

OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650

October 6, 1982

Mainline USA, Inc.
105 East Madison
Iola, Kansas 66749

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the McMillen Lease, Well No. 9, located in Neosho County, Kansas and submitted to our laboratory on October 1, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/rmc

5 c to Iola, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

Oilfield Research Laboratories
GENERAL INFORMATION & SUMMARY

Company Mainline USA, Inc. Lease McMillen Well No. 9
 Location NW $\frac{1}{4}$
 Section 14 Twp. 28S Rge. 18E County Neosho State Kansas

Elevation, Feet

Name of Sand.....	Bartlesville
Top of Core	772.0
Bottom of Core	792.2
Top of Sand	772.0
Bottom of Sand	792.2
Total Feet of Permeable Sand	14.3
Total Feet of Floodable Sand	11.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 6	1.0	1.0
6 - 18	5.4	6.4
18 - 30	4.1	10.5
40 - 79	3.8	14.3

Average Permeability Millidarcys	28.8
Average Percent Porosity	18.1
Average Percent Oil Saturation	25.3
Average Percent Water Saturation.....	55.7
Average Oil Content, Bbls./A. Ft.	382.
Total Oil Content, Bbls./Acre.....	7,227.
Average Percent Oil Recovery by Laboratory Flooding Tests.....	6.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	117.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,386.
Total Calculated Oil Recovery, Bbls./Acre.....	

See "Calculated Recovery"
 Section

-2-

The core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water and salt water were used as drilling fluids.

It was reported by the client that there was an additional 17 feet of oil bearing sand below the bottom of the analyzed core. The client stated that this 17 feet of core was lost because of a mechanical failure of the core barrel.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
772.0 - 773.0	Grayish brown very shaly sandstone.
773.0 - 774.3	Gray very shaly sandstone.
774.3 - 776.9	Brown sandstone.
776.9 - 777.2	Gray shale.
777.2 - 777.6	Brown sandstone.
777.6 - 778.8	Grayish brown very shaly sandstone.
778.8 - 781.2	Brown sandstone.
781.2 - 782.0	Brown sandstone with scattered gray shale partings.
782.0 - 784.5	Brown sandstone.
784.5 - 786.6	Grayish light brown calcareous very shaly sandstone.
786.6 - 787.6	Light brown shaly sandstone.
787.6 - 792.2	Brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,386 barrels of oil per acre was obtained from 11.8 feet of sand. The weighted average percent oil saturation was reduced from 30.7 to 23.8, or represents an average recovery of 6.9 percent. The weighted average effective permeability of the samples is 1.43 millidarcys, while the average initial fluid production pressure is 25.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 20 samples tested, 12 produced water and oil, and 2 produced water only. This indicates that approximately 60 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 3,480 barrels of oil per acre. This is an average recovery of 295 barrels per acre foot from 11.8 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.07
Reservoir water saturation, percent, estimated	40.0
Average porosity, percent	21.4
Oil saturation after flooding, percent	23.8
Performance factor, percent, estimated	55.0
Net floodable sand, feet	11.8

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Mainline USA, Inc. Lease McMillen Well No. 9

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	772.6	10.7	14	78	92	116	Imp.	1.0	1.0	116	0.00
2	773.6	11.1	7	55	62	60	Imp.	1.3	2.3	78	0.00
3	774.5	19.0	20	49	69	295	21.	0.8	3.1	236	16.80
4	775.6	20.2	28	43	71	439	41.	0.8	3.9	351	32.80
5	776.5	20.3	31	45	76	488	24.	1.0	4.9	488	24.00
6	777.5	17.8	20	48	68	276	16.	0.4	5.3	110	6.40
7	778.4	9.1	14	82	96	99	Imp.	1.2	6.5	119	0.00
8	779.5	20.4	29	47	76	459	13.	1.4	7.9	643	18.20
9	780.5	22.2	28	48	76	482	13.	1.0	8.9	482	13.00
10	781.4	19.9	23	54	77	355	23.	0.8	9.7	284	18.40
11	782.5	20.9	36	43	79	584	49.	1.0	10.7	584	49.00
12	783.6	19.6	27	50	77	411	27.	0.7	11.4	288	18.90
13	784.4	18.3	32	48	80	454	23.	0.8	12.2	363	18.40
14	785.5	6.6	19	76	95	97	Imp.	1.1	13.3	107	0.00
15	786.7	15.9	25	68	93	308	1.8	0.5	13.8	154	0.90
16	787.5	19.0	25	63	88	369	5.7	0.5	14.3	185	2.85
17	788.5	21.8	27	56	83	457	17.	1.6	15.9	731	27.20
18	789.5	22.8	32	56	88	566	13.	1.0	16.9	566	13.00
19	790.6	23.6	34	51	86	623	74.	1.0	17.9	623	74.00
20	791.4	24.4	38	48	86	719	78.	1.0	18.9	719	78.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Mainline USA, Inc.		Lease		McMillen		Well No.		9
Depth Interval, Feet		Feet of Core Analyzed		Average Permeability, Millidarcys		Permeability Capacity Ft. x Md.				
772.0 - 778.8		3.0		26.7		80.00				
778.8 - 792.2		11.3		29.4		331.85				
772.0 - 792.2		14.3		28.8		411.85				
Depth Interval, Feet		Feet of Core Analyzed		Average Percent Porosity		Average Percent Oil Saturation		Average Percent Water Saturation		Total Oil Content Bbls./Acre
772.0 - 778.8		6.5		14.6		18.0		59.3		1,498
778.8 - 792.2		12.4		19.9		29.1		53.8		5,729
772.0 - 792.2		18.9		18.1		25.3		55.7		7,227

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Mainline USA, Inc.			Lease			McMillen			Well No.			9		
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.						
			%	Bbbls./A. Ft.	%	Bbbls./A. Ft.	% Oil	% Water									
1	772.6	10.9	14	118	0	0	14	78	118	Imp.	-						
2	773.6	11.6	7	63	0	0	7	56	63	Imp.	-						
3	774.5	19.1	20	296	0	0	20	76	296	0.75	30						
4	775.6	20.3	28	441	2	31	26	64	410	0.67	30						
5	776.5	20.4	31	491	6	95	25	70	396	0.45	25						
6	777.5	17.3	21	282	0	0	21	47	282	Imp.	-						
7	778.4	9.3	14	101	0	0	14	82	101	Imp.	-						
8	779.5	20.5	29	461	5	80	24	60	381	0.15	25						
9	780.5	22.1	28	480	5	86	23	61	394	0.15	40						
10	781.4	19.8	23	353	0	0	23	55	353	Imp.	-						
11	782.5	21.0	36	587	8	130	28	64	457	3.45	20						
12	783.6	19.7	27	413	4	61	23	62	352	0.90	25						
13	784.4	18.5	32	459	10	144	22	65	315	0.97	25						
14	785.5	7.0	19	103	0	0	19	76	103	Imp.	-						
15	786.7	16.4	24	305	0	0	24	70	305	0.15	45						
16	787.5	19.2	25	372	3	45	22	72	327	1.20	25						
17	788.5	21.9	27	459	5	85	22	66	374	0.75	25						
18	789.5	22.9	32	569	11	195	21	68	374	1.72	20						
19	790.6	23.5	34	620	13	237	21	74	383	3.22	20						
20	791.4	24.3	38	716	10	189	28	64	527	3.90	20						

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

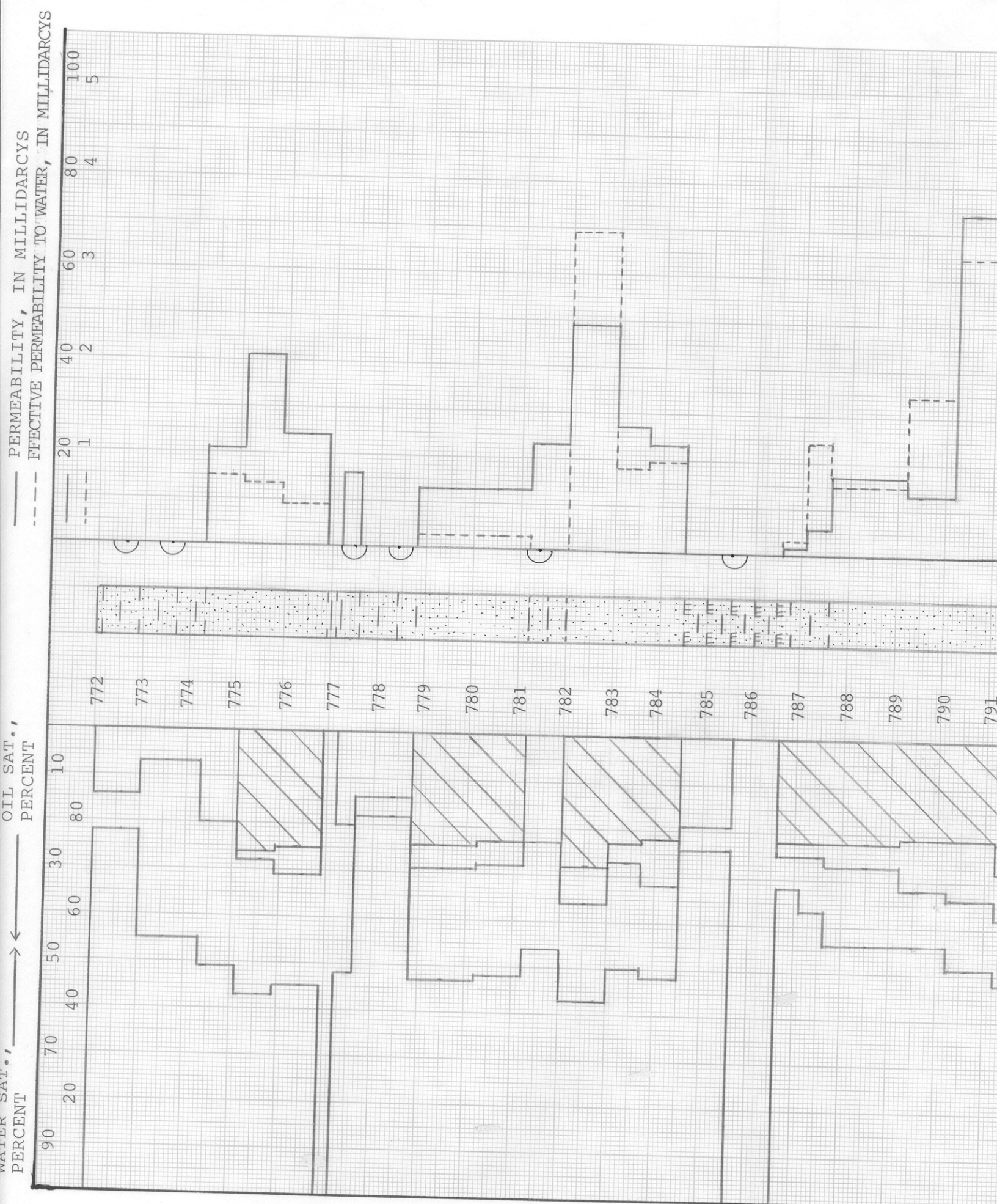
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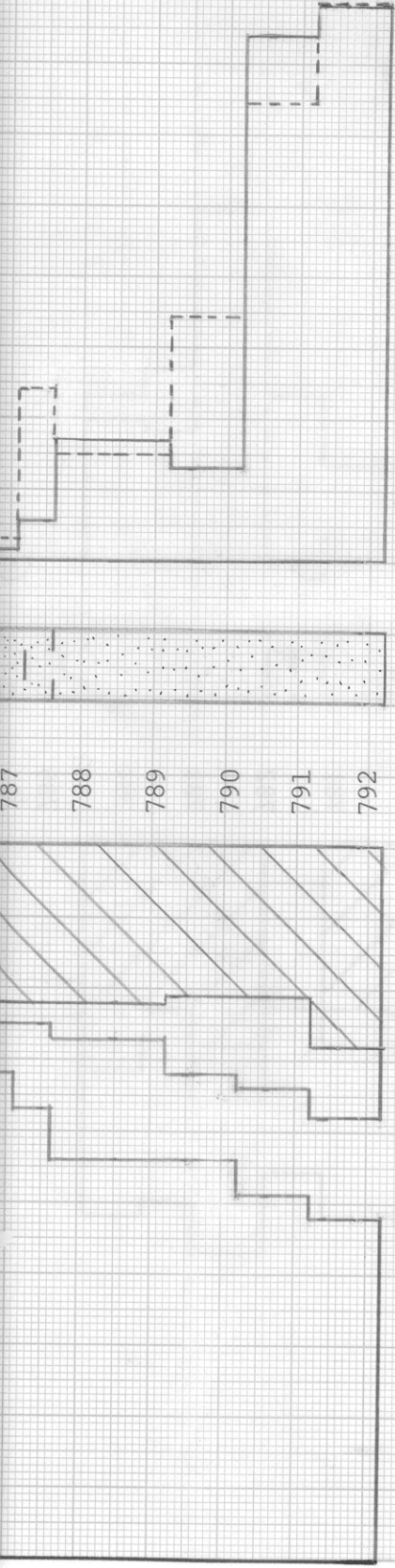
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Mainline USA, Inc.	Lease	Mcmillen	Well No.	9
Depth Interval, Feet	772.0 - 778.8	778.8 - 792.2	772.0 - 792.2		
Feet of Core Analyzed	1.8	10.0	11.8		
Average Percent Porosity	20.3	21.6	21.4		
Average Percent Original Oil Saturation	29.6	30.9	30.7		
Average Percent Oil Recovery	4.2	7.4	6.9		
Average Percent Residual Oil Saturation	25.4	23.5	23.8		
Average Percent Residual Water Saturation	67.3	65.2	65.5		
Average Percent Total Residual Fluid Saturation	92.7	88.7	89.3		
Average Original Oil Content, Bbls./A. Ft.	469.	520.	511.		
Average Oil Recovery, Bbls./A. Ft.	67.	127.	117.		
Average Residual Oil Content, Bbls./A. Ft.	402.	393.	394.		
Total Original Oil Content, Bbls./Acre	844.	5,194.	6,038.		
Total Oil Recovery, Bbls./Acre	120.	1,266.	1,386.		
Total Residual Oil Content, Bbls./Acre	724.	3,928.	4,652.		
Average Effective Permeability, Millidarcys	0.55	1.59	1.43		
Average Initial Fluid Production Pressure, p.s.i.	27.5	24.5	25.0		

NOTE: Only those samples which recovered oil were used in calculating the above averages.





KEY:



SANDSTONE



SHALE



IMPERMEABLE TO WATER

SHALY SANDSTONE



SANDSTONE WITH SHALE PARTINGS



SHALY CALCAREOUS SANDSTONE



FLOODPOT RESIDUAL OIL SATURATION

MAINLINE USA, INCORPORATED

MC MILLEN LEASE

NEOSHO COUNTY, KANSAS

WELL NO. 9

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
772.0 - 778.8	6.5	14.6	18.0	59.3	26.7	3480 (PRIMARY AND WATERFLOODING)
778.8 - 792.2	12.4	19.9	29.1	53.8	29.4	
772.0 - 792.2	18.9	18.1	25.3	55.7	28.8	

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CHANUTE, KANSAS
OCTOBER, 1982
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