CORE ANALYSIS REPORT

FOR

UNION OIL COMPANY OF CALIFORNIA

DUNCAN NO. 1-6 WELL

WILDCAT

LEA COUNTY, NEW MEXICO

LOCATION: SEC. 6-T13S-R36E

CORE

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS
October 11, 1957

Union Oil Company of California
Box 6738
Roswell, New Mexico

Attention: Mr. D. A. Dunn

> Subject: Core Analysis
> Duncan No. 1-6 Well
> Wildcat
> Lea County, New Mexico
> Location: Sec. 6-T13S-R36E

Gentlemen:

Diamond coring equipment and water base mud were used to core several intervals between 10,290 and 14,393 feet in the Duncan No. 1-6. Samples were selected by an engineer of Core Laboratories, Inc. at the direction of a representative of Union Oil Company of California. These samples were quick-frozen at the well site and analyzed in the Hobbs laboratory. The samples on which two permeability measurements are shown were analyzed by whole-core analysis procedures. The remaining samples were analyzed by conventional procedures. Results of the analysis are presented in this report.

Formation analyzed from 10,290 to 10,322 feet is essentially impermeable and nonproductive.

Wolfcamp formation analyzed from 10,325 to 10,356 feet exhibited residual fluid saturations indicative of oil production where the formation was permeable. In the interval, there are 9.3 feet of formation considered to be permeable and oil productive. The average permeability is 6.5 millidarcys, and the productive capacity is 60 millidarcy-feet, and an economic completion will be dependent upon a successful formation treatment. The average porosity in the interval is 8.2 per cent.

Estimates of recoverable oil have been prepared using the observed core
analysis data in conjunction with estimated reservoir fluid characteris-
tics considered applicable. These estimates are presented on the core
summary and calculated recoverable oil page of the report, and are sub-
ject to the conditions set forth in the body of and in the footnotes to the
summary page.

Intervals analyzed between 10, 370 and 12, 803 feet were analyzed for
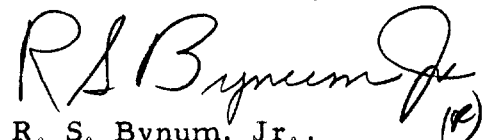permeability and porosity only.

Devonian formation analyzed at intervals between 14, 077 and 14, 283 feet
is considered to be virtually nonproductive due to the low porosity and
the low permeability.

Formation analyzed between 14, 353. 4 and 14, 387. 3 feet is interpreted
to be primarily water productive where the formation is permeable.

We sincerely appreciate this opportunity to be of service to you.

Very truly yours,

Core Laboratories, Inc.

R. S. Bynum, Jr.,
District Manager

RSB:PE:ds

Form F-11B

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CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

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CORE SUMMARY AND CALCULATED RECOVERABLE OIL

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FORMATION NAME AND DEPTH INTERVAL: Wolfcamp 10,325.0-10,356.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	29.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		29.9
FEET OF CORE INCLUDED IN AVERAGES	9.3	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	29.9
AVERAGE PERMEABILITY: MILLIDARCYS Max.:	6.5	OIL GRAVITY: °API	(e)	42
90°.:	6.5			
PRODUCTIVE CAPACITY: MILLIDARCY-FEET Max.:	60	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1500
90°.:	60			
AVERAGE POROSITY: PER CENT	8.2	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.90
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	7.8	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		235

Calculated maximum solution gas drive recovery is   43   barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is   185 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		
FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE		
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API		
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL		
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL		
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		

Calculated maximum solution gas drive recovery is   barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

(c) Calculated   (e) Estimated   (m) Measured   (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

Distribution of Final Reports

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CORE ANALYSIS REPORT

FOR

UNION OIL COMPANY OF CALIFORNIA

ATWOOD BRADLEY NO. 1-5 WELL

LEA COUNTY, NEW MEXICO
LOCATION: SEC. 5-T13S-R36E

CORE

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

December 13, 1957

Union Oil Company of California
Box 6738
Roswell, New Mexico

Attention: Mr. D. A. Dunn

                        Subject: Core Analysis
                                 Atwood Bradley No. 1-5 Well
                                 Lea County, New Mexico
                                 Location: Sec. 5-T13S-R36E

Gentlemen:

Diamond coring equipment and water base mud were used to core the
intervals, 10,274 to 10,296 and 10,305 to 10,410 feet, in the Atwood
Bradley No. 1-5. Samples of recovered formation were selected for
analysis as directed by representatives of Union Oil Company of
California. These samples were quick-frozen to preserve fluid con-
tent, and were transported to the Hobbs laboratory for analysis. Sam-
ples shown on the accompanying Completion Coregraph having only one
permeability value assigned were analyzed by conventional procedures,
and samples having two or more permeability values assigned were
analyzed by whole-core procedures using long segments of full-diameter
core. Complete analysis results are presented in this report.

Wolfcamp formation analyzed from 10,335 to 10,341 feet is character-
ized by extremely low permeability and porosity and is considered to
be essentially nonproductive.

From 10,341 to 10,347 feet, Wolfcamp formation is characterized by
favorable residual fluid saturations, and is considered to be capable of
oil production from points where permeability equals or exceeds 0.1
millidarcy. The average permeability of the 5.3 permeable feet in this
interval is 2.1 millidarcys, and the total observed natural productive

capacity is 11 millidarcy-feet, which is entirely inadequate to support satisfactory rates of oil production unless favorable response is obtained to treatment. The average measured porosity of this interval is 6.3 per cent, and the empirically calculated connate water saturation averages 29.0 per cent of pore space.

Cumulative production to be obtained from the Wolfcamp formation, 10,341 to 10,347 feet, will be restricted because of the limited thickness and low productive capacity. However, to aid in evaluating this interval, estimates of recoverable oil have been calculated using the observed core analysis data in conjunction with estimated reservoir fluid characteristics considered applicable. These estimates are presented on page one of the report and are subject to the conditions set forth in the body of and in the footnotes to the summary page.

Formation analyzed from 10,347 to 10,349 feet is considered to be essentially nonproductive by virtue of very low permeability and porosity.

Analyzed portions of the Wolfcamp formation in the extended interval, 10,361.0 to 10,391.5 feet exhibit unfavorable residual fluid saturations and are interpreted to be predominantly water productive where permeable.

We sincerely appreciate this opportunity to be of service and trust that this report will prove useful in making a preliminary evaluation of the Wolfcamp formation analyzed from the Atwood Bradley No. 1-5.

Very truly yours,

Core Laboratories, Inc.

R. S. Bynum, Jr.,
District Manager

RSB:JDJ:sw
2 cc. - Addressee
2 cc. - Mr. J. S. McNulty
          Union Oil Company of California
          Midland, Texas
4 cc. - Union Oil Company of California
          Midland, Texas

Form F-11B

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 1 of 1 File WP-3-954 WC & FC
Well Atwood Bradley No. 1-5

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Wolfcamp 10,341.0-10,347.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL	6.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		29.0
FEET OF CORE INCLUDED IN AVERAGES	5.3	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	29.0
AVERAGE PERMEABILITY: MILLIDARCYS Max.: 90°:	2.1 1.6	OIL GRAVITY: °API	(e)	43
PRODUCTIVE CAPACITY: MILLIDARCY-FEET Max.: 90°:	11 8.5	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1500
AVERAGE POROSITY: PER CENT	6.3	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.90
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE	8.0	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		183

Calculated maximum solution gas drive recovery is 33 barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is 144 barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		
FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE		
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API		
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL		
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL		
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

(c) Calculated   (e) Estimated   (m) Measured   (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.