KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 47-1

Engineering Report on Sorghum Hollow Pool,
Montgomery County, Kansas

by

Gene E. Abernathy

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KANSAS GEOLOGICAL SURVEY
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KGS
OF
47-1

ENGINEERING REPORT

BY

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LIST OF ATTACHMENTS

ENGINEERING REPORT

June 1, 1947

By: Gene E. Abernathy

In re: Sorghum Hollow Pool
Circle Valley Field
Sec 19, 20, T 32 S,. R 14 E.

RESERVOIR STUDY

OBJECT

To review data pertinent to a study of the Sorghum Hollow Pool, and to formulate the most efficient secondary program for a proposed unit.

CONCLUSIONS

1.

	Minimum Estimated Recovery Figures	Maximum Estimated Recovery Figures
Estimated Productive Acres	275	465
Estimated Possible Recovery of Net Bbls of Oil	630,000	1,068,000
Development Cost - Including Pilot Flood & Purchase Cost	$244,926.00	$375,656.00
Operating Cost	$180,000.00	$305,000.00
Net Profit Before Taxes	$766,374.00	$1,323,774.00
Life of Project	14 years	16 years
Water Input Ratio	5 - 1	5 - 1
Immediate Cost to Include Purchase & Pilot Flood Costs	$40,000.00	$40,000.00
Cost Per Month After Pilot Flood is Proven Until Development is Completed	$15,000.00	$15,000.00

2. Only minimum estimates of financial returns are made to formulate the Recommendations of this Report.

3. The Sorghum Hollow Pool is a Weiser sand lens in a trend running N.E. - S.W. The sand under the leases reported on have an average thickness of 38 feet.

4. In the event of Pilot Flood failure, the primary production

along with salvage value of leases will pay for Pilot Flood and Purchase Costs within six years.

5. Options are now held on the Harmon - Woody and Simmons leases, including a one years lease on the Keath Land. This includes all the leases under discussion within this report.

RECOMMENDATIONS

1. Examine titles of all leases.

2. Begin Pilot Water Flood immediately after clearing lease titles.

3. Endeavor to reach an agreement with offset lease operators in regard to unitizing the pool or its operation.

4. Proceed according to plan.

DISCUSSION

Location

The property is located in the Sorghum Hollow Pool, Circle Valley Field, in Township 32 South, Range 14 East, Montgomery County, Kansas. The location is ten miles West of Independence and three miles South of Elk City, and is in the Northwestern part of Montgomery County. The property this report covers is; The Harmon Lease consisting of 200 acres located in the N.E./4 of section 19 and the S.W./4 of the N.W./4 of section 20; The Woody Lease consisting of 120 acres located in the S./2 of the N./2 of section 20; The Simmons Lease consisting of 160 acres located in the S.E./4 of section 19; And the Keath Lease consisting of 80 acres in the N./2 of N.W./4 of section 20.

Geology

The Sorghum Hollow Pool is a Weiser sand lens in a trend running N.E. - S.W. The surface rocks in this area consist of members of the Pedee and Lansing groups of the Pennsylvanian System. There is a minimum of 275 productive acres under the leases described above with the oil sand ranging in thickness from 21 feet to 58 feet, having an average sand thickness of 38 feet. The total depth of the sand ranges from 835 feet to 940 feet below the surface. Seemingly the sand section is fairly uniform under all the leases. The well locations on the Harmon - Woody leases cannot now be ascertained due to incomplete records. They may be obtained however by running a Gamma Ray -

Neutron Electric log and the data obtained correlated with the drillers log. When this is obtained a contoured map on sand tops should be made of the locality. The sand section apparently has never been defined on the West side of the Simmons lease. Drilling additional wells here in "feeling" out the trend might possibly result in additional recovery by water flood that cannot be forecasted at this time under minimum recovery figures. Minimum and maximum calculations are given due to the possible uncertainty of actually producing within the maximum 465 acres. While production is shown on the attached lease plat North of the Harmon lease and while this should 'prove' the area in between, there is a chance it will not produce. Because of that small chance the value of this project is considered only on the minimum recovery. Among the operators, the nomenclature of this particular sand lens seems to be very much in dispute. As pointed out under Acknowledgements, The State Geological Survey has termed this the Weiser sand. Mr. Tom Lee of The Union Gas Co calls this the Hancock sand. The Layton Oil Co calls it the Prue sand. Mr. Carl Pate of Oil Research Laboratories calls it a stray sand. While the writer of this report is inclined to accept the nomenclature of the State Geological Survey, he does not think any imposed name for this sand lens important enough to seriously interfere with the acceptance of this report if other factors are favorable. Rather, this report should be accepted or rejected on the reservoir engineering data presented; the naming of the sand or any personal opinion given without basis of fact should be considered as irrevelent and immaterial.

Core Analysis

There has been only one core taken in this area that is available. The Sagamore Oil & Gas Co cored Simmons No 22. The core was taken by cable tools with water and was not canned but allowed to lay on the rig floor in the weather for several days. The core was shipped to Core Laboratories, Dallas, Texas, and was again allowed to stand for several weeks before any analysis was made. This method of coring would tend to lower the oil content and also increase the interstitual water. A summary of that core analysis is presented here:

Net sand thickness	23.25 feet
Oil content	5,240 bbls / acre
Average permeability	10.58 millidarcies
Average porosity	17.55 percent
Average residual liquid saturation, % oil by vol.	2.90 percent

There have been four wells on the Harmon lease that the casing has been ripped opposite the water formation (300') and the water allowed to "natural flood" the Weiser sand. Apparently this has not been successful as no influence has been noted in the adjacent producing oil wells. However, this incident does not mean that the sand will not flood, rather it is an indication that proper methods are essential to a successful water flood.

It is recommended that cores be taken from all input or producing wells as they are drilled to provide additional information for estimating oil recovery and also water volumes that the wells will take. According to the information available from the well logs and records, the average sand thickness for the entire area is slightly higher (38') than that of the core (23'). Using the core analysis oil volume content and considering 38' sand thickness, with a 50% recovery, we can estimate at a very minimum:

Production due to water flood	720,000 bbls
Total net production	630,000 bbls
Gross income @ $1.77 per bbl	$1,118,000.00

Production History

Although some of the past records are incomplete, it appears that the first well drilled on these leases was on the Simmons lease some time in the early part of 1906, with most of the drilling completed by the end of 1916. A Mr. Clell Simmons, who is a son of the late Mr. M. J. Simmons the original lessor, was contacted in regard to complete production data of the Simmons lease from 1906 to 1912. Mr. Simmons who was the pumper from 1912 until the wells were pulled in 1926, said as far as he knew the information was unavailable. He has tried to get this information and has been unsuccessful to-date. Mr. Simmons said that from 1906 up to and including 1912 the oil was pumped from the lease to tank cars in Elk City, Kansas, and was shipped to the Cary Salt Company in Hutchinson, Kansas. It was also his opinion that this same situation existed on the Harmon - Woody lease and practically for the same period. If this is true and the writer knows of no reason to doubt it, then all of the flush production was taken off the three leases before production records were preserved, making the estimates of 195,000 bbls of oil recovered by primary means (1912 to present time) from the Harmon - Woody lease, and 100,000 bbls from the Simmons lease very conservative.

In recent years the production has not been separated from the Harmon and Woody leases. Consequently, the production curves are combined for this lease. Total production on all lease curves as given, however, can be assumed to be reasonably accurate as they are pipeline runs. As previously pointed out, the first production from the Harmon - Woody lease was also in 1906. After reaching a peak of 9,200 bbls (according to available records dating back to 1911) per annum in 1914, the production declined until with the combined lease production, a maximum of 12,000 bbls per annum was reached in 1919. The production has declined to approximately 1500 bbls production from the Harmon - Woody lease for 1946. The Simmons No. 22, recently drilled, has not yet produced. The producing and abandoned wells for this pool according to present available information are shown on the accompanying pool map.

Normally the production from a secondary recovery by water flood will approximately equal the primary production. Therefore, using the production figures from the Harmon - Woody lease divided by their productive

acres (acres drained), should compare favorably with the adjoining leases and their productive acres. The Harmon - Woody lease production figures were used in place of the Simmons production figures because of a longer producing period on the Harmon - Woody. Therefore, with this method we can estimate:

Production due to water flood	715,000 bbls
Total net production	626,000 bbls
Gross income @ $1.77 per bbl	$1,110,000.00

As this estimate is practically identical with the estimated recovery figured from the core analysis, it is proposed to use the core analysis exclusively for reserve estimates.

Primary Reserves

Under the present method of producing the Harmon - Woody lease, they have not yet reached their economic limit. The Woody lease has six pumping wells and four abandoned wells, and the Harmon lease has five pumping wells and six abandoned wells. Also it is probable that there is some undeveloped primary production on the West half of the Simmons lease, and the North part of the Harmon quarter-section. However, this is not attractive for primary production and is only mentioned for the benefit of this report.

There is this to consider however, should the Pilot Flood fail, then the primary reserves of present producing wells plus the salvage value of leases will pay for the Pilot Flood project within six years.

Unitization

It is recommended that if the Pilot Flood is successful, every endeavor be made to form a unit as soon as possible to include all of sections 19, 20, 29, and 30, township 32 south, range 14 east. As the leaseholder of the Harmon - Woody, Simmons' and Keath leases would have the larger participating interests, it naturally follows that they would also be the unit operator. For the purpose of this report it is not believed necessary to work out each leases participating interest. This can be done later in a committee, if an agreement can be reached with offset independent operators and with Union Gas Co of Independence, Kansas, who now have the S.W./4 of section 20, township 32 south, range 14 east, and are starting a flood in sections 25 and 36, township 32 south, range 13 east.

Secondary Recovery

The attached water flood financial statement reflects the development costs of three projects and are hereby summarized:

	Minimum Estimated Recovery Figures	Maximum Estimated Recovery Figures
Estimated Productive Acres	275	465
Estimated Possible Recovery of Net Bbls of Oil	630,000	1,068,000
Development Cost - Including Pilot Flood & Purchase Cost	$244,926.00	$375,656.00
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Net Profit Before Taxes	$766,374.00	$1,323,774.00
Life of Project	14 years	16 years
Water Input Ratio	5 - 1	5 - 1
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Cost Per Month After Pilot Flood Is Proven Until Development is Completed	$15,000.00	$15,000.00

The accompanying Pool Map shows the proposed Water Flood Project with the locations of the suggested work in detail.

The water supply wells should be drilled early in the program and also the salt water return lines be installed as soon as possible, which will lessen the number of water supply wells needed. The 300 foot water sand in this area according to all reports should provide an adequate water supply over the life of the flood. Offset operators, in testing this water supply have been unable to lower the drawdown at 2000 barrels per day production.

During the Pilot Flood the producing well can utilize the present central power, not salvaging the equipment until the Pilot Flood is proved. The casing in all wells should be set in the top of the sand to avoid all by-passing, channeling, and contamination. Casing racked in the yard on the Harmon lease may be used for the water supply well.

Electric logs on all wells not now correlated with a drillers log is recommended in order to locate the casing seat and also to get information on the sands possible productivity. With these logged wells, accurately tied down to a field survey, the sand may be contoured and cross-sectioned for further information. It is recommended that all input water be treated and filtered with a constant check being kept on the input wells, to keep them from channeling.

It is anticipated that the present primary production from the Harmon - Woody leases will continue to pay for the pumper during Pilot Flood operations ($70.00 per month) and also furnish gas for power use on the other leases, during the development period.

The oil now produced from the property is 30 gravity and is purchased by the Sinclair Prairie Oil Company at the present price of $1.77 per barrel. As the storage tanks are wooden with the decks definitely not gas-tight, the use of welded steel stock tanks should raise the gravity a minimum of 2 degrees or to $1.82 per barrel.

Symposium

Mr. Douglas Layton of Layton Oil Co., located at Independence, Kansas, who has a number of active water floods in operation in this territory was contacted. This company has operated a water flood on this same sand located in section 20, T 33 S, R 14 E. A experimental line flood was started during 1944. After producing better than 2000 bbls per acre from 4 input wells, that has not yet flooded out the producing wells adjacent to the input wells, operations were temporarily suspended due to material shortages. According to Mr. Layton they are anticipating continuing flooding operations in the very near future, and the only reason they have not done so before now is because of previous lease committments in other sections of the county.

While not directly affecting this particular report, Mr. Layton volunteered the information that a number of their Montgomery County properties while showing only (approximately) 1000 bbls per acre primary production due to a lack of any sustained drive, has doubled and often times tripled the primary recovery when water flooded. While not knowing that the writer was in any way interested in this territory, Mr. Layton discussed quite freely the leases covered by this report. He expressed doubt as to their wisdom in their decision not to buy the Harmon - Woody, and Simmons leases, but said they did so because they had all the lease operations they could currently handle. According to Mr. Layton, the north end which includes the leases under discussion have several degrees higher gravity oil than any other location on this trend.

The Union Gas Company's flood project in sections 25 and 36, T 32 S, R 13 E, was discussed with Mr. Tom Lee, a geologist for Union Gas Co. Mr. Lee said that they expected to recover a minimum of 2800 bbls per acre by water flooding the sand. They have cored eight holes with a indicated minimum oil content of 6000 bbls per acre. They are now ready to commence flooding, having all their input wells and water wells drilled and expect to start in the very near future.

It is the opinion of several that they (Union Gas) were in hopes of also acquiring the leases described within this report (at junk prices) because of insufficient funds of the present leaseholders to adequately pursue a satisfactory water flood.

Mr. Carl Pate of Oil Research Laboratories in Chanute, Kansas, while declining to give any specific core information unless released by Union Gas Co. did say that he thought Mr. Lee's estimate of 2800 bbls minimum anticipated recovery very conservative. He also said that in his opinion it should prove to be a very fine flood project.

Mr. C. L. White, District Supt. of Phillips Petroleum Company in Eureka, Kansas, upon examining the one available core log commented that it should prove to be a very profitable flood operation.

Acknowledgement

Assistance in the area geology and well logs was given by the Kansas State Geological Survey and is gratefully acknowledged.

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G.E.A./4

Attach.

PILOT FLOOD FINANCIAL STATEMENT

Three and 6/10 months necessary for fill-up, (see Calculations, page No. 16)

Revenue

Present monthly gross production from the Harmon - Woody and Simmons leases is 183 bbls.

183 x 3.6	660 bbls	
Total Net Production	577 bbls	
Total gross income @ $1.77 per bbl		$1,020.00

Purchase Costs

Harmon - Woody leases	$12,000.00
Simmons lease	5,000.00
Total purchase costs	$17,000.00

Development Costs

Convert two temporarily abandoned Harmon wells to input; C/O and convert two plugged Harmon wells to input; Drill, core, and equip one producing well; Drill & equip one water well with individual unit; Set 1 - 100 bbl test tank; set proper size water treating equipment; Use central pwr for producing well; C/O each well with acid; Cement 4 strings of csg; Electric log 4 wells.

Total	13,116.00

Operating Costs

Until Pilot Flood is proven	2,200.00
Contingencies	7,684.00
Total Pilot Flood Investment	$40,000.00

Salvage Value

Original purchase of Harmon - Woody & Simmons leases	$10,000.00
Pilot Flood	6,400.00
Oil revenue during Pilot Flood test	1,020.00
Total Salvage Value	$17,420.00

Actual Cost of Pilot Flood not including Contingencies	$32,316.00
Salvage	17,420.00
Total Cost of Project if Pilot Flood is Unsuccessful	$14,896.00

Pilot Flood Payout

$A \times B \times (C - D) = F$

$G \div F = H$

PILOT FLOOD FINANCIAL STATEMENT

Pilot Flood Payout cont.

A = Monthly production from Harmon -- Woody, and Simmons leases not considering production from one Harmon producing well obtained from Pilot Flood Development.
B = Factor for changing gross value to net
C = Income from one barrel of oil
D = Lifting cost per barrel of oil
F = Net income per month
G = Cost of Project if Pilot Flood is Unsuccessful
H = Number of months for payout of actual project cost

183 x .875 x ($1.77 - .52) = $200.00
$14,896.00 ÷ $200.00 = 74 months or six years

WATER FLOOD FINANCIAL STATEMENT

I. Minimum Estimated Returns on 275 Productive Acres

Revenue			
Production due to water flood	720,000 bbls		
Total net production	630,000 bbls		
Total gross income @ $1.77 per bbl			$1,118,000.00
Purchase Costs			
Harmon - Woody lease		$12,000.00	
Simmons lease		5,000.00	
Total purchase costs		$17,000.00	
Development Costs			
A. Pilot Flood (Development plus Operating minus Oil Revenue)		14,296.00	
B. Ultimate Cost of Project			
Drill 19 - 850' wells and equip for producing @ $3,974.00		75,500.00	
Drill 13 - 850' wells and equip for input @ $2,352.00		30,600.00	
Clean - Out 10 - 850' wells and equip for producing @ $3,144.00		31,440.00	
Clean - Out 16 - 850' wells and equip for input @ $1,513.00		24,210.00	
Plug 14 - 850' wells @ $300.00		4,200.00	
Drill & equip 5 water wells @ $5,477.00		27,400.00	
Salt water input system, 2000' - 4" @ .48		960.00	
4000' - 2" @ .19		760.00	
Tank batteries, 9 - 500 bbl tanks & fittings @ $1,000.00		9,000.00	
Salt water return lines, 4000' - 2" @ .19		760.00	
Lead lines to producing wells, 10,000' - 2" @ .19		1,900.00	
Test lines to producing wells, 10,000' - 2" @ .19		1,900.00	
Treatment facilities		3,000.00	
Roustabout labor		1,000.00	
Contingencies		1,000.00	
Total Development Cost		$244,926.00	

WATER FLOOD FINANCIAL STATEMENT

I. Minimum Estimated Returns on 275 Productive Acres cont.

Development Cost Per Acre (275 acres), $890.00

Salvage, 50% of $113,800.00 (Tangible equip.)	$56,900.00	
Salvage, Pilot Flood; Harmon - Woody & Simmons	16,400.00	
Total Salvable Equipment	$73,300.00	
Net Cost of Project	$171,626.00	
Operating Costs @ .25 per bbl for 14 years	$180,000.00	
Total Cost	$351,626.00	
Total Profit Before Taxes		$766,374.00

WATER FLOOD FINANCIAL STATEMENT

II. Maximum Estimated Returns on 465 Productive Acres

Revenue

Production due to water flood	1,220,000 bbls	
Total net production	1,068,000 bbls	
Total gross income @ $1.77 per bbl		$1,888,000.00

Purchase Costs

Harmon - Woody lease	$12,000.00
Simmons lease	5,000.00
Total purchase costs	$17,000.00

Development Costs

A. Pilot Flood (Development plus Operating minus Oil Revenue)	14,296.00
B. Ultimate Cost of Project	
Drill 33 - 850' wells and equip for producing @ $3,974.00	131,000.00
Drill 27 - 850' wells and equip for input @ $2,352.00	63,500.00
Clean-out 11 - 850' wells and equip for producing @ $3,144.00	34,600.00
Clean-out 17 - 850' wells and equip for input @ $1,513.00	25,800.00
Plug 14 - 850' wells @ $300.00	4,200.00
Drill & equip 8 water wells @ $5,477.00	43,800.00
Salt water input system, 4000' - 4" @ .48	1,920.00
8000' - 2" @ .19	1,520.00
Tank batteries, 15 - 500 bbl tanks & fittings @ $1,000.00	15,000.00
Salt water return lines, 7450' - 2" @ .19	1,420.00
Lead lines to producing wells, 20,000' - 2" @ .19	3,800.00
Test lines to producing wells, 20,000' - 2" @ .19	3,800.00
Treatment facilities	6,000.00
Roustabout labor	3,000.00
Contingencies	5,000.00
Total Development Cost	$375,656.00

WATER FLOOD FINANCIAL STATEMENT

II. Maximum Estimated Returns on 465 Productive Acres cont.

Development Cost Per Acre (465 acres), $807.00

Salvage, 50% of $200,060.00 (Tangible equip.)	$100,030.00	
Salvage, Pilot Flood; Harmon - Woody & Simmons	16,400.00	
Total Salvable Equipment	$116,430.00	
Net Cost of Project	$259,226.00	
Operating Costs @ .25 per bbl for 16 years	305,000.00	
Total Cost	$564,226.00	
Total Profit Before Taxes		$1,323,774.00

Calculations *

The following is the calculated productive acres for the various leases:

	During Primary Recovery	During Minimum Secondary Recovery	During Maximum Secondary Recovery
Simmons lease	47	95	145
Harmon lease	45	50	170
Woody lease	30	70	70
Keath lease	25	60	80
Total	147	275	465

A + B = C

195,000 ÷ 75 = 2600 bbls
A = Estimated total primary recovery on Harmon - Woody leases
B = Estimated productive acres on Harmon - Woody leases
C = Estimated bbls per acre from primary recovery

D x E = F
275 x 2600 = 715,000 bbls
D = Estimated minimum total productive acres under all leases
E = Estimated recovery per acre under two leases (Harmon - Woody) with the most complete production data available
F = Estimated total primary production possible for Simmons, Harmon - Woody, and Keath leases

Using the core analysis oil content of 5,240 bbls per acre:

275 x 5,240 = 1,440,000, total bbls of oil in place
1,440,000 x 50% = 720,000, estimated bbls of minimum total production to be recovered by water flood

* See pages No. 4 & 5 of this Engineering Report.

Calculations

$\frac{43,560 \times 23.25' \times 7.48 \times 17.55}{42}$ = 31,620 bbls of reservoir space per acre

$\frac{43,560 \times 23.25' \times 7.48 \times 2.9}{42}$ = 5,240 bbls per acre of oil content

$\frac{43,560 \times 23.25' \times 7.48 \times 8.83}{42}$ = 15,950 bbls per acre of interstitual water

31,620 - (5,240 + 15,950) = 10,430 bbls of fill-up necessary per acre

Pilot Flood

Located on 2 1/2 acre spacing

10,430 x 2.5 = 27,075 bbls of input necessary for fill-up

At 1000 bbls per day input and figuring 1/4 will benefit producing well;

27,075 ÷ 250 = 109 days or 3.6 months

SALVABLE EQUIPMENT

"A" condition: New equipment.
"B" condition: 75% of new equipment value; will operate satisfactorily without repair or shopping.
"C" condition: 50% of new equipment value; fair condition, but may need some repair or shopping before being used.
"D" condition: 25% of new equipment value; poor condition, taking considerable repair or shopping.
"E" condition: Junk.

Description	Condition	Quantity	Unit Price	Total Price
HARMON - WOODY LEASE				
Power House (20' x 55')	C	2	$200.00	$400.00
Lease House; 7 room, Modern, Delco wtr & light plant, etc.	C	1	2000.00	2000.00
Jones Jack	B	13	20.00	260.00
Darnell Geared Power	C	1	100.00	100.00
Band Wheel Power (steel)	C	1	100.00	100.00
Note: All casing in wells calculated at 25% of total footage recoverable.				
6 5/8" I.D., 17 lb (in wells)	B	500'	.8584	107.00
6 1/4" I.D., 20 lb Do	B	10,100'	.8070	2004.00
6 1/4" I.D., 20 lb (stacked)	C	1,500'	.5400	810.00
2" tubing, 4.6 lb	C	10,000'	.1282	1282.00
2" line pipe, 3.75 lb	C	3,000'	.0912	275.00
Well head equipment	B&C	13	20.00	260.00
5/8" sucker rods	C	9,800'	.0688	672.00
Bottom hole pumps and working barrels	C&D	13	10.00	130.00
3/4" pull rods	C	5,000'	.0721	362.00
Pull rod stakes, knock off posts, etc.	E	-	-	60.00
Superior - 20 HP	C	1	600.00	600.00
Superior - 25 HP	C	1	740.00	740.00
Cooler - 3 HP	C	1	200.00	200.00
Tanks, 100 bbl. wood	C	3	70.00	210.00
Miscell., equip tools etc	B&C	-	-	300.00
TOTAL SALVABLE EQUIPMENT ON HARMON - WOODY LEASE				$10,872.00

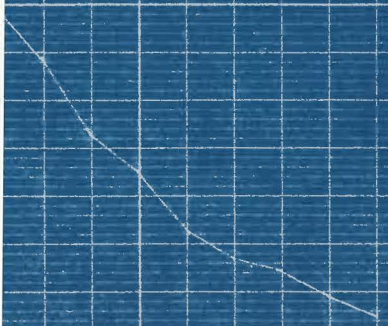
SALVABLE EQUIPMENT cont.

Description	Condition	Quantity	Unit Price	Total Price
		SIMMONS LEASE		
6 1/4" I.D., 20 lb (in well)	C	500'	$0.5400	$68.00
2" tubing, 4.6 lb	C	850'	.1282	109.00
5/8" sucker rods	C	850'	.0688	51.00
Engine, F & M, 118	B	1	130.00	130.00
Tank, 100 bbl. wood	C	1	70.00	70.00
Miscel. equipment	C&D	-	-	10.00
TOTAL SALVABLE EQUIPMENT ON SIMMONS LEASE				$438.00
Discount for possible decrease in valuation			$1,310.00	
PRESENT GROSS TOTAL SALVABLE EQUIPMENT ON HARMON - WOODY, SIMMONS LEASES LESS $1,310.00				$10,000.00

ANNUAL GROSS OIL PRODUCTION IN B ARRELS

SIMMONS LEASE

Production data on Simmons lease from 1906 to Aug 1913 is unavailable.



1920 1930 1940

YEARS

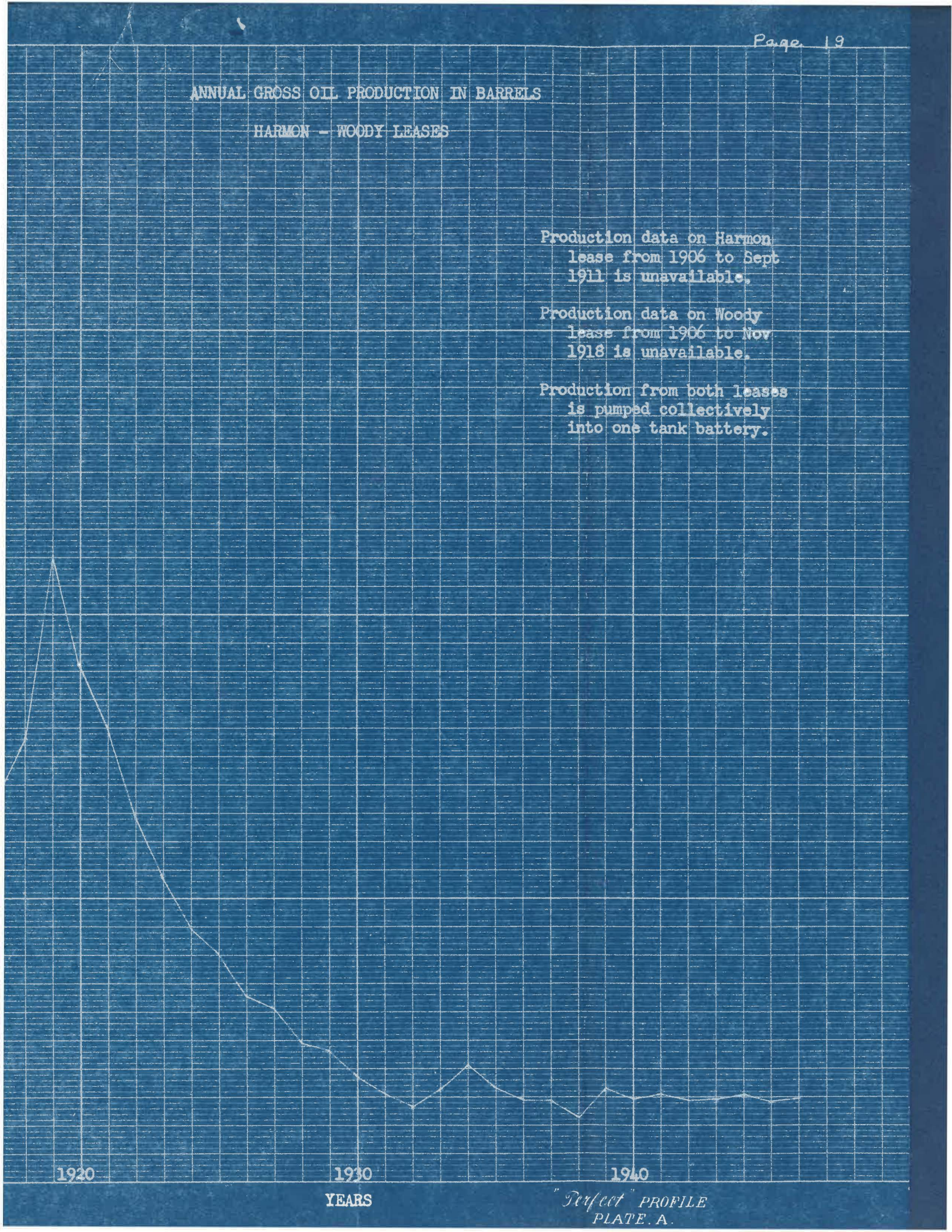
ANNUAL GROSS OIL PRODUCTION IN BARRELS

HARMON - WOODY LEASES

Production data on Harmon lease from 1906 to Sept 1911 is unavailable.

Production data on Woody lease from 1906 to Nov 1918 is unavailable.

Production from both leases is pumped collectively into one tank battery.



"Perfect" PROFILE
PLATE. A.