

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

March 26, 1956



REPLY TO
1020 PATTERSON BLDG.
DENVER, COLORADO

Chandler-Musgrove, Inc.
210 Denver Club Building
Denver, Colorado

Attention: Mr. Collis Chandler

Subject: Core Analysis
Durland-Phillips No. 2 Well
Peavy Field
Logan County, Colorado

Gentlemen:

Diamond coring equipment and oil emulsion mud were used to core portions of the "D" and "J" sands present in the subject well. Representatives of Chandler-Musgrove, Inc. selected samples of recovered formation on which analysis was desired, and submitted these samples to the Kimball laboratory. The results of the analysis are presented in this report.

The "D" sand from 6065 to 6066 feet is essentially impermeable and non-productive.

From 6066 to 6074 feet, the "D" sand is characterized by low residual oil and high total water saturations. These high total water saturations may indicate that the zone would be water productive, or they may be due to excessive invasion of the cores by the drilling fluid filtrate during the coring procedure. Invasion of the cores is often excessive, particularly in permeable, porous zones. Supplementary information determined by drill stem testing the lower part of the "D" sand from approximately 6073 to 6079.5 feet flowed oil in 11 minutes and recovered 300 feet of oil and 10 feet of water. This supplementary testing data suggests strongly that the high water saturations in the "D" sand from 6066 to 6074 feet are due to invasion, and that the zone is in fact a condensate productive zone. The low residual oil saturations are of the



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order of magnitude quite often associated with condensate productive formations. The low chloride content of the water produced on test, 1100 ppm of chloride ion, further indicates that the formation was invaded to a significant degree by drilling fluid filtrate.

From 6074 to 6079.5 feet, the residual oil saturations are of the order of magnitude usually associated with oil productive formation, and the total water saturations are somewhat lower than were observed in the condensate productive portion of the zone. The "D" sand from 6074 to 6079.5 feet is indicated to be oil productive, both by the core analysis data and by the results of other methods of formation evaluation. The average permeability of this five-foot zone is 264 millidarcys, and the productive capacity is 1320 millidarcy-feet, adequate to support satisfactory rates of fluid production without a formation fracturing treatment. The average porosity in the zone is 16.6 per cent, and the calculated connate water saturation is 40 per cent of pore space.

Estimates of recoverable oil have been calculated for the "D" sand using the observed core analysis data in conjunction with estimated reservoir fluid characteristics considered applicable. The maximum solution gas drive recovery is calculated to be 156 barrels per acre-foot, assuming that production could be continued until reservoir pressure declined to zero psig. Maximum water drive recovery is calculated to be 448 barrels per acre-foot, assuming full maintenance of estimated original reservoir pressure, 100 per cent sweep efficiency, and continuation of production to 100 per cent water cut. These estimates represent the maximum recoveries which could be obtained from the zone under the particular production mechanisms considered, no adjustments having been made in the values for the effects on ultimate recovery which would be exerted by economic limits imposed on oil production rates, gas-oil ratios, or water-oil ratios. Calculations to determine the effects of these economic factors, as well as certain other controlling factors, require a considerable amount of additional information which cannot be obtained from core analysis, and are usually made only during the course of a comprehensive engineering study in which all available data on the reservoir are reviewed.

The "J" sand from 6177 to 6182 feet is essentially impermeable, and is of

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no productive significance in the well.

We sincerely appreciate this opportunity to be of service to you, and we trust that this report will prove useful in making a preliminary evaluation of the "D" and "J" sands analyzed from this well.

Very truly yours,

Core Laboratories, Inc.


J. D. Harris, (7)
District Manager

JDH:TLK:ir

11 cc - Addressee

1 cc - Mr. H. E. Zoller, Jr.
Denver, Colorado

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Petroleum Reservoir Engineering
DALLAS

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CORE SUMMARY AND CALCULATED RECOVERABLE OIL

CORE SUMMARY

FORMATION NAME	"D" Sand			
DEPTH, FEET	6074.0-6079.5			
% CORE RECOVERY	100			
FEET OF PERMEABLE, PRODUCTIVE FORMATION RECOVERED	5.0			
AVERAGE PERMEABILITY MILLIDARCYS	264			
CAPACITY — AVERAGE PERMEABILITY X FEET PRODUCTIVE FORMATION	1320			
AVERAGE POROSITY, PERCENT	16.6			
AVERAGE RESIDUAL OIL SATURATION, % PORE SPACE	11.3			
GRAVITY OF OIL, °A.P.I.	37.5			
AVERAGE TOTAL WATER SATURATION, % PORE SPACE	43.6			
AVERAGE CALCULATED CONNATE WATER SATURATION, % PORE SPACE	40			
SOLUTION GAS-OIL RATIO, CUBIC FEET PER BARREL (1)	500			
FORMATION VOLUME FACTOR—VOLUME THAT ONE BARREL OF STOCK TANK OIL OCCUPIES IN RESERVOIR (1)	1.30			

CALCULATED RECOVERABLE OIL { Prediction dependent upon complete isolation of each division. Structural position of well, total permeable thickness of oil zone and drainage area of well should be considered.

BY NATURAL OR GAS EXPANSION, BBLs. PER ACRE FOOT (2)	156			
INCREASE DUE TO WATER DRIVE, BBLs. PER ACRE FOOT	292			
TOTAL AFTER COMPLETE WATER DRIVE, BBLs. PER ACRE FOOT (3)	448			

Core Laboratories, Inc.

J. D. Harris
 J. D. Harris (4)

NOTE:

(*) REFER TO ATTACHED LETTER.

(1) REDUCTION IN PRESSURE FROM estimated SATURATION PRESSURE TO ATMOSPHERIC PRESSURE.

(2) AFTER REDUCTION FROM ORIGINAL RESERVOIR PRESSURE TO ZERO POUNDS PER SQUARE INCH.

(3) RESERVOIR PRESSURE MAINTAINED BY WATER DRIVE AT OR ABOVE estimated ORIGINAL SATURATION PRESSURE.

(4) NO ESTIMATE FOR GAS PHASE RESERVOIRS.

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