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Petroleum Reservoir Engineering
DALLAS, TEXAS

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File RFL 5152B

Company Phillips Petroleum Company Date Sampled June 4, 1968
Well 7/11-1X, DST 3 Province _____
Field Block 7/11 Country North Sea, Norway

FORMATION CHARACTERISTICS

Formation Name _____
Date First Well Completed _____, 19____
Original Reservoir Pressure _____ PSIG @ _____ Ft.
Original Produced Gas-Liquid Ratio _____ SCF/Bbl
Production Rate _____ Bbls/Day
Separator Pressure and Temperature _____ PSIG _____ ° F.
Liquid Gravity at 60° F. _____ ° API
Datum _____ Ft. Subsea

WELL CHARACTERISTICS

Elevation _____ Ft.
Total Depth _____ Ft.
Producing Interval 9770-9800 Ft.
Tubing Size and Depth _____ In. to _____ Ft.
Open Flow Potential _____ MMSCF/Day
Last Reservoir Pressure 5705 PSIG @ 9779 Ft.
Date _____, 19____
Reservoir Temperature 235 ° F. @ _____ Ft.
Status of Well _____
Pressure Gauge _____

SAMPLING CONDITIONS

Flowing Tubing Pressure _____ PSIG
Flowing Bottom Hole Pressure _____ PSIG
Primary Separator Pressure 250 PSIG
Primary Separator Temperature 71 ° F.
Secondary Separator Pressure _____ PSIG
Secondary Separator Temperature _____ ° F.
Field Stock Tank Liquid Gravity _____ ° API @ 60° F.
Primary Separator Gas Production Rate 5613 MSCF/Day
Pressure Base 14.696 PSIA
Temperature Base 60 ° F.
Compressibility Factor (F_{ov}) 1.024
Gas Gravity (Laboratory) 0.693
Gas Gravity Factor (F_r) 1.2013
Stock Tank Liquid Production Rate @ 60° F. 417 Bbls/Day
Primary Separator Gas/Stock Tank Liquid Ratio 13460 SCF/Bbl
or 74.29 Bbls/MMSCF

Core Laboratories, Inc., Engineer
REMARKS:

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Well 7/11-1X, DST 3

Hydrocarbon Analyses of Separator Products and Calculated Well Stream

<u>Component</u>	<u>Separator Liquid</u>		<u>Separator Gas</u>		<u>Well Stream</u>	
	<u>Mol Per Cent</u>	<u>Mol Per Cent</u>	<u>Mol Per Cent</u>	<u>GPM</u>	<u>Mol Per Cent</u>	<u>GPM</u>
Helium			Trace			
Hydrogen			Trace			
Hydrogen Sulfide			Nil			
Carbon Dioxide	0.54		2.58		2.44	
Nitrogen	0.03		0.86		0.80	
Methane	6.98		83.47		78.07	
Ethane	3.92		7.48		7.23	
Propane	5.34		3.10	0.851	3.26	0.895
iso-Butane	2.19		0.57	0.186	0.68	0.222
n-Butane	5.22		0.99	0.311	1.29	0.406
iso-Pentane	4.17		0.29	0.106	0.56	0.204
n-Pentane	4.52		0.27	0.098	0.57	0.206
Hexanes	9.54		0.20	0.081	0.86	0.350
Heptanes plus	57.55		0.19	0.086	4.24	2.466
	100.00		100.00	1.719	100.00	4.749

Properties of Heptanes plus

API gravity @ 60° F.	47.6	
Specific gravity @ 60/60° F.	0.7899	0.788
Molecular weight	147	145

Calculated separator gas gravity (air = 1.000) = 0.693
 Calculated gross heating value for separator gas = 1147 BTU
 per cubic foot of dry gas @ 14.696 psia and 60° F.

Primary separator gas collected @ 250 psig and 71 °F.
 Primary separator liquid collected @ 250 psig and 71 °F.

Primary separator gas/separator liquid ratio 11880 SCF/Bbl @ 60° F.
 Primary separator liquid/stock tank liquid ratio 1.133 Bbls @ 60° F./Bbl
 Primary separator gas/well stream ratio 929.44 MSCF/MMSCF
 Stock tank liquid/well stream ratio 69.05 Bbls/MMSCF

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File RFL 5152B

Well 7/11-1X, DST 3

Pressure-Volume Relations of Reservoir Fluid at 235° F.
(Constant Composition Expansion)

<u>Pressure</u> <u>PSIG</u>	<u>Relative</u> <u>Volume</u>	<u>Deviation Factor</u> <u>Z</u>
7000	0.8658	1.184
6500	0.8923	1.133
6000	0.9237	1.083
5739	0.9424	1.057
5705 Reservoir Pressure	0.9450	1.054
5679	0.9468	1.051
5571	0.9554	1.040
5375	0.9728	1.022
5189	0.9901	1.004
5131	0.9962	0.999
5090 Dew Point Pressure	1.0000	0.995
5062	1.0028	
4992	1.0108	
4906	1.0199	
4712	1.0431	
4430	1.0842	
4014	1.1592	
3637	1.2476	
3232	1.3728	
2843	1.5363	
2447	1.7664	
2058	2.0953	
1754	2.4606	
1531	2.8329	
1332	3.2705	
1169	3.7444	
1047	4.1976	
929	4.7498	

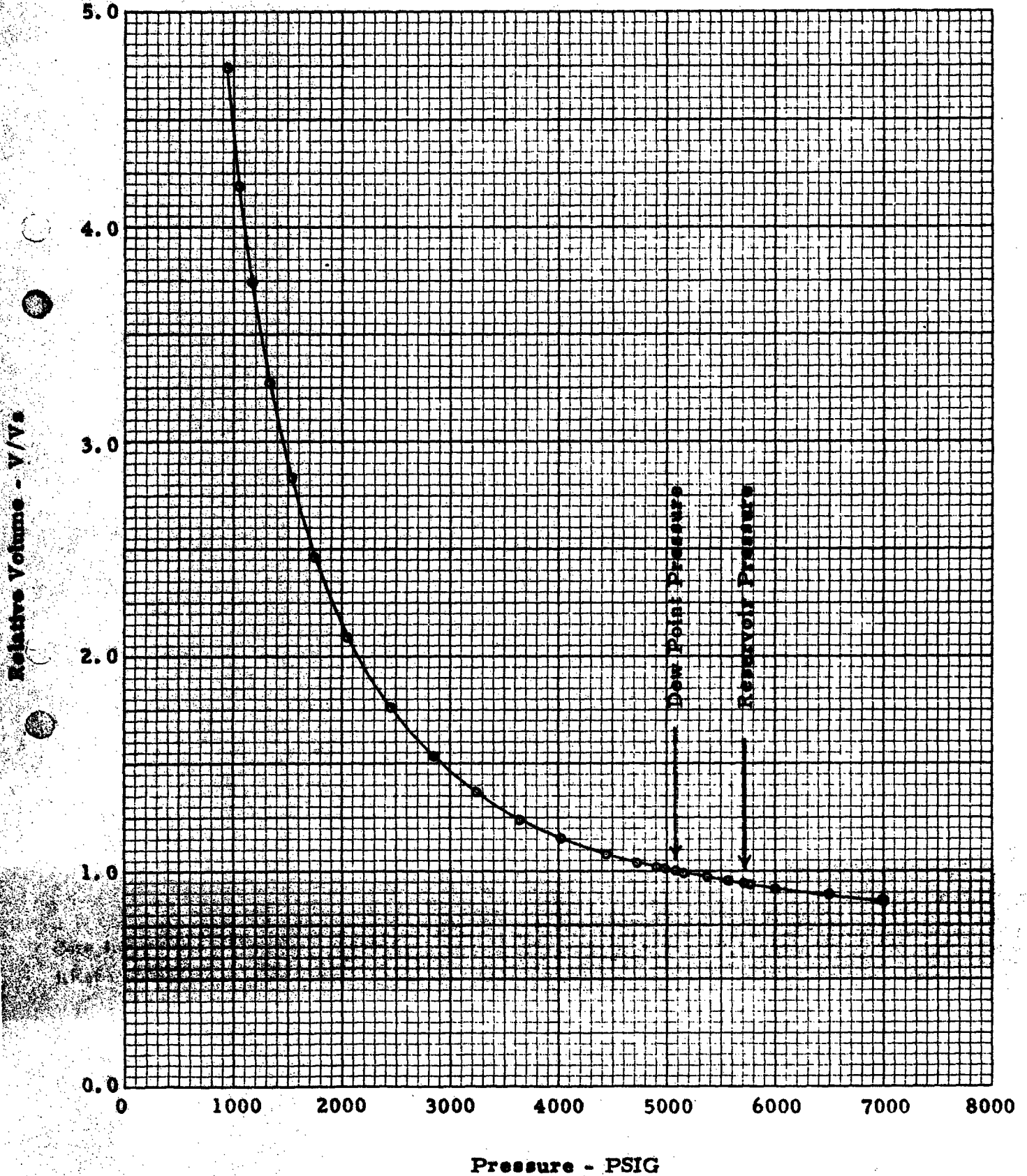
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Pressure-Volume Relations of Reservoir Fluid at 235° F.

Company Phillips Petroleum Company Formation _____
 Well 7/11-IX, DST 3 Province _____
 Field Block 7/11 Country North Sea, Norway



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Company Phillips Petroleum Company Date Sampled June 10, 1968
Well 7/11-1X (DST 4) Province _____
Field Block 7/11 Country North Sea, Norway

FORMATION CHARACTERISTICS

Formation Name _____
Date First Well Completed _____, 19____
Original Reservoir Pressure _____ PSIG @ _____ Ft.
Original Produced Gas-Liquid Ratio _____ SCF/Bbl
Production Rate _____ Bbls/Day
Separator Pressure and Temperature _____ PSIG _____ ° F.
Liquid Gravity at 60° F. _____ ° API
Datum _____ Ft. Subsea

WELL CHARACTERISTICS

Elevation _____ Ft.
Total Depth _____ Ft.
Producing Interval 9527-9697 Ft.
Tubing Size and Depth _____ In. to _____ Ft.
Open Flow Potential _____ MMSCF/Day
Last Reservoir Pressure 5328 PSIG @ 9529 Ft.
Date _____, 19____
Reservoir Temperature 230 ° F. @ _____ Ft.
Status of Well _____
Pressure Gauge _____

SAMPLING CONDITIONS

Flowing Tubing Pressure _____ PSIG
Flowing Bottom Hole Pressure _____ PSIG
Primary Separator Pressure 1000 PSIG
Primary Separator Temperature 118 ° F.
Secondary Separator Pressure _____ PSIG
Secondary Separator Temperature _____ ° F.
Field Stock Tank Liquid Gravity _____ ° API @ 60° F.
Primary Separator Gas Production Rate 26108 MSCF/Day
Pressure Base 14.696 PSIA
Temperature Base 60 ° F.
Compressibility Factor (F_{pv}) 1.080
Gas Gravity (Laboratory) 0.704
Gas Gravity Factor (F_g) 1.1918

Stock Tank Liquid Production Rate @ 60° F. 855 Bbls/Day
Primary Separator Gas/ Stock Tank Liquid Ratio 30536 SCF/Bbl
or 32.75 Bbls/MMSCF

Core Laboratories, Inc., Engineer

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Company Phillips Petroleum Company Formation _____

Well 7/11-1X (DST 4) Province _____

Field Block 7/11 Country North Sea, Norway

HYDROCARBON ANALYSIS OF Separator GAS SAMPLE

COMPONENT	MOL PER CENT	G P M
Helium	Trace	
Hydrogen	Trace	
Hydrogen Sulfide	Nil	
Carbon Dioxide	2.65	
Nitrogen	0.81	
Methane	83.37	
Ethane	7.12	1.794
Propane	2.94	0.807
iso-Butane	0.58	0.189
n-Butane	1.05	0.330
iso-Pentane	0.37	0.135
n-Pentane	0.36	0.130
Hexanes	0.28	0.114
Heptanes plus	0.47	0.213
	<u>100.00</u>	<u>3.712</u>

Calculated gas gravity (air = 1.000) = 0.704

Calculated gross heating value = 1164 BTU
per cubic foot of dry gas at 14.696 psia at 60° F.

Collected at 1000 psig and 118 ° F.

Core Laboratories, Inc.
Reservoir Fluid Analysis

P. L. Moses

P. L. Moses
Manager

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Company Phillips Petroleum Company Date Sampled June 11, 1968
Well 7/11-1X, DST 5 Province _____
Field Block 7/11 Country North Sea, Norway

FORMATION CHARACTERISTICS

Formation Name _____
Date First Well Completed _____, 19____
Original Reservoir Pressure _____ PSIG @ _____ Ft.
Original Produced Gas-Liquid Ratio _____ SCF/Bbl
Production Rate _____ Bbls/Day
Separator Pressure and Temperature _____ PSIG _____ ° F.
Liquid Gravity at 60° F. _____ ° API
Datum _____ Ft. Subsea

WELL CHARACTERISTICS

Elevation _____ Ft.
Total Depth _____ Ft.
Producing Interval 9440-9455 Ft.
Tubing Size and Depth _____ In. to _____ Ft.
Open Flow Potential _____ MMSCF/Day
Last Reservoir Pressure 5260 PSIG @ 9442 Ft.
Date _____, 19____
Reservoir Temperature 228 ° F. @ _____ Ft.
Status of Well _____
Pressure Gauge _____

SAMPLING CONDITIONS

Flowing Tubing Pressure _____ PSIG
Flowing Bottom Hole Pressure _____ PSIG
Primary Separator Pressure 210 PSIG
Primary Separator Temperature 54 ° F.
Secondary Separator Pressure _____ PSIG
Secondary Separator Temperature _____ ° F.
Field Stock Tank Liquid Gravity _____ ° API @ 60° F.
Primary Separator Gas Production Rate 6161 MSCF/Day
Pressure Base 14.696 PSIA
Temperature Base 60 ° F.
Compressibility Factor (F_{pv}) 1.023
Gas Gravity (Laboratory) 0.674
Gas Gravity Factor (F_g) 1.2181

Stock Tank Liquid Production Rate @ 60° F. 508 Bbls/Day
Primary Separator Gas/Stock Tank Liquid Ratio 12128 SCF/Bbl
82.45 Bbls/MMSCF

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Well 7/11-1X, DST 5

Hydrocarbon Analyses of Separator Products and Calculated Well Stream

Component	Separator Liquid		Separator Gas		Well Stream	
	Mol Per Cent		Mol Per Cent	GPM	Mol Per Cent	GPM
Helium			Trace			
Hydrogen			Trace			
Hydrogen Sulfide			Nil			
Carbon Dioxide	0.24		2.55		2.38	
Nitrogen	0.03		0.79		0.73	
Methane	5.93		85.06		79.27	
Ethane	3.46		7.01		6.75	
Propane	4.69		2.68	0.736	2.83	0.777
iso-Butane	1.96		0.49	0.160	0.60	0.196
n-Butane	5.46		0.79	0.248	1.13	0.355
iso-Pentane	3.42		0.22	0.080	0.45	0.164
n-Pentane	5.18		0.19	0.069	0.56	0.202
Hexanes	10.79		0.12	0.049	0.90	0.366
Heptanes plus	58.84		0.10	0.045	4.40	2.605
	<u>100.00</u>		<u>100.00</u>	<u>1.387</u>	<u>100.00</u>	<u>4.665</u>

Properties of Heptanes plus

API gravity @ 60° F.	<u>47.4</u>	
Specific gravity @ 60/60° F.	<u>0.7909</u>	<u>0.790</u>
Molecular weight	<u>149</u>	<u>148</u>

Calculated separator gas gravity (air = 1.000) = 0.674
 Calculated gross heating value for separator gas = 1120 BTU
 per cubic foot of dry gas @ 14.696 psia and 60° F.

Primary separator gas collected @ 210 psig and 54 °F.
 Primary separator liquid collected @ 210 psig and 54 °F.

Primary separator gas/separator liquid ratio 11137 SCF/Bbl @ 60° F.
 Primary separator liquid/stock tank liquid ratio 1.089 Bbls @ 60° F./Bbl
 Primary separator gas/well stream ratio 926.85 MSCF/MMSCF
 Stock tank liquid/well stream ratio 76.42 Bbls/MMSCF

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Well 7/11-1X, DST 5

Pressure-Volume Relations of Reservoir Fluid at 228° F.
(Constant Composition Expansion)

<u>Pressure</u> <u>PSIG</u>	<u>Relative</u> <u>Volume</u>	<u>Deviation Factor</u> <u>Z</u>
7000	0.9051	1.191
6500	0.9332	1.141
6000	0.9663	1.091
5692	0.9903	1.060
5647	0.9940	1.056
5606	0.9975	1.052
5593	0.9984	1.051
<u>5576</u> Dew Point Pressure	1.0000	1.049
<u>5553</u>	1.0018	1.047
5528	1.0041	1.044
5442	1.0116	1.036
5344	1.0216	1.027
<u>5260</u> Reservoir Pressure	1.0301	1.020
5129	1.0442	
4878	1.0741	
4511	1.1278	
4137	1.1962	
3757	1.2847	
3359	1.4061	
2973	1.5616	
2579	1.7802	
2189	2.0932	
1838	2.4973	
1573	2.9342	
1352	3.4319	
1189	3.9240	
1029	4.5540	

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Well 7/11-1X, DST 5

Retrograde Condensation During Gas Depletion at 228° F.

<u>Pressure PSIG</u>	<u>Retrograde Liquid Volume Per Cent of Hydrocarbon Pore Space</u>
5576 Dew Point Pressure	0.00
5260 Reservoir Pressure	0.25
4800 First Depletion Level	0.71
3800	3.61
2800	6.46
1800	6.78
1000	6.57
500	6.30
0	5.75

Core Laboratories, Inc.
Reservoir Fluid Analysis

P L Moses (PB)
P. L. Moses
Manager

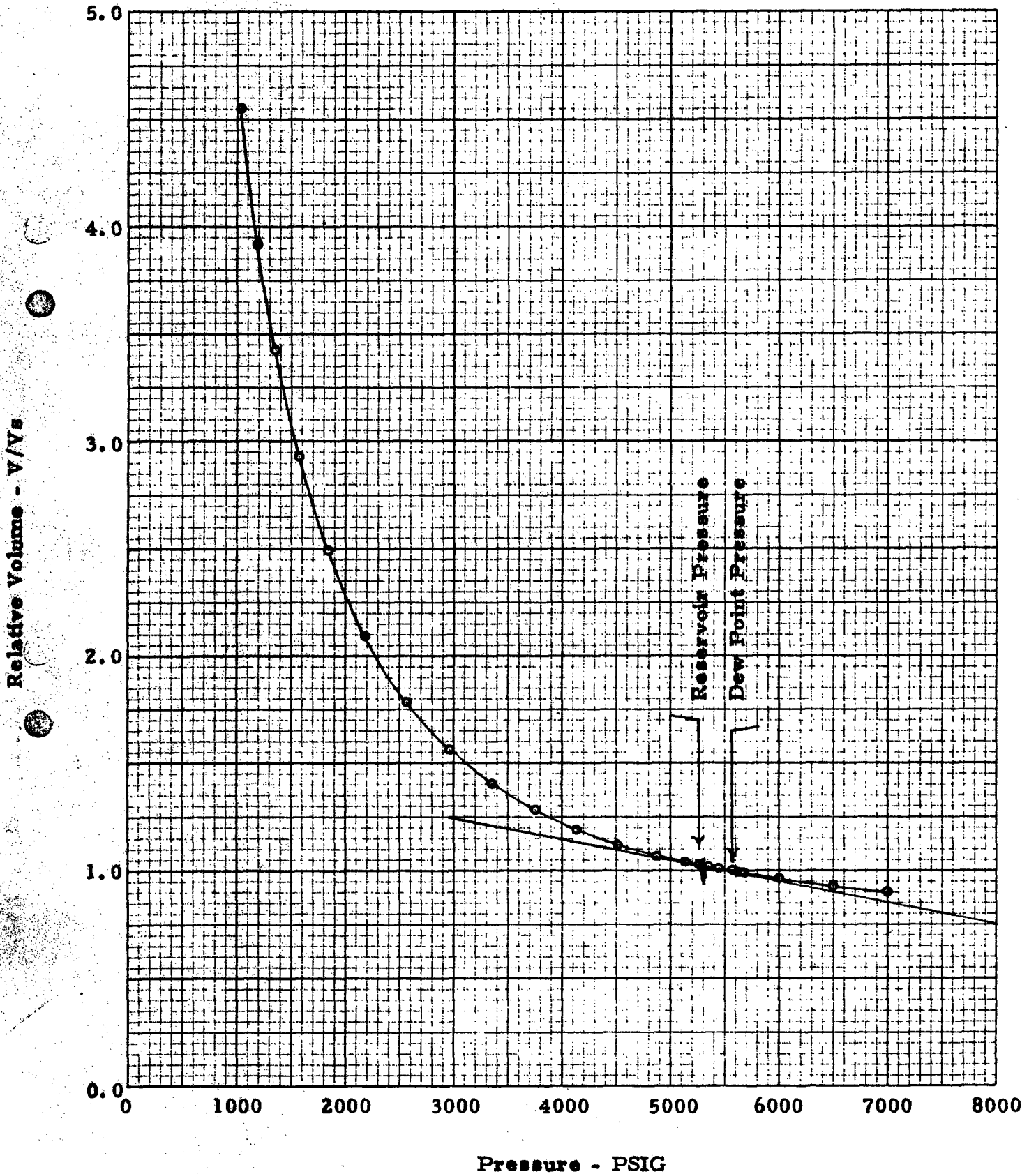
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Pressure-Volume Relations of Reservoir Fluid at 228° F.

Company Phillips Petroleum Company Formation _____
 Well 7/11-1X, DST 5 Province _____
 Field Block 7/11 Country North Sea, Norway



Retrograde Condensation During Depletion,

$T = 228^{\circ} F$

Company Phillips Petroleum Company Formation _____
 Well 7/11-1X, DST 5 Province _____
 Field Block 7/11 Country North Sea, Norway

Retrograde Liquid Volume - Per Cent of Hydrocarbon Pore Space

