

CHEMICAL & GEOLOGICAL LABORATORIES



CHEMISTS

GEOLOGISTS

ENGINEERS

P. O. BOX 279
CASPER, WYOMING

AMERADA PETROLEUM CORPORATION

WELL NO. 1-A EAVES

DEVONIAN

KNOWLES FIELD, NEW MEXICO

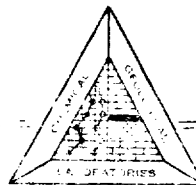
CORE ANALYSIS REPORT

CHEMICAL & GEOLOGICAL LABORATORIES

CHEMISTS

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P. O. BOX 274
CASPER, WYOMING

August 10, 1950

In re: Hayes A-1
Knowles Field, New Mexico

Amerada Petroleum Corporation
Beacon Building
P. O. Box 2040
Tulsa, Oklahoma

Gentlemen:

The entire core of 22½ feet, representing 25 feet of formation, was analyzed by full diameter methods. Results show that 17 feet are capable of oil production,--sections at 12,555-12,562, and 12,570-12,580.

The summary of results (page 10) show that there are 19 feet of formation with a permeability of 1 millidarcy and greater, and 9 feet of formation with a permeability of 100 millidarcys or greater. This latter footage will be the flush or initial production.

The 19 feet of formation with 1 millidarcy permeability or greater has a weighted average porosity of 8.38%. The 100 millidarcy or greater footage has a weighted average porosity of 10.60%.

The weighted mean true density of the analyzed sections is 2.84 which indicates dolomite, and this was confirmed by geological examination.

S_A (specific surface area in square centimeters per cubic centimeter of pore space) is a measure of type of pore space. The high S_A of 13,765 indicates intergranular porosity that is unproducible. The figures of 6,200 and 4,907 show principally intergranular porosity with few small vugs. The decreasing S_A from 805 and lower indicates vuggy and fractured conditions with the vugs becoming larger and more communicating as S_A decreases to its minimum of 49.

The formation factors seem to be in line with the physical characteristics of the formation, with the exception of samples 27 and 30. These two seemed low, but they were checked two or three times with the same result.

Very truly yours,

CHEMICAL & GEOLOGICAL LABORATORIES

J. G. Crawford
J. G. Crawford
Chemical Engineer

JGC:avc

AMERADA PETROLEUM CORPORATION

WELL NO. RAVES A-1

KNOWLES FIELD, NEW MEXICO

DEVONIAN

Formation Water Analysis

Full Diameter Corestudy from 12,555 to 12,580

Formation Resistivity Factors from 12,509 to 12,533

Core analysis began July 13, 1950

Core analysis ended July 31, 1950

Amerada Petroleum Corporation
Well No. Eaves A-1
Knowles Field, New Mexico
Lab. No. 4139 & 4140

I N D E X

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CHEMICAL & GEOLOGICAL LABORATORIES

521 South Center St. P. O. Box 279
Casper, Wyoming

WATER ANALYSIS REPORT

Field... **Knowles, New Mexico** Well No. **A-1 Eaves**
Operator... **Amerada Petroleum Corporation** Location...
Sampled by... Date...
Formation... **Devonian** Depths... How sampled...
Other pertinent data...
Analyzed by... **R. L. Brown** Date **July 14, 1950** Lab. No. **4140**

PARTS PER MILLION (MILLIGRAMS PER LITER)

Na & K	Ca	Mg	Fe	SO ₄	Cl	CO ₃	HCO ₃	OH	H ₂ S
13,113	1,801	326		1,646	22,800		605		

MILLIGRAM EQUIVALENTS

570.45	89.87		34.24	642.96	9.92
--------	-------	--	-------	--------	------

MILLIGRAM EQUIVALENTS IN PERCENT

41.51	6.54	1.95	2.49	46.79	0.72
-------	------	------	------	-------	------

Total Solids in Parts
per Million

Specific Resistivity

Properties of Reaction in
Percent

By evaporation... **43.016**
After ignition... **39.594**
Calculated... **39.984**

at **68** °F

19 ohms cm³

0.19 ohms, m³

Observed pH... **6.6**

Primary salinity... **83.02**
Secondary salinity... **15.54**
Primary alkalinity... **0.00**
Secondary alkalinity... **1.44**
Chloride salinity... **94.95**
Sulfate salinity... **5.05**

Remarks and conclusions... **Formation water.**

Amerada Petroleum Corporation
Well No. Hayes A-1
Knowles Field, New Mexico
Lab. No. 4139

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FORMATION RESISTIVITY FACTORS

Depth
12,509 to 12,533

<u>SAMPLE NUMBER</u>	<u>FORMATION RESISTIVITY FACTOR</u>	
J-26	295	4.93
J-27	170	3.83
J-28	141	
J-45	348	5.60
J-47-A	589	
J-47-B	499	
J-47-C	145	8.42
J-51-A	168	
J-51-B	420	4.88
J-52	145	3.73
J-55	308	6.39
J-56	186	5.71
J-58-A	153	7.76
J-58-B	106	
J-59	159	4.59
J-62	382	3.73
J-64	83	

NOTE: Cores saturated 100% with formation water Lab. No. 4140.
Specific Resistivity of water @ 68° F — 0.19 ohms/m³.
* formation resistivity factors in ohms/m³.

AMERADA PETROLEUM CORPORATION

Eaves A-1

Knowles Field, New Mexico

Devonian

(12,555-12,580)

Lab. No. 4139

LITHOLOGYOur Sample No.

- | | |
|-----|--|
| 1 | Dolomite, light gray, sucrose crystalline, black oil in vugs. |
| 2 | Dolomite, light gray, sucrose crystalline with inclusions
anhydrite, vugular, dead oil in vugs and small fractures. |
| 3 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs and small fractures. |
| 4 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs and small fractures. |
| 4 A | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs and small fractures. |
| 5 | Dolomite, light gray, sucrose crystalline, vugular with
dead oil in vugs. |
| 5 A | Dolomite, light gray, sucrose crystalline, tight. |
| 6 | Dolomite, light gray-tan, sucrose crystalline, tight with
few minute vugs. |
| 7 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs. |
| 8 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs. |
| 9 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs. |
| 10 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs. |
| 11 | Dolomite, light gray, sucrose crystalline, vugular with dead
oil in vugs and small fractures. |
| 12 | Dolomite, light gray-tan, sucrose crystalline, slightly
vugular with dead oil in vugs and small fractures. |
| 13 | Dolomite, light gray-tan, sucrose crystalline, vugular with
dead oil in vugs and small fractures. |
| 14 | Dolomite, light gray-tan, sucrose crystalline, vugular with
dead oil in vugs. |
| 15 | Dolomite, light gray-tan, sucrose crystalline with few
scattered vugs containing dead oil. |
| 16 | Dolomite, light gray-tan, sucrose crystalline, with dead
oil in fractures. |
| 17 | Dolomite, light gray-tan, sucrose crystalline with few
minute vugs and fractures containing dead oil. |

Amerada Petroleum Corporation, Eaves A-1

Our Sample No.

- 18 Dolomite, light gray-tan, sucrose crystalline with few scattered minute vugs and fractures containing dead oil.
- 19 Dolomite, light gray-tan, sucrose crystalline with few scattered minute vugs and fractures containing dead oil.
- 20 Dolomite, light gray-tan, sucrose crystalline with few scattered minute vugs, some of which contain dead oil.
- 21 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 22 Dolomite, light gray-tan, sucrose crystalline with few scattered minute vugs, some of which contain dead oil.
- 23 Dolomite, light gray-tan, sucrose crystalline with few vugs containing dead oil.
- 24 Dolomite, tan, sucrose crystalline, very fine, vugular, containing dead oil.
- 25 Dolomite, light gray, sucrose crystalline, minutely vugular with dead oil in vugs.
- 26 Dolomite, light gray, sucrose crystalline, minutely vugular with dead oil in vugs and inclusions tan, finely sucrose dolomite.
- 27 Dolomite, light gray-tan, sucrose crystalline, minutely vugular with dead oil in vugs.
- 28 Dolomite, light gray-tan, sucrose crystalline with few scattered vugs and small fractures containing dead oil.
- 29 Dolomite, light gray-tan, sucrose crystalline with few scattered vugs and small fractures containing dead oil.
- 30 Dolomite, light gray to tan mottled, finely sucrose to sucrose crystalline with minute vugs containing dead oil.
- 31 Dolomite, light tan, sucrose crystalline, minutely vugular with dead oil in vugs and small fractures.
- 32 Dolomite, light gray-tan, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 33 Dolomite, light gray-tan, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 34 Dolomite, light gray-tan, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 35 Dolomite, tan, sucrose crystalline with few scattered vugs containing dead oil.
- 36 Dolomite, tan, sucrose crystalline with few scattered vugs containing dead oil.
- 37 Dolomite, tan, sucrose crystalline with few scattered vugs containing dead oil.
- 38 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.

Amerada Petroleum Corporation, Eaves A-1

Our Sample No.

- 39 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 40 Dolomite, tan, sucrose crystalline with few scattered vugs containing dead oil.
- 41 Dolomite, light gray-tan, sucrose crystalline with few scattered minute vugs, some of which contain dead oil.
- 42 Dolomite, light gray, sucrose crystalline, vugular with dead oil in vugs.
- 43 Dolomite, light gray, sucrose crystalline with few scattered vugs containing dead oil.
- 44 Dolomite, light gray, sucrose crystalline, vugular with dead oil in vugs.
- 45 Dolomite, light gray, sucrose crystalline, vugular with dead oil in vugs.
- 46 Dolomite, light gray, sucrose crystalline, vugular with dead oil in vugs.
- 47 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 48 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 49 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 50 Dolomite, light gray, sucrose crystalline, vugular with dead oil in vugs.
- 51 Dolomite, light gray, sucrose crystalline, vugular with dead oil in vugs.
- 52 Dolomite, light gray, sucrose crystalline, minutely vugular with dead oil in vugs.
- 53 Dolomite, light gray, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 54 Dolomite, light gray, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 55 Dolomite, light gray-tan, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 56 Dolomite, light gray-tan, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 57 Dolomite, light gray, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 58 Dolomite, light gray, sucrose crystalline, very fine, vugular with dead oil in vugs.
- 59 Dolomite, tan, sucrose crystalline with few scattered small vugs and fractures containing dead oil.
- 60 Dolomite, light gray-tan, sucrose crystalline with few scattered minute vugs and small fractures containing dead oil.

Amerada Petroleum Corporation, Eaves A-1

Our Sample No.

- 61 Dolomite, light gray-tan, sucrose crystalline with few scattered vugs and small fractures containing dead oil.
- 62 Dolomite, light gray, sucrose crystalline with few scattered small vugs (no dead oil) and small fractures containing dead oil.
- 63 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 64 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 65 Dolomite, light gray-tan, sucrose crystalline, vugular with dead oil in vugs.
- 66 Dolomite, tan, sucrose crystalline, vugular with dead oil in vugs.
- 67 Dolomite, light gray, sucrose crystalline, fine, vugular with dead oil in vugs.
- 68 Dolomite, tan, sucrose crystalline, minutely vugular with dead oil in vugs.
- 69 Dolomite, tan, sucrose crystalline, minutely vugular with dead oil in vugs.
- 70 Dolomite, light tan, sucrose crystalline, minutely vugular with dead oil in vugs.

CHEMICAL & GEOLOGICAL LABORATORIES
301 South Center St. P O Box 279
Casper, Wyoming

FULL DIAMETER CORE STUDY

FIELD	KNOWLEDGE	WELL NO.	Eaves A-1
OPERATOR	Amerasia Petroleum Corporation	LOCATION	
FORMATION	Davallian	DEPTHS	12,555 to 12,580
ANALYZED BY	Chemical & Geological Laboratories	DATE	July 27, 1950

KEY TO DESCRIPTION OF SAMPLES

- | | | | |
|---|---|---|-------------|
| A | - | - | Large Vugs |
| B | - | - | Vugs |
| C | - | - | Cracks |
| D | - | - | Fine Pores |
| E | - | - | Impermeable |

[illegible]

Amerada Petroleum Corporation
Well No. Hayes A-1
Knowles Field, New Mexico
Lab. No. 4139

DENSITY DISTRIBUTION

True Density (D) g cm./cc.	Total Feet (F)	Per cent Footage	Cum. per cent Footage	D x F
2.76	0.34	1.51	1.51	0.94
2.78	0.33	1.47	2.98	0.92
2.79	0.45	2.00	4.98	1.26
2.80	2.00	8.89	13.87	5.60
2.81	1.94	8.62	22.49	5.45
2.82	2.79	12.40	34.89	7.87
2.83	3.59	15.95	50.84	10.16
2.84	1.47	6.53	57.37	4.17
2.85	2.38	10.58	67.95	6.78
2.86	2.56	11.38	79.33	7.32
2.87	1.51	6.71	86.04	4.33
2.88	1.45	6.44	92.48	4.18
2.89	0.66	2.93	95.41	1.91
2.90	0.35	1.56	96.97	1.02
2.92	0.33	1.47	98.44	0.96
2.96	0.35	1.56	100.00	1.04
Total	22.50	100.00		63.91

Weighted Mean Density 2.84 gm./cc.

Amerada Petroleum Corporation
Well No. Hayes A-1
Knowles Field, New Mexico
Lab. No. 4139 & 4140

SUMMARY OF REPORT

Footage Cored:- 12,509 to 12,533 & 12,555 to 12,580

No. of Samples:- 89

Large Cores:

Porosity	72
Radial Permeability	72
Bulk Density	72
Matrix Density	72
S _A	72
Resistivity Factors	72

Other Analysis:

Resistivity Factors	17
Water Analysis	1

Summary of Results

DISTRIBUTION BY PERMEABILITY RANGES

<u>Range</u> <u>Permeability</u>	<u>Footage</u>	<u>Porosity</u>	<u>S_A</u>	<u>Formation Resistivity</u> <u>Factor ohms/m³</u>
0.00 - 0.01	1.84	4.49%	13,765	1,263
0.011 - 0.1	0.99	7.17%	6,200	473
0.11 - 1.0	0.69	9.99%	4,907	289
1.01 - 10	3.18	5.33%	805	415
10.1 - 100	6.81	6.87%	328	322
100.1 - 1000	4.68	9.90%	134	208
1000+	4.31	11.36%	49	211
Total Tested	22.50	8.06%	1,799	373
0.01+	20.66	8.37%	733	293
0.1+	19.67	8.44%	458	284
1.0+	18.98	8.38%	297	284
10.0+	15.80	8.99%	193	258
100+	8.99	10.60%	93	209
1000+	4.31	11.36%	49	211

"True" Mean Density 2.84

Specific Resistivity of Water Analysis 0.19 ohms/m³

Formation resistivity factors, 12,509 to 12,533 average 253 ohms/m³