF RETURN,PCT	100.00
INITIAL W.I., PCT	100.0000	INITIAL N.I., PCT	80.0000

5 PCT	4761.429	40 PCT	2996.560
10 PCT	4408.569	50 PCT	2697.500
15 PCT	4098.355	60 PCT	2450.921
20 PCT	3824.329	80 PCT	2070.706
30 PCT	3364.477	100 PCT	1793.163

LEMON RANCH FIELD
SWOPE LIME RESERVOIR
COMANCHE CO. KANSAS
ESCALATED PRICES AND COSTS

DEPLETION WITHOUT GAS
INJECTION AFTER JUNE 1981

APPENDIX III

EXHIBIT III-11

RESERVES AND ECONOMICS
AS OF DATE : 6/ 1/1981

-END- MO-YR	GROSS OIL PRODUCTION -----MB----	GROSS GAS PRODUCTION -----MMF---	OIL TO NET INTEREST -----MB----	GAS TO NET INTEREST -----MMF---	REVENUE TO INTEREST -----M$---	NET INVESTMENT ----M$----	NET OPER EXPENSES ---M$---	NET INCOME BEFORE FIT -----M$----	CUMULATIVE NET INCOME ----M$----	15.00 PCT CUM DISC NET INCOME -----M$----
12-81	54.274	122.319	43.419	97.855	1746.575	0.000	84.000	1662.575	1662.575	1591.965
12-82	48.960	138.487	39.168	110.790	1736.787	300.000	150.720	1286.067	2948.642	2678.775
12-83	24.059	79.913	19.247	63.930	962.162	0.000	162.778	799.384	3748.026	3264.301
12-84	13.175	47.499	10.540	37.999	589.199	0.000	175.799	413.400	4161.426	3524.955
12-85	7.812	29.494	6.249	23.596	382.381	0.000	189.864	192.517	4353.943	3628.444
12-86	4.922	19.112	3.938	15.289	262.377	0.000	205.053	57.324	4411.267	3656.226
12-87										
12-88										
12-89										
12-90										
S TOT	153.201	436.824	122.561	349.459	5679.481	300.000	968.214	4411.267	4411.267	3656.226
AFTER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4411.267	3656.226
TOTAL	153.201	436.824	122.561	349.459	5679.481	300.000	968.214	4411.267	4411.267	3656.226
CUM.	290.000	290.000								
ULT.	443.201	726.824								

NET OIL REVENUE	4292.203	5 PCT	4130.428	40 PCT	2825.780
NET GAS REVENUE	1387.278	10 PCT	3880.094	50 PCT	2588.511
NET PROD REVENUE	0.000	15 PCT	3656.226	60 PCT	2388.091
		20 PCT	3455.203	80 PCT	2069.212
CUM NET PW/INV(1)	0.000	30 PCT	3110.048	100 PCT	1827.638
LIFE (YEARS)	5.58				
RATE OF RETURN,PCT	100.00				
INITIAL N.I., PCT	80.0000				

CUM NET INC/INV(1)	0.000
GROSS WELLS	10.
MONTH IN 1ST YEAR	7.
INITIAL W.I., PCT	100.0000

APPENDIX IV

EXHIBIT IV-1

Lemon Ranch Field
Bottom Hole Pressure
Cumulative Production History

APPENDIX IV

EXHIBIT IV-2

Lemon Ranch Drill Stem Test Data

Well	ISIP	FSIP	IFP	FFP	P* AT -3000'	Initial Flow	Final Flow	Recovery	Date
Lemon #1	1758	1773	205-206	349-461	1825	152 MCF/D	87 MCF/D	180' Gassy mud 1985' Gassy muddy oil	12/1/78
Lemon #2	Plugging	813	-	245-129	-	Weak to light blow		220' SGOCM	3/24/79
Lemon #3	1739	-	85-92	-	1735	Strong blow	GTS 6"	240' CO 20' Frothy oil	4/7/79
Lemon #5	1668	1705	58-63	86-139	-	48 M/D	48 M/D	500' CGO 100' Muddy oil	4/28/79
Lemon #6	1733	-	180-252	-	-	200 M/D	-	1140' Gassy oil	5/8/79
Lemon #7	1502	1695	68-50	74-77	-	Strong blow	GTS 35 min	30' OGCM 60 HOGCM 60 MO	5/19/79
Lemon #8	1219	1498	29-43	64-67	-	Weak blow inc.	to good blow	165' SLOGCM 60' HOGCM 3720' GIP	6/2/79
Lemon #9	1571	1739	83-45	83-17	-	NGTS	17 MCF/D	35' SLOCM	8/23/79
Lemon #10	1633	1566	55-75	55-144	-	GTS 27"	11 MCF	60' SOGCM 120' HOGCM 120' Gassy oil	11/18/79
Lemon #11	1822	1823	169-173	158-160	1823	GTS 6" 280 M/D	353 M/D	70' M 600' MW 60' SOCMW 60' OCG Foamy muddy water	1/4/80
Rhodes #1	471	1495	37-34	50-50	-	Strong blow		60' M 60' SOCM	6/16/79
Rhodes #2	1689	1693	258-457	538-554	1707	411 MCF/D	332 M/D Flowed oil	300' Gassy oil	6/27/79
Rhodes #3	1714	-	148-150	-	-	130 M/D		140' HOGCM 430' HG Frogky oil	12/18/79
Rhodes #4	1731	1735	185-110	156-237	1732	130 M/D	101 M/D	630' GFO 120' GMCO	2/15/80

APPENDIX IV

EXHIBIT IV-3

Lemon Ranch Field
Pressure and Gas - Oil Ratio Data
July 8, 1980

Well No.	Estimated Test Data	Estimated Bbls Oil/Day	Estimated MCF Gas/Day	GOR-CF/B	SITP-PSI	SIBHP-PSI	Survey Date	Estimated Cumulative Bbls Oil
Lemon #1	6/15/80	62	91	1,468	1,020		7/8/80	30,500
Lemon #3	6/15/80	54	102	1,594	1,250	-	7/8/80	20,600
Lemon #5	6/15/80	94	180	1,915	800	1,659	7/8/80	9,800
Lemon #5	1/26/81	11	30	2,727	-	1,634 1/	1/27/81	17,000
Lemon #6	3/15/80	90	150	1,667	1,200	1,446	7/8/80	26,100
Lemon #8	6/15/80	80	80	1,000	1,450	-	7/8/80	6,900
Lemon #9	6/15/80	25	60	2,400	400	1,619	7/8/80	1,000
Lemon #10	6/15/80	82	100	1,220	800	1,586	7/8/80	13,400
Lemon #11	6/15/80	20	984	49,200	1,500	1,686	7/8/80	0
Rhodes #1	3/15/80	25	50	2,000	680	-	7/8/80	22,300
Rhodes #2	5/30/80	80	395	4,938	1,200	1,069	7/8/80	23,100
Rhodes #3	6/15/80	81	135	1,667	800	-	7/8/80	8,500
Rhodes #3	10/23/80	75	150		454	1,118 2/	10/24/80	15,600
Rhodes #4	7/1/80	132	132	1,000	1,500	-	7/8/80	2,300

Notes: 1/ Extrapolated to P*. Measured 875 psi max./24 hours.
2/ Extrapolated to P*. Measured 792 psi max./72 hours.

RHODES #3
PRESS BUILDUP 10-24-80
SWOPE PERFS 4,770-4,778

APPENDIX IV

EXHIBIT IV-4

P R E S S U R E B U I L D - U P A N A L Y S I S

POINTS USED	RADIUS FELT,FT	SLOPE PSI/CYC	K (MDS)	P.I. B/D/PSI	SKIN FACTOR	SKIN DP	COMPL. EFF, %	SIBHP PSIG	AVG. P PSIG	
1- 3	24.	49.9	16.7527	0.324	-3.20	-139.	160.1	561.	736.	
3- 9	43.	100.5	8.1264	0.184	-3.56	-311.	176.4	634.	912.	
9-24	99.	172.2	4.5841	0.124	-3.96	-593.	197.8	790.	1111.	*
24-25	102.	82.3	9.6771	0.171	-2.22	-159.	136.3	792.	944.	

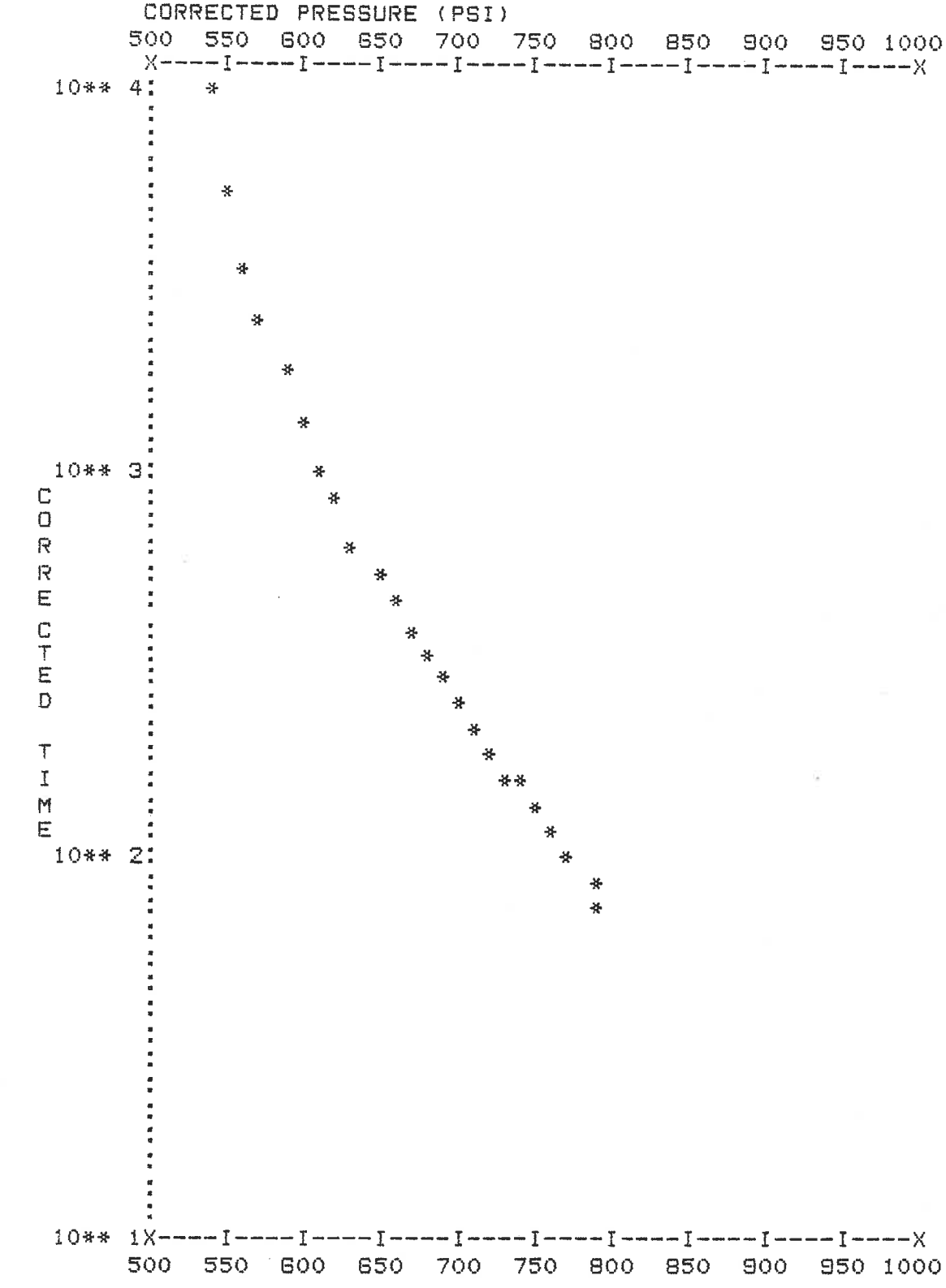
POINT	PRESSURE	DP PSI	CORRECTED PRESSURE@	DT (HOURS)	(T+DT)/DT	CORRECTED (T+DT)/DT@@	WB STOR LDP/LDT
1	537.	32.	537.	0.500	9953.0	9953.0	0.0000
2	551.	46.	551.	1.000	4977.0	4977.0	0.5236
3	561.	56.	561.	1.500	3318.3	3318.3	0.4851
4	571.	66.	571.	2.000	2489.0	2489.0	0.5711
5	587.	82.	587.	3.000	1659.7	1659.7	0.5353
6	598.	93.	598.	4.000	1245.0	1245.0	0.4376
7	610.	105.	610.	5.000	996.2	996.2	0.5439
8	620.	115.	620.	6.000	830.3	830.3	0.4990
9	634.	129.	634.	8.000	623.0	623.0	0.3993
10	649.	144.	649.	10.000	498.6	498.6	0.4930
11	660.	155.	660.	12.000	415.7	415.7	0.4037
12	671.	166.	671.	14.000	356.4	356.4	0.4448
13	680.	175.	680.	16.000	312.0	312.0	0.3954
14	689.	184.	689.	18.000	277.4	277.4	0.4258
15	697.	192.	697.	20.000	249.8	249.8	0.4039
16	711.	206.	711.	24.000	208.3	208.3	0.3860
17	723.	218.	723.	28.000	178.7	178.7	0.3673
18	734.	229.	734.	32.000	156.5	156.5	0.3687
19	742.	237.	742.	36.000	139.2	139.2	0.2915
20	751.	246.	751.	40.000	125.4	125.4	0.3538
21	760.	255.	760.	46.000	109.2	109.2	0.2571
22	773.	268.	773.	54.000	93.1	93.1	0.3101
23	785.	280.	785.	62.000	81.3	81.3	0.3171
24	790.	285.	790.	68.000	74.2	74.2	0.1916
25	792.	287.	792.	72.000	70.1	70.1	0.1223

@ CORRECTED FOR AFTERFLOW
@@ CORRECTED FOR SUPERPOSITION

RHODES #3
PRESS BUILDUP 10-24-80
SWOPE PERFS 4,770-4,778

APPENDIX IV

EXHIBIT IV-4a



LEMON RANCH #5
PRESS BUILDUP 1-27-81
SWOPE PERFS 4782-4787

APPENDIX IV

EXHIBIT IV-5

P R E S S U R E B U I L D - U P A N A L Y S I S

POINTS USED	RADIUS FELT,FT	SLOPE PSI/CYC	K (MDS)	P.I. B/D/PSI	SKIN FACTOR	SKIN DP	COMPL. EFF, %	SIBHP PSIG	AVG. P PSIG
1- 2	13.	12.6	16.2127	0.143	-2.97	-32.	142.1	625.	690.
2- 3	16.	26.6	7.6112	0.074	-3.18	-74.	149.3	633.	762.
3- 6	24.	59.3	3.3472	0.036	-3.30	-170.	155.3	669.	921.
6-12	32.	126.2	1.5198	0.019	-3.55	-390.	165.8	730.	1206.
12-23	51.	239.9	0.7665	0.011	-3.84	-801.	178.5	875.	1634. *

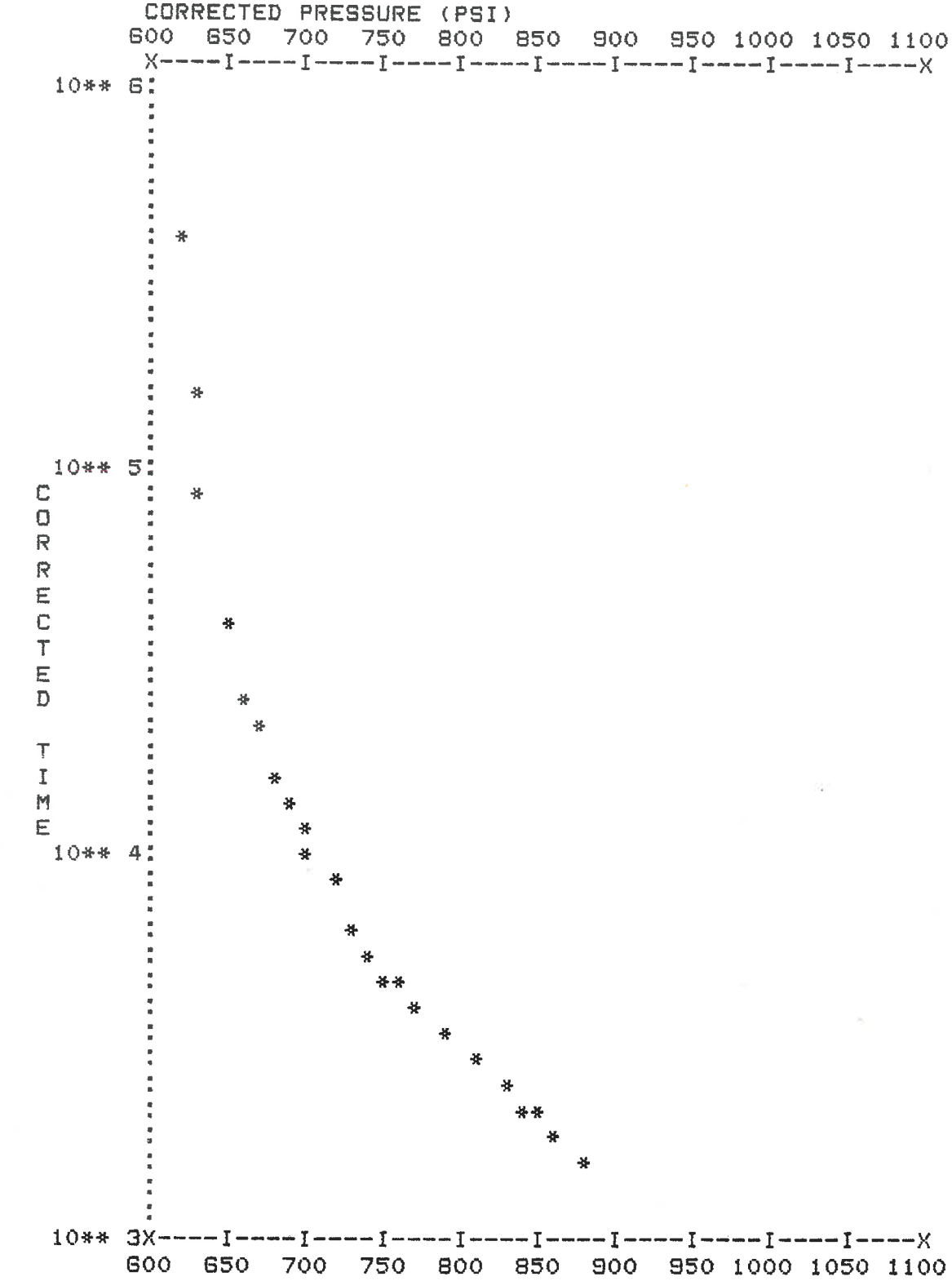
POINT	PRESSURE	DP PSI	CORRECTED PRESSURE@	DT (HOURS)	(T+DT)/DT	CORRECTED (T+DT)/DT@@	WB STOR LDP/LDT
1	620.	7.	620.	0.100	370910.1	370910.1	0.0000
2	625.	12.	625.	0.250	148364.6	148364.6	0.5882
3	633.	20.	633.	0.500	74182.8	74182.8	0.7370
4	649.	36.	649.	1.000	37091.9	37091.9	0.8480
5	660.	47.	660.	1.500	24728.3	24728.3	0.6576
6	669.	56.	669.	2.000	18546.5	18546.5	0.6090
7	681.	68.	681.	2.500	14837.4	14837.4	0.8701
8	688.	75.	688.	3.000	12364.6	12364.6	0.5374
9	695.	82.	695.	3.500	10598.4	10598.4	0.5789
10	703.	90.	703.	4.000	9273.7	9273.7	0.6971
11	718.	105.	718.	5.000	7419.2	7419.2	0.6908
12	730.	117.	730.	6.000	6182.8	6182.8	0.5935
13	744.	131.	744.	7.000	5299.7	5299.7	0.7332
14	754.	141.	754.	8.000	4637.4	4637.4	0.5509
15	764.	151.	764.	9.000	4122.2	4122.2	0.5817
16	774.	161.	774.	10.000	3710.1	3710.1	0.6086
17	792.	179.	792.	12.000	3091.9	3091.9	0.5813
18	809.	196.	809.	14.000	2650.4	2650.4	0.5886
19	825.	212.	825.	16.000	2319.2	2319.2	0.5877
20	836.	223.	836.	18.000	2061.6	2061.6	0.4295
21	851.	238.	851.	20.000	1855.5	1855.5	0.6179
22	862.	249.	862.	22.000	1687.0	1687.0	0.4741
23	875.	262.	875.	24.000	1546.5	1546.5	0.5849

@ CORRECTED FOR AFTERFLOW
@@ CORRECTED FOR SUPERPOSITION

APPENDIX IV

EXHIBIT IV-5a

LEMON RANCH #5
PRESS BUILDUP 1-27-81
SWOPE PERFS 4782-4787



LEMON RANCH #1
INITIAL DST - 12-1-78
SWOPE LIME

APPENDIX IV

EXHIBIT IV-6

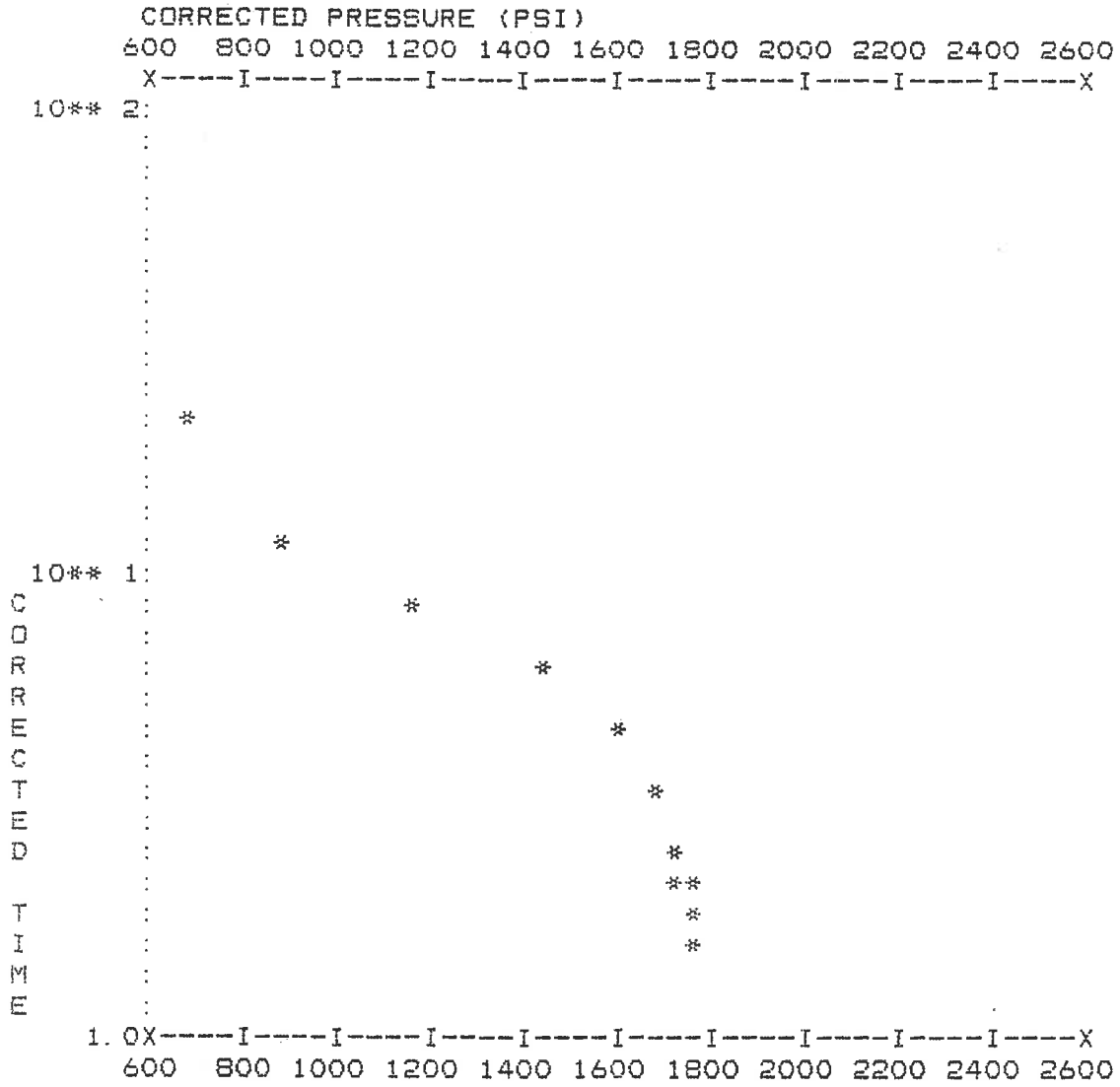
PRESSURE BUILD-UP ANALYSIS

POINTS USED	RADIUS FELT, FT	SLOPE PSI/CYC	K (MDS)	P. I. B/D/PSI	COMPL. EFF., %	SIBHP PSIG	AVG. P PSIG
1- 2	173.	634. 0	66. 15	2. 54	355. 5	860.	1520.
2- 3	185.	1920. 2	21. 84	1. 12	437. 0	1161.	2859.
3- 4	194.	2452. 2	17. 10	0. 94	457. 4	1422.	3330.
4- 5	215.	1160. 6	36. 13	1. 44	353. 4	1586.	2325.
5- 6	264.	563. 7	74. 40	1. 81	227. 5	1676.	1945.
6- 7	323.	261. 6	160. 33	2. 01	123. 4	1700.	1801.
7- 8	337.	844. 4	49. 67	1. 72	313. 8	1728.	2025.
8-20	575.	254. 1	165. 04	1. 98	118. 5	1773.	1819.

LEMON RANCH #1
INITIAL DST - 12-1-78
SWOPE LIME

APPENDIX IV

EXHIBIT IV-6a



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Lemon #2-X COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petoleum,Corp. DATE 3-24-79 FILE NO S-1373

FIELD TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE NO	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4764 65	x 0.0	0.0	6.8	33.1	12.9	No Perm	Vertical fracture with oil in fracture
2	4765 66	x 0.0	0.0	6.7	37.9	9.4	No Perm	
3	4766 67	x 0.0	0.0	7.3	39.2	10.7	No Perm	
Net	0'	0.0	0.0	6.9	36.7	11.0		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Potroleum Corp. DATE 3-24-79

WELL Lemon #2-X ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

PERMEABILITY MILLIDARCYS O—O

30 20 10 0

POROSITY—% X—X

20 10 0

CORING TIME MIN/FT

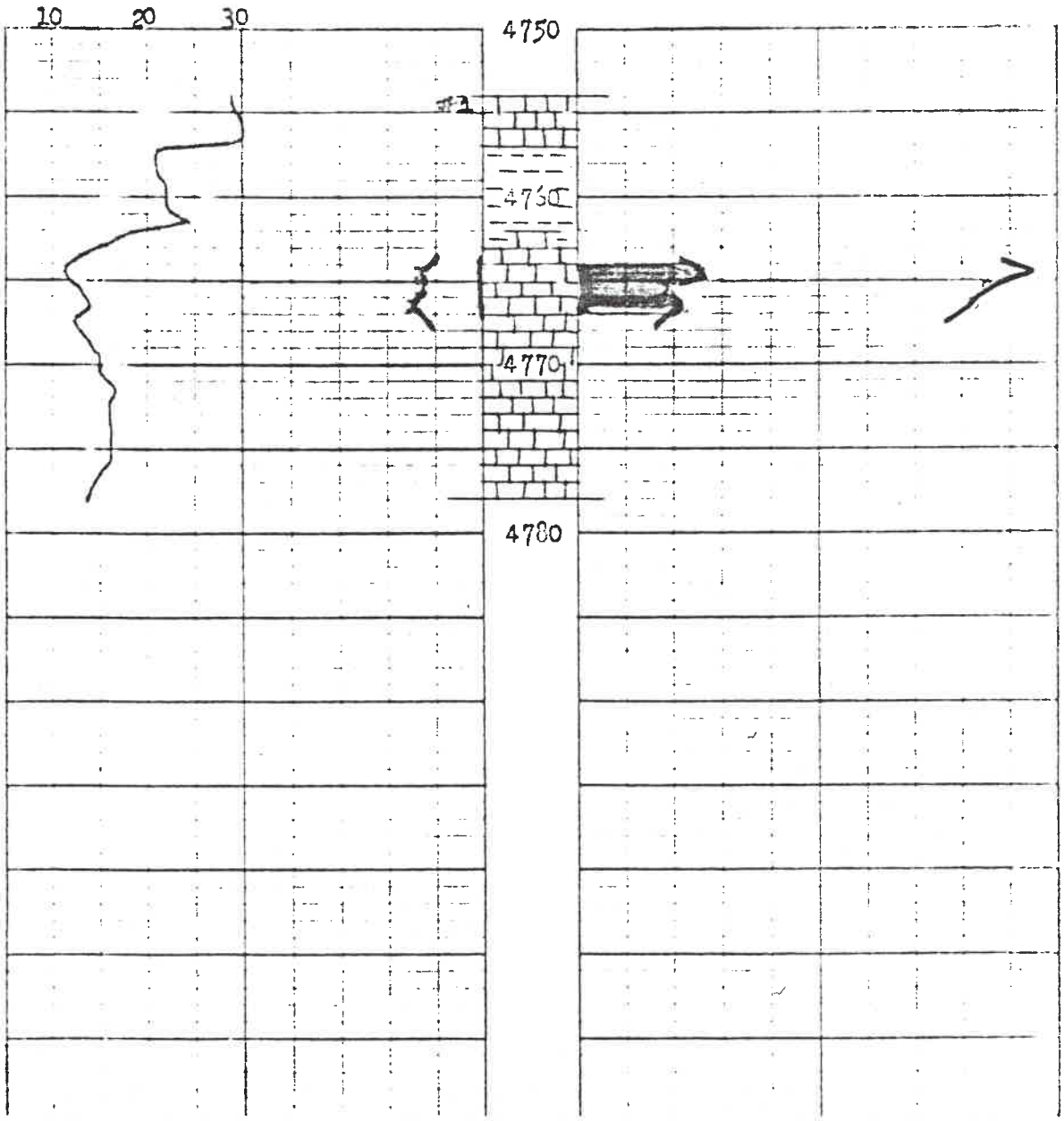
10 20 30

CONNATE WATER % SATURATION

0 70 60 50 40

OIL % PORE SATURATION X—X

0 10 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA KANSAS 67208

WELL Lemon #5 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petr. Corp. DATE 4-28-79 FILE NO. S-1383

FIELD TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE NO.	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4784 85	77.8	38.5	26.5	14.5	7.6	Oil *	*High Gas-Oil Ratio
2	4785 86	x 0.0	0.0	1 .2	21.8	2.6	No Perm	
3	4786 87	36.6	10.1	24.4	16.2	7.1	Oil *	
4	4787 88	32.2	13.2	25.5	13.7	10.0	Oil *	
Net	3'	48.9	20.6	25.5	14.8	8.2		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 4-28-79

WELL Lemon #5 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

The analyses and interpretations are based on material brought to Kansas Cores by the client, and such data and interpretations are accessible only to that company which the client represents. Kansas Cores makes no warranty and makes no guarantee for the interpretations and opinions of the data. Our opinions of an analysis are placed at the discretion of the operator.

PERMEABILITY MILLIDARCYS

200 150 100 50 0

POROSITY—% X

CORING TIME 20 10 0

MIN/FT

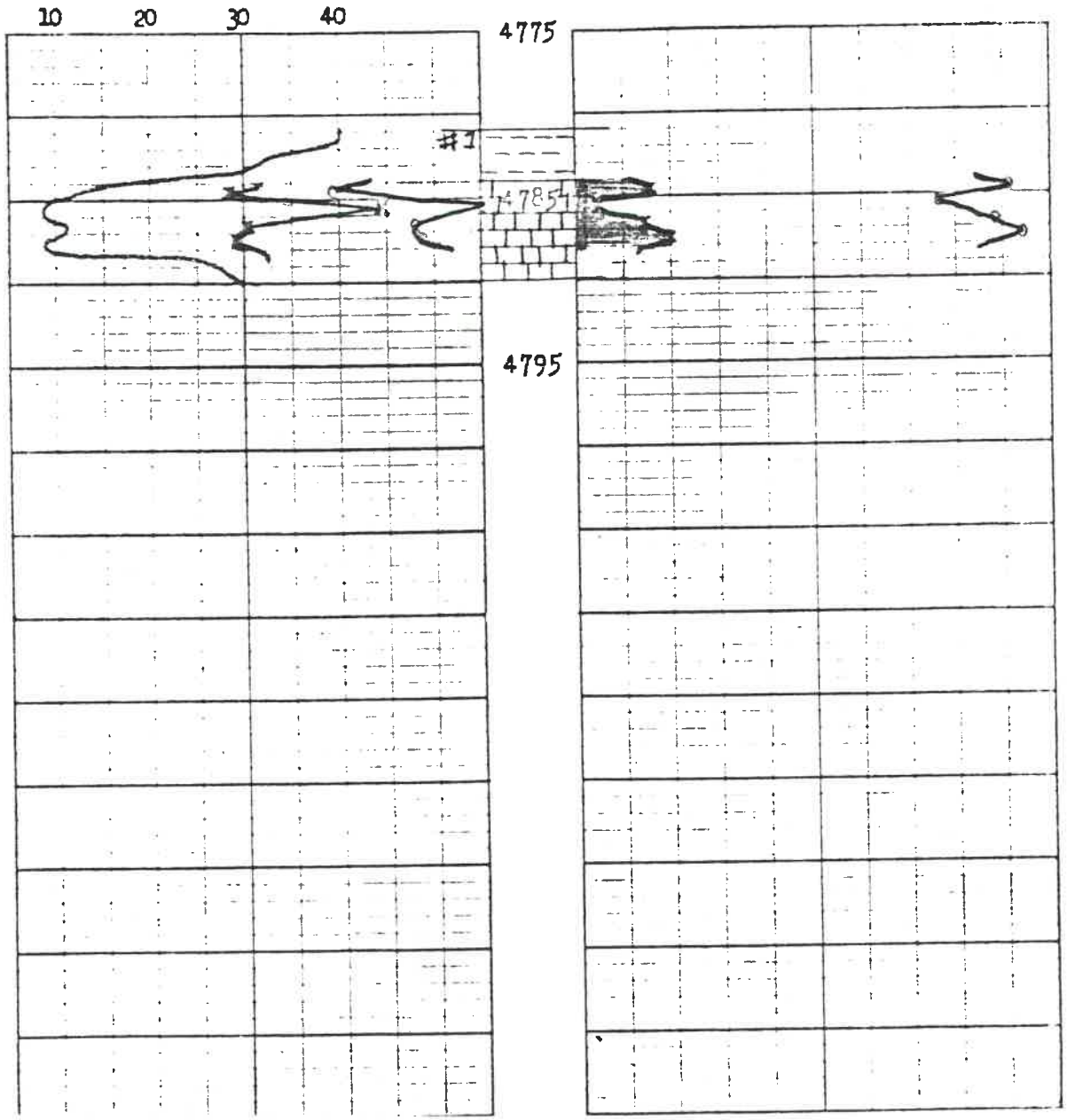
10 20 30 40

CONNATE WATER % SATURATION

0 50 40 30 20

OIL % PORE SATURATION X

0 10 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS 67208

WELL Lemon #6 COUNTY Commanche STATE Kansas

COMPANY K.R.M Petr. Corp. DATE 5-8-79 FILE No. S-1386

FIELD _____ TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE No.	DEPTH		PERMEABILITY MILLIDARCYS HORIZONTAL	VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4781 82		10.1	1.8	29.7	30.0	2.7	Gas	
2	4782 83		8.0	4.2	20.7	28.4	9.1	Oil	
3	4783 84		5.8	2.1	22.8	27.1	11.5	Oil	
4	4784 85		22.5	7.4	16.5	40.2	17.0	Oil	
5	4785 86		130	57.0	23.2	19.3	8.7	Oil	
6	4786 87		130	120	19.2	21.1	8.1	Oil	
7	4787 88		26.7	32.2	17.8	24.8	11.0	Oil	
8	4788 89	×	0.0	0.0	12.0	19.8	11.0	No Perm	
9	4789 90		280	280	19.7	18.6	11.2	Oil	
10	4790 91	×	0.0	0.0	12.4	23.2	11.6	No Perm	
11	4791 92	×	0.0	0.0	6.9	29.9	5.7	No Perm	
Net	8'		76.6	63.0	21.2	26.2	9.9		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 5-8-79

WELL Lemon #6 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

PERMEABILITY MILLIDARCYS O—O

400 200 100 50 0

POROSITY—% X—X

20 10 0

CONNATE WATER % SATURATION O—O

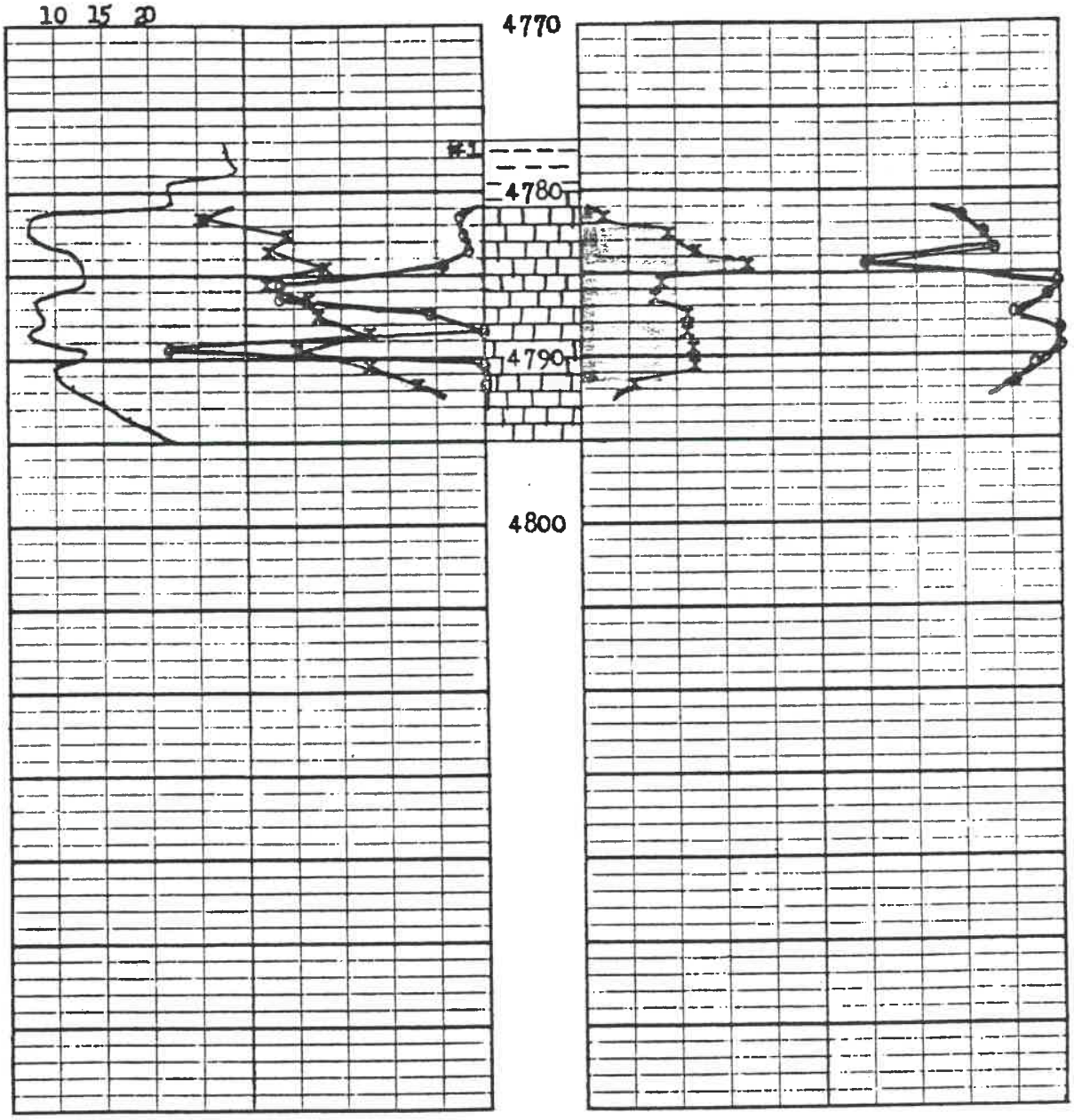
0 60 50 40 30

OIL % PORE SATURATION X—X

0 10 20 30

CORING TIME MIN/FT

10 15 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Lemon #7 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 5-18-79 FILE NO. S-1388

FIELD _____ TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE No	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4793 94	1.0	0.0	7.6	34.1	1.7	No Perm	
2	4794 95	X 0.0	0.0	10.8	57.9	2.4	No Perm	
3	4795 96	X 0.0	0.0	22.4	33.9	1.0	No Perm	
4	4796 97	X 0.0	0.0	23.9	25.5	2.2	No Perm	
5	4797 98	1.0	0.0	21.7	31.0	1.6	No Perm	
Net	2'	1.0	0.0	14.8	32.1	1.7		

Kansas Cores

PETROLEUM·RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 5-18-79

WELL Lemon #7 ANALYST IS

FIELD ELEVATION

COUNTY Comanche STATE Kansas GR KB

PERMEABILITY MILLIDARCYS O—O

30 20 10 0

POROSITY—% X—X

20 10 0

CONNATE WATER % SATURATION

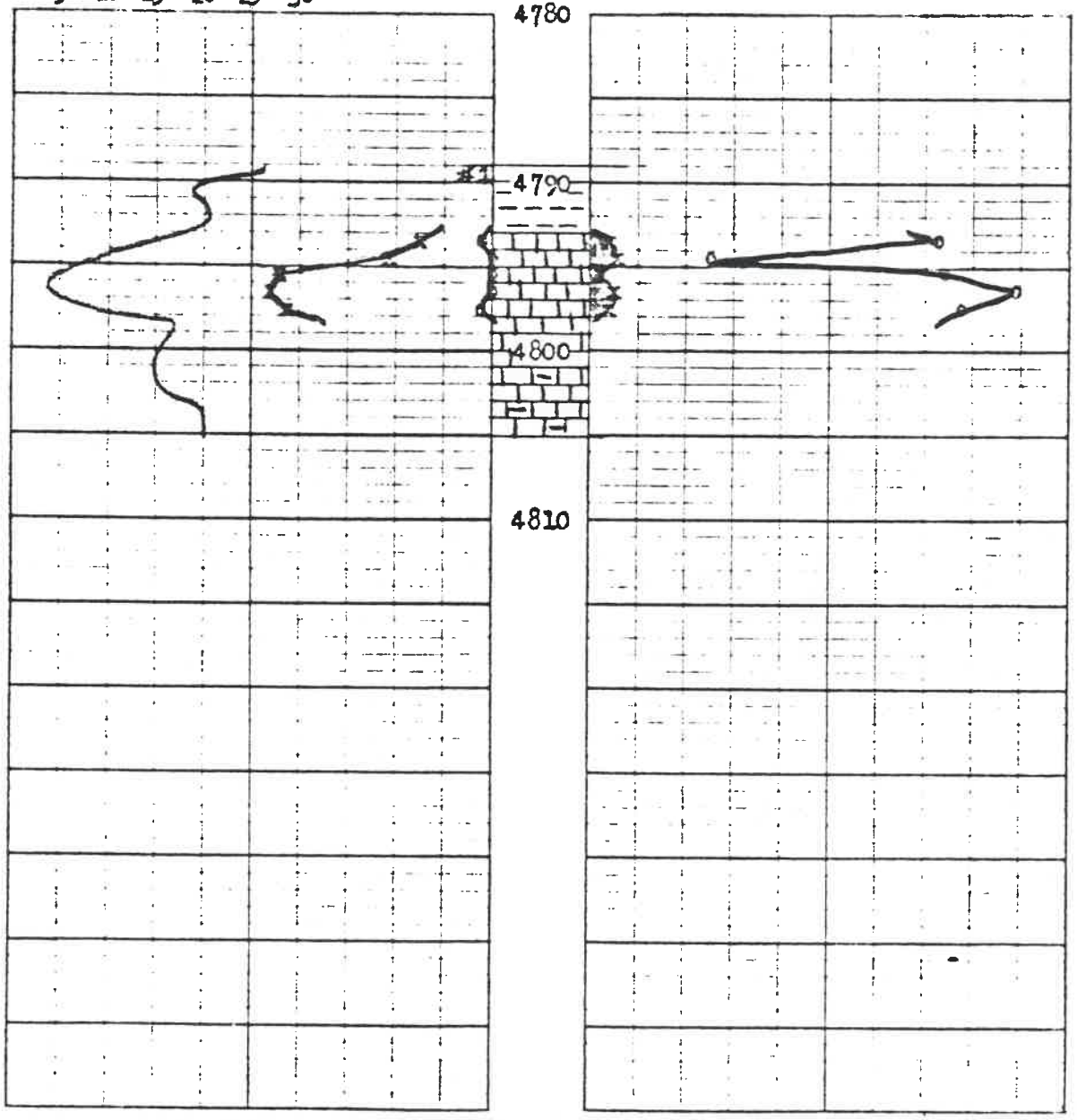
0 60 50 40 30

OIL % PORE SATURATION X—X

0 10 20

CORING TIME MIN/FT

5 10 15 20 25 30



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Lemon #8 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 6-2-79 FILE NO. S-1391

FIELD TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE No.	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4776 77	X 0.0	0.0	7.8	36.7	2.3	No Perm	
2	4777 78	0.8	0.0	7.9	29.7	9.0	Oil	
3	4778 79	1.2	0.2	7.8	21.2	5.1	Oil	
4	4779 80	12.1	4.6	15.1	23.4	8.1	Oil	
5	4780 81	X 0.0	0.0	6.1	50.0	14.6	No Perm	
6	4781 82	1.0	0.0	8.6	36.9	10.6	Oil	
7	4782 83	X 0.0	0.0	7.4	40.5	4.7	No Perm	
8	4783 84	X 0.0	0.0	9.6	48.9	1.2	No Perm	
Net	4'	3.8	1.2	9.9	27.8	8.2		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corporation

WELL Lemon #8

FIELD

COUNTY Commanche STATE Kansas

DATE 6-2-79

ANALYST IS

ELEVATION

GR _____ KB _____

All analyses and interpretations are based upon data brought to Kansas Cores by the client and such data and interpretations are accepted as that condition which the client represents it was. Kansas Cores makes no warranty and makes no guarantee for the interpretations and assumes the data. Our opinions and recommendations are based upon the experience of the operator.

PERMEABILITY MILLIDARCYS O—O

15 10 5

POROSITY % X—X

20 10

CONNATE WATER % SATURATION

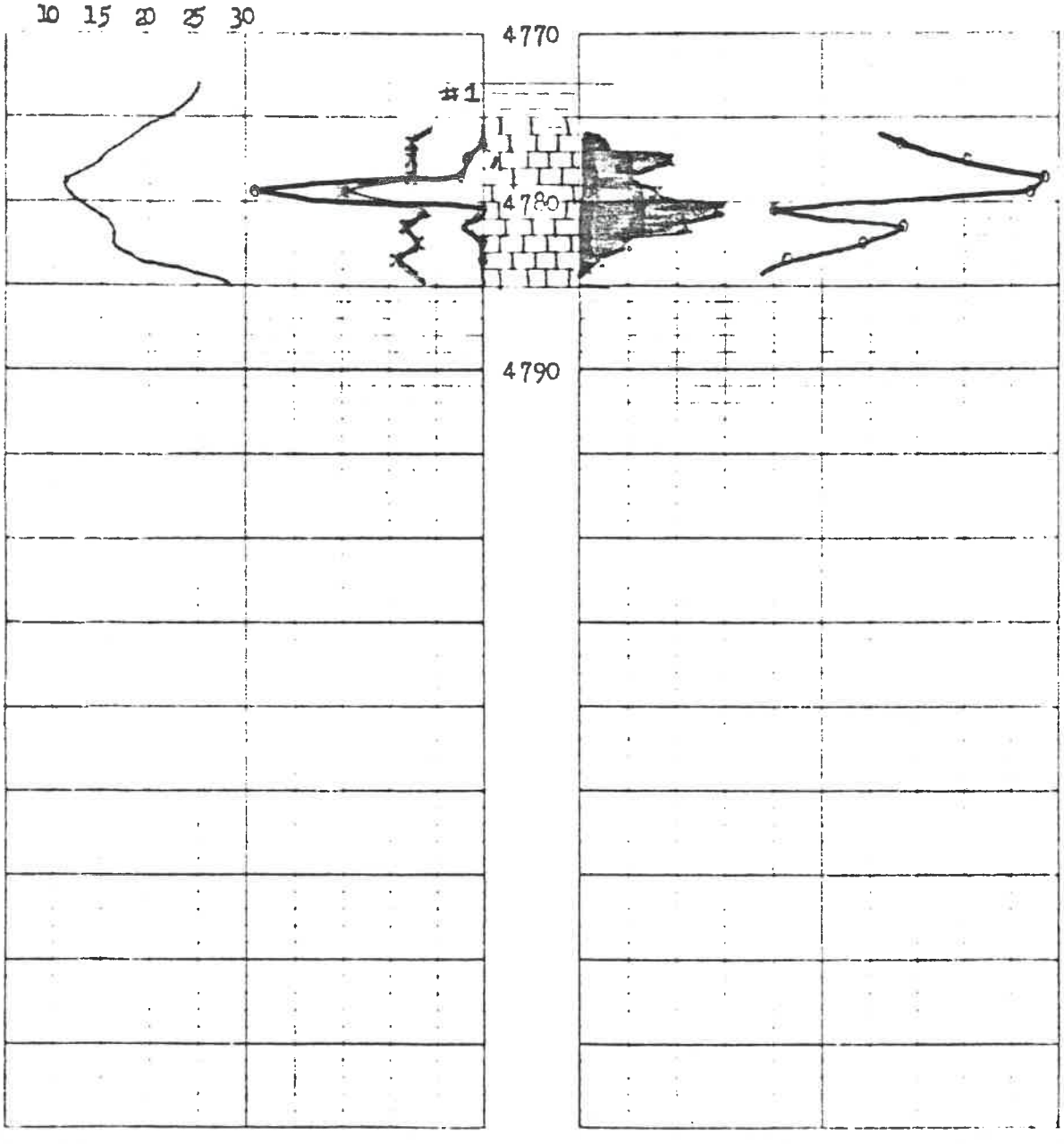
60 50 40 30

OIL % PORE SATURATION X—X

10 20

CORING TIME MIN/FT

10 15 20 25 30



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Lemon #9 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 8-23-79 FILE NO. S-1406

FIELD TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE NO.	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL		VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	RECOVERABLE PRODUCTION	REMARKS
1	68 4774 75	X	0.0	0.0	15.5	25.0	10.3	No Perm	
2	69 4775 76		1.0	0.8	16.9	18.5	9.2	No Perm	
3	70 4776 77	X	0.0	0.0	7.0	45.9	13.4	No Perm	
4	71 4777 78	X	0.0	0.0	11.1	28.8	3.3	No Perm	
Net	1'		1.0	0.8	16.9	18.5	9.2		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 8-23-79

WELL Lemon #9 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

PERMEABILITY MILLIDARCYS O—O

30 20 10 0

POROSITY—% X—X

20 10 0

CORING TIME MIN/FT

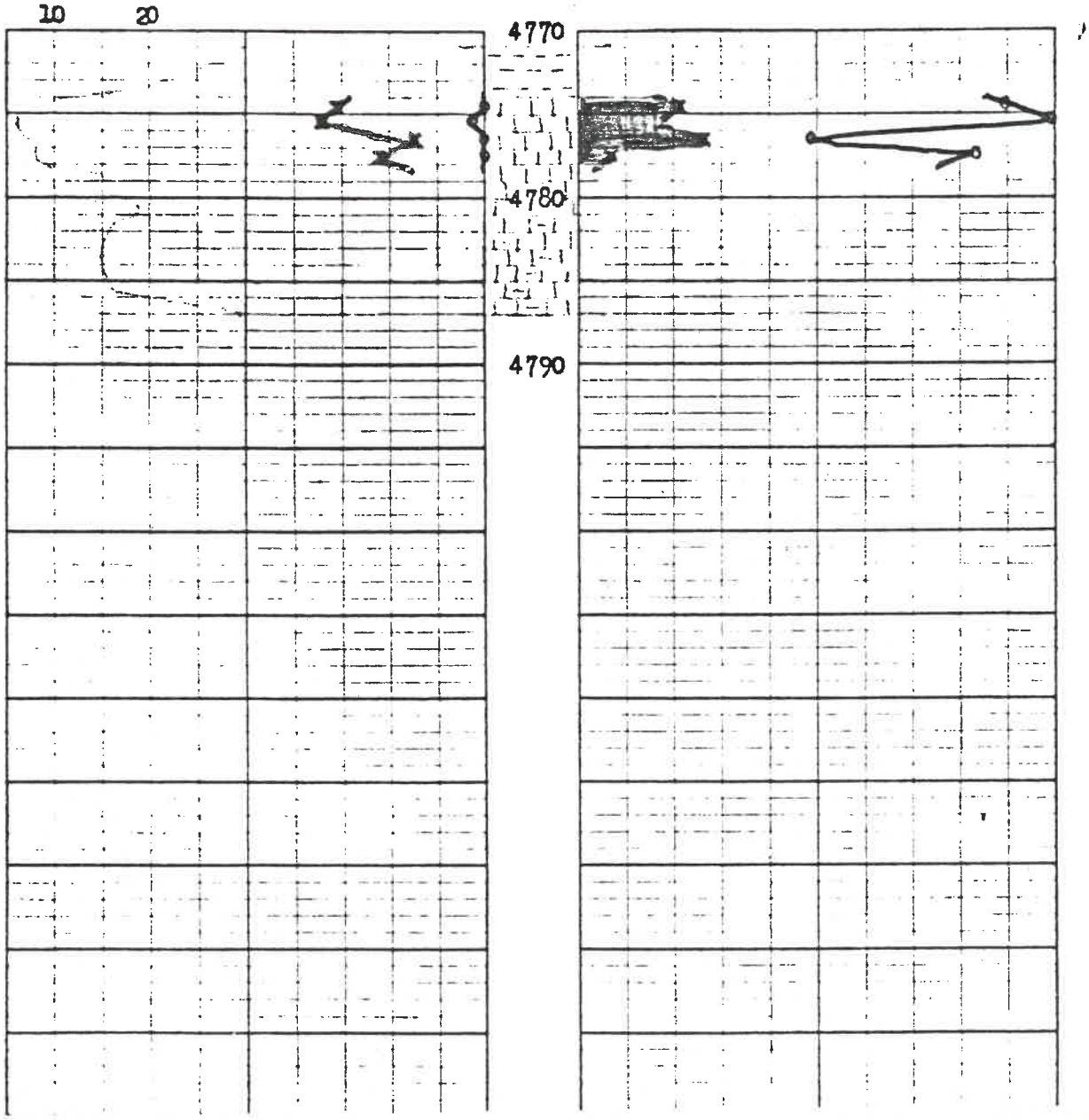
10 20

CONNATE WATER % SATURATION

0 60 50 40 30

OIL % PORE SATURATION X—X

0 10 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Lemon #10 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 11-18-79 FILE NO. S-1415

FIELD _____ TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE NO.	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4770-71	23.0	21.6	21.6	17.4	3.8		The low oil percentages indicate mainly gas wit some oil will be produc from this entire zone.
2	4771-72	2.0	2.1	25.0	18.2	6.8		
3	4772-73	3.0	2.4	28.5	13.4	2.6		
4	4773-74	2.1	0.8	14.8	34.1	17.0		
5	4774-75	X 0.0	0.0	6.7	47.6	4.2		
Net	4'	7.5	6.7	22.5	20.8	7.6		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 11-19-79

WELL Lemon #10 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR _____ KB _____

PERMEABILITY MILLIDARCYS O—O

30 20 10

POROSITY % X—X

30 20 10

DRILLING TIME MIN/FT

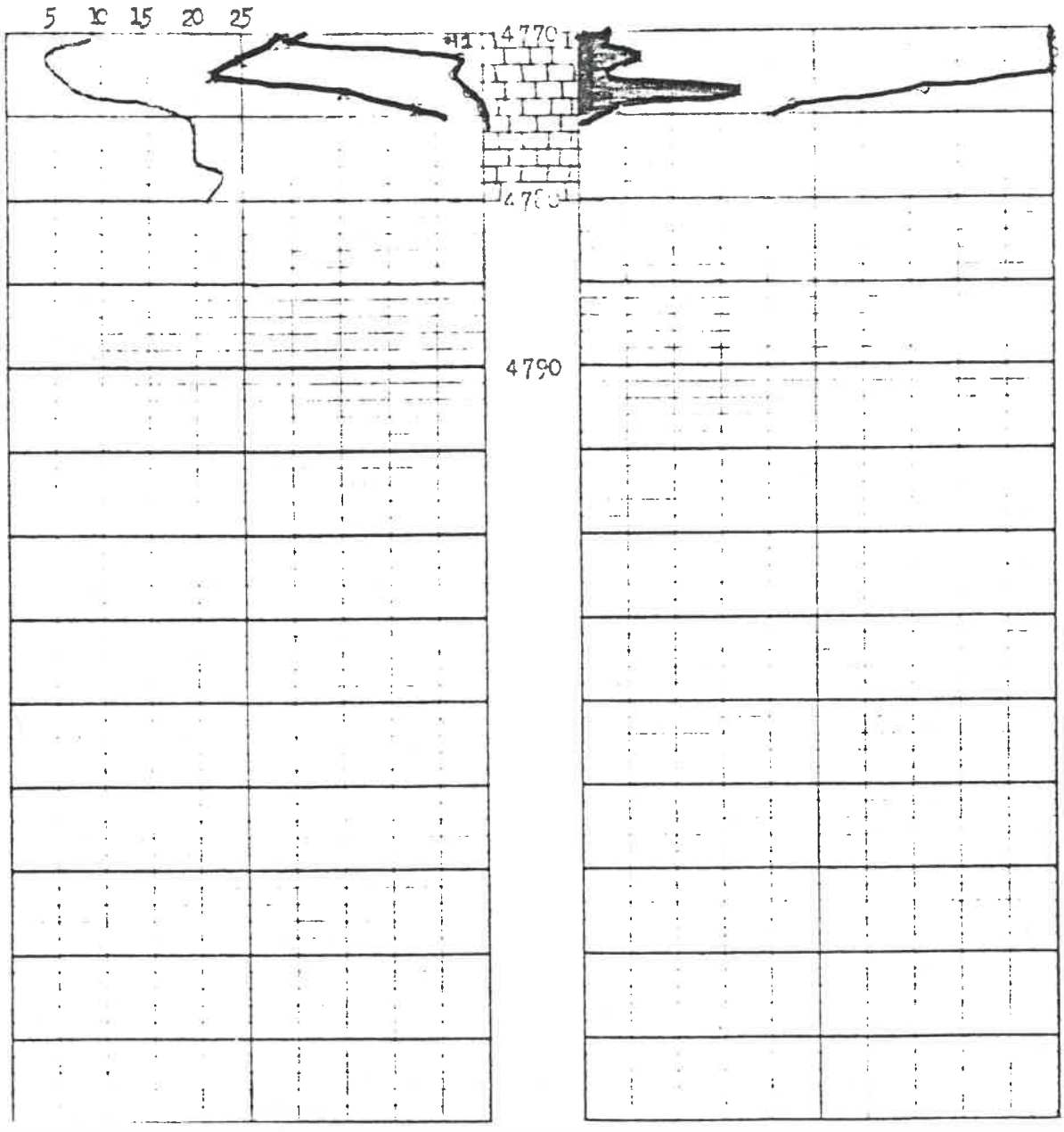
5 10 15 20 25

CONNATE WATER % SATURATION

60 50 40 30

OIL % PORE SATURATION X—X

10 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Lemon #11 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 1-3-80 FILE NO S-1429

FIELD TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE NO.	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	38 4760 61	43.8	3.2	15.8	26.5	14.0	Oil	
2	59 4761 62	125	62.7	15.6	32.6	13.6	Oil	
3	60 4762 63	1.0	0.8	14.4	17.5	4.7	Oil	Slight vertical fracture with oil in fracture
4	61 4764 65	4.6	3.0	14.4	30.3	11.7	Oil	
5	62 4765 66	2.1	0.0	12.2	23.0	21.1	Oil	
6	634766 67	X 0.0	0.0	7.7	31.8	17.5	No Perm	
Net	6'	35.3	11.6	10.4	21.7	10.9		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 1-3-80

WELL Lemon #11 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

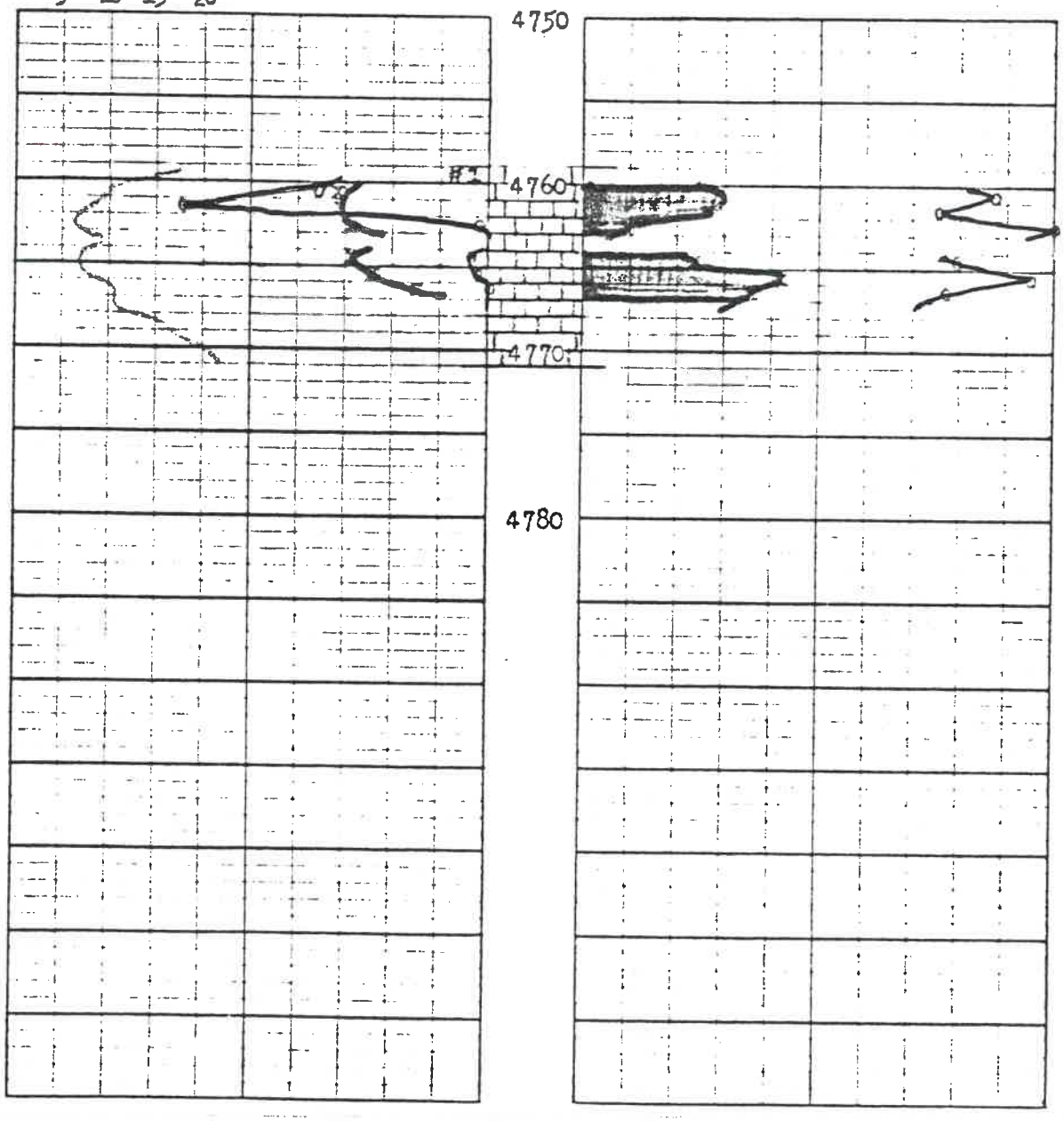
PERMEABILITY MILLIDARCYS 200 100 50 25 0

POROSITY—% 20 10 0

CORING TIME MIN/FT 5 10 15 20

CONNATE WATER % SATURATION 0 60 50 40 30

OIL % PORE SATURATION 0 10 20 30



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Rhoades #1 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 6-15-79 FILE NO S-1392

FIELD _____ TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE No	DEPTH		PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4766 67	X	0.0	0.0	11.1	31.0	9.1	No Perm	
2	4767 68		22.1	9.8	16.1	19.3	9.0	Oil	
3	4768 69		4.6	4.6	14.2	18.2	13.7	Oil	
4	4769 70	X	0.0	0.0	9.6	27.3	12.5	No Perm	
Net	2'		13.4	7.2	15.1	18.8	11.4		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 6-15-79

WELL Rhoades #1 ANALYST IS

FIELD ELEVATION

COUNTY Comanche STATE Kansas DF KB

PERMEABILITY MILLIDARCYS

60 40 20 0

POROSITY % X—X

20 10 0

CONNATE WATER % SATURATION

0 60 50 40 30

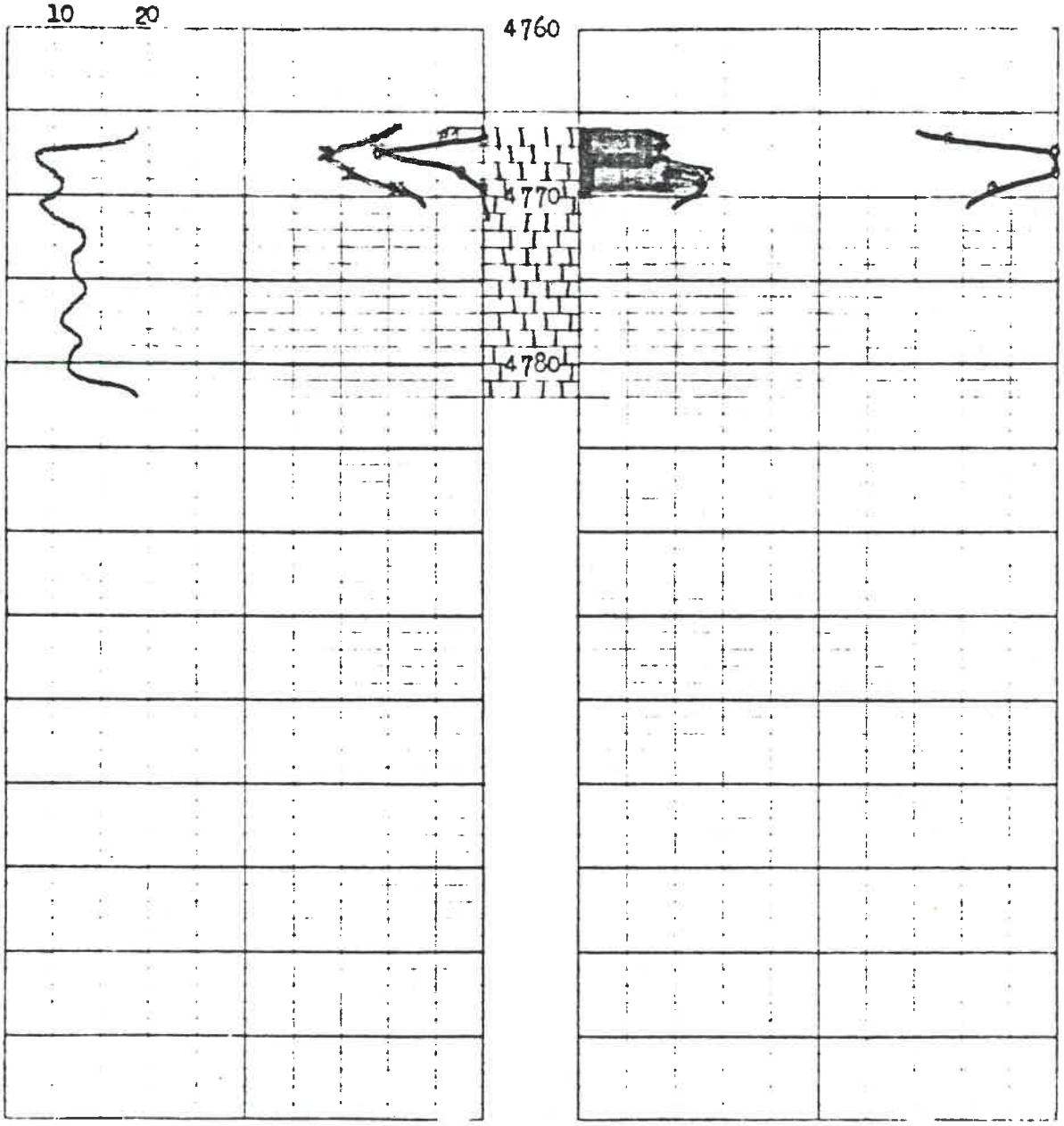
OIL % PORE SATURATION X—X

0 10 20

CORING TIME

MIN/FT

10 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL Rhoades #2 COUNTY Commanche STATE Kansas

COMPANY K.R.M. Petroleum Corp. DATE 6-27-79 FILE NO. S-1398

FIELD _____ TYPE CORES Diamond ANALYST IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE No	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	4755 56	21.3	13.6	29.9	15.0	1.7	Gas	
2	4756 57	140	130	22.1	21.6	10.1	Oil	
3	4757 58	110	55.2	19.3	23.8	10.4	Oil	
4	4758 59	300	125	22.0	19.3	13.2	Oil	
5	4759 60	2.1	0.0	16.1	24.3	10.6	Oil	
6	4760 61	51.6	32.8	16.5	28.2	9.8	Oil	
7	4761 62	48.2	39.6	16.8	25.4	7.6	Oil	
8	4762 63	56.1	31.2	15.2	24.9	6.3	Oil	
9	4763 64	32.6	18.9	13.6	23.5	8.6	Oil	
10	4764 65	X 0.0	0.0	10.3	36.2	5.1	No Perm	
Net	9'	84.7	49.6	19.1	22.9	8.7		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 6-27-79

WELL Rhoades #2 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

PERMEABILITY MILLIDARCYS O—O

300 200 100 0

POROSITY—% X—X

20 10 0

CONNATE WATER % SATURATION

O—O

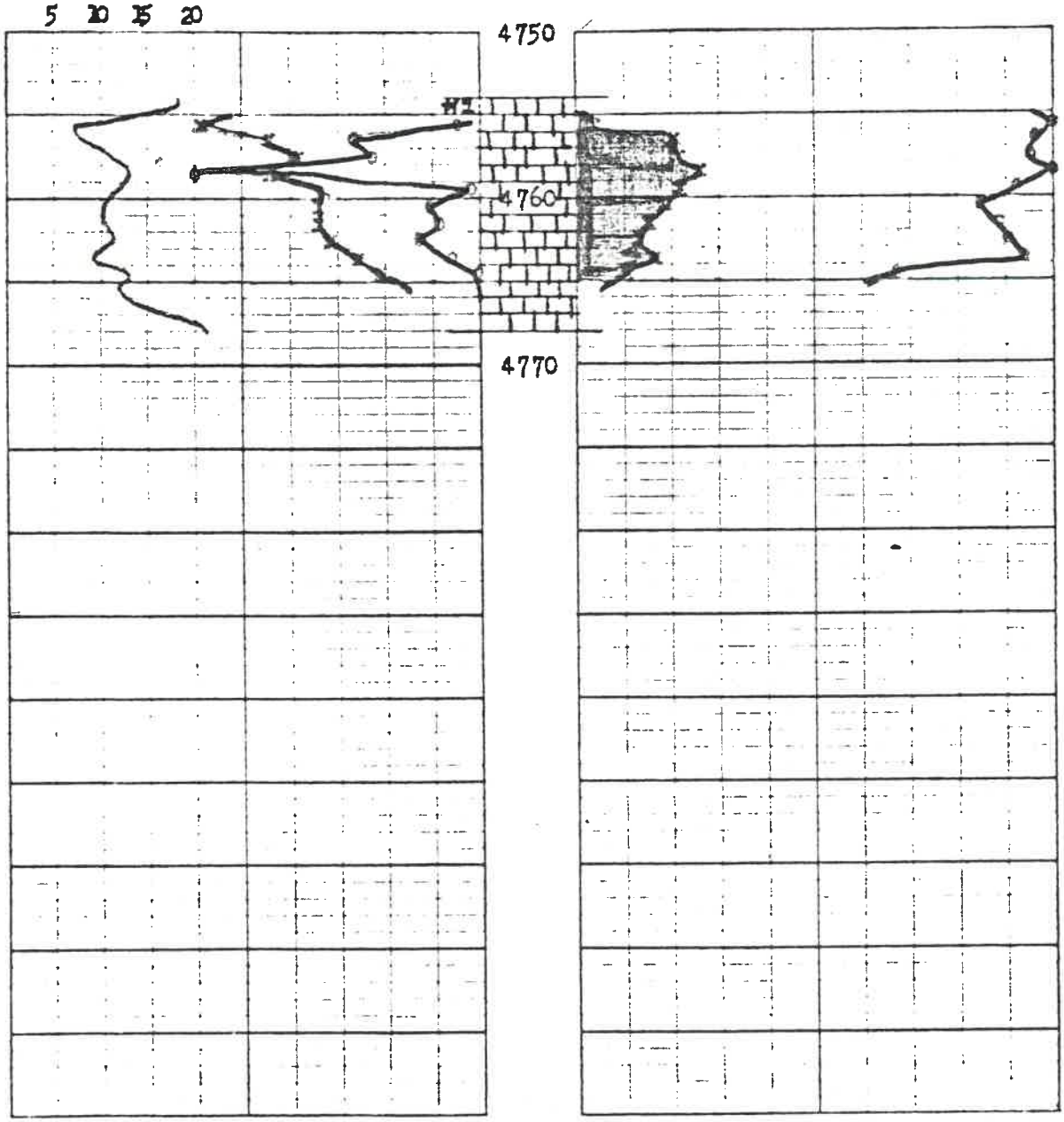
0 60 50 40 30

OIL % PORE SATURATION X—X

0 10 20 30

CORING TIME MIN/FT

5 10 15 20



Kansas Cores

PETROLEUM RESERVOIR ENGINEERING
WICHITA, KANSAS 67208

WELL	Rhoads #3	COUNTY	Comanche	STATE	Kansas
COMPANY	K.R.M. Petr. Corp.	DATE	12-18-79	FILE NO	S-1425
FIELD		TYPE CORES	Diamond	ANALYST	IS

ANALYSIS DATA AND INTERPRETATIONS

SAMPLE NO	DEPTH	PERMEABILITY MILLIDARCYS HORIZONTAL	PERMEABILITY MILLIDARCYS VERTICAL	POROSITY %	SATURATION WATER % PORE SPACE	SATURATION OIL % PORE SPACE	PROBABLE PRODUCTION	REMARKS
1	72 4770-71	× 0.0	0.0	10.8	33.6	7.8	No Perm	
2	73 4771-72	2.4	1.2	14.6	26.9	10.0	Oil	
3	74 4772-73	2.2	0.8	19.9	32.0	12.9	Oil	
4	75 4773-74	67.9	55.2	23.2	21.7	14.8	Oil	
5	76 4774-75	22.1	7.4	17.8	19.3	16.9	Oil	
6	77 4775-76	× 0.0	0.0	5.8	34.9	4.7	No Perm	
7	78 4776-77	2.9	1.8	11.2	26.6	9.2	Oil	
8	79 4777-78	4.7	3.0	11.7	25.3	13.8	Oil	Vertical fractures
9	80 4778-79	× 0.0	0.0	9.7	27.2	12.4	No Perm	Vertical fractures
10	81 4779-80	× 0.0	0.0	8.6	30.6	8.8	No Perm	Vertical fractures
11	82 4780-81	× 0.0	0.0	8.5	47.1	2.9	No Perm	
Net	6'	17.0	6.0	16.4	25.3	12.9		

Kansas Cores

PETROLEUM RESERVOIR ENGINEERING

WICHITA, KANSAS

COMPANY K.R.M. Petroleum Corp. DATE 12-18-79

WELL Rhoads #3 ANALYST IS

FIELD ELEVATION

COUNTY Commanche STATE Kansas GR KB

PERMEABILITY MILLIDARCYS O—O

80 60 40 20 0

POROSITY—% X—X

CORING TIME 20 10 0

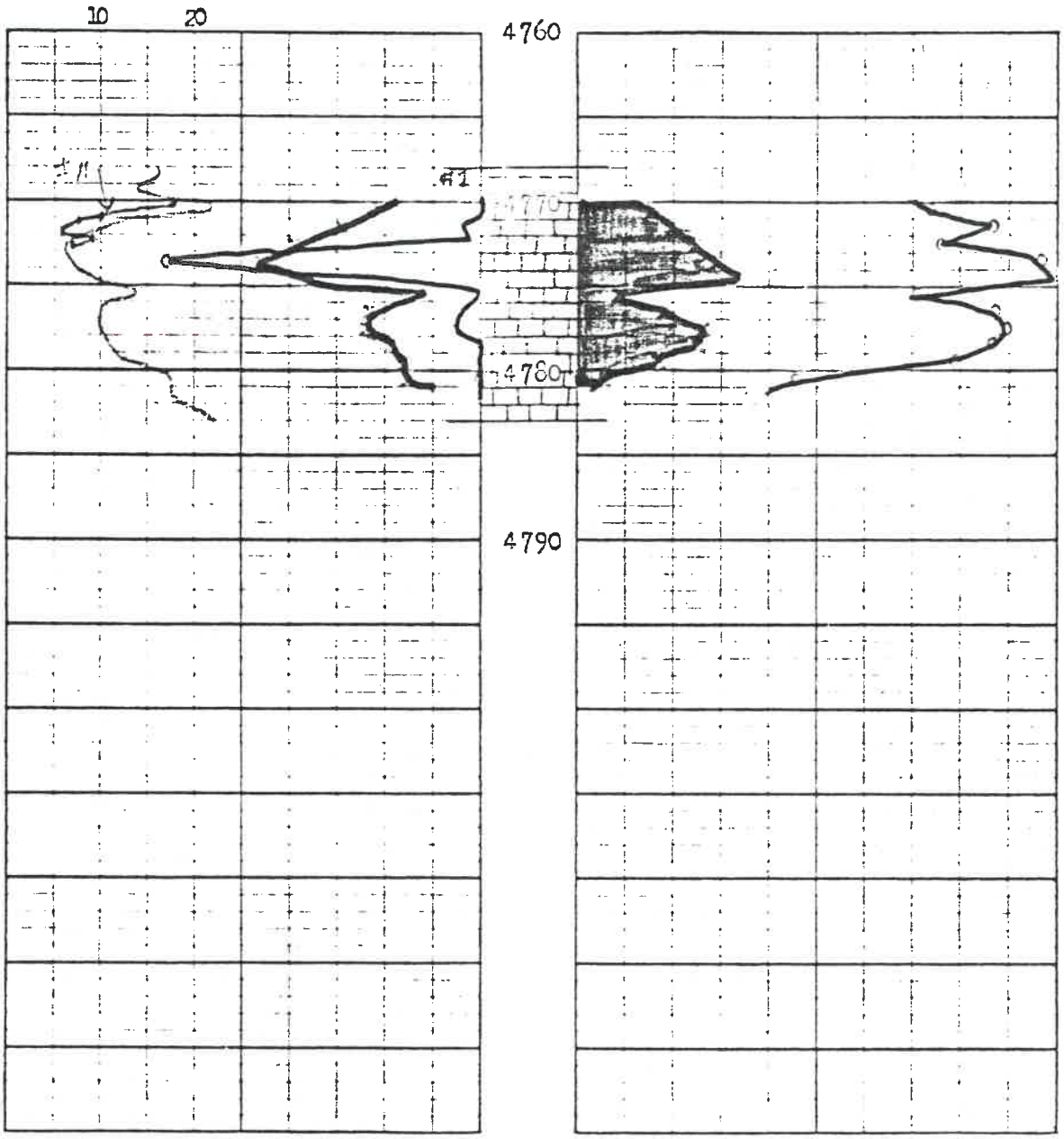
MIN/FT

CONNATE WATER % SATURATION

0 60 50 40 30

OIL % PORE SATURATION X—X

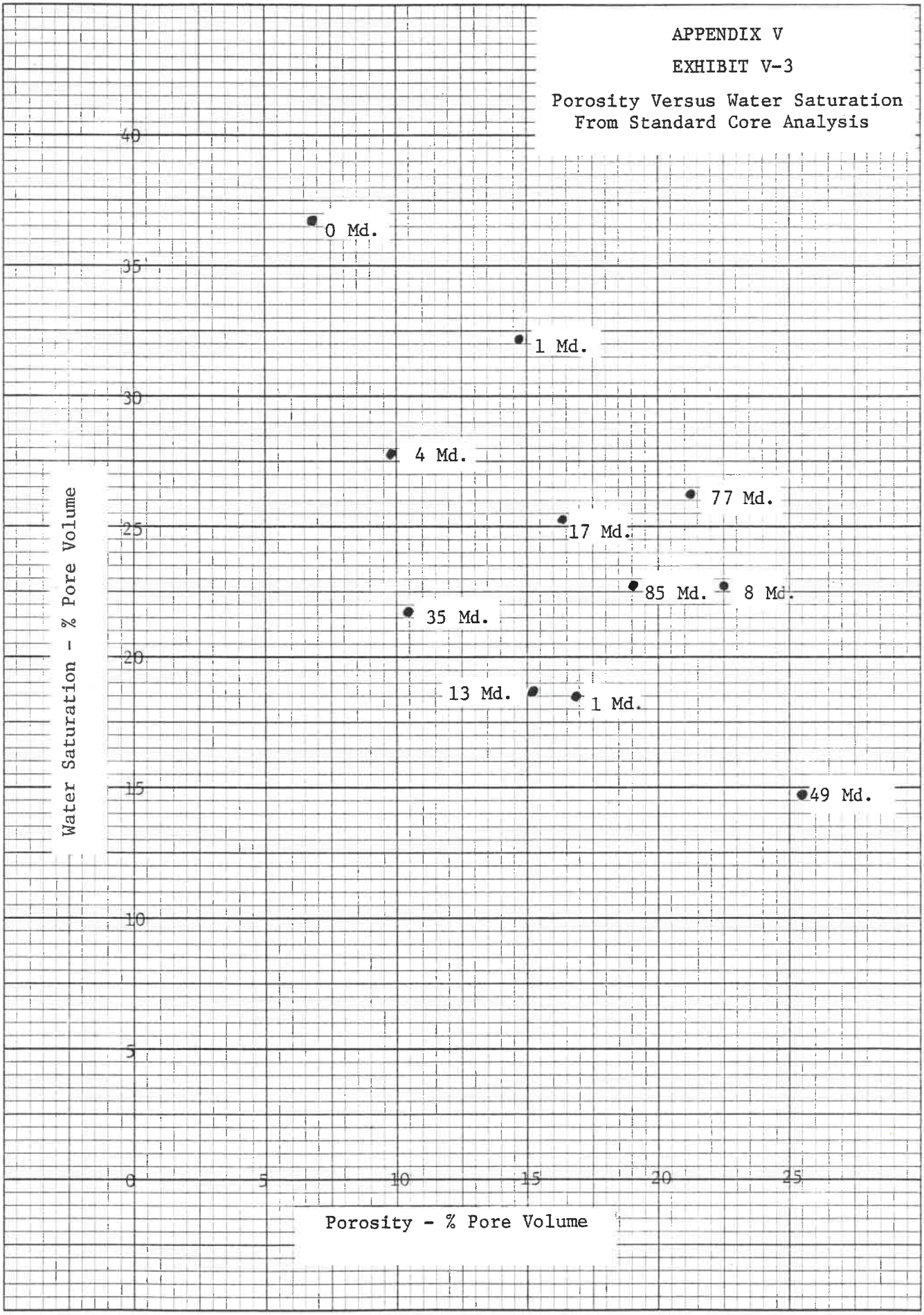
0 10 20



APPENDIX V

EXHIBIT V-3

Porosity Versus Water Saturation
From Standard Core Analysis



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CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

APPENDIX V

EXHIBIT V-3

Special Core Analysis Study

for

KRM PETROLEUM CORPORATION

G. C. Lemon No. 3 Well
Comanche County, Kansas

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

October 1, 1979

KRM Petroleum Corporation
Guaranty Bank Building
817 Seventeenth Street
Denver, Colorado 80202

Attention: Mr. J. C. Simmons

Subject: Special Core Analysis Study
G. C. Lemon No. 3 Well
Kansas City-Lansing Formation
Comanche County, Kansas
File Number: SCAL-79164-S

Gentlemen:

In a telephone conversation on April 16, 1979, between J. C. Simmons and a representative of Core Laboratories, Inc., a special core analysis test program was discussed which would evaluate flow characteristics of the reservoir in question. In a letter dated May 2, 1979, J. C. Simmons requested Core Laboratories, Inc., to perform three each of the following: (1) Unsteady-State Gas-Oil Relative Permeability Tests, and (2) Unsteady-State Waterflood Susceptibility Tests on carbonate core plugs. Presented in this report are the results of the requested analyses. The core plugs used in this study are lithologically described and identified as to sample number and depth interval on Page 1.

Five full-diameter well core segments, each representing a different depth interval between the depths 4779 feet and 4784 feet, were submitted for use in this study. One core plug, 1-1/2 inches in diameter, was obtained from each well core segment using a diamond core bit with water as the bit coolant and lubricant. Each core plug was extracted of hydrocarbons with alternate injections of toluene and acetone, leached of salt with methyl alcohol, and then dried. Air permeabilities and Boyle's law porosities were determined on the cleaned and dried core plugs. Based on the results of the air permeability and porosity determinations, three core plugs were selected for further testing. The three selected core plugs were evacuated and pressure saturated with a brine containing 91,000 ppm sodium chloride.

Initial (pseudo-connate) water saturations were established in the three brine-saturated core plugs utilizing a centrifugal technique and an air-brine system. The pore space voided by this method was resaturated with a refined mineral oil having a viscosity of approximately 20 centipoise. Effective permeabilities to oil were determined in the presence of the initial water saturations. The oil present in each core plug was dynamically displaced by humidified nitrogen

gas and incremental volumes of oil and gas production were measured as a function of time. Gas-oil relative permeability characteristics were calculated from the production data and these results are presented on Pages 2 through 4 and in graphical form on Pages 5 through 10. An examination of the test results reveals that the oil displacement efficiency by gas is within the range considered average for Samples 2 and 4, and slightly below average for Sample 5 as compared to carbonates in general.

Upon completion of the gas-oil relative permeability tests, each core plug was submerged under a laboratory oil having a viscosity of 1.02 centipoise and evacuated a short period of time to remove any gas saturation which may have been present. Each core plug was then mounted in a hydraulic-type core holder and all mobile fluids present within each core plug were dynamically displaced with the 1.02 centipoise oil. Effective permeabilities to oil were then determined in the presence of the initial water saturations which ranged from 12.5 to 37.5 percent pore space, and averaged 22.3 percent pore space. The 91,000 ppm sodium chloride brine containing sufficient calcium sulfate to increase the viscosity to 1.74 centipoise was used as the displacing phase for the waterflood tests. The fluids used in the waterflood tests were selected so as to yield an oil-water viscosity ratio equal to the oil-water viscosity ratio present in the reservoir. The oil remaining in the core plugs at terminal conditions of water floodout (99.9 percent water cut) ranged from 20.5 to 32.9 percent pore space and averaged 25.8 percent pore space. These data are summarized on Page 11, presented in tabular form on Pages 12 through 14, and in graphical form on Pages 15 through 17.

It was a pleasure working with and for KRM Petroleum Corporation on this study. Should you have any questions pertaining to these test results or if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc.

John W. White

John W. White
for Duane L. Archer, Manager
Special Core Analysis

JWW:fm
10 cc. - Addressee

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

File SCAL-79164-S

Company KRM Petroleum Corp. Formation Kansas City - Lansing
Well G. C. Lemon No. 3 County Comanche
Field State Kansas

Identification and Description of Samples

Sample Number	Depth, feet	Lithological Description
2	4780	Ls, brn, fnly xln, dns, many pp vugs
4	4782	Ls, brn fnly xln, dns, many pp vugs
5	4783	Ls, brn, med xln, dns, many pp vugs

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Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

Gas-Oil Relative Permeability Data

Sample Number 2

Air Permeability, md 78

Oil Permeability at Initial Water Saturation, md 67

Initial Water Saturation, Percent Pore Space 12.5

Porosity, Percent 27.0

Gas Saturation, Percent Pore Space	Gas-Oil Relative Permeability Ratio	Relative Permeability to Gas,* Fraction	Relative Permeability to Oil,* Fraction
0.0	0.000	0.0000	1.000
6.5	0.014	0.0076	0.565
8.3	0.031	0.014	0.469
9.7	0.048	0.020	0.417
10.9	0.069	0.026	0.374
12.0	0.096	0.032	0.332
13.1	0.130	0.038	0.292
14.0	0.168	0.044	0.264
15.0	0.220	0.056	0.256
16.7	0.255	0.064	0.210
21.0	0.704	0.102	0.145
24.4	1.35	0.130	0.096
27.7	2.49	0.164	0.066
32.0	5.49	0.199	0.036
35.2	10.3	0.236	0.023
37.9	17.2	0.270	0.016
40.0	27.3	0.295	0.011
40.7	31.7	0.316	0.010
42.0	43.9	0.324	0.0074

*Relative to oil permeability.

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DALLAS, TEXAS 75247

Gas-Oil Relative Permeability Data

Sample Number 4

Air Permeability, md 63

Oil Permeability at Initial Water Saturation, md 56

Initial Water Saturation, Percent Pore Space 16.8

Porosity, Percent 22.0

Gas Saturation, Percent Pore Space	Gas-Oil Relative Permeability Ratio	Relative Permeability to Gas,* Fraction	Relative Permeability to Oil,* Fraction
0.0	0.000	0.000	1.000
6.5	0.048	0.025	0.519
8.2	0.074	0.033	0.447
9.7	0.103	0.041	0.397
11.0	0.136	0.049	0.357
12.2	0.174	0.056	0.321
13.4	0.219	0.063	0.287
14.5	0.271	0.069	0.256
15.4	0.329	0.076	0.231
16.9	0.437	0.088	0.202
20.2	0.800	0.120	0.150
24.3	1.62	0.159	0.098
28.7	3.51	0.203	0.058
32.3	6.65	0.249	0.037
36.3	14.7	0.298	0.020
40.2	34.9	0.356	0.010
42.1	57.1	0.393	0.0069
43.4	83.9	0.420	0.0050

*Relative to oil permeability.

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Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

Gas-Oil Relative Permeability Data

Sample Number 5

Air Permeability, md 8.7

Oil Permeability at Initial Water Saturation, md 3.9

Initial Water Saturation, Percent Pore Space 37.5

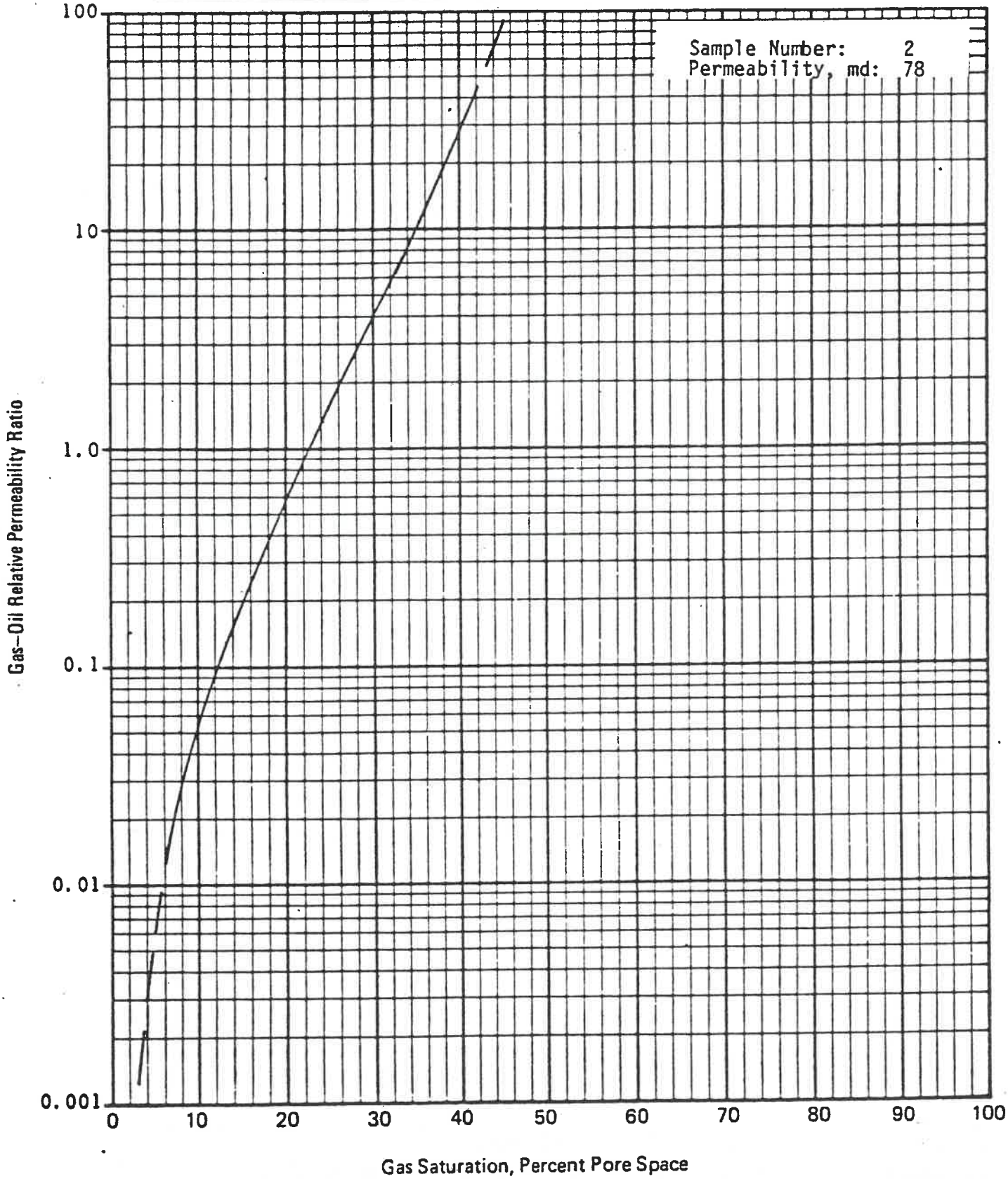
Porosity, Percent 22.8

Gas Saturation, Percent Pore Space	Gas-Oil Relative Permeability Ratio	Relative Permeability to Gas,* Fraction	Relative Permeability to Oil,* Fraction
0.0	0.000	0.000	1.000
3.0	0.060	0.049	0.819
4.1	0.090	0.060	0.664
5.1	0.125	0.070	0.555
5.9	0.166	0.078	0.472
6.6	0.208	0.086	0.414
7.2	0.250	0.094	0.374
7.6	0.287	0.100	0.350
8.0	0.318	0.107	0.335
8.3	0.350	0.112	0.321
8.8	0.393	0.118	0.299
10.4	0.589	0.140	0.238
13.7	1.27	0.181	0.143
16.3	2.33	0.210	0.090
19.0	4.68	0.245	0.052
22.0	10.4	0.285	0.027
23.7	17.4	0.310	0.018
24.7	24.2	0.329	0.014
25.3	30.5	0.343	0.011
25.9	37.2	0.354	0.0095

*Relative to oil permeability.

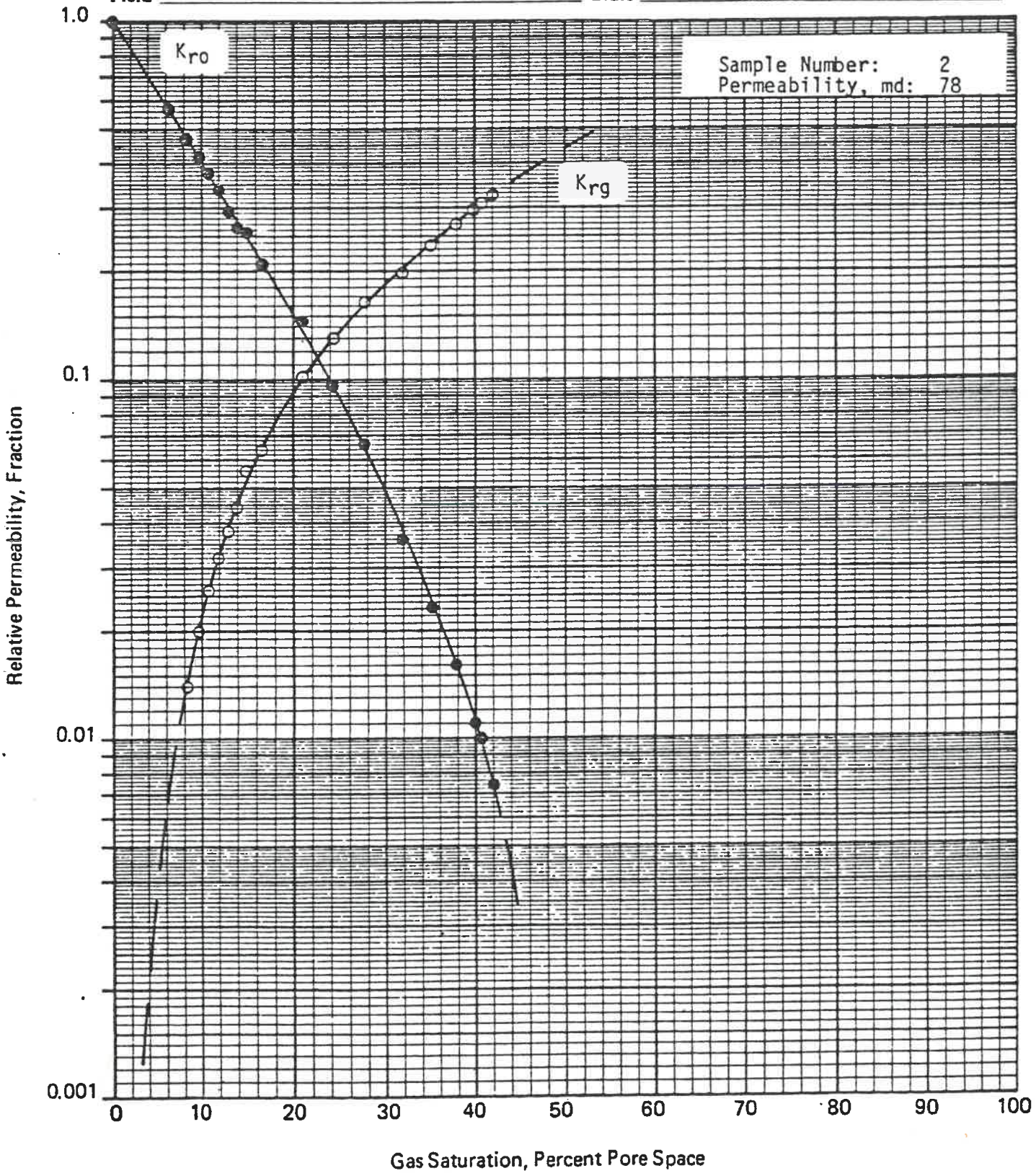
Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas



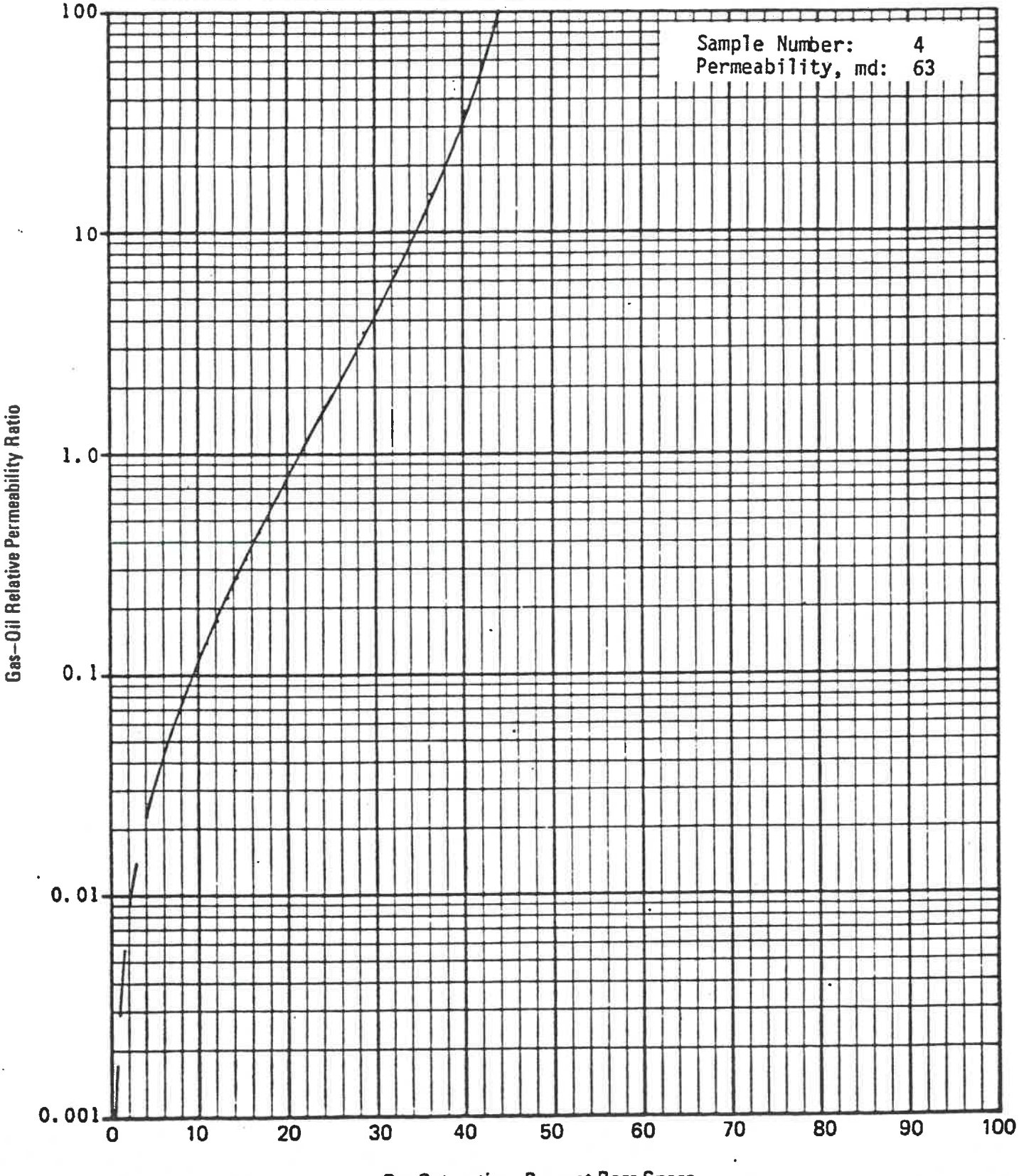
Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas



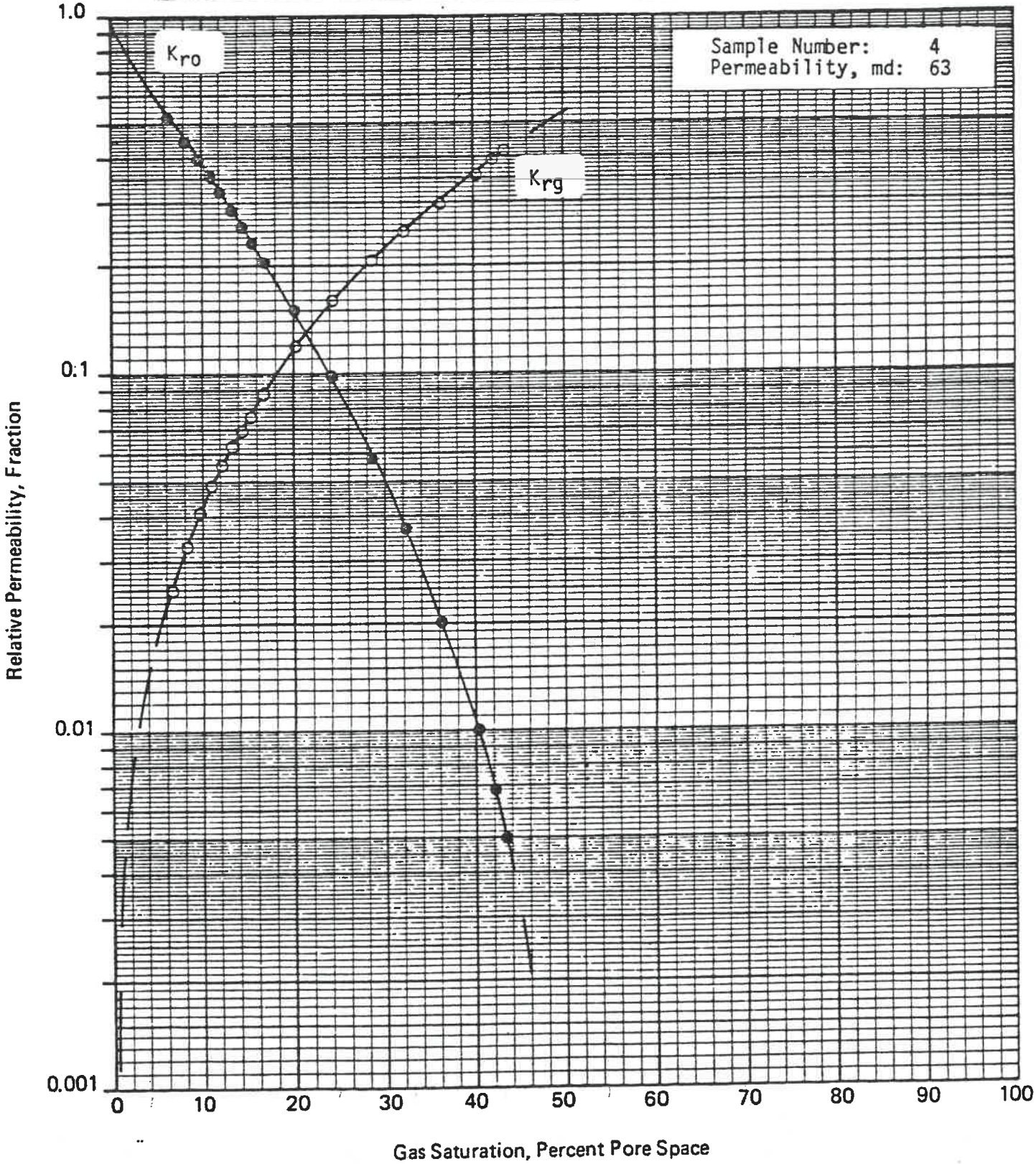
Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas



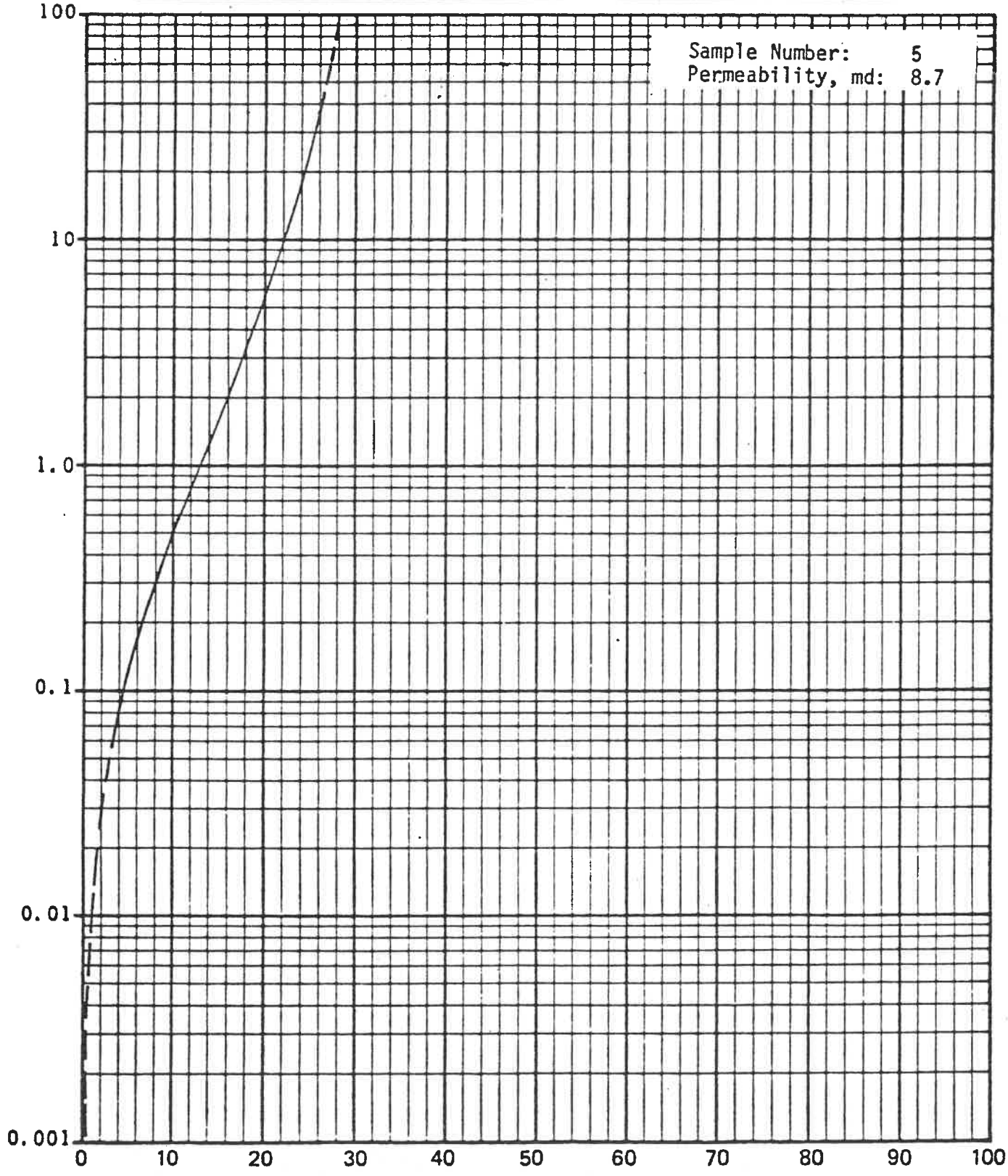
Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas

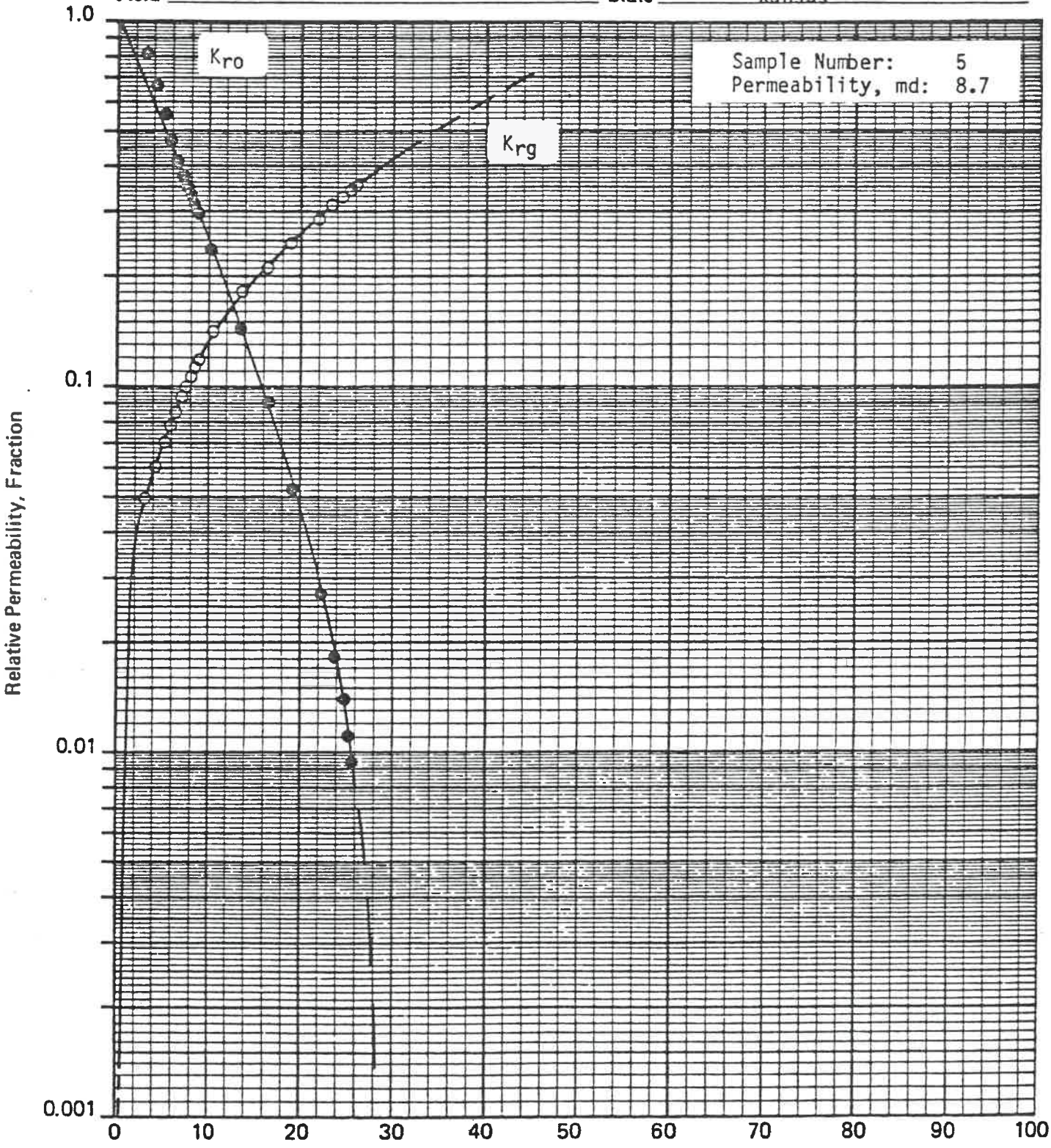


Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas



Company KRM Petroleum Corporation | Formation Kansas City-Lansing
Well G. C. Lemon No. 3 | County Comanche
Field | State Kansas



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Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

Summary of Waterflood Test Results

Sample Number	Depth, feet	Air Permeability, Millidarcies	Porosity, Percent	Initial Conditions: Water Saturation, Percent Pore Space	Initial Conditions: Oil Permeability, Millidarcies	Terminal Conditions: Oil Saturation, Percent Pore Space	Terminal Conditions: Water Permeability, Millidarcies	Oil Recovered, Percent Pore Space	Oil Recovered, Percent Oil in Place
2	4780	78	27.0	12.5	48 (61.5% Ka)	32.9	42 (53.8% Ka)	54.6	62.4
4	4782	63	22.0	16.8	60 (95.2% Ka)	24.1	34 (54% Ka)	59.1	71.0
5	4783	8.7	22.8	37.5	4.7 (54% Ka)	20.5	3.2 (36.8% Ka)	42.0	67.2

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

Waterflood Susceptibility Data

Sample Number 2
Permeability to Air, md 78
Permeability to Oil with Initial Water Present, md 48
Initial Water, Percent Pore Space 12.5
Porosity, Percent 27.0
Flooding Pressure Differential, psi 25

Water Input, Pore Volumes	Cumulative Oil Recovery, Percent Pore Space	Average Oil Recovery,* Percent Pore Space	Average Water Cut,** Percent
0.295	29.5		
0.338	32.3	30.9	34.9
0.370	33.3	32.8	68.2
0.414	34.1	33.7	83.0
0.493	35.2	34.6	85.6
0.621	36.4	35.8	90.3
0.768	37.5	37.0	92.6
0.972	38.7	38.1	94.2
1.24	39.9	39.3	95.6
1.53	40.9	40.4	96.6
2.09	42.1	41.5	97.8
2.69	43.2	42.7	98.2
3.93	44.8	44.0	98.7
5.20	45.9	45.4	99.1
7.64	47.8	46.8	99.2
10.1	48.8	48.3	99.6
15.2	50.4	49.6	99.7
20.1	51.4	50.9	99.8
29.7	52.9	52.2	99.8

*Calculated for mid-point of incremental throughput
**Calculated from incremental throughput volumes
***Breakthrough recovery

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

Waterflood Susceptibility Data

Sample Number 2 (continued)
Permeability to Air, md 78
Permeability to Oil with Initial Water Present, md 48
Initial Water, Percent Pore Space 12.5
Porosity, Percent 27.0
Flooding Pressure Differential, psi 25

Water Input, Pore Volumes	Cumulative Oil Recovery, Percent Pore Space	Average Oil Recovery,* Percent Pore Space	Average Water Cut,** Percent
34.4	53.5	53.2	99.9
39.3	54.1	53.8	99.9
44.0	54.4	54.2	99.9
48.9	54.6	54.5	99.9

*Calculated for mid-point of incremental throughput
**Calculated from incremental throughput volumes
***Breakthrough recovery

Waterflood Susceptibility Data

Sample Number 4
Permeability to Air, md 63
Permeability to Oil with Initial Water Present, md 60
Initial Water, Percent Pore Space 16.8
Porosity, Percent 22.0
Flooding Pressure Differential, psi 15

Water Input, Pore Volumes	Cumulative Oil Recovery, Percent Pore Space	Average Oil Recovery,* Percent Pore Space	Average Water Cut,** Percent
0.350	35.0		
0.402	36.5	35.7	70.7
0.494	38.2	37.4	81.2
0.630	40.0	39.1	87.2
0.824	41.6	40.8	91.8
1.11	43.2	42.4	94.4
1.46	44.7	43.9	95.7
2.25	46.4	45.5	97.9
3.18	48.4	47.4	97.8
5.01	50.6	49.5	98.8
6.84	51.9	51.3	99.3
8.63	53.2	52.5	99.3
12.2	54.4	53.8	99.6
15.7	55.3	54.9	99.7
22.5	56.3	55.8	99.9
29.7	57.3	56.8	99.9
36.5	58.2	57.7	99.9
43.3	58.6	58.4	99.9
50.0	58.9	58.8	99.9
56.7	59.1	59.0	99.9

*Calculated for mid-point of incremental throughput
**Calculated from incremental throughput volumes
***Breakthrough recovery

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75247

Waterflood Susceptibility Data

Sample Number 5
Permeability to Air, md 8.7
Permeability to Oil with Initial Water Present, md 4.7
Initial Water, Percent Pore Space 37.5
Porosity, Percent 22.8
Flooding Pressure Differential, psi 350

Water Input, Pore Volumes	Cumulative Oil Recovery, Percent Pore Space	Average Oil Recovery,* Percent Pore Space	Average Water Cut,** Percent
0.159	15.9***		
0.217	18.7	17.3	52.0
0.284	20.8	19.8	67.9
0.383	22.8	21.8	80.0
0.506	24.4	23.6	87.1
0.657	25.8	25.1	90.5
0.860	27.2	26.5	93.5
1.12	28.3	27.7	95.7
1.44	29.5	28.9	96.3
1.81	30.4	30.0	97.3
2.23	31.3	30.9	97.9
2.66	32.0	31.7	98.4
3.50	33.0	32.5	98.8
4.44	33.8	33.4	99.1
5.49	34.6	34.2	99.2
7.38	35.9	35.3	99.3
9.41	36.9	36.4	99.5
11.6	37.7	37.3	99.6
13.8	38.4	38.0	99.7

*Calculated for mid-point of incremental throughput
**Calculated from incremental throughput volumes
***Breakthrough recovery

Waterflood Susceptibility Data

Sample Number 5 (continued)
Permeability to Air, md 8.7
Permeability to Oil with Initial Water Present, md 4.7
Initial Water, Percent Pore Space 37.5
Porosity, Percent 22.8
Flooding Pressure Differential, psi 350

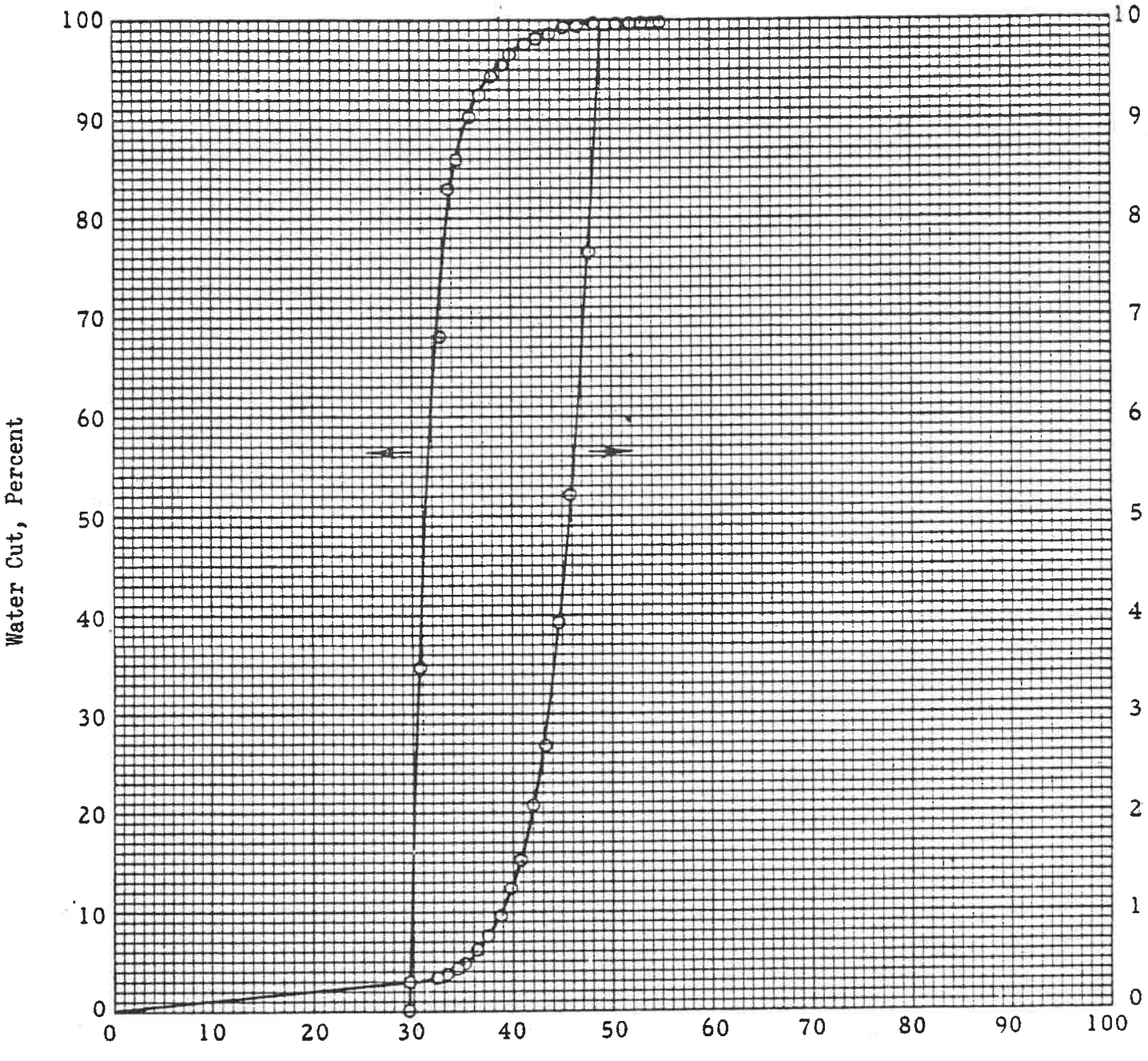
Water Input, Pore Volumes	Cumulative Oil Recovery, Percent Pore Space	Average Oil Recovery,* Percent Pore Space	Average Water Cut,** Percent
17.8	39.3***	38.8	99.8
21.9	39.9	39.6	99.8
26.1	40.4	40.1	99.9
34.1	41.1	40.7	99.9
41.9	41.6	41.3	99.9
49.6	42.0	41.8	99.9

*Calculated for mid-point of incremental throughput
**Calculated from incremental throughput volumes
***Breakthrough recovery

Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas

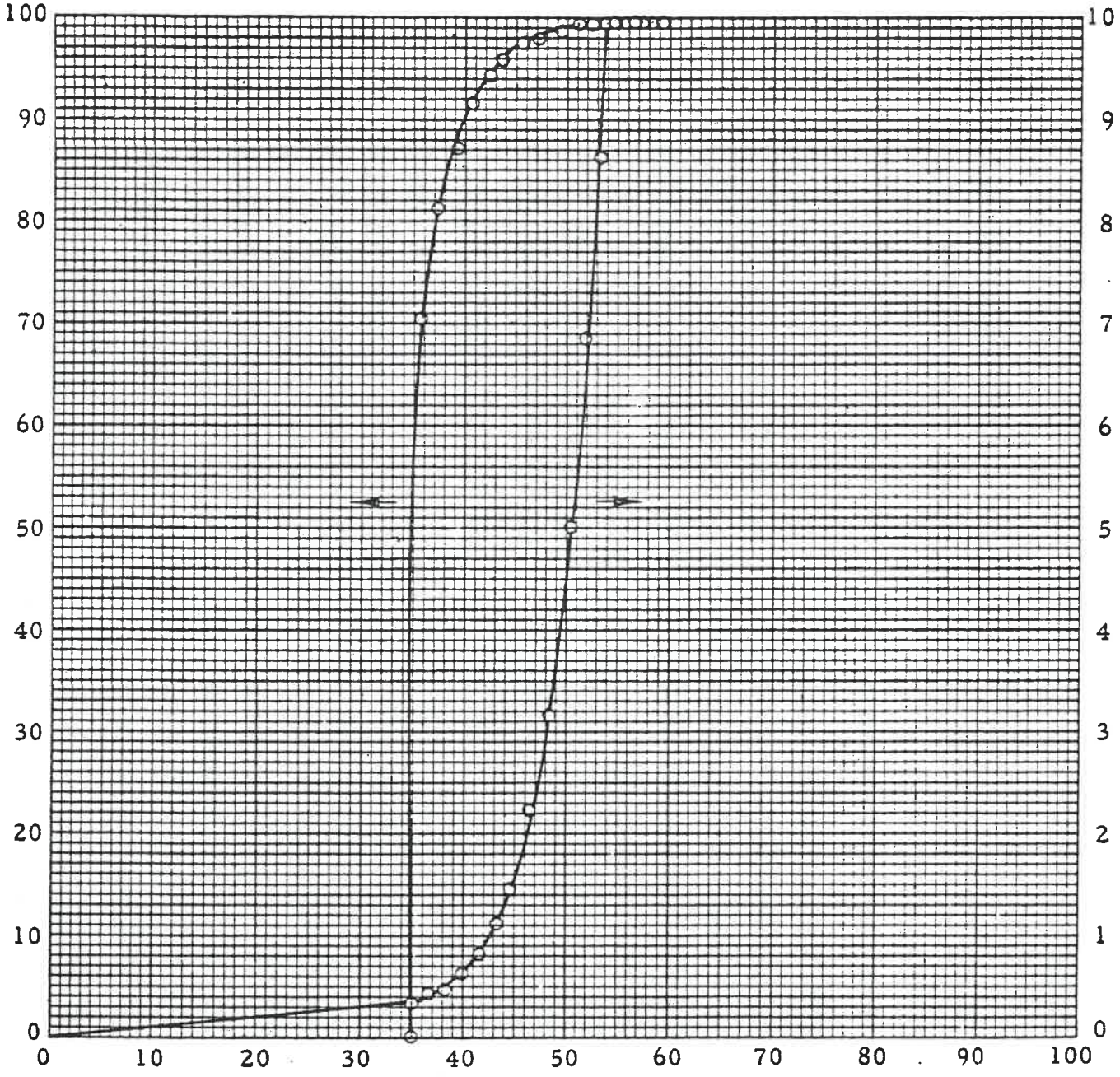
Sample Number: 2
Permeability, md: 78



Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas

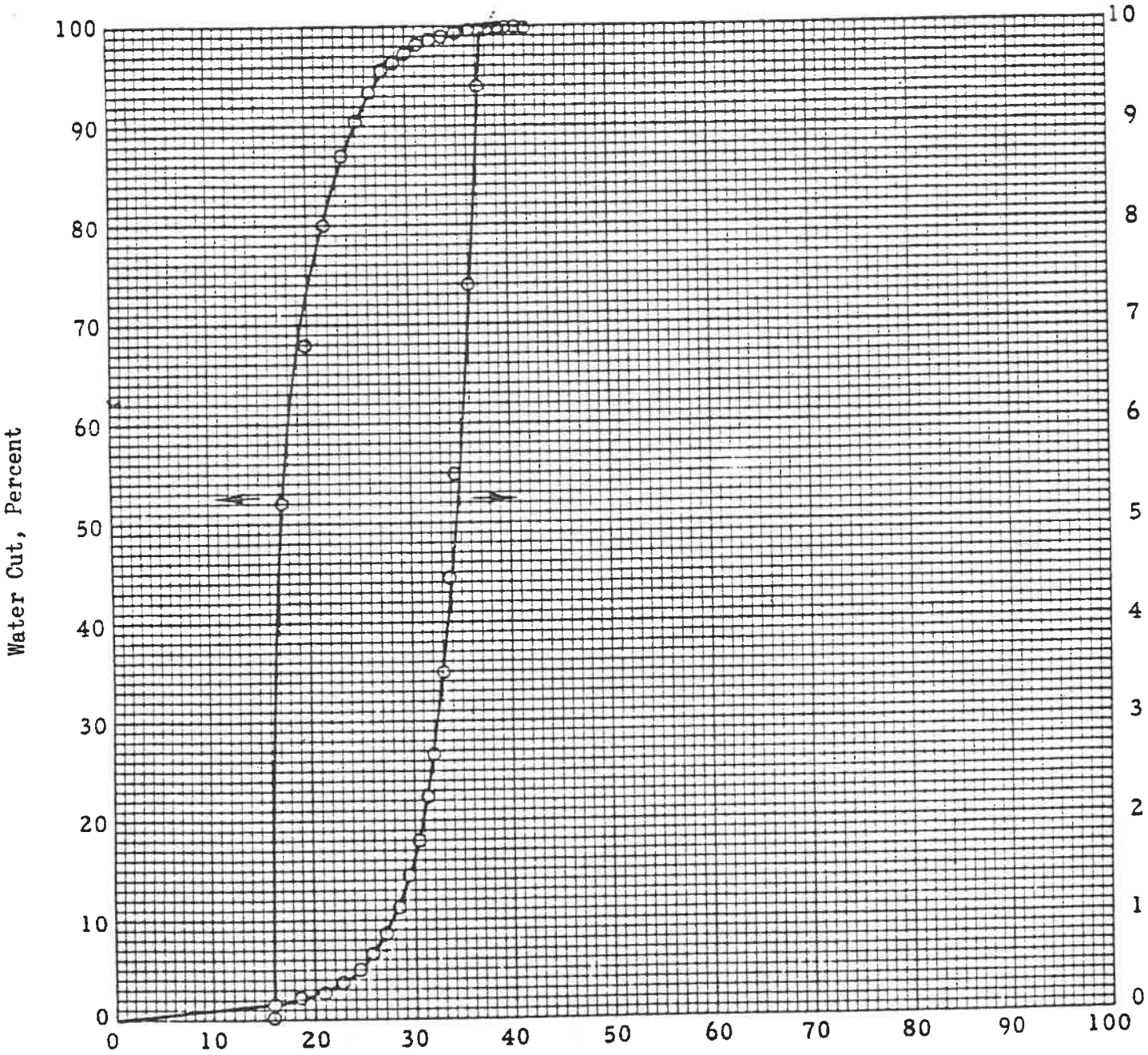
Sample Number: 4
Permeability, md: 63



Company KRM Petroleum Corporation
Well G. C. Lemon No. 3
Field

Formation Kansas City-Lansing
County Comanche
State Kansas

Sample Number: 5
Permeability, md: 8.7



APPENDIX VI

KRM-LEMON RANCH FIELD
SWOPE LIME RESERVOIR
COMANCHE CO, KANSAS

EXHIBIT VI-1

R E S E R V O I R F L U I D S T A B L E

PRESSURE PSIG----	DIFFERENTIAL DATA FVF V/B---	GAS SOL F/B----	FLASH FVF V/B---	FLASH GAS SOL F/B----	GAS GRAVITY -------	Z FACTOR ------	GAS FVF B/MCF--
50.	1.1200	110.	1.1200	110.	0.000	1.0000	45.6056
100.	1.1900	205.	1.1900	205.	0.000	0.9950	25.5879
150.	1.2270	259.	1.2270	259.	0.000	0.9770	17.4952
200.	1.2550	320.	1.2550	320.	0.000	0.9590	13.1727
300.	1.2640	331.	1.2640	331.	0.000	0.9350	8.7613
600.	1.3170	446.	1.3170	446.	0.000	0.8980	4.3076
900.	1.3650	555.	1.3650	555.	0.000	0.8680	2.7980
1200.	1.4120	663.	1.4120	663.	0.000	0.8440	2.0487
1400.	1.4420	733.	1.4420	733.	0.000	0.8330	1.7361
1695.	1.4900	845.	1.4900	845.	0.000	0.8150	1.4055

N - MSTB	0.000	SAT PSI	1695.
G/N RATIO - CF/B	000.000	SCW - PCT	15
G - MMCF	0.000	GAS CAP PSI	0.
BW - RVB/STB	1.0100	CW - V/MMV/PSI	2.500
SEP. CF/STB	000.	CO - V/MMV/PSI	13.900
RESVR TEMP - F	125.	CF - V/MMV/PSI	4.000
NITROGEN - PCT	00.00	CARB. DIOX. - PCT	00.00
HYD. SULF. - PCT	00.000		

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

APPENDIX VI

Exhibit VI-2

Reservoir Fluid Study

for

K.R.M. PETROLEUM CORPORATION

G.C. Lemon No. 6 Well
Lemon Ranch Pool Field
Comanche County, Kansas

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75207
June 22, 1979

RESERVOIR FLUID DIVISION

K.R.M. Petroleum Corporation
817 17th Street
Suite 820
Denver, Colorado 80202

Attention: Mr. Jerry C. Simmons

Subject: Reservoir Fluid Study
G.C. Lemon No. 6 Well
Lemon Ranch Pool Field
Comanche County, Kansas
Our File Number: RFL 79352

Gentlemen:

Duplicate subsurface fluid samples were collected from the subject well by a representative of Tefteller, Inc. on May 21, 1979. These samples were submitted to our Dallas laboratory for use in a reservoir fluid study. Presented to you in the following report are the results of this study.

As a quality check, the room temperature saturation pressure of each subsurface sample was initially determined. At 72°F., the two subsurface samples were found to have bubble point pressures of 1473 psig and 1475 psig. These values were considered to be in excellent agreement with one another and the sample having the higher room temperature saturation pressure was selected for use in the reservoir fluid study.

The hydrocarbon composition of the reservoir fluid was measured by low temperature fractional distillation. The results of this distillation in terms of both mol percent and weight percent are presented on page two.

A portion of the subsurface fluid was initially subjected to constant composition expansion at the reservoir temperature of 125°F. During this expansion, a bubble point pressure of 1695 psig was determined. The results of the pressure-volume measurements at the reservoir temperature are presented on page four.

During differential pressure depletion at the reservoir temperature, the fluid liberated a total of 845 cubic feet of gas at 14.65 psia and 60°F. per barrel of residual oil at 60°F. The relative oil volume associated with this test was 1.490 barrels of saturated fluid per barrel of residual oil. In addition, the

oil density and the properties of the evolved gases were measured at each point during the depletion. A summary of the differential pressure depletion data may be found on page five.

Viscosity measurements were then performed on the reservoir fluid at 125°F. in a rolling ball viscosimeter. The viscosity of the fluid was found to vary from a minimum of 0.388 centipoise at the saturation pressure to a maximum of 1.390 centipoises at atmospheric pressure.

Four single-stage separator tests were then performed at 70°F. to determine the effect of separator pressure upon gas/oil ratio, stock tank oil gravity, formation volume factor and separator gas composition. The results of the four separator tests are tabulated on page seven and the associated chromatographic analyses of the separator gas samples may be found on page eight. The separator data indicates that optimum separation should occur near 90 psig at 70°F. and near optimum separation should occur over pressures ranging from 60 psig to 100 psig.

It has been our pleasure to perform this reservoir fluid study for K.R.M. Petroleum Corporation. Should you have any questions or if we may be of further assistance in any matter, please feel free to call upon us.

Very truly yours,

Core Laboratories, Inc.

P. L. Moses, Manager
Reservoir Fluid Analysis

PLM:JF:bt
7 cc: Addressee

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 79352

Company K.R.M. Petroleum Corp. Date Sampled May 21, 1979

Well G.C. Lemon No. 6 County Comanche

Field Lemon Ranch Pool State Kansas

FORMATION CHARACTERISTICS

Formation Name	Lansing Kansas City
Date First Well Completed	, 19
Original Reservoir Pressure (Lemon No. 3)	1762 PSIG @ 4777 Ft.
Original Produced Gas-Oil Ratio	640 SCF/Bbl
Production Rate	160 Bbl/Day
Separator Pressure and Temperature	10 PSIG. 80 °F.
Oil Gravity at 60° F.	47 °API
Datum	3011 Ft. Subsea
Original Gas Cap	None

WELL CHARACTERISTICS

Elevation	1766 KB Ft.
Total Depth	4802 PB Ft.
Producing Interval	4778-4788 Ft.
Tubing Size and Depth	2-3/8 In. to 4770 Ft.
Productivity Index	Bbl/D/PSI @ Bbl/Day
Last Reservoir Pressure	1768 PSIG @ 4783 Ft.
Date	May 21 , 1979
Reservoir Temperature	125 °F. @ 4783 Ft.
Status of Well	Shut in
Pressure Gauge	Amerada
Normal Production Rate	Bbl/Day
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG, °F.
Base Pressure	PSIA
Well Making Water	% Cut

SAMPLING CONDITIONS

Sampled at	4683 Ft.
Status of Well	Shut in
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG, °F.
Tubing Pressure	535 PSIG
Casing Pressure	Nil PSIG
Sampled by	Tefteller, Inc.
Type Sampler	

REMARKS:

CL 831

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 79352

Company K.R.M. Petroleum Corp. Formation Lansing Kansas City

Well G.C. Lemon No. 6 County Comanche

Field Lemon Ranch Pool State Kansas

HYDROCARBON ANALYSIS OF Reservoir Fluid SAMPLE

COMPONENT	MOL PER CENT	WEIGHT PER CENT	DENSITY @ 60° F. GRAMS PER CUBIC CENTIMETER	° API @ 60° F.	MOLECULAR WEIGHT
Hydrogen Sulfide	Nil	Nil			
Carbon Dioxide	1.01	0.50			
Nitrogen	1.29	0.41			
Methane	29.53	5.35			
Ethane	6.07	2.06			
Propane	10.30	5.13			
iso-Butane	2.26	1.48			
n-Butane	6.57	4.31			
iso-Pentane	2.38	1.94			
n-Pentane	2.05	1.67			
Hexanes	4.16	4.03			
Heptanes plus	34.38	73.12	0.8326	38.3	188
	100.00	100.00			

VOLUMETRIC DATA OF Reservoir Fluid SAMPLE

1. Saturation pressure (bubble-point pressure) 1695 PSIG @ 125 °F.
2. Specific volume at saturation pressure: ft³/lb 0.02348 @ 125 °F.
3. Thermal expansion of saturated oil @ 5000 PSI = $\frac{V \text{ @ } 125\ ^\circ F}{V \text{ @ } 70\ ^\circ F}$ = 1.03347
4. Compressibility of saturated oil @ reservoir temperature: Vol/Vol/PSI:

   From 5000 PSI to 3500 PSI = 9.61×10^{-6}
   From 3500 PSI to 2500 PSI = 11.43×10^{-6}
   From 2500 PSI to 1695 PSI = 13.91×10^{-6}

Pressure-Volume Relations at 125 °F.

Pressure PSIG	Relative Volume (1)	Y Function (2)
5000	0.9634	
4500	0.9678	
4000	0.9725	
3500	0.9775	
3000	0.9829	
2500	0.9888	
2000	0.9955	
1900	0.9969	
1800	0.9984	
1700	0.9999	
1695	1.0000	
1685	1.0033	
1675	1.0054	
1652	1.0104	
1590	1.0273	
1525	1.0474	2.329
1438	1.0781	2.260
1339	1.1192	2.207
1219	1.1808	2.134
1095	1.2631	2.055
959	1.3866	1.955
828	1.5515	1.867
690	1.8093	1.761
550	2.2210	1.660
427	2.8406	1.559
311	3.8688	1.480

(1) Relative Volume: V/Vsat is barrels at indicated pressure per barrel at saturation pressure.

(2) Y Function = $\frac{(Psat-P)}{(Pabs)\,(V/Vsat-1)}$

Differential Vaporization at 125 °F.

Pressure PSIG	Solution Gas/Oil Ratio(1)	Relative Oil Volume(2)	Relative Total Volume(3)	Oil Density gm/cc	Deviation Factor Z	Gas Formation Volume Factor(4)	Incremental Gas Gravity
1695	845	1.490	1.490	0.6823			
1400	733	1.442	1.634	0.6921	0.833	0.00970	0.751
1200	663	1.412	1.781	0.6989	0.844	0.01145	0.745
900	555	1.365	2.170	0.7100	0.868	0.01563	0.746
600	446	1.317	3.024	0.7224	0.898	0.02407	0.773
300	331	1.264	5.738	0.7359	0.935	0.04892	0.841
150	259	1.227	11.216	0.7454	0.959	0.09579	0.996
0	0	1.033		0.7829			1.874
	at 60°F. =	1.000					

Gravity of residual oil = 43.2°API at 60°F.

(1) Cubic feet of gas at 14.65 psia and 60°F. per barrel of residual oil at 60°F.
(2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60°F.
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60°F.
(4) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.65 psia and 60°F.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS 75207

File RFL 79352

Well G.C. Lemon No. 6

Viscosity Data at 125 °F.

Pressure PSIG	Oil Viscosity Centipoise	Calculated Gas Viscosity Centipoise	Oil/Gas Viscosity Ratio
5000	0.464		
4000	0.441		
3000	0.418		
2000	0.395		
1750	0.389		
1695	0.388		
1400	0.416	0.0149	27.9
1200	0.438	0.0142	30.8
900	0.475	0.0132	36.0
600	0.525	0.0123	42.7
300	0.600	0.0114	52.6
150	0.666	0.0106	62.8
0	1.390	0.0079	175.9

SEPARATOR TESTS OF Reservoir Fluid SAMPLE

SEPARATOR PRESSURE, PSI GAUGE	SEPARATOR TEMPERATURE, ° F.	GAS/OIL RATIO (1)	GAS/OIL RATIO (2)	STOCK TANK GRAVITY, ° API @ 60° F.	FORMATION VOLUME FACTOR (3)	SEPARATOR VOLUME FACTOR (4)	SPECIFIC GRAVITY OF FLASHED GAS
15	70	787	801			1.018	0.988*
to							
0	70	21	21	43.8	1.443	1.005	1.342
40	70	677	705			1.041	0.916*
to							
0	70	58	58	45.2	1.405	1.005	1.471
60	70	624	660			1.058	0.875*
to							
0	70	86	86	45.6	1.394	1.005	1.491
100	70	560	608			1.086	0.824*
to							
0	70	130	131	45.8	1.390	1.005	1.483

*Collected and analyzed for hydrocarbons, in the laboratory.

(1) Gas/Oil Ratio in cubic feet of gas @ 60° F. and 14.65 PSI absolute per barrel of oil @ indicated pressure and temperature.

(2) Gas/Oil Ratio in cubic feet of gas @ 60° F. and 14.65 PSI absolute per barrel of stock tank oil @ 60° F.

(3) Formation Volume Factor is barrels of saturated oil @ 1695 PSI gauge and 125 ° F. per barrel of stock tank oil @ 60° F.

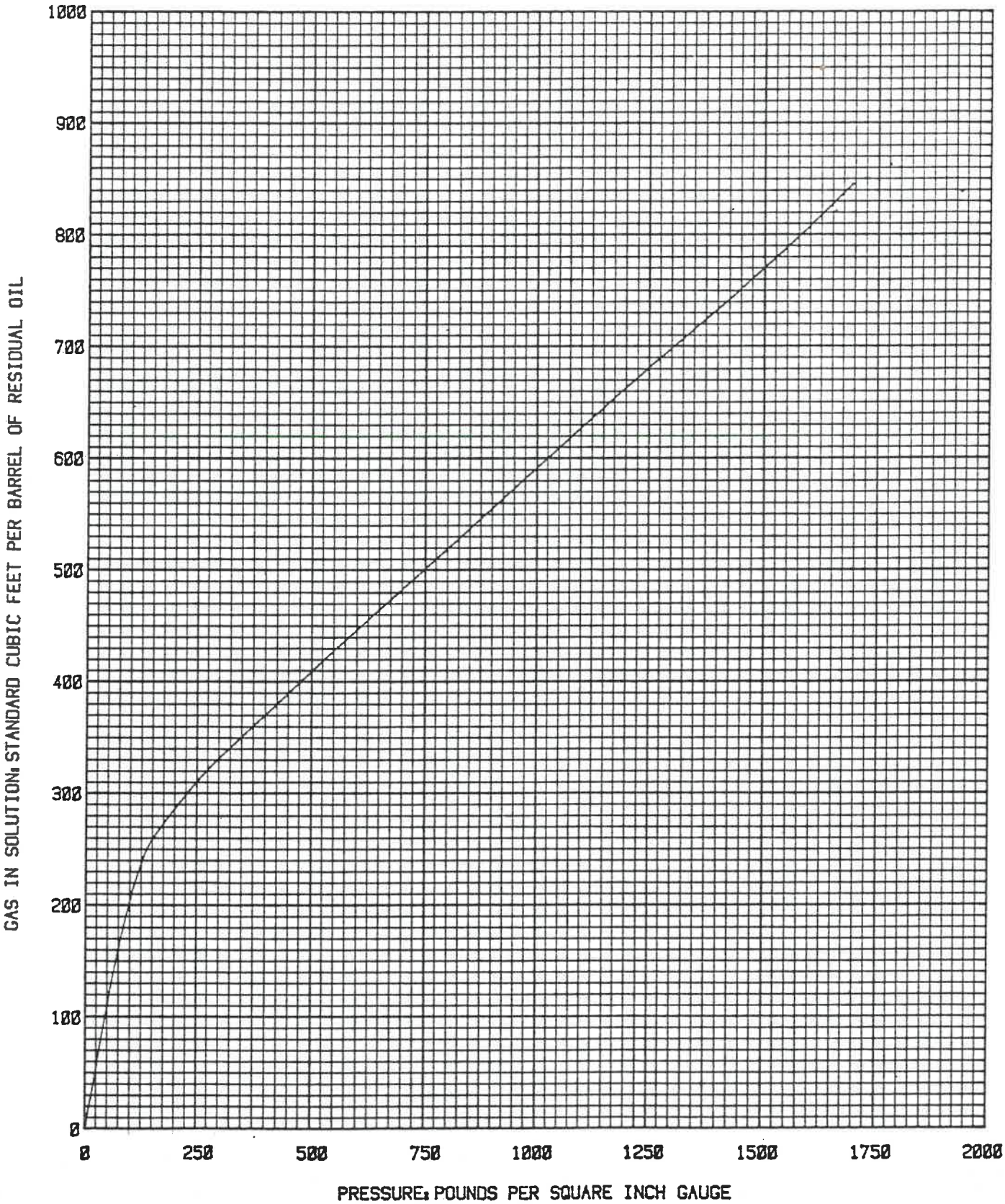
(4) Separator Volume Factor is barrels of oil @ indicated pressure and temperature per barrel of stock tank oil @ 60° F.

Hydrocarbon Analyses of Separator Gas Samples

Separator Conditions:	15 PSIG and 70 °F.		40 PSIG and 70 °F.		60 PSIG and 70 °F.		100 PSIG and 70 °F.	
Component	Mol Percent	GPM	Mol Percent	GPM	Mol Percent	GPM	Mol Percent	GPM
Hydrogen Sulfide	Nil		Nil		Nil		Nil	
Carbon Dioxide	1.92		2.05		2.12		2.18	
Nitrogen	2.57		2.84		3.01		3.27	
Methane	56.47		61.12		63.83		67.95	
Ethane	10.81	2.874	11.15	2.965	11.13	2.960	10.73	2.853
Propane	16.27	4.451	14.64	4.006	13.31	3.642	11.07	3.029
iso-Butane	2.26	0.735	1.73	0.563	1.44	0.468	1.08	0.351
n-Butane	6.47	2.028	4.58	1.435	3.71	1.163	2.71	0.849
iso-Pentane	1.23	0.448	0.75	0.273	0.58	0.211	0.40	0.146
n-Pentane	1.16	0.418	0.68	0.245	0.52	0.187	0.36	0.130
Hexanes	0.52	0.211	0.29	0.118	0.22	0.089	0.16	0.065
Heptanes plus	0.32	0.144	0.17	0.077	0.13	0.059	0.09	0.041
	100.00	11.309	100.00	9.682	100.00	8.779	100.00	7.464
Calculated gas gravity(Air=1.000):	0.988		0.916		0.875		0.824	
Calculated gross heating value (BTU per cubic foot of dry gas at 14.65 psia and 60°F.):	1589		1465		1402		1317	

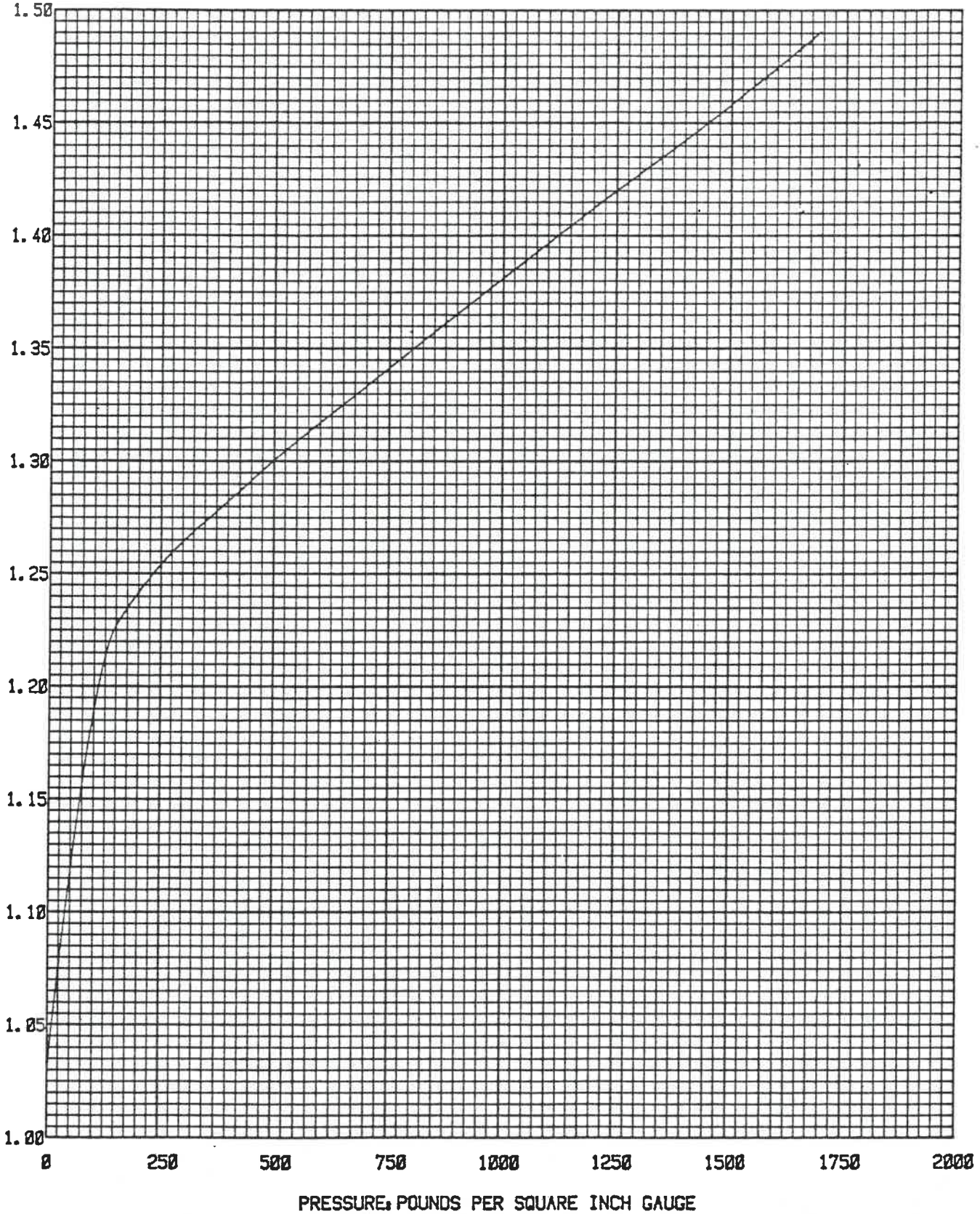
DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID AT 125 °F.

Company K.R.M. PETROLEUM CORP. Formation LANSING KANSAS CITY
Well G.C. LEMON NO. 6 County COMANCHE
Field LEMON RANCH POOL State KANSAS



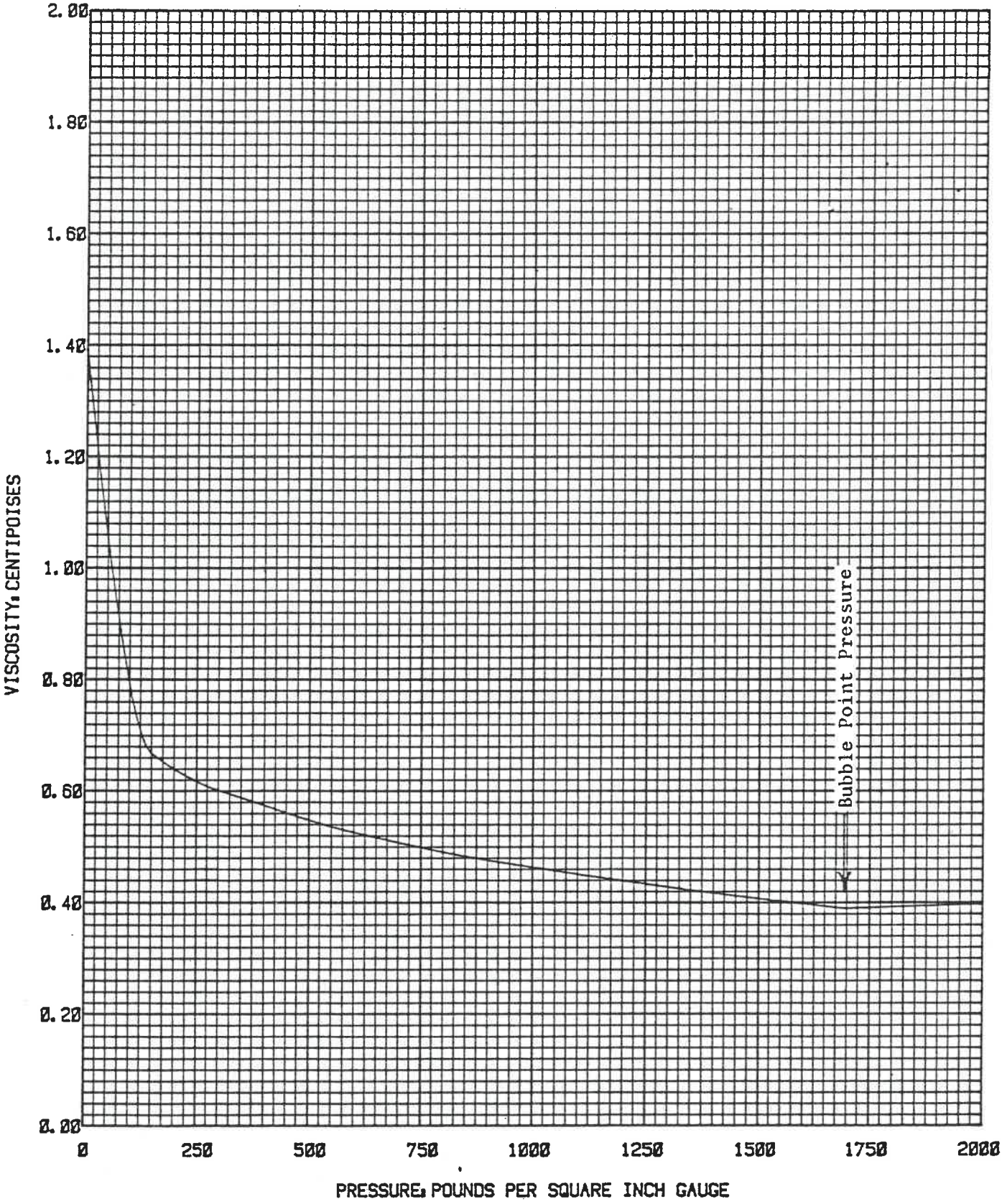
DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID AT 125 °F.

Company K.R.M. PETROLEUM CORP. Formation LANSING KANSAS CITY
Well G.C. LEMON NO. 6 County COMANCHE
Field LEMON RANCH POOL State KANSAS



VISCOSITY OF RESERVOIR FLUID AT 125 °F.

Company K. R. M. PETROLEUM CORP. Formation LANSING KANSAS CITY
Well G. C. LEMON NO. 6 County COMANCHE
Field LEMON RANCH POOL State KANSAS



APPENDIX V

EXHIBIT V-1

Lemon Ranch Log Data

Well	Net Feet - %	Porosity - % (Density Log)[1]	Water Saturation - %[2]
Lemon #1	6	14.0	15.0
Lemon #2X	4	6.0	45.0
Lemon #3	6	22.0	9.0
Lemon #5	6	12.0	13.0
Lemon #6	8	17.5	10.5
Lemon #7	4	16.0	15.0
Lemon #8	3	11.0	16.0
Lemon #9	2	16.0	16.0
Lemon #10	4	15.0	16.0
Lemon #11	4	7.0	30.0
Rhodes #1	6	10.0	21.0
Rhodes #2	5	12.0	12.0
Rhodes #3	6	21.0	12.0
Rhodes #4	4	22.0	10.0
Average 13 Wells[3]	5	15.3	14.5

Notes

1/ Based on grain density of 2.73 g/cc.

2/ Based on formation water resistivity of 0.044 ohm-meters and cementation factor of 2.

3/ Average does not include Lemon #2X.

Welex

LINEAR NEUTRON DENSITY POROSITY LOG

COMPANY KRM PETROLEUM CORPORATION

WELL LEMON #1

FIELD

COUNTY COMANCHE STATE KANSAS

Location C-NW-SE

Sec. 14 Twp 34S Rge 20W

Other Services: G-GRD

Permanent Datum GROUND LEVEL Elev. 1755'

Log Measured From KELLY BUSHING 8 Ft. Above Perm. Datum

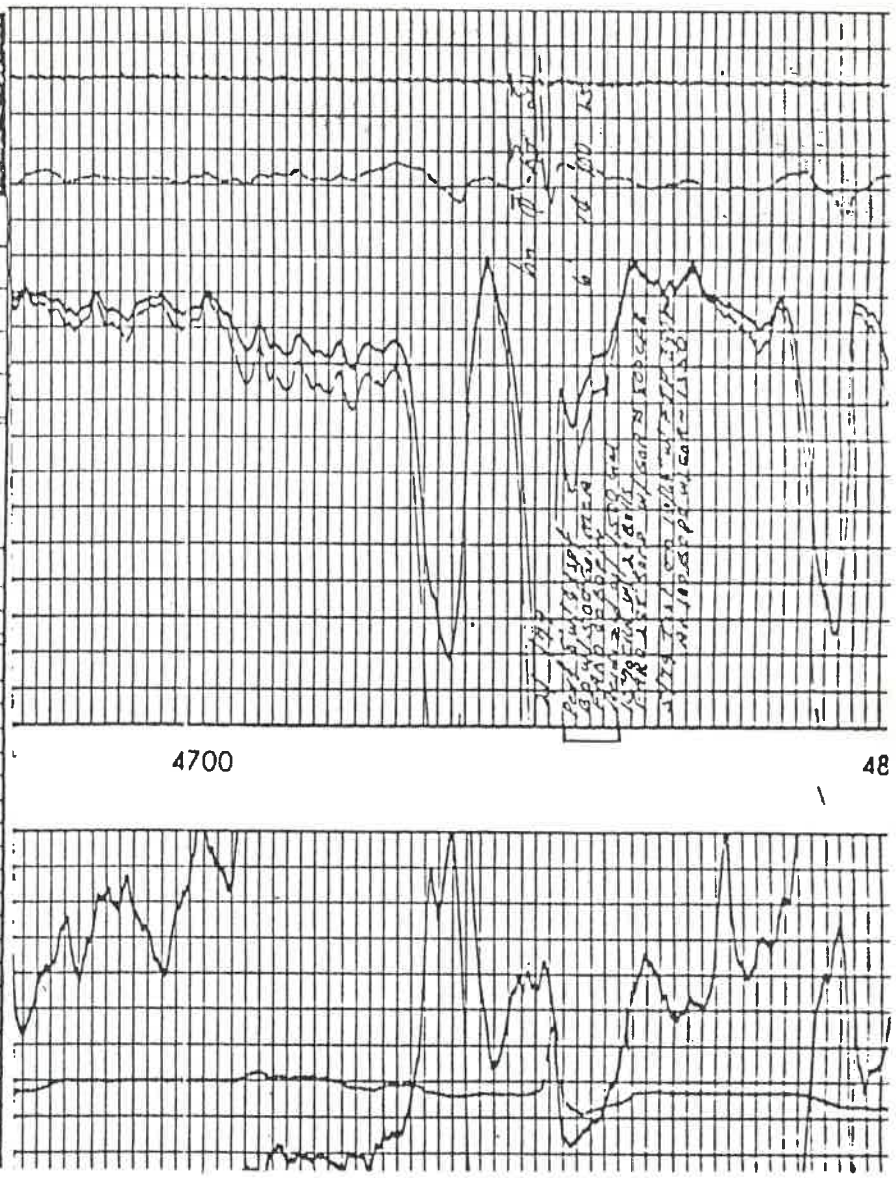
Drilling Measured From KELLY BUSHING

Elev.: K.B. 1763'

D.F.

G.L. 1755'

	GAMMA	DENSITY	NEUTRON	
Date	12-14-78			
Run No.	TWO	TWO	TWO	
Depth–Driller	6475'	6475'	6475'	
Depth–Welex	6476'	6476'	6476'	
Btm. Log Inter.	6454'	6475'	6475'	
Top Log Inter.	4477'	4477'	5365'	
Casing–Driller	8 5/8 @ 580'	@	@	@
Casing–Welex	580'			
Bit Size	7 7/8			
Type Fluid in Hole	DRILL			
	MUD			
Dens. | Visc.	9 | 45	|	|	|
pH | Fluid Loss	11 | 4.5 ml	| ml	| ml	| ml
Source of Sample	FLOWLINE			
R @ Meas. Temp.	.9 @ 53 °F	@ °F	@ °F	@ °F
R @ Meas. Temp.	.55 @ 53 °F	@ °F	@ °F	@ °F
R @ Meas. Temp.	2.4 @ 53 °F	@ °F	@ °F	@ °F
Source R , R	MEAS. | MEAS.	|	|	|
R @ BHT	.38 @ 137°F	@ °F	@ °F	@ °F
Time Since Circ.	4 HOURS			
Max Rec. Temp.	137°F @ TD	°F @	°F @	°F @
Equip. | Location	702 | GREELEY	|	|	|



Welex

COMPENSATED DENSITY LOG

COMPANY Field Print
WELL Frank Yoder
FIELD
County
State

COMPANY K.R.M. PETROLEUM CORP
WELL LEMON #2-X
FIELD
COUNTY COMANCHE STATE KANSAS

Location: NE-SW

Sec 14 Twp 34S Rge 20W

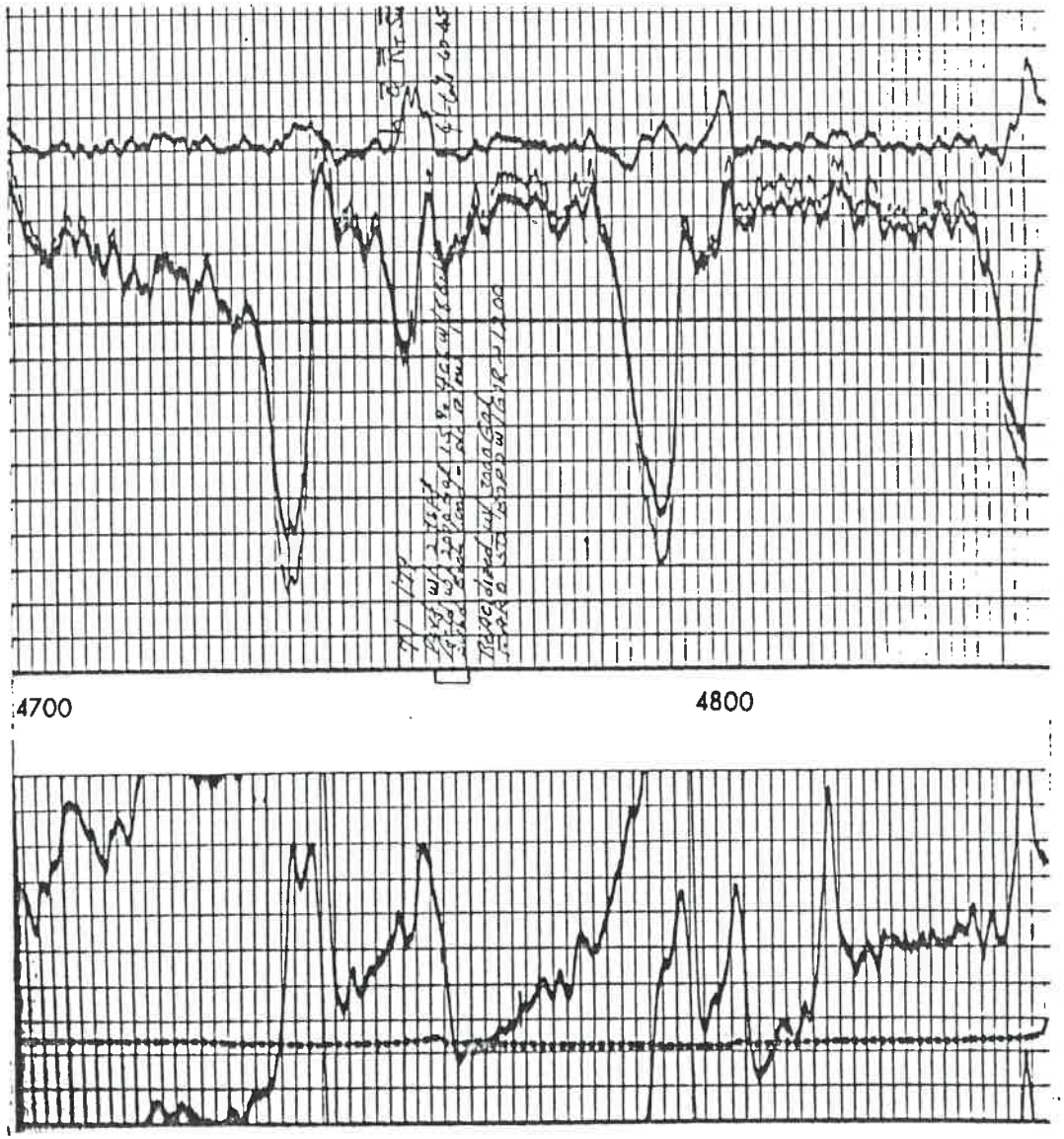
Other Services:
R-GRD-SWN
BOTTOM-GAMMA
MSG-FF-AUL

Permanent Datum GROUND LEVEL Elev 1754'
Log Measured From KB 12 Ft Above Perm. Datum
Drilling Measured From KB

Elev.: K.B. 1766'
D.F. NA
G.L. 1754'

Date	3-28-79	
Run No	ONE	ONE
Type Log	GAMMA	DENSITY
Depth—Driller	5303	5303
Depth—Welex	5290	5290
Bottom Logged Interval	5289	5289
Top Logged Interval	3850	
Type Fluid in Hole	W.B MUD	
Salinity PPM Cl	22,000	
Density	8.8	
Level	FULL	
Max rec. temp. deg F.	123 @ T.D.	
Operating Rig time	1½ HR	
Recorded By	J. MORTON	
Witnessed by	MR LANDERS	

RUN No.	BORE-HOLE RECORD Bit	From	To	CASING RECORD Size	Wgt.	From	To
1	12¼	000	654	8⅝		0	654
2	7⅞	654	5303				



Welex

COMPENSATED DENSITY GAMMA CALIPER LOG

COMPANY K.B.M. PETROLEUM CORPORATION
WELL LEMON #3
FIELD COMANCHE State KANSAS
County

COMPANY K.B.M. PETROLEUM CORPORATION

WELL LEMON #3

FIELD

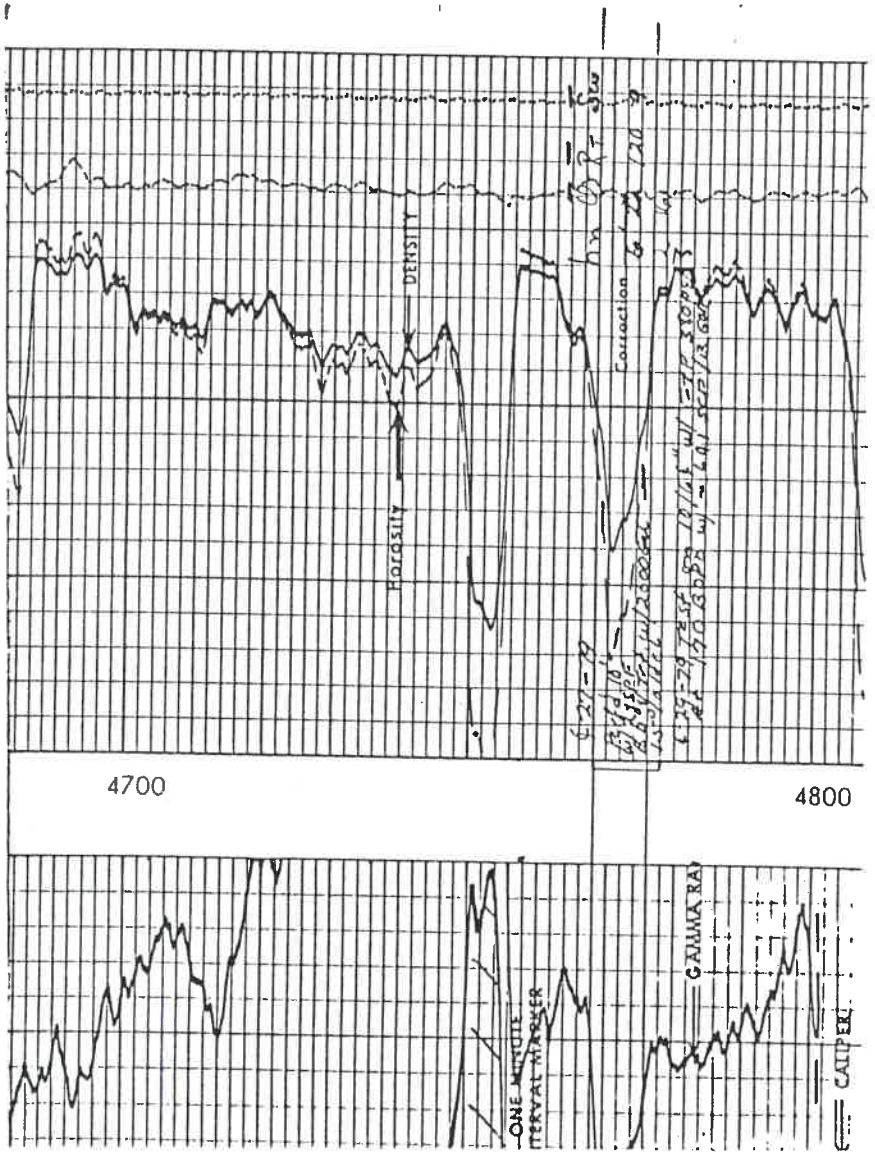
COUNTY COMANCHE STATE KANSAS

Location	Other Services
C-NE-SE	G-GRD-SWN

Sec 14 Twp 34S Rge 20W

Permanent Datum GROUND LEVEL Elev 1754' | Elev. K.B 1766'
Log Measured From KELLY BUSHING Ft. Above Perm Datum | D.F.
Drilling Measured From KELLY BUSHING | G.L. 1754'

Date	4-8-79			
Run No.	ONE			
Depth—Driller	4830'			
Depth—Welex	4829'			
Btm. Log Inter.	4828'			
Top Log Inter.	3800'			
Casing—Driller	8 5/8" @ 644'	@	@	@
Casing—Welex	663			
Bit Size	7 7/8"			
Type Fluid in Hole	DRILLING MUD			
Dens. / Visc.	9.1 / 38	/	/	/
pH / Fluid Loss	11 / 10.8ml	ml	ml	ml
Source of Sample	FLOW LINE			
R_m @ Meas. Temp.	.38 @ 80 F	@ F	@ F	@ F
R_mf @ Meas. Temp.	.33 @ 80 F	@ F	@ F	@ F
R_mc @ Meas. Temp.	1.5 @ 80 F	@ F	@ F	@ F
Source R_mf & R_mc	MEASURED			
R_m @ BHT	.255 @ 120F	@ F	@ F	@ F
Time Since Circ.	5 HOURS			
Max. Rec. Temp.	120F @ TD	F @	F @	F @
Equip. Location	702 GREAT BEND			
Recorded By	M. GERHARDT			



Welex

COMPENSATED DENSITY GAMMA/CALIPER LOG

COMPANY KRM PETROLEUM CORPORATION

WELL LEMON #5

FIELD

COUNTY COMANCHE STATE KANSAS

Location: NW - SW

Other Services: GAMMA-GRD-SWN

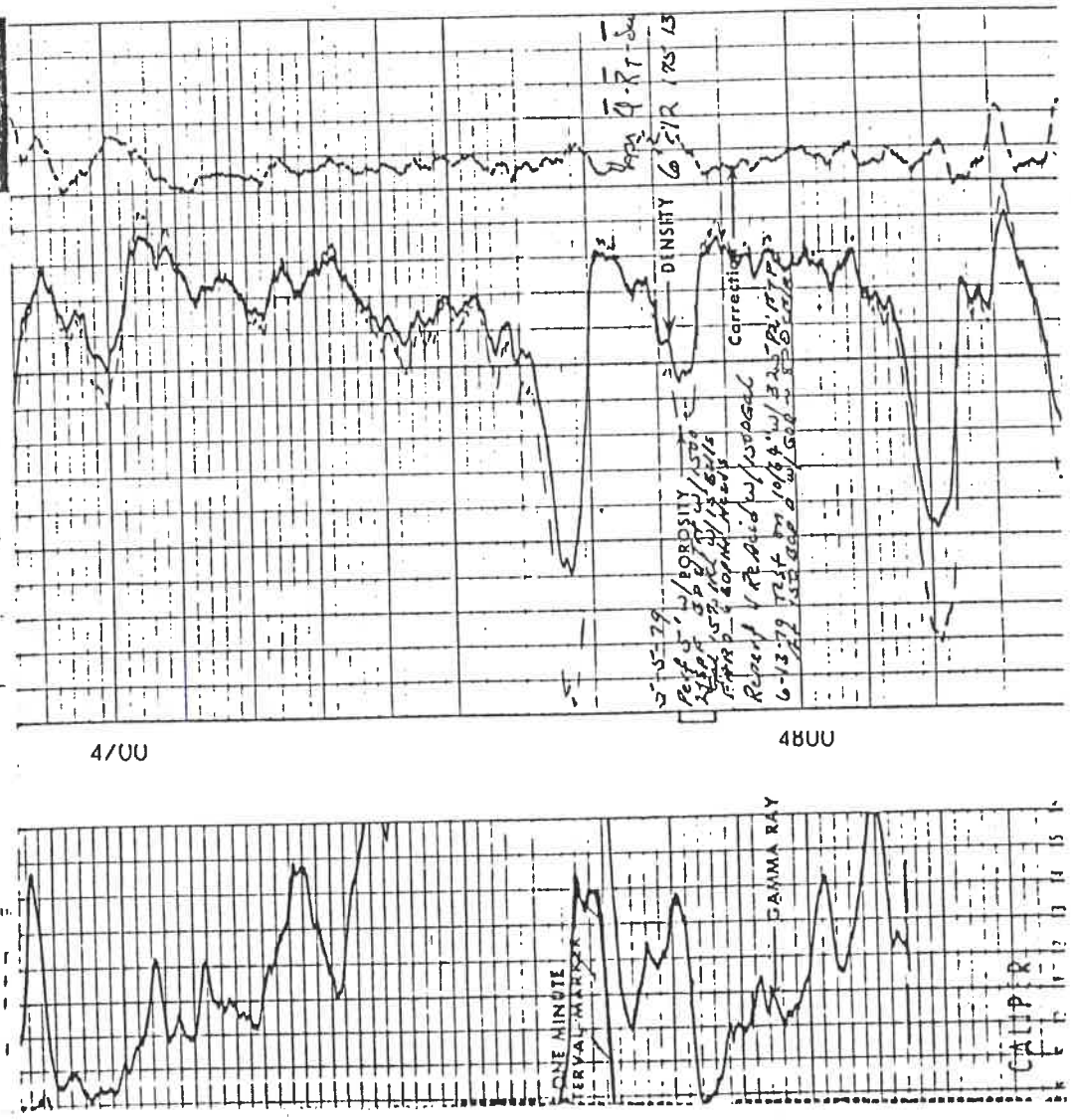
Sec 13 Twp 34S Rge 20W

Permanent Datum GROUND LEVEL Elev 1760' Elev K B 1772'

Log Measured From 12 Ft Above Perm Datum D F

Drilling Measured From KELLY BUSHING G L 1760'

Date	4-28-79					
Run No	ONE					
Depth Driller	4850'					
Depth Welex	4843'					
Btm Log Inter	4842'					
Top Log Inter	3500'					
Casing Driller	8-5/8" 781	@		@		@
Casing Welex	8-5/8" 781					
Bit Size	7-7/8"					
Type Fluid in Hole	DRILLING MUD					
Dens Visc	9.4 47					
pH Fluid Loss	10.5 13.(ml		ml		ml	
Source of Sample	FLOW LINE					
Rm @ Meas Temp	.25 @ 79 F	@	F	@	F	@
Rmf @ Meas Temp	.21 @ 79 F	@	F	@	F	@
Rmc @ Meas Temp	1.14 @ 79 F	@	F	@	F	@
Source Rmf Rmc	MEASURED					
Rm @ BHT	.17 @ 118F	@	F	@	F	@
Time Since Circ	2 HOURS					
Max Rec Temp	118F @ T.D.	F @		F @		F @



Welex

COMPENSATED DENSITY LOG

COMPANY K. R. M. PETROLEUM CORPORATION

WELL LEMON #6

FIELD

COUNTY COMANCHE STATE KANSAS

Location

Other Services.

GAMMA-GRD-SWN

Sec 14 Twp 34S Rge 20W

Permanent Datum GROUND LEVEL Elev. 1754'

Log Measured From KELLY BUSHING 12 Ft. Above Perm. Datum

Drilling Measured From KELLY BUSHING

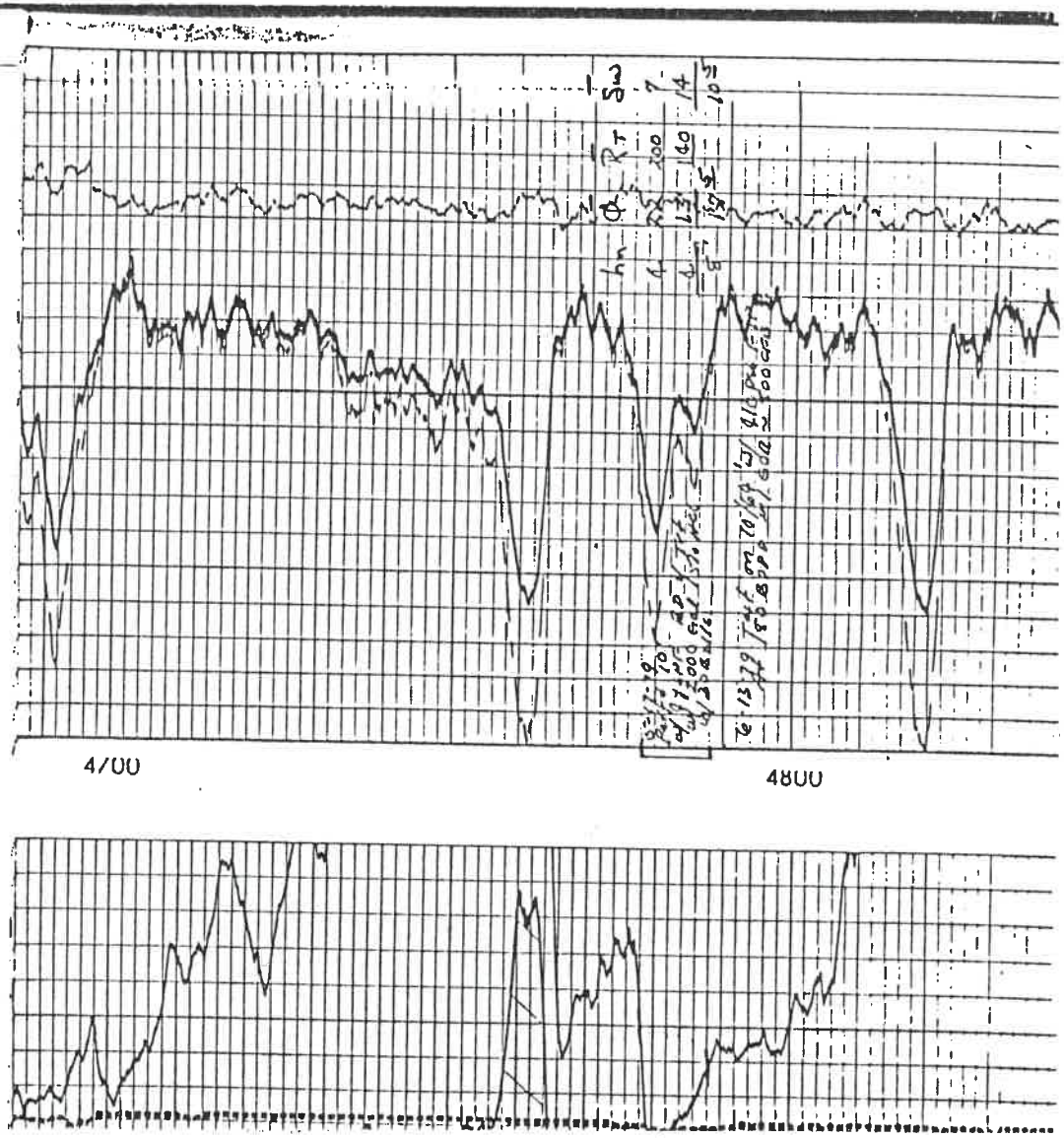
Elev K.B 1766'

D.F.

G.L. 1754'

Date	5-9-79
Run No	ONE
Type Log	GAMMA-GAMMA
Depth – Driller	4850'
Depth – Welex	4846'
Bottom Logged Interval	4845'
Top Logged Interval	3500'
Type Fluid in Hole	DRILLING MUD
Salinity, PPM Cl	
Density	9.3
Level	40' BELOW G.L.
Max rec. temp. deg F	118°
Operating Rig time	1½ HOURS
Recorded By	MR. J. MORTON
Witnessed By	MR. L. LANDIS

Run No.	Bit	BORE HOLE RECORD From	To	CASING RECORD Size	Wgt	From	To
ONE	12¼"	0	781'	8-5/8"		0	781'
TWO	7⅞"	781'	4850'				



Welex

COMPENSATED DENSITY GAMMA CALIPER LOG

COMPANY KRM PETROLEUM CORPORATION
WELL LEMON #7
FIELD COMANCHE County COMANCHE State KANS.

COMPANY KRM PETROLEUM CORPORATION

WELL LEMON #7

FIELD

COUNTY COMANCHE STATE KANSAS

Location: C - SW - SW

Sec 13 Twp 34S Rge 20W

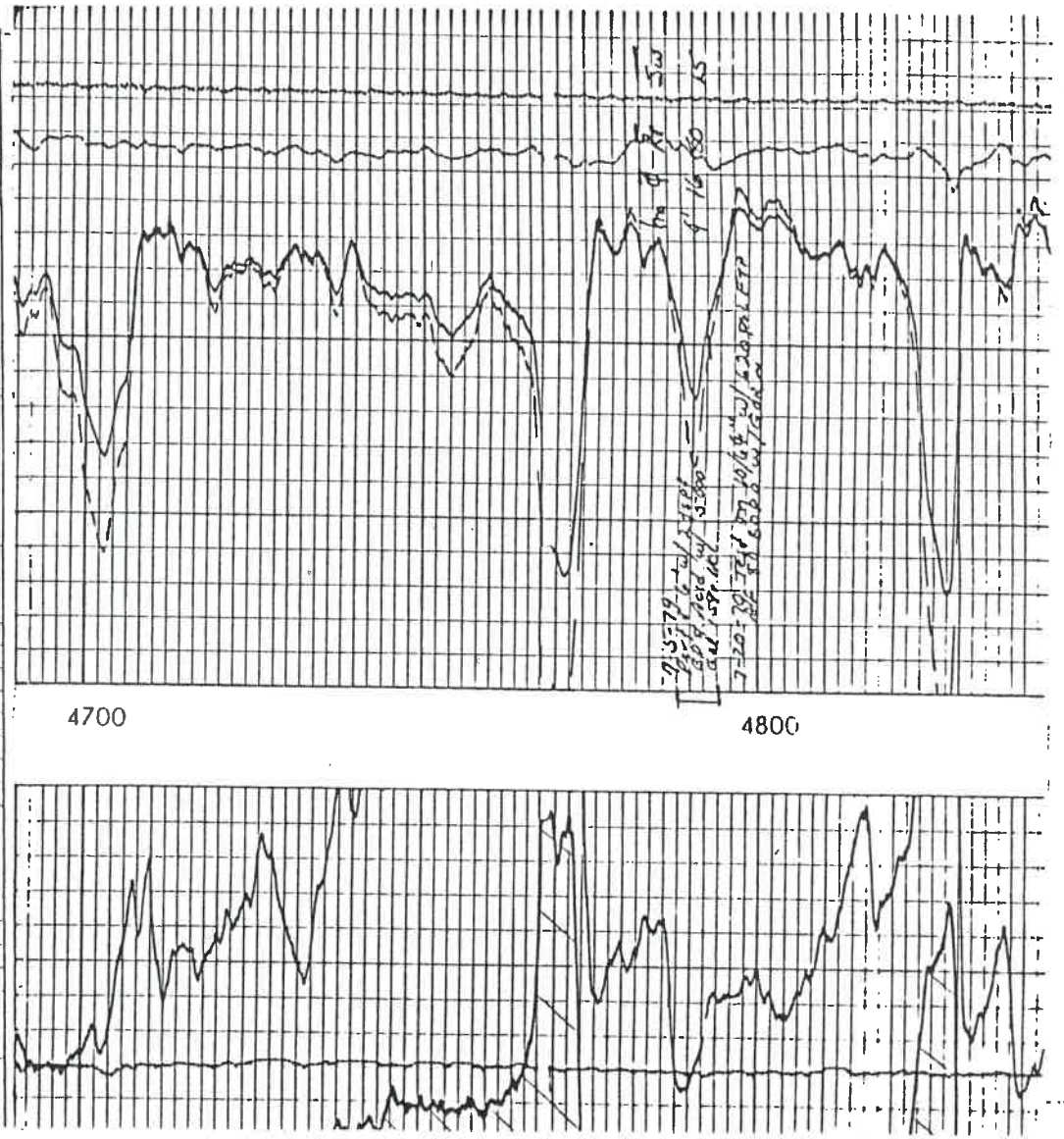
Other Services: GAMMA-GRD-SWN

Permanent Datum GROUND LEVEL Elev 1758' Elev.: K.B. 1770'

Log Measured From KELLY BUSHING 12 Ft. Above Perm. Datum D.F.

Drilling Measured From KELLY BUSHING G.L. 1758'

Date	5-22-79			
Run No	ONE			
Depth—Driller	5335'			
Depth—Welex	5326'			
Btm. Log Inter.	5325'			
Top Log Inter.	3800'			
Casing—Driller	8-5/8" 782 @	@	@	@
Casing—Welex	8-5/8" 781			
Bit Size	7-7/8"			
Type Fluid in Hole	DRILLING MUD			
Dens. / Visc.	9.2 / 45	/	/	/
pH / Fluid Loss	9.0 / 15 gal	/ ml	/ ml	/ ml
Source of Sample	FLOW LINE			
R@ Meas. Temp.	.36 @ 84 F	@ F	@ F	@ F
R@ Meas. Temp.	.46 @ 84 F	@ F	@ F	@ F
R@ Meas. Temp.	.19 @ 84 F	@ F	@ F	@ F
Source R.B.	MEASURED	/	/	/
R@ BHT	.24 @ 125 F	@ F	@ F	@ F
Time Since Circ.	7 HOURS			
Max. Rec. Temp.	125 F @ T.D.	F @	F @	F @
Equip. Location	702 GREAT BEND	/	/	/



Welex

COMPENSATED DENSITY LOG

COMPANY KRM PETROLEUM CORPORATION
WELL LEMON #8
FIELD COMANCHE
County COMANCHE State KANS

COMPANY KRM PETROLEUM CORPORATION

WELL LEMON #8

FIELD

COUNTY COMANCHE STATE KANSAS

Location: NE - NE

Sec. 23 Twp. 34S Rge. 20W

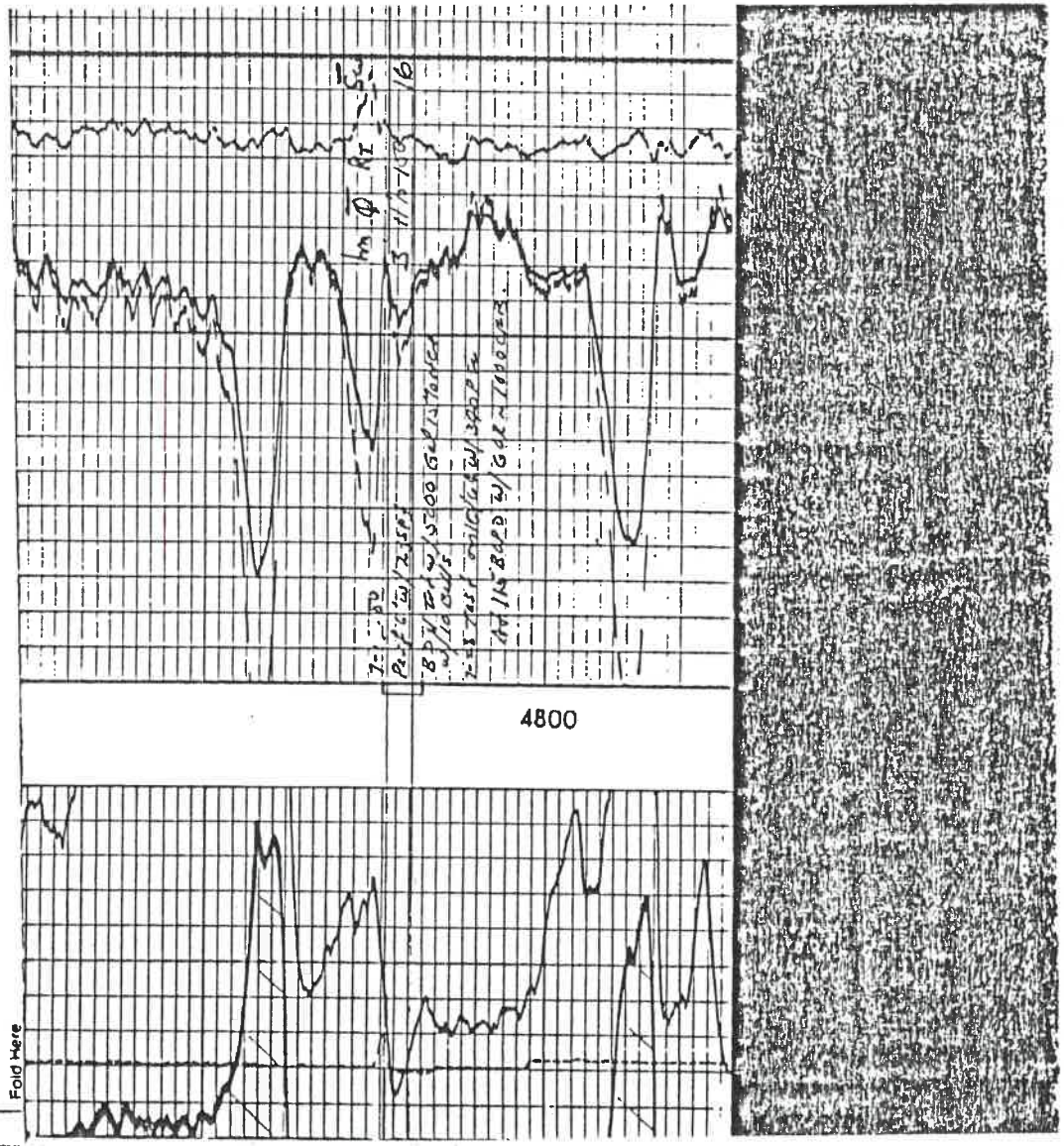
Other Services: GAMMA-GRD-SWN

Permanent Datum GROUND LEVEL Elev. 1748'
Log Measured From KELLY BUSHING Ft. Above Perm. Datum
Drilling Measured From KELLY BUSHING

Elev.: K.B. 1760'
D.F. 1758'
G.L. 1748'

Date	6-5-79
Run No	ONE
Type Log	GAMMA-GAMMA
Depth—Driller	5325'
Depth—Welex	5322'
Bottom Logged Interval	5321'
Top Logged Interval	3800'
Type Fluid in Hole	CHEMICAL MUD
Salinity, PPM Cl	18,000
Density	
Level	FULL
Max rec. temp. deg. F.	128°
Operating Rig time	2 HOURS
Recorded By	J. MORTON
Witnessed by	MR. C. LANDES

RUN No	BORE-HOLE RECORD Bit	From	To	CASING RECORD Size	Wgt.	From	To
1	12¼"	0	783'	8-5/8" SURF.		0	783'
2	7-7/8"	783'	5325'				



Fold Here

Welex

COMPENSATED DENSITY GAMMA CALIPER LOG

COMPANY KRM PETROLEUM CORPORATION

WELL LEMON #9

FIELD LEMON RANCH

County COMANCHE State KANSAS

COMPANY KRM PETROLEUM CORPORATION
WELL LEMON #9
FIELD LEMON RANCH
County COMANCHE State KANSAS

Location: C-SE-NW

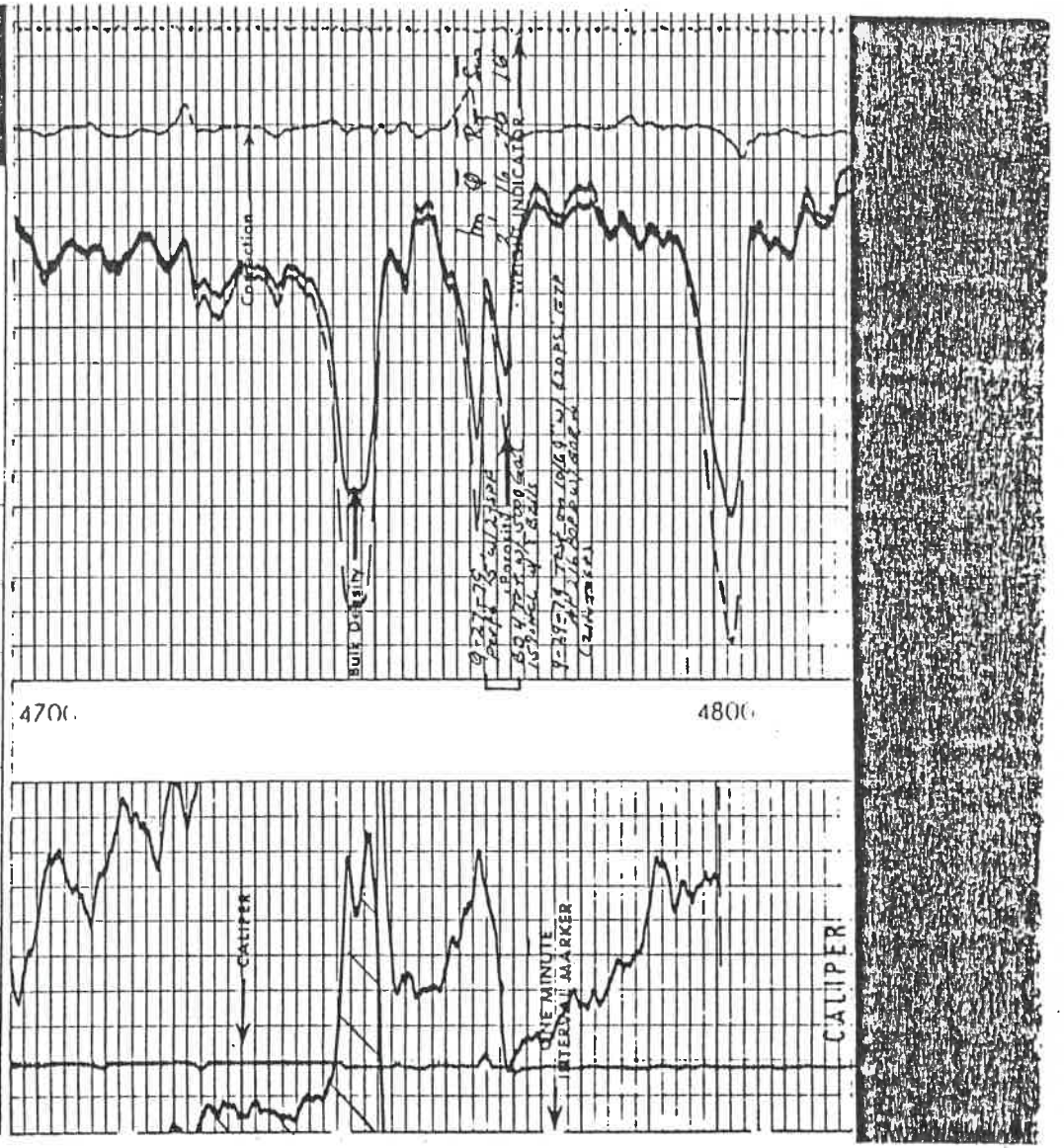
Other Services: C-GRD-SWN

Sec 14 Twp 34S Rge 20W

Permanent Datum GROUND LEVEL Elev. 1759'
Log Measured From KELLY BUSHING, 12 Ft Above Perm. Datum
Drilling Measured From KELLY BUSHING

Elev.: K.B. 1771'
D F
G L. 1759'

Date	8-23-79			
Run No	ONE			
Depth—Driller	4840'			
Depth—Welex	4827'			
Btm. Log Inter.	4827'			
Top Log Inter.	3800'			
Casing—Driller	8-5/8" @ 669'	@	@	@
Casing—Welex	8-5/8" @ 550'			
Bit Size	7-7/8"			
Type Fluid in Hole	PREMIX MONPAC MUD			
Dens. / Visc.	9.1 / 53	/	/	/
pH / Fluid Loss	11 / 20 ml	/ ml	/ ml	/ ml
Source of Sample	MUD PIT			
R @ Meas. Temp	.17 @ 83 F	@ F	@ F	@ F
R @ Meas. Temp	.16 @ 80 F	@ F	@ F	@ F
R @ Meas. Temp	.23 @ 81 F	@ F	@ F	@ F
Source R. R.	MEASURED			
R @ BHT	.12 @ 120 F	@ F	@ F	@ F
Time Since Circ.	7 HOURS			
Max. Rec. Temp.	120 F @ T.D.	F @	F @	F @
Equip. / Location	702 GREAT BEND	/	/	/
Recorded By	S. WINDER			
Witnessed By	MR. LANDES			



Welex

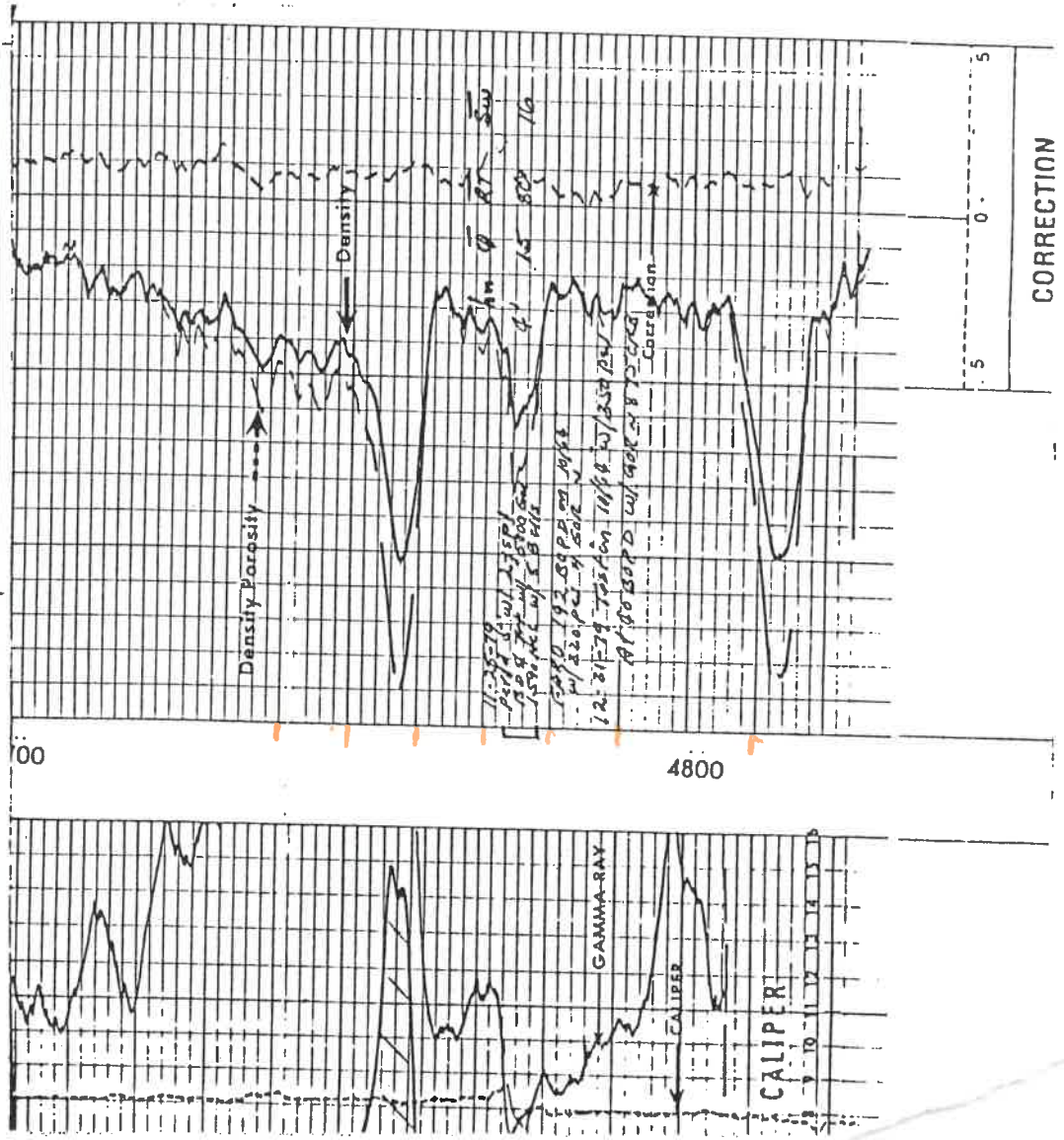
LINEAR NEUTRON COMPENSATED DENSITY GAMMA CALIPER LOG

COMPANY KRM PETROLEUM CORPORATION
WELL LEMON =10
FIELD
COUNTY COMANCHE STATE KANSAS
Location C-NW-NW
Sec 24 Twp 34S Rge 20W
Other Services GAMMA-GUARD

Permanent Datum GROUND LEVEL Elev. 1750'
Log Measured From KELLY BUSHING, 8 Ft Above Perm Datum
Drilling Measured From KELLY BUSHING

Elev. K B 1758'
D F 1756'
G L 1750'

Date	11-19-79	11-19-79	11-19-79
Run No. ONE	GAMMA	NEUTRON	DENSITY
Depth - Driller	4830'	4830'	4830'
Depth - Welex	4825'	4825'	4825'
Btm. Log Inter.	4805'	4798'	4824'
Top Log Inter.	3900'	3900'	3900'
Casing Driller	8-5/8" 691'	@	@
Casing Welex			
Bit Size	7-7/8"		
Type Fluid in Hole	DRILLING MUD		
Dens. / Visc.	9.3 44	/	/
pH / Fluid Loss	10.0 14.4	/ ml	/ ml
Source of Sample	FLOW LINE		
R_m @ Meas. Temp	.33 @ 68 F	@ F	@ F
R_mf @ Meas. Temp	.31 @ 60 F	@ F	@ F
R_mc @ Meas. Temp	.28 @ 56 F	@ F	@ F
Source R_mf R_mc	MEASURED	/	/
R_m @ BHT	.19 @ 120 F	@ F	@ F
Time Circ. Stopped	2 HOURS		
Max. Rec. Temp.	120 F @ T.D.	F @	F @



Welex

LINEAR NEUTRON • DENSITY POROSITY LOG

COMPANY KRM PETROLEUM CORPORATION

WELL LEMON #11

FIELD

COUNTY COMANCHE STATE KANSAS

Location: C-NE-NW

Other Services: GAMMA-GUARD

Sec 14 Twp 34S Rge 20W

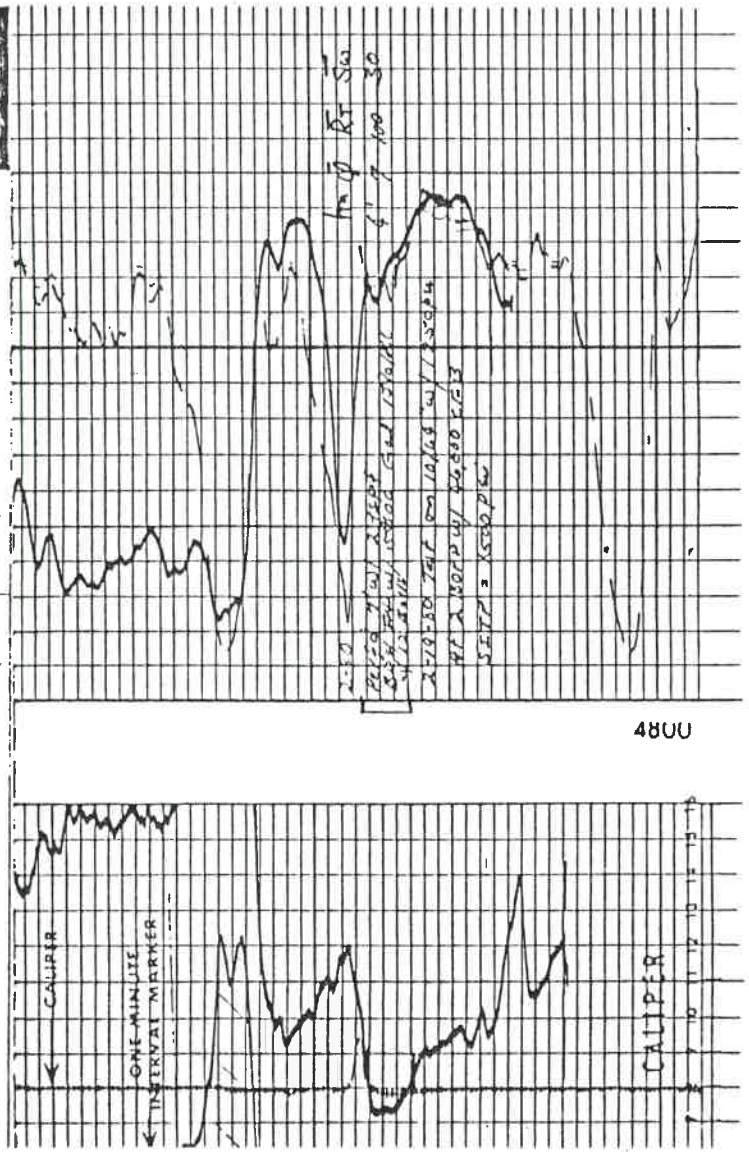
Permanent Datum GROUND LEVEL Elev 1763'

Log Measured From KELLY BUSHING, 12 Ft Above Perm Datum

Drilling Measured From KELLY BUSHING

Elev K B 1775'
D F
G L 1763'

Date	1-5-80	1-5-80	1-5-80
Run No	ONE	GAMMA	NEUTRON	DENSITY
Depth - Driller	4829'	4829'	4829'
Depth - Welex	4806'	4806'	4806'
Btm Log Inter	4786'	4776'	4806'
Top Log Inter	3900'	3900'	3900'
Casing - Driller	8-5/8" 784'		
Casing - Welex	8-5/8" @786'		
Bit Size	7-7/8"		
Type Fluid in Hole	DRILLING MUD		
Dens / Visc	9 45		
pH / Fluid Loss	11 8.7 ml	ml	ml
Source of Sample	FLOW LINE		
R @ Meas Temp	.42 @ 45 F	@ F	@ F
R mf @ Meas Temp	.38 @ 52 F	@ F	@ F
R @ Meas Temp	.65 @ 58 F	@ F	@ F
Source of R w	MEASURED		
R @ BHT	.16 @ 120 F	@ F	@ F
Time Since Circ	2½ HOURS		
Max Rec Temp	120 @ T.D.	F@	F@
Equip Location	1932 GREAT BEND		
Recorded By	S. WINDER	M. SORENSEN	
Witnessed By	MR.		



DENSITY POROSITY
ρ_g = 2.71
20% 10% 0%
30

NEUTRON POROSITY
MATRIX LIMESTONE
20 10 0

GAMMA
0 360

CALIPER
6" 16"

Welex

COMPENSATED DENSITY GAMMA CALIPER LOG

COMPANY FIELD PRINT
WELL
FIELD
County
State

COMPANY KRM PETROLEUM CORPORATION

WELL RHOADES #1

FIELD LEMON RANCH

COUNTY COMANCHE STATE KANSAS

Location
SE-NE

Sec. 14 Twp 34S Rge 20W

Other Services:
G-GRD-SWN

Permanent Datum GROUND LEVEL Elev. 1759'
Log Measured From KELLY BUSHING 12 Ft. Above Perm. Datum
Drilling Measured From KELLY BUSHING

Elev.: K.B. 1771'
D.F.
G.L. 1759'

Date	6-17-79	DENSITY	GAMMA	
Run No.		ONE	ONE	
Depth–Driller		4830'	4830'	
Depth–Welex		4824'	4824'	
Btm. Log Inter.		4823'	4797'	
Top Log Inter.		3800'	3800'	
Casing–Driller		8⅝" @ 783'	10¾" @ 93'	@ @
Casing–Welex		779'		
Bit Size		7⅞"		
Type Fluid in Hole		PREMIX MONPAC DRILLING MUD		
Dens. | Visc.		8.6 | 56	|	| |
pH | Fluid Loss		12.0 | 9.2 ml	| ml	| ml | ml
Source of Sample		FLOWLINE		
R_m @ Meas. Temp.		.22 @ 89 °F	@ °F	@ °F @ °F
R_{mf} @ Meas. Temp.		.19 @ 90 °F	@ °F	@ °F @ °F
R_{mc} @ Meas. Temp		.37 @ 98 °F	@ °F	@ °F @ °F
Source R_{mf} R_{mc}		MEAS | MEAS	|	| |
R_m @ BHT		.165 @ 118 °F	@ °F	@ °F @ °F
Time Since Circ.		6 hours		

Welex

COMPENSATED DENSITY LOG

COMPANY KRM PETROLEUM CORPORATION

WELL RHODES #2

FIELD LEMON RANCH

COUNTY COMANCHE STATE KANSAS

Location: C-SW-NE

Other Services: G-GRD-SWN

Sec. 12 Twp. 34S Rge. 20W

1771'

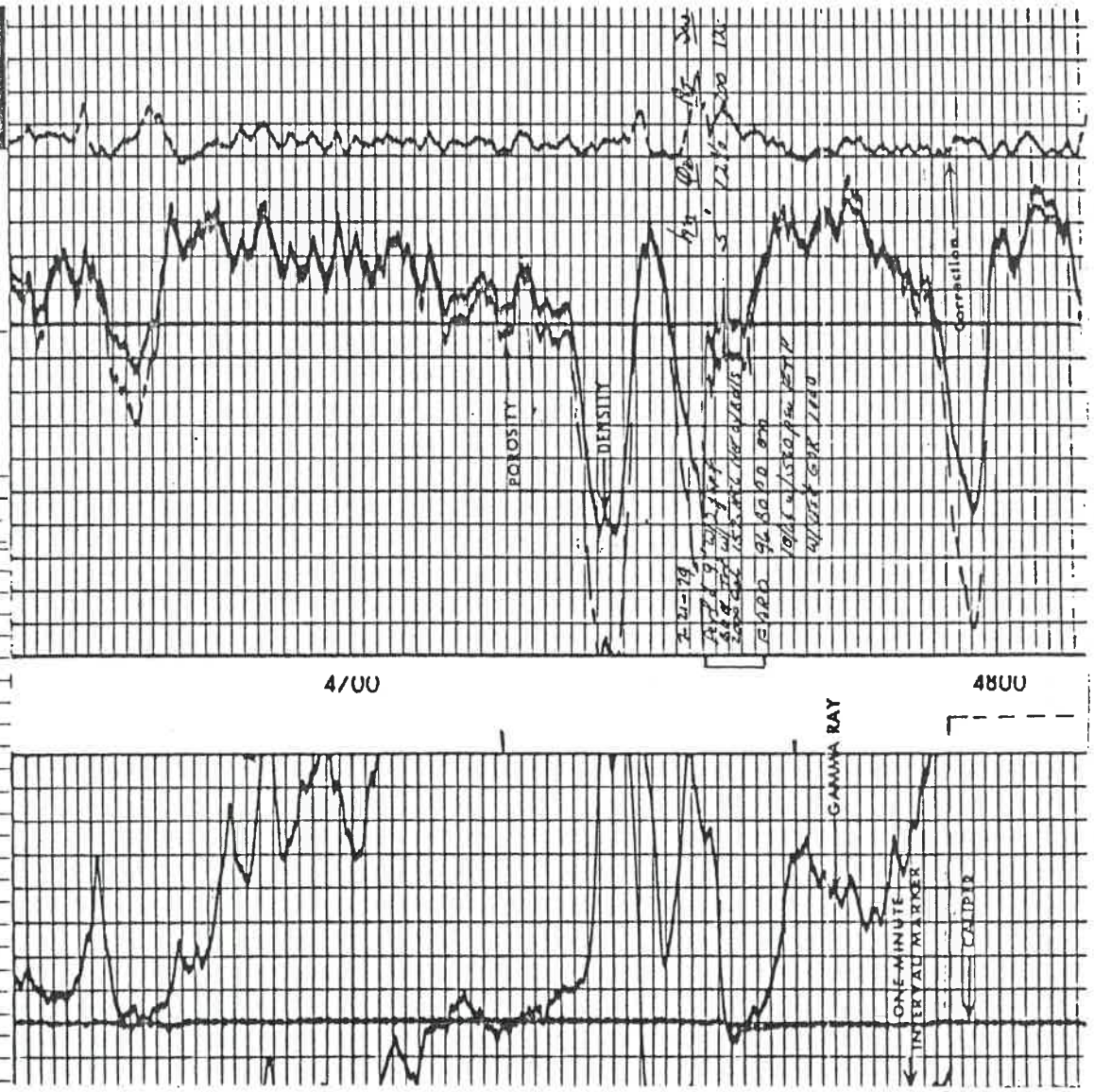
Permanent Datum GROUND LEVEL Elev. 1759' Elev.: K.B. 1771'

Measured From KELLY BUSHING 12' Ft. Above Perm. Datum D.F.

Log Measured From KELLY BUSHING G.L. 1759'

Run No.	ONE	ONE
Type Log	GAMMA	DENSITY
Depth—Driller	4820'	4820'
Depth—Welex	4818'	4818' SEE REMARKS
Depth Logged Interval	4790'	4817'
Top Logged Interval	3900'	3900'
Type Fluid in Hole	DRILLING MUD	
Salinity, PPM Cl.	22,000	
Density	8.7	
Level	FULL	
Max. rec. temp. deg. F.	120	
Operating Rig time	2 HRS.	
Recorded By	MONTE SCHRADER	
Witnessed by	MR. LANDES	

BORE-HOLE RECORD			CASING RECORD			
Bit	From	To	Size	Wgt.	From	To
12¼"	0	782	8 5/8"		0	782'
7⅞"	782	4820'				



Welex

LINEAR NEUTRON COMPENSATED DENSITY GAMMA CALIPER LOG

COMPANY KRM PETROLEUM CORPORATION
WELL RHODES #3
FIELD LEMON RANCH
County COMANCHE State KANSAS

COMPANY KRM PETROLEUM CORPORATION

WELL RHODES #3

FIELD LEMON RANCH

COUNTY COMANCHE STATE KANSAS

Location: C-NW-NE

Sec 14 Twp 34S Rge 20W

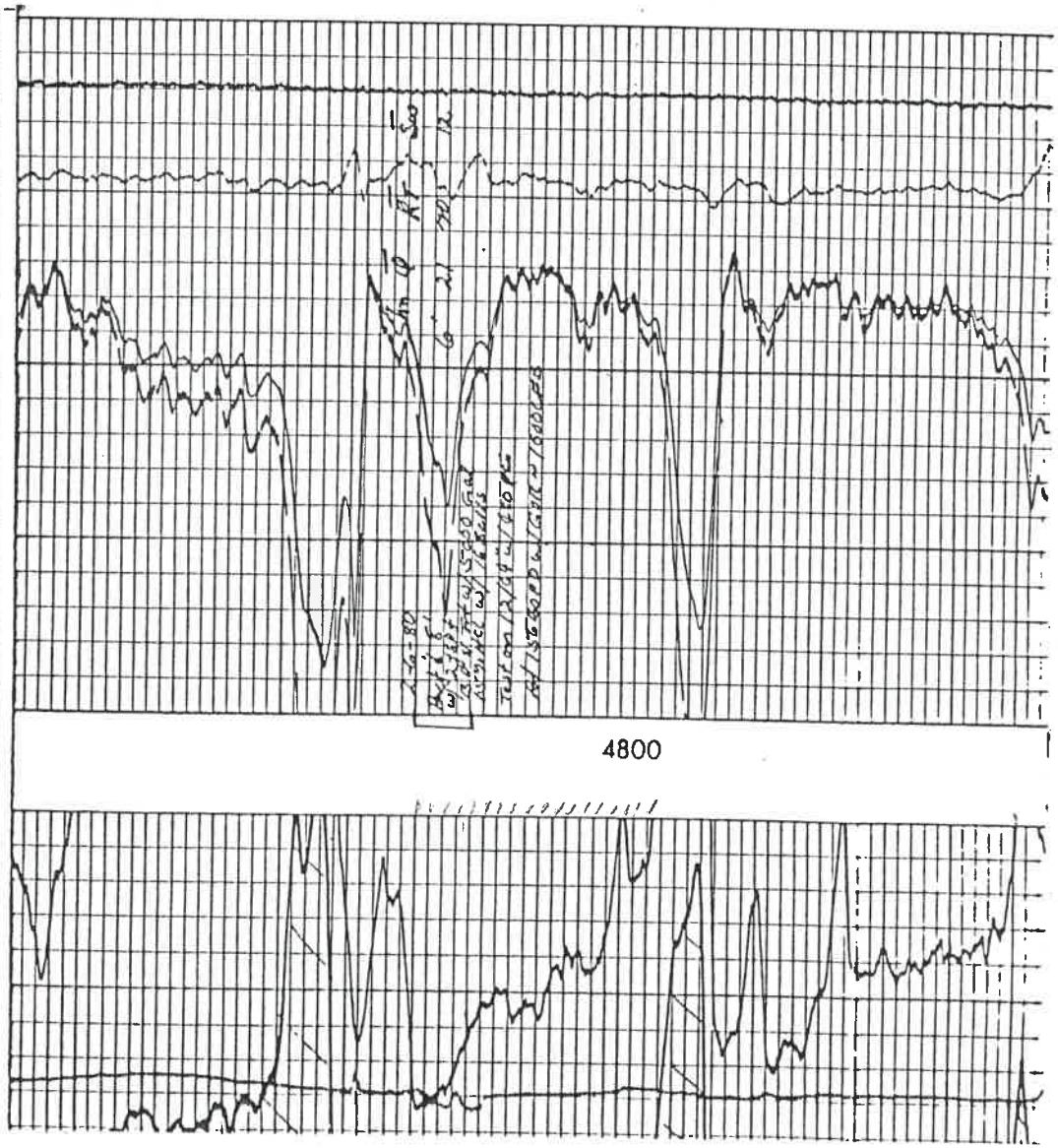
Other Services: GAMMA-GUARD

Permanent Datum GROUND LEVEL Elev. 1761' Elev. K.B. 1773'

Log Measured From KELLY BUSHING, 12 Ft. Above Perm. Datum D.F.

Drilling Measured From KELLY BUSHING G.L. 1761'

Date	12-21-79	12-21-79	12-21-79	
Run No. ONE	GAMMA	NEUTRON	DENSITY	
Depth—Driller	5278'	5278'	5278'	
Depth—Welex	5275'	5275'	5275'	
Btm. Log Inter.	5255'	5247'	5274'	
Top Log Inter.	3800'	3800'	3800'	
Casing—Driller	8-5/8" 772'	@	@	@
Casing—Welex				
Bit Size	7-7/8"			
Type Fluid in Hole	DRILLING MUD			
Dens. / Visc.	9.3 142	/	/	/
pH / Fluid Loss	9.0 11.9 ml	/ ml	/ ml	/ ml
Source of Sample	FLOW LINE			
R_m @ Meas. Temp.	2.4 @ 56 F	@ F	@ F	@ F
R_mf @ Meas. Temp.	2.6 @ 40 F	@ F	@ F	@ F
R_mc @ Meas. Temp.	3.8 @ 40 F	@ F	@ F	@ F
Source R_mf R_mc	MEASURED	/	/	/
R_m @ BHT	1.08 @ 124 F	@ F	@ F	@ F
Time Since Circ.	4 HOURS			
Max. Rec. Temp.	124 F @ T.D.	F @	F @	F @
Equip. / Location	702 GREAT BEND	/	/	/
Recorded By	MONTE SCHRADER			



WIRELINE SERVICES
GEARHART-OWEN

COMPENSATED DENSILOG
COMPENSATED NEUTRON LOG

COMPANY KRM PETROLEUM

WELL RHOADES NO. 4

FIELD LEMON RANCH

COUNTY COMANCHE STATE KANSAS

Location: C NE NE

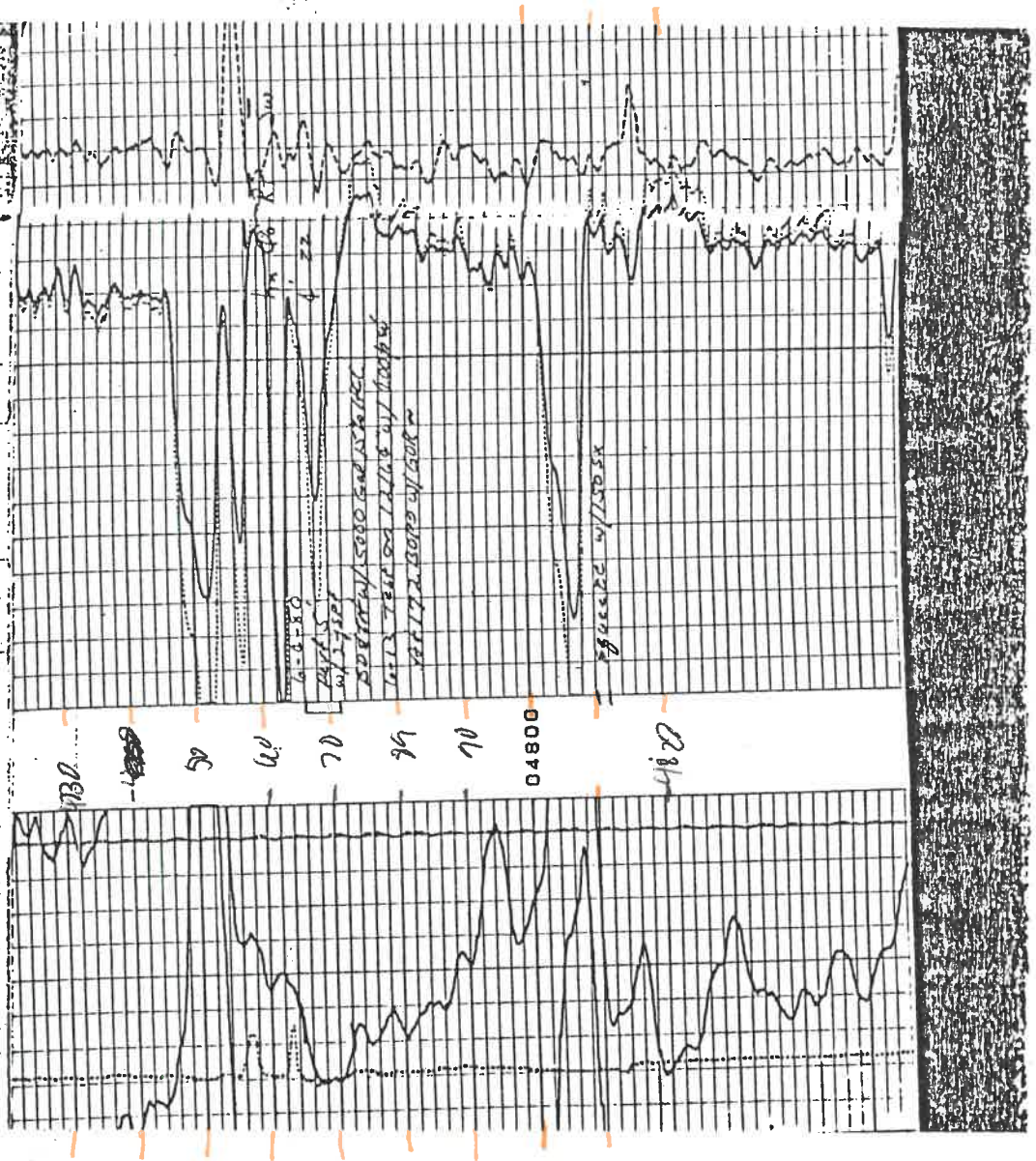
Other Services: DIL

Sec 14 Twp. 34S Rge. 20W

Permanent Datum:	GL	Elev.: 1765	Elev. K.B. 1777
Log Measured from	KB	11 Ft. Above Perm. Datum	D.F. ---
Drilling Measured From	KB		G.L. 1765

Date	2-18-80		
Run No	One		
Depth Driller	5280		
Depth Logger	5274		
Bottom logged interval	5273		
Top logged interval	4050		
Type fluid in hole	Chem Gel		
Density / Visc.	9.2	47	
pH / Fluid Loss	8.5	30.4	
Max rec. temp., deg F.	120 °F		
Source of Samples	Flowline		
Rm @ Meas Temp.	.26 @ 50 °F		
Rmf @ Meas Temp.	.16 @ 50 °F		
Rmc @ Meas Temp.	.35 @ 50 °F		
Source Rmf / Source Rmc	M	M	
Time End Circulation	2300 Hours		
Time Logger on Bottom	0615 Hours		
Recorded By	Dean		
Witnessed By	Mr. Bird		

Run	Bore Hole Record	Casing Record



APPENDIX V

EXHIBIT V-2

Lemon Ranch Core Data
Summary - Standard Analyses

Well	Cored Interval	Net[1] Feet	Permeability - Md. Horizontal	Permeability - Md. Vertical	Porosity %	Saturations - % Water	Saturations - % Oil
Lemon #2X	4764-67	0	0	0	6.9	36.7	11.0
Lemon #5	4784-88	3	48.9	20.6	25.5	14.8	8.2
Lemon #6	4781-92	8	76.6	63.0	21.2	26.2	9.9
Lemon #7	4793-98	2	1.0	0	14.8	32.1	1.7
Lemon #8	4776-84	4	3.8	1.2	9.9	27.8	8.2
Lemon #9	4774-78	1	1.0	0.8	16.9	18.5	9.2
Lemon #10	4770-75	4	7.5	6.7	22.5	20.8	7.6
Lemon #11	4760-67	6	35.3	11.6	10.4	21.7	10.9
Rhodes #1	4766-70	2	13.4	7.2	15.1	18.8	11.4
Rhodes #2	4755-65	9	84.7	49.6	19.1	22.9	8.7
Rhodes #3	4770-81	6	17.0	6.0	16.4	25.3	12.9
Average 10 Wells[2]	--	4.5	42.5	25.9	17.4	23.5	8.9

Notes

1/ Net feet - Greater than 1.0 millidarcy.

2/ Lemon #2X not included in average.

KRM LEMON RANCH #8
INITIAL/DST 6-2-79
SWOPE LIME @ 4779 MP

APPENDIX IV

EXHIBIT IV-7

PRESSURE BUILD-UP ANALYSIS

POINTS USED	RADIUS FELT, FT	SLOPE PSI/CYC	K (MDS)	P. I. B/D/PSI	COMPL. EFF., %	SIBHP PSIG	AVG. P PSIG
1- 2	7.	195. 1	0. 16	0. 00	174. 3	203.	476.
2- 3	8.	346. 4	0. 09	0. 00	190. 0	261.	687.
3- 4	9.	446. 4	0. 07	0. 00	197. 7	313.	810.
4- 5	9.	732. 7	0. 04	0. 00	212. 3	430.	1129.
5- 6	10.	1011. 6	0. 03	0. 00	223. 7	623.	1395.
6- 7	11.	1596. 3	0. 02	0. 00	246. 4	810.	1841.
7- 8	11.	2081. 7	0. 01	0. 00	261. 6	902.	2155.
8-14	13.	2443. 9	0. 01	0. 00	270. 8	1312.	2372.
14-16	13.	2097. 4	0. 01	0. 00	262. 8	1393.	2158.
16-20	14.	1850. 1	0. 02	0. 00	239. 6	1498.	2132.

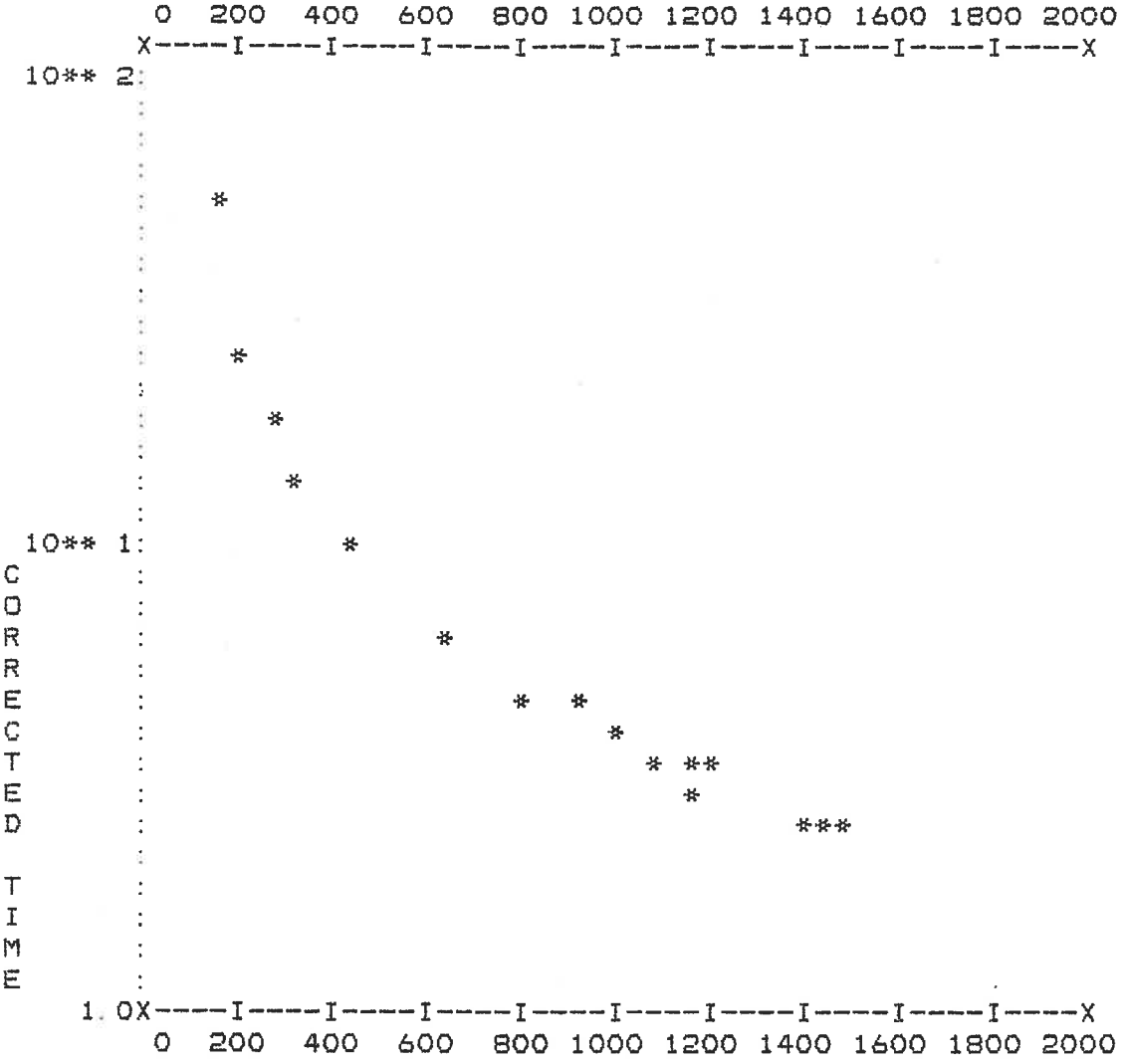
POINT	PRESSURE	CORRECTED PRESSURE@	DT (HOURS)	(T+DT)/DT	CORRECTED (T+DT)/DT@@
1	146.	146.	0. 05	49. 000	49. 000
2	203.	203.	0. 10	25. 000	25. 000
3	261.	261.	0. 15	17. 000	17. 000
4	313.	313.	0. 20	13. 000	13. 000
5	430.	430.	0. 30	9. 000	9. 000
6	623.	623.	0. 50	5. 800	5. 800
7	810.	810.	0. 70	4. 429	4. 429
8	902.	902.	0. 80	4. 000	4. 000
9	992.	992.	0. 90	3. 667	3. 667
10	1076.	1076.	1. 00	3. 400	3. 400
11	1140.	1140.	1. 10	3. 182	3. 182
12	1204.	1204.	1. 20	3. 000	3. 000
13	1266.	1266.	1. 30	2. 846	2. 846
14	1312.	1312.	1. 40	2. 714	2. 714
15	1156.	1156.	1. 50	2. 600	2. 600
16	1393.	1393.	1. 60	2. 500	2. 500
17	1428.	1428.	1. 70	2. 412	2. 412
18	1453.	1453.	1. 80	2. 333	2. 333
19	1474.	1474.	1. 90	2. 263	2. 263
20	1498.	1498.	2. 00	2. 200	2. 200

@ CORRECTED FOR AFTERFLOW
@@ CORRECTED FOR SUPERPOSITION

KRM LEMON RANCH #8
INITIAL/DST 6-2-79
SWOPE LIME @ 4779 MP

APPENDIX IV

EXHIBIT IV-7a



KRM RHODES #1
INITIAL/DST 6-16-79
SWOPE LIME @ 4765 MP

APPENDIX IV

EXHIBIT IV-8

PRESSURE BUILD-UP ANALYSIS

POINTS USED	RADIUS FELT, FT	SLOPE PSI/CYC	K (MDS)	P.I. B/D/PSI	COMPL. EFF., %	SIBHP PSIG	AVG. P PSIG
1- 2	13.	158.5	0.20	0.01	227.6	144.	321.
2- 3	14.	275.6	0.11	0.00	250.5	188.	451.
3- 4	15.	439.9	0.07	0.00	271.4	236.	608.
4- 5	17.	479.1	0.07	0.00	276.0	306.	641.
5- 7	21.	454.6	0.07	0.00	271.8	427.	623.
7- 8	22.	644.1	0.05	0.00	321.5	450.	706.
8- 9	22.	2202.9	0.01	0.00	473.1	516.	1326.
9-11	23.	6595.4	0.00	0.00	516.2	830.	2944.
11-12	23.	7201.2	0.00	0.00	519.6	969.	3136.
12-15	23.	6286.8	0.00	0.00	510.8	1256.	2863.
15-19	24.	5126.7	0.01	0.00	483.7	1474.	2567.

POINT	PRESSURE	CORRECTED PRESSURE@	DT (HOURS)	(T+DT)/DT	CORRECTED (T+DT)/DT@@
1	99.	99.	0.05	25.000	25.000
2	144.	144.	0.10	13.000	13.000
3	188.	188.	0.15	9.000	9.000
4	236.	236.	0.20	7.000	7.000
5	306.	306.	0.30	5.000	5.000
6	380.	380.	0.50	3.400	3.400
7	427.	427.	0.70	2.714	2.714
8	450.	450.	0.80	2.500	2.500
9	516.	516.	0.90	2.333	2.333
10	688.	688.	1.00	2.200	2.200
11	830.	830.	1.10	2.091	2.091
12	969.	969.	1.20	2.000	2.000
13	1080.	1080.	1.30	1.923	1.923
14	1176.	1176.	1.40	1.857	1.857
15	1256.	1256.	1.50	1.800	1.800
16	1321.	1321.	1.60	1.750	1.750
17	1383.	1383.	1.70	1.706	1.706
18	1430.	1430.	1.80	1.667	1.667
19	1474.	1474.	1.90	1.632	1.632

@ CORRECTED FOR AFTERFLOW
@@ CORRECTED FOR SUPERPOSITION

KRM RHODES #1
INITIAL/DST 6-16-79
SWOPE LIME @ 4765 MP

APPENDIX IV

EXHIBIT IV-8a