



CORE LABORATORIES  
Petroleum Reservoir Engineering



4th March, 1986

AMOCO AUSTRALIA PETROLEUM CO.,  
10 Lampton Avenue,  
DERWENT PARK, TAS. 7000

Attention : Mr. W.C. Cowan

Subject : Reservoir Fluid Study  
Well : Yolla #1, DST 2A  
File : AFL 85061

Dear Sir,

Samples of separator gas and separator liquid were submitted to our Adelaide laboratory for use in a reservoir fluid study. The results of this study as requested by Amoco Australia are presented in the following report.

As a quality check, the room temperature saturation pressure of each separator liquid sample was initially determined. At 64°F, the samples in cylinders OT152T and OT066T were found to have bubble point pressures of 80 psig and 50 psig respectively. Cylinder of OT152T was selected for use in reservoir fluid study. The results are reported and depicted graphically on pages two and three along with the opening pressures of all sample cylinders. The hydrocarbon composition of the separator gas was measured through undecanes plus by routine gas chromatography. The hydrocarbon composition of the separator liquid was measured through heptanes plus and extended through undecanes plus by means of a high temperature distillation.

After correcting the reported field separator gas production rate the separator gas and liquid samples were physically recombined to their producing gas/liquid ratio of 3368 standard cubic feet of primary separator gas per barrel of primary separator liquid at 90 psig and 102°F. This gas/liquid ratio was also used in conjunction with measured hydrocarbon compositions of the separator products to calculate the hydrocarbon composition of the producing well stream material. The compositional data is presented on pages four through seven.

The recombined fluid was then charged to a high pressure visual cell, held at the reservoir temperature of 209°F. At this temperature the fluid was

subjected to a constant composition expansion and found to have a saturation pressure of 4954 psig. The pressure volume data can be found on page eight.

This information was communicated to Amoco and a decision was made to equilibrate the fluid to reservoir conditions of 2695 psig and 209°F. The resulting gas and liquid were isolated and used in individual reservoir fluid studies. The hydrocarbon composition of the separated gas sample was measured through undecanes plus by routine gas chromatography and is reported on page nine. This reservoir fluid was then charged to a high pressure visual cell and subjected to constant composition expansion of 209°F during which a retrograde dew point pressure of 2695 psig was observed. Presented on page 9 are the results of the pressure-volume measurements, along with the gas deviation factor at the dew point pressure and above.

The reservoir fluid was then subjected to constant volume depletion at a temperature of 209°F. After determining the saturated sample volume, a series of expansions and constant pressure displacements were made, with each displacement terminating at the original saturated volume. The quantity of retrograde liquid condensed during this depletion was measured and is presented on page fourteen of this report.

A larger volume of recombined reservoir fluid was charged to another high pressure cell and subjected to an identical depletion process. This time each displaced gas phase underwent compositional analysis, deviation factor measurement and determination of the produced volume. A summary of the constant volume depletion test data may be found on page eleven, including calculated gas viscosities. The abovementioned compositional and volumetric data were used along with published equilibrium gas/liquid ratio values to calculate the surface recoveries that can be expected as the reservoir pressure declines. These calculations were performed on the basis of one MMSCF of original reservoir fluid in place at the retrograde dew point pressure. A plant efficiency of 100 percent was assumed in these calculations the results of which can be found on pages twelve and thirteen.

The hydrocarbon composition through undecanes plus of the separated liquid sample is reported on page twenty-one. This reservoir fluid sample was also charged to a high pressure visual cell at the reservoir temperature of 209°F.

This sample was then subjected to a constant composition expansion during which a bubble point pressure of 2710 psig was observed. The volumetric and pressure volume data is reported on page twenty-two and twenty-three respectively and depicted graphically on page thirty-one.

This fluid was then subjected to differential pressure depletion. During this test, the fluid was found to contain 998 cubic feet of gas per barrel of residual oil for a relative oil volume of 1.601 barrels of saturated oil per barrel of residual oil. The results of the differential vaporisation

Page iii

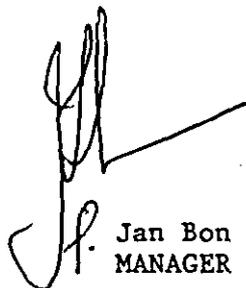
together with the properties of the evolved gases are presented on page twenty-four and depicted graphically on pages thirty-two through thirty-five.

The hydrocarbon compositions of the gases evolved during this differential vaporization were measured through undecanes plus and are reported on pages twenty-five through twenty-nine.

A single-stage separator test were performed to determine the effects of separator pressure upon gas-oil ratio, stock tank oil gravity and formation volume factor. This data is reported on page thirty.

It has been a pleasure to perform this reservoir fluid study for Amoco Australia Petroleum Co. Should you have any questions, or if we may be of further assistance, please do not hesitate to call on us.

Yours sincerely,



Jan Bon  
MANAGER

Company : Amoco Australia Petroleum Co. Date Sampled : 4th October, 1985  
Well : Yolla #1, DST #2A State : Tasmania  
Field : Wildcat Country : Australia

FORMATION CHARACTERISTICS

Formation Name :  
\* Original Reservoir Pressure : 2695 psig @ 6012 ft  
Original Produced Gas-Oil Ratio :  
Production Ratio :  
Separator Pressure and Temperature :  
Liquid Gravity @ 60°F :  
Datum :

WELL CHARACTERISTICS

Elevation : 35.75 ft RKB  
Total Depth :  
Producing Interval : 6013 - 6015 ft RKB  
Tubing Size : 4½ inch drill pipe  
Open Flow Potential :  
Last Reservoir Pressure : Original Test  
Date :  
\*\* Reservoir Temperature : 209°F @ 6012 ft RKB  
Status of Well :  
Pressure Gauge :

SAMPLING CONDITIONS

Flowing Tubing Pressure : 1210 psig @ 86°F  
Flowing Bottom Hole Pressure :  
Primary Separator Pressure : 90 psig  
Primary Separator Temperature : 102°F  
Secondary Separator Pressure :  
Secondary Separator Temperature :  
Field Stock Tank Liquid Gravity : 45.5°API @ 60°F  
Primary Separator Gas Production Rate : 1020 MSCF/Day  
Pressure Base : 14.73 psia  
Temperature Base : 60°F  
Compressibility Factor (Fpv) : 1.0129  
Gas Gravity (Field) : 0.870  
Gas Gravity Factor (Fg) : 1.07832  
Stock Tank Liquid Production Rate @ 102°F : 302 Bbls/Day  
Primary Separator Gas/Separator Liquid Ratio : 3377 SCF/Bbl  
or : 296.08 Bbl/MMSCF

Sampled by : Otis Engineering  
REMARKS :

\* Original reservoir pressure based on RFT point @ 6012 ft (1832.5 m KB)  
\*\* Corrected from RPG gauge @ 5807 ft to 6012 ft using 2.5°/100 ft.

QUALITY CHECK OF SAMPLES RECEIVED IN THE LABORATORY

SEPARTOR LIQUID SAMPLES:

<u>Cylinder #:</u>	OT152T	OT066T
<u>Opening Pressure:</u>	40 psig @ 64°F	35 psig @ 68°F
<u>Sample #:</u>	1	2

<u>cm<sup>3</sup> Mercury Injected</u>	<u>Pressure, psig</u>	<u>cm<sup>3</sup> Mercury Injected</u>	<u>Pressure, psig</u>
0	80	0	50
1	80	1	50
2	80	2	50
3	80	3	50
4	80	4	50
5	205	5	50
5.5	395	6	270
6	595	6.5	460
6.5	795	7	645
7	970	7.5	835
7.5	1160	8	1015

Psat = 80 psig @ 64°F

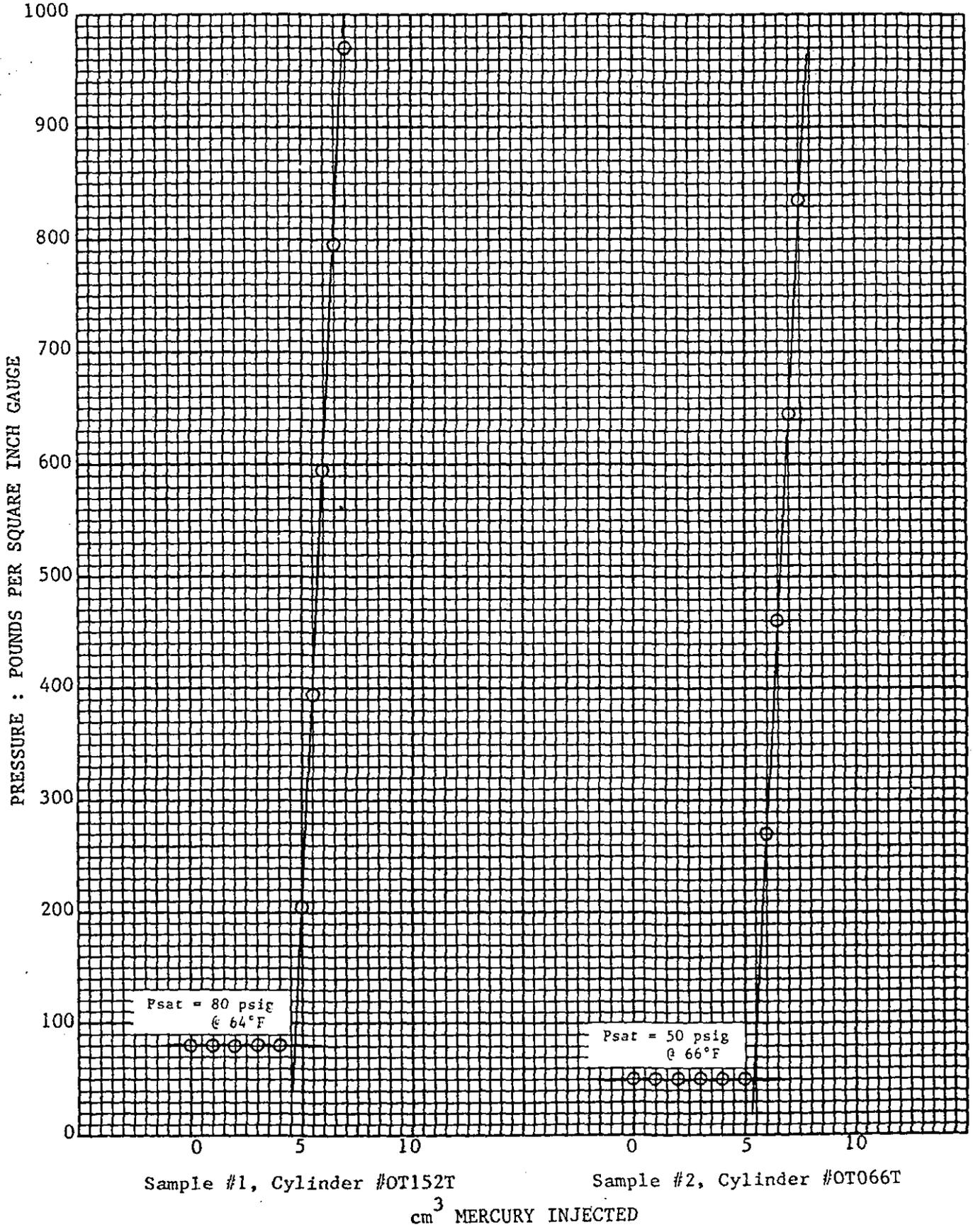
Psat = 50 psig @ 66°F

SEPARATOR GAS SAMPLES:

<u>Cylinder #:</u>	A12459	A11587	A8659
<u>Opening Pressure:</u>	102 psig @ 103°F	102 psig @ 102°F	101 psig @ 100°F

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



HYDROCARBON ANALYSIS OF SEPARATOR GAS SAMPLE

<u>Cylinder #:</u>	A8659	
<u>Component</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00	
Carbon Dioxide	7.61	
Nitrogen	0.58	
Methane	66.89	
Ethane	11.03	2.942
Propane	7.80	2.141
iso-Butane	1.59	0.519
n-Butane	2.20	0.692
iso-Pentane	0.66	0.241
n-Pentane	0.55	0.199
Hexanes	0.40	0.163
Heptanes plus	0.69	0.313
	<u>100.00</u>	<u>7.210</u>

Gas gravity (Air = 1.000): 0.867

Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F): 1297

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

HYDROCARBON ANALYSIS OF SEPARATOR LIQUID SAMPLE

<u>Cylinder #:</u>	OT152T	
<u>Component</u>	<u>Mol Percent</u>	<u>Weight Percent</u>
Hydrogen Sulphide	0.00	0.00
Carbon Dioxide	0.57	0.16
Nitrogen	0.01	trace
Methane	2.37	0.25
Ethane	1.87	0.37
Propane	3.86	1.12
iso-Butane	1.93	0.74
n-Butane	3.70	1.41
iso-Pentane	2.77	1.31
n-Pentane	3.08	1.46
Hexanes	7.48	4.22
Heptanes plus	72.36	88.96
	<u>100.00</u>	<u>100.00</u>

Properties of Heptanes plus

API gravity @ 60°F	44.2
Density, gm/cc @ 60°F	0.8048
Molecular weight	187

HIGH TEMPERATURE DISTILLATION OF HEXANES PLUS  
 FRACTION OF SEPARATOR LIQUID SAMPLE TO UNDECANES PLUS

<u>Component</u>	<u>Cut Temp °C</u>	<u>Mol Percent</u>	<u>Weight Percent</u>	<u>Volume Percent</u>	<u>Density, gm/cc @ 60°F</u>	<u>°API @ 60°F</u>	<u>Mol Weight</u>
	IBP 49						
Hexanes	84	9.37	4.53	5.13	0.7062	68.7	86
Heptanes	112	11.31	6.04	6.55	0.7375	60.2	95
Octanes	138	11.55	7.01	7.33	0.7647	53.4	108
Nonanes	162	8.09	5.41	5.55	0.7799	49.8	119
Decanes	185	8.07	5.94	6.05	0.7845	48.7	131
Undecanes plus	FBP 185	51.61	71.07	69.39	0.8191	41.1	245
		<u>100.00</u>	<u>100.00</u>	<u>100.00</u>			

HYDROCARBON ANALYSES OF SEPARATOR PRODUCTS  
AND CALCULATED WELL STREAM TO UNDECANES PLUS

<u>Cylinder #:</u>	OT152T		A8659	
	<u>Separator Liquid</u>	<u>Separator Gas</u>	<u>Separator Liquid</u>	<u>Separator Gas</u>
<u>Component</u>	<u>Mol Percent</u>	<u>Mol Percent</u>	<u>Mol Percent</u>	<u>Well Stream</u>
				<u>Mol Percent</u>
Hydrogen Sulphide	0.00	0.00		0.00
Carbon Dioxide	0.57	7.61		6.43
Nitrogen	0.01	0.58		0.48
Methane	2.37	66.89		56.12
Ethane	1.87	11.03		9.50
Propane	3.86	7.80		7.14
iso-Butane	1.93	1.59		1.65
n-Butane	3.70	2.20		2.45
iso-Pentane	2.77	0.66		1.01
n-Pentane	3.08	0.55		0.97
Hexanes	7.48	0.40		1.58
Heptanes	9.03	0.32		1.78
Octanes	9.22	0.20		1.71
Nonanes	6.46	0.08		1.15
Decanes	6.44	0.03		1.10
Undecanes plus	41.21	0.06		6.93
	<u>100.00</u>	<u>100.00</u>		<u>100.00</u>

Properties of Heptanes plus

API gravity @ 60°F	44.1	
Density, gm/cc @ 60°F	0.8048	0.801
Molecular weight	187	183

Calculated separator gas gravity (air = 1.000) = 0.867  
 Calculated gross heating value for separator gas  
 per cubic foot of dry gas @ 14.696 psia and 60°F = 1297 BTU

Primary separator gas collected @ 90 psig and 102°F  
 Primary separator liquid collected @ 90 psig and 102°F

Primary separator gas/separator liquid ratio : 3368 SCF/Bbl @ 102°F  
 Primary separator liquid/stock tank liquid ratio : 1.025 Bbls @ 102°F/Bbl  
 Primary separator gas/well stream ratio : 832.95 MSCF/MMSCF  
 Stock tank liquid/well stream ratio : 241.2 Bbls/MMSCF

PRESSURE - VOLUME RELATIONS @ 209°F

<u>Pressure,</u> <u>psig</u>	<u>Relative</u> <u>Volume (1)</u>	<u>Compressibility</u> <u>x 10<sup>-6</sup> (2)</u>	<u>Y</u> <u>Function (3)</u>
6000	0.9490	40.83	
5500	0.9700	46.70	
5400	0.9746	49.28	
5300	0.9796	52.40	
5200	0.9849	56.07	
5100	0.9907	60.48	
5000	0.9969	65.83	
<u>4954</u> *	1.0000	67.20	
4930	1.0025		
4911	1.0043		
4893	1.0062		2.010
4860	1.0097		1.998
4778	1.0184		1.995
4614	1.0371		1.983
4333	1.0731		1.953
3872	1.1476		1.886
3238	1.2994		1.762
2695	1.5111		1.631
2224	1.8087		1.508

\* Saturation Pressure

(1) Relative volume: V/Vsat is barrels @ indicated pressure per barrel @ saturation pressure.

(2) Instantaneous Compressibility =  $-\frac{dV}{VdP}$

(3) Y Function =  $\frac{(P_{sat} - P)}{(P_{abs}) (V/V_{sat} - 1)}$

HYDROCARBON ANALYSIS OF RESERVOIR FLUID SAMPLE TO UNDECANES PLUS

<u>Component</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00	
Carbon Dioxide	7.44	
Nitrogen	0.65	
Methane	68.52	
Ethane	10.27	2.739
Propane	6.70	1.839
iso-Butane	1.37	0.447
n-Butane	1.91	0.601
iso-Pentane	0.65	0.237
n-Pentane	0.56	0.203
Hexanes	0.64	0.260
Heptanes	0.48	0.584 (C7+)
Octanes	0.30	
Nonanes	0.15	
Decanes	0.08	
Undecanes plus	0.28	
	<u>100.00</u>	<u>6.910</u>
Gas gravity (Air = 1.000):		0.868
Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F):		1301

*These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.*

PRESSURE - VOLUME RELATIONS @ 209°F

<u>Pressure,</u> <u>psig</u>	<u>Relative</u> <u>Volume (1)</u>	<u>Deviation</u> <u>Factor, Z</u>
5000	0.6316	0.993
4500	0.6717	0.951
4000	0.7254	0.914
3500	0.7998	0.882
3200	0.8588	0.866
3000	0.9078	0.858
2900	0.9354	0.855
2800	0.9656	0.853
<u>2695</u> *	1.0000	0.850
2650	1.0157	
2600	1.0339	
2500	1.0750	
2350	1.1445	
2150	1.2889	
1950	1.4019	
1680	1.6534	
1450	1.9499	
1250	2.3011	
980	3.0056	
715	4.2190	

\* Saturation Pressure

(1) Relative Volume:  $V/V_{sat}$  is barrels @ indicated pressure per barrel @ saturation pressure.

DEPLETION STUDY @ 209°F

Hydrocarbon Analyses of Produced Well Stream - Mol Percent

Component	Reservoir Pressure - psig						
	2695	2300	1900	1400	900	500	500 *
Hydrogen Sulphide	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Dioxide	7.44	7.43	7.43	7.45	7.47	7.49	1.85
Nitrogen	0.65	0.66	0.67	0.67	0.66	0.63	0.05
Methane	68.52	68.73	68.87	68.86	68.79	68.61	10.34
Ethane	10.27	10.21	10.21	10.25	10.31	10.39	4.24
Propane	6.70	6.68	6.66	6.68	6.72	6.76	5.05
iso-Butane	1.37	1.36	1.35	1.36	1.38	1.39	1.75
n-Butane	1.91	1.89	1.89	1.90	1.90	1.92	3.00
iso-Pentane	0.65	0.65	0.64	0.64	0.65	0.66	1.80
n-Pentane	0.56	0.55	0.54	0.54	0.55	0.57	1.94
Hexanes	0.64	0.64	0.63	0.63	0.63	0.64	3.68
Heptanes	0.48	0.47	0.46	0.45	0.45	0.46	5.24
Octanes	0.30	0.28	0.27	0.26	0.25	0.26	5.55
Nonanes	0.15	0.14	0.14	0.13	0.13	0.13	4.43
Decanes	0.08	0.08	0.07	0.07	0.06	0.06	4.36
Undecanes plus	0.28	0.23	0.17	0.11	0.05	0.03	46.72
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
Molecular weight of heptanes plus	118	116	113	110	108	107	148
Density of heptanes plus	0.758	0.755	0.752	0.749	0.747	0.746	0.786
<u>Deviation Factor-Z</u>							
Equilibrium gas	0.850	0.847	0.859	0.886	0.922	0.955	
Two-phase	0.850	0.848	0.857	0.881	0.913	0.946	
Gas viscosity	<del>0.0196</del>	0.0196	0.0176	0.0156	0.0141	0.0132	
Well Stream produced -	0.0217	(Page 16 graph)					
Cumulative percent of initial	0.000	14.396	29.897	49.638	68.567	82.930	

$$B_{gi} = \frac{0.0283 z T(-r)}{P \text{ (psia)}} = \frac{0.0283 \times 0.250 \times (460 + 209)}{710} = 0.00594 \text{ rcf/scf}$$

\* Composition of equilibrium liquid phase

CALCULATED CUMULATIVE RECOVERY DURING DEPLETION

Cumulative Recovery per MMSCF of Original Fluid	Initial in Place	Reservoir Pressure - psig					
		2695	2300	1900	1400	900	500
<u>Well Stream - MSCF</u>	1000.00	0.00	143.96	298.97	496.38	685.67	829.30
<u>Normal Temperature Separation *</u>							
Stock Tank Liquid - Barrels	10.38	0.00	1.28	2.40	3.52	4.35	4.98
Primary Separator Gas - MSCF	989.82	0.00	142.69	296.57	492.83	681.25	824.22
Second Stage Gas - MSCF	0.13	0.00	0.02	0.03	0.05	0.06	0.07
Stock Tank Gas - MSCF	0.49	0.00	0.06	0.12	0.17	0.21	0.24
<u>Total "Plant Products" in Primary Separator Gas - Gallons</u>							
Ethane	2735	0	391	813	1352	1872	2270
Propane	1828	0	262	544	905	1253	1519
Butanes (total)	1072	0	148	306	510	707	857
Pentanes plus	902	0	131	272	456	635	773
<u>Total "Plant Products" in Well Stream - Gallons</u>							
Ethane	2739	0	392	814	1354	1874	2273
Propane	1839	0	264	547	909	1258	1525
Butanes (total)	1047	0	149	310	515	714	865
Pentanes plus	1335	0	184	372	601	813	976

(31.8 bbls/mmcf)

\* Primary separator @ 90 psig and 102°F, second stage @ 50 psig and 75°F, stock tank @ 70°F.

CALCULATED INSTANTANEOUS RECOVERY DURING DEPLETION

	Reservoir Pressure - psig					
	2695	2300	1900	1400	900	500
<u>Normal Temperature Separation *</u>						
Stock Tank Liquid Gravity, °API @ 60°F	61.3	62.0	62.7	63.6	64.2	64.5
Separator Gas/Well Stream Ratio, MSCF/MMSCF						
Primary Separator Gas Only	989.82	991.21	992.71	994.17	995.39	995.41
Primary and Second Stage Separator Gases	989.96	991.33	992.80	994.25	995.45	995.47
Separator Gas/Stock Tank Liquid Ratio, SCF/STB						
Primary Separator Gas Only	95339	111754	137292	175400	225119	227563
Primary and Second Stage Separator Gases	95352	111767	137306	175414	225133	227577
<u>GPM from Smooth Well Stream Compositions</u>						
Ethane plus	6.960	6.874	6.798	6.767	6.764	6.817
Propane plus	4.221	4.150	4.075	4.033	4.014	4.046
Butanes plus	2.382	2.317	2.247	2.200	2.169	2.190
Pentanes plus	1.335	1.279	1.212	1.159	1.122	1.133

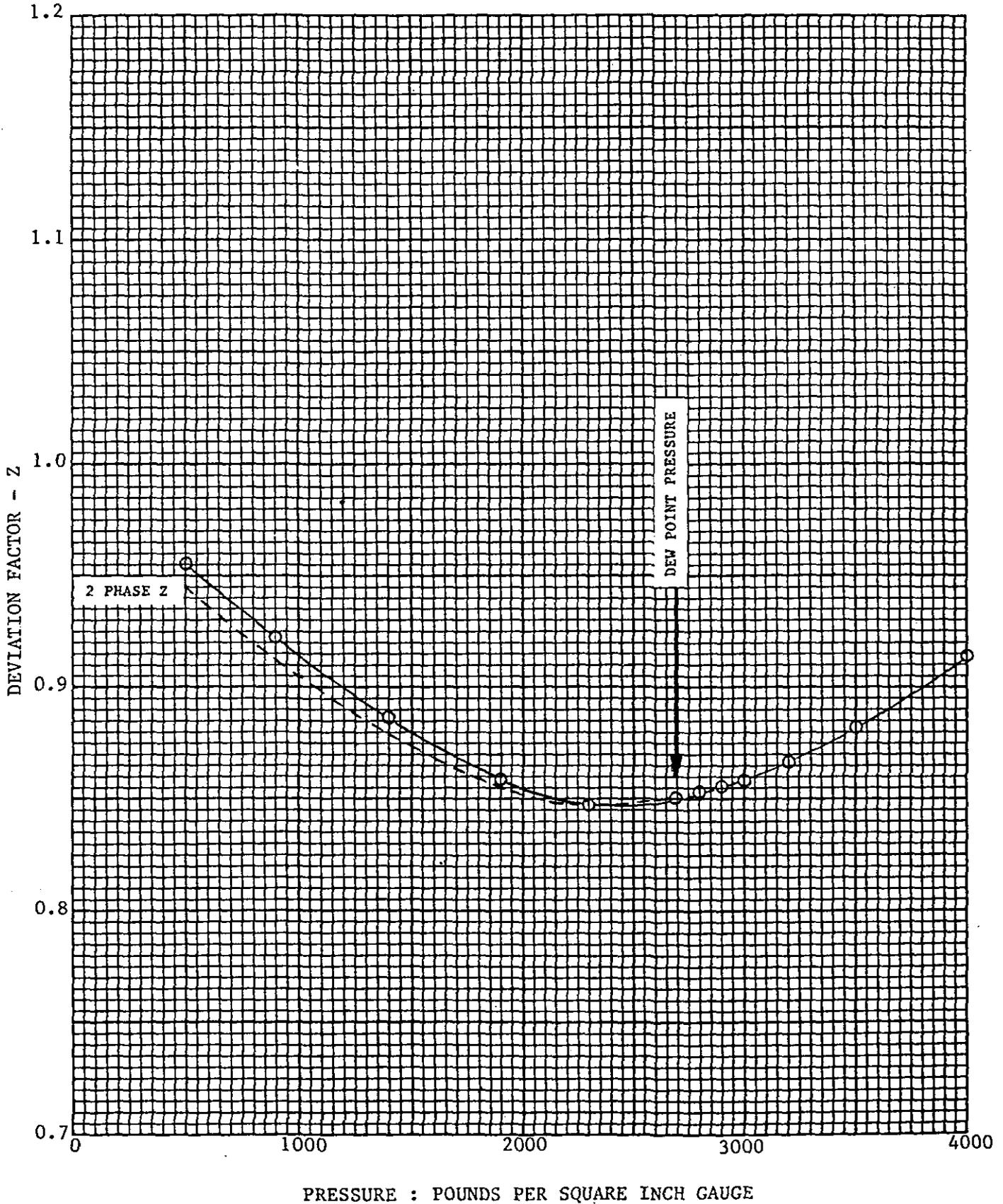
\* Primary separator @ 90 psig and 102°F, second stage @ 50 psig and 75°F, stock tank @ 70°F.

RETROGRADE CONDENSATION DURING GAS DEPLETION @ 209°F

<u>Pressure, psig</u>	<u>Retrograde Liquid Volume Percent of Hydrocarbon Pore Space</u>
<u>2696</u> Dew point pressure	0.00
2300	0.10
1900	0.26
1400	0.43
900	0.47
500	0.40

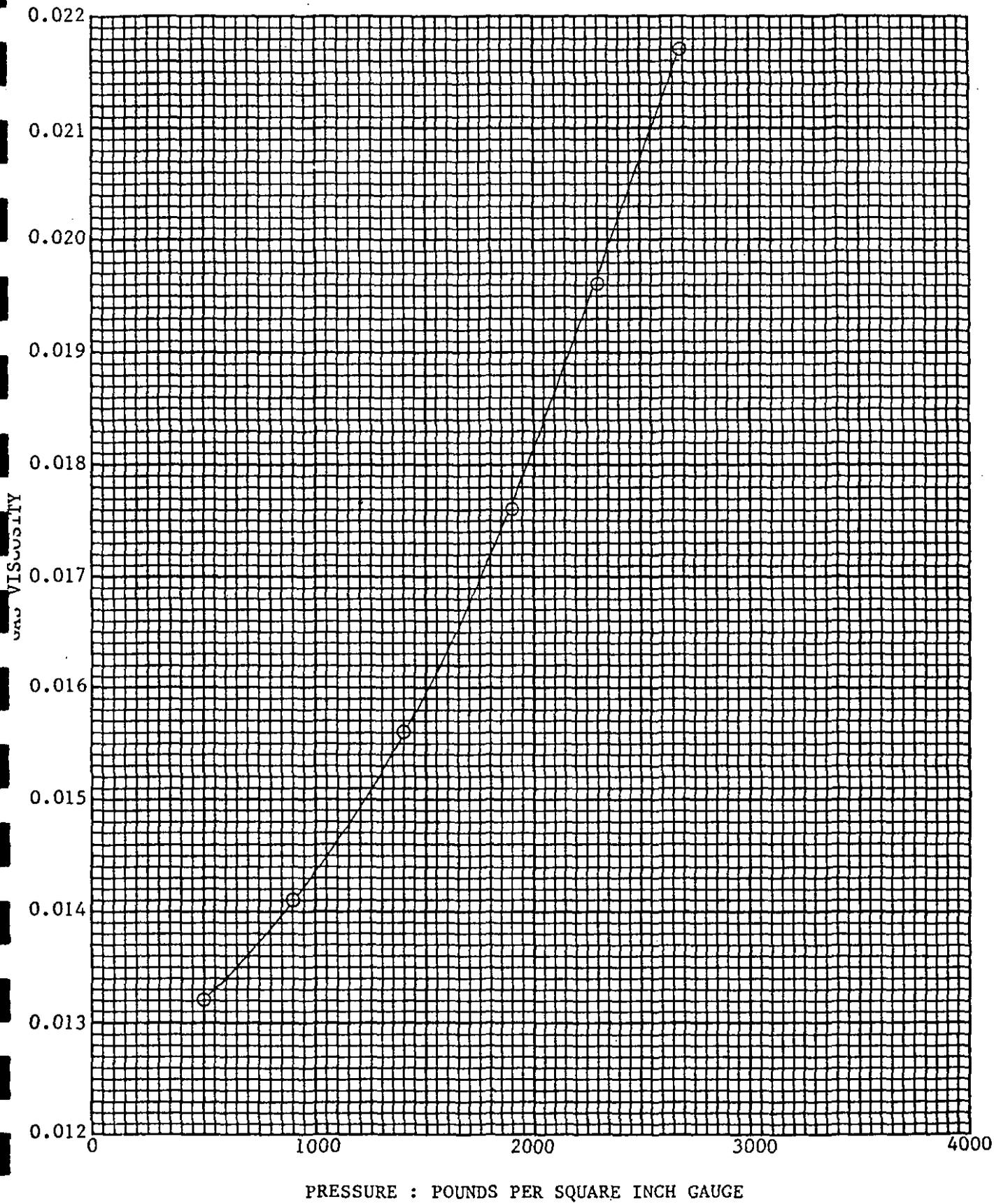
DEVIATION FACTOR Z OF GAS PHASE DURING DEPLETION AT 209°F

Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



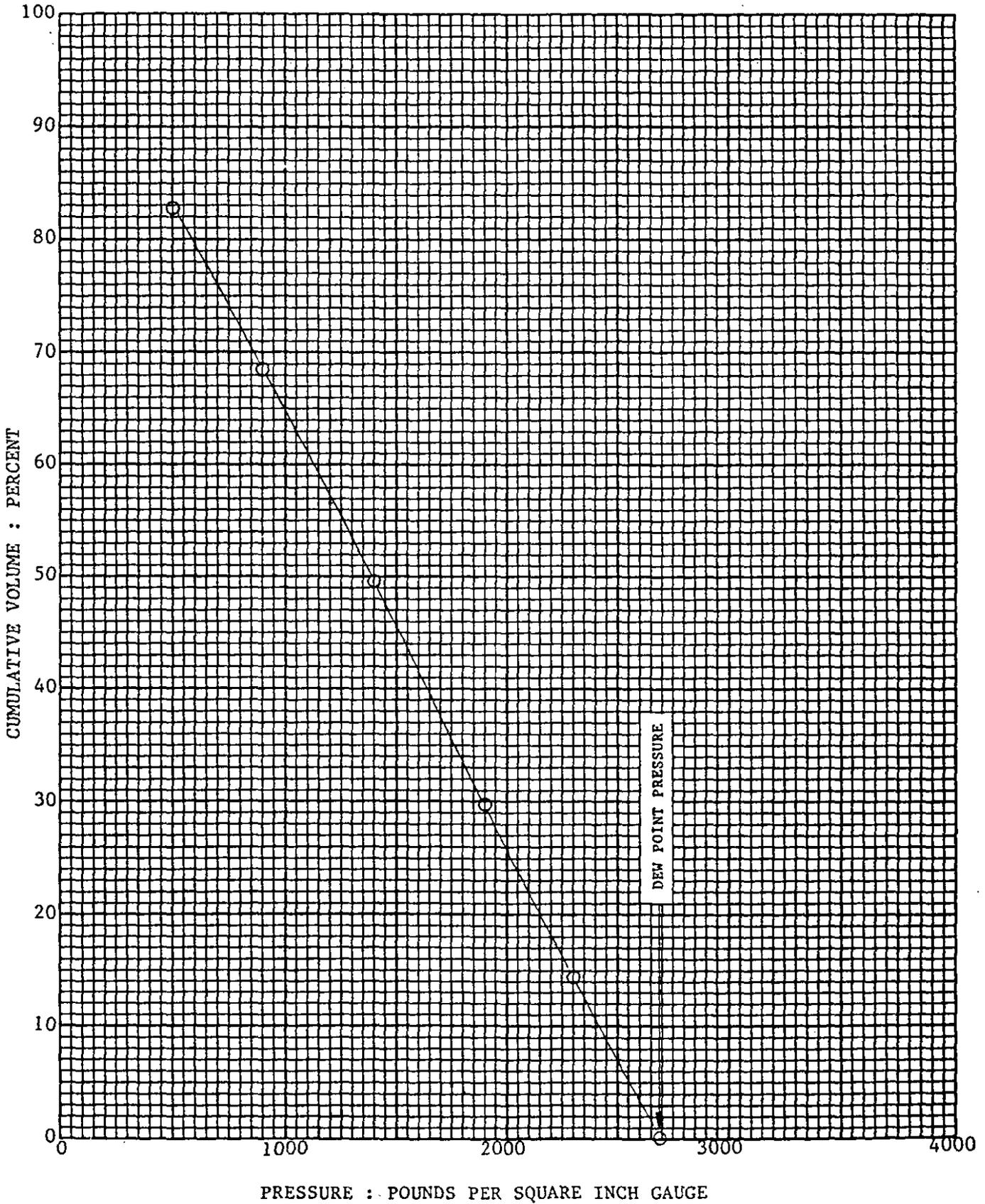
GAS VISCOSITY DURING DEPLETION AT 209°F

Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



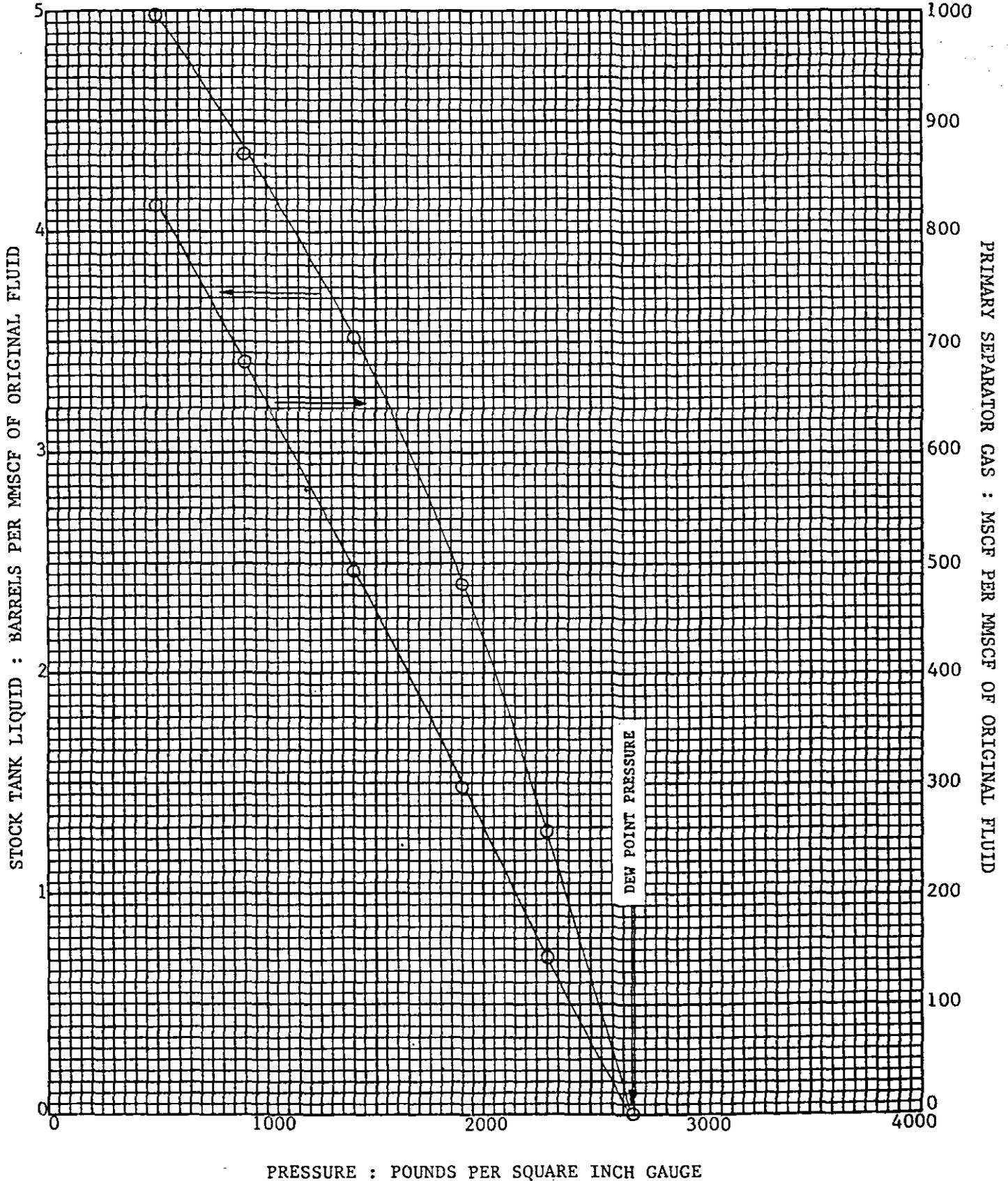
VOLUME OF GAS PRODUCED DURING DEPLETION AT 209°F

Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



CUMULATIVE RECOVERY DURING DEPLETION OF 209°F

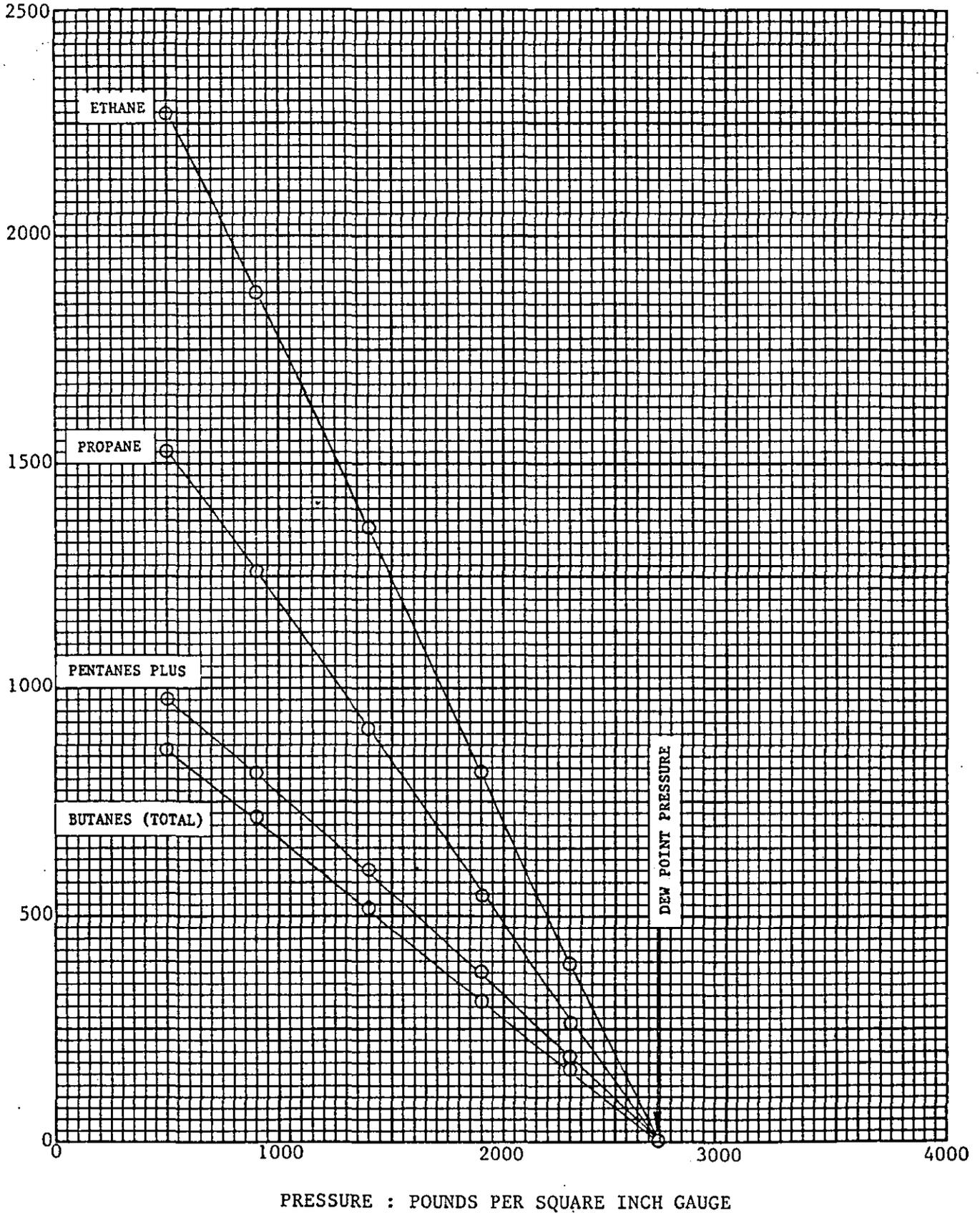
Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



CUMMULATIVE RECOVERY PLANT PRODUCTS IN WELL STREAM AT 209°F

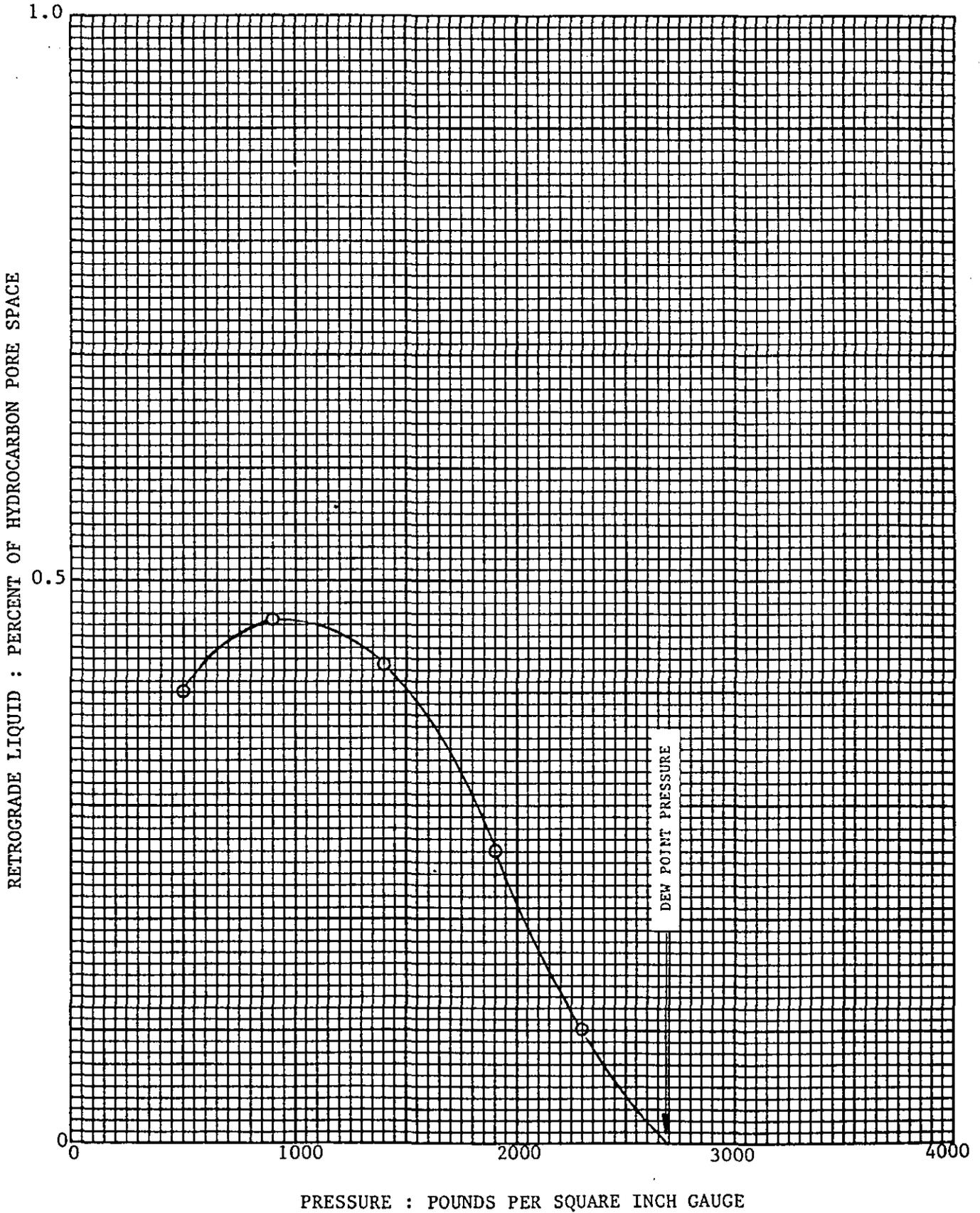
Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
 Well Yolla #1, DST 2A State Tasmania  
 Field Yolla Country Australia

PLANT PRODUCTS : GALLONS PER MSCF OF ORIGINAL FLUID



RETROGRADE CONDENSATE DURING DEPLETION AT 209°F

Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



HYDROCARBON COMPOSITION OF RESERVOIR FLUID SAMPLE TO UNDECANES PLUS

<u>Component</u>	<u>Mol Percent</u>	<u>Weight Percent</u>
Hydrogen Sulphide	0.00	0.00
Carbon Dioxide	5.01	2.91
Nitrogen	0.24	0.09
Methane	38.77	8.21
Ethane	8.42	3.34
Propane	7.75	4.51
iso-Butane	2.04	1.56
n-Butane	3.21	2.46
iso-Pentane	1.52	1.45
n-Pentane	1.54	1.47
Hexanes	2.90	3.29
Heptanes	3.60	4.52
Octanes	3.68	5.25
Nonanes	2.55	4.01
Decanes	2.53	4.38
Undecanes plus	16.24	52.55
	<u>100.00</u>	<u>100.00</u>

Properties of Hexanes plus

API gravity @ 60°F	44.3
Density, gm/cc @ 60°F	0.8039
Molecular weight	187

VOLUMETRIC DATA OF RESERVOIR FLUID SAMPLE

Saturation pressure (bubble point pressure): 2710 psig @ 209°F

Specific volume @ saturation pressure,  $\frac{\text{ft}^3}{\text{lb}}$ : 0.02576 @ 209°F

Thermal expansion of saturated oil @ 5000 psig @  $\frac{209^\circ\text{F}}{65^\circ\text{F}} = 1.09750$

Compressibility of saturated oil @ reservoir temperature: Vol/Vol/Psi:

From 5000 psig to 4500 psig =  $14.92 \times 10^{-6}$

From 4500 psig to 4000 psig =  $15.84 \times 10^{-6}$

From 4000 psig to 3500 psig =  $17.34 \times 10^{-6}$

From 3500 psig to 3000 psig =  $18.80 \times 10^{-6}$

From 3000 psig to 2710 psig =  $20.41 \times 10^{-6}$

PRESSURE - VOLUME RELATIONS OF RESERVOIR FLUID @ 209°F

<u>Pressure,</u> <u>psig</u>	<u>Relative</u> <u>Volume (1)</u>	<u>Compressibility</u> <u>x 10<sup>-6</sup> (2)</u>	<u>Y</u> <u>Function (3)</u>
5000	0.9614	14.30	
4500	0.9686	15.34	
4000	0.9763	16.56	
3500	0.9848	17.92	
3100	0.9921	19.26	
3000	0.9941	19.68	
2900	0.9961	20.16	
2800	0.9981	20.73	
<u>2710</u> *	1.0000	21.46	
2692	1.0028		2.373
2677	1.0052		2.367
2652	1.0087		2.358
2601	1.0178		2.339
2539	1.0289		2.318
2425	1.0513		2.277
2280	1.0845		2.218
2121	1.1280		2.154
1928	1.1940		2.075
1730	1.2816		1.994
1518	1.4086		1.903
1290	1.6030		1.804
1098	1.8401		1.714
862	2.3015		1.619
672	2.9350		1.533
490	4.0276		1.452

\* Saturation Pressure

(1) Relative volume:  $V/V_{sat}$  is barrels @ indicated pressure per barrel @ saturation pressure.

(2) Instantaneous Compressibility =  $-\frac{dV}{VdP}$

(3) Y Function =  $\frac{(P_{sat} - P)}{(P_{abs}) (V/V_{sat} - 1)}$

DIFFERENTIAL VAPORIZATION @ 209°F

<u>Pressure, psig</u>	<u>Solution Gas/Oil Ratio (1)</u>	<u>Relative Oil Volume (2)</u>	<u>Relative Total Volume (3)</u>	<u>Oil Density, gm/cc</u>	<u>Deviation Factor, Z</u>	<u>Gas Formation Volume Factor (4)</u>	<u>Incremental Gas Gravity</u>
2710 *	998	1.601	1.601	0.6218			
2400	872	1.530	1.678	0.6362	0.845	0.00662	0.837
2100	747	1.468	1.808	0.6478	0.851	0.00761	0.833
1800	634	1.415	1.999	0.6582	0.864	0.00900	0.834
1500	528	1.366	2.286	0.6685	0.881	0.01099	0.840
1200	437	1.322	2.720	0.6780	0.899	0.01399	0.856
900	344	1.279	3.493	0.6878	0.920	0.01901	0.885
600	253	1.234	5.085	0.6980	0.944	0.02902	0.942
300	154	1.181	9.942	0.7102	0.971	0.05828	1.080
0	0	1.084		0.7317			1.369

@ 60°F = 1.000

Gravity of Residual Oil = 46.7°API @ 60°F.

Density of Residual Oil = 0.7933 gm/cc @ 60°F

Gas Pressure Base = 14.696 psia @ 60°F

\* Saturation Pressure

- (1) Cubic feet of gas @ 14.696 psia and 60°F per barrel of residual oil @ 60°F.
- (2) Barrels of oil @ indicated pressure and temperature per barrel of residual oil @ 60°F.
- (3) Barrels of oil plus liberated gas @ indicated pressure and temperature per barrel of residual oil @ 60°F.
- (4) Cubic feet of gas @ indicated pressure and temperature per cubic foot @ 14.696 psia and 60°F.

HYDROCARBON ANALYSIS OF DIFFERENTIALLY LIBERATED GASES

<u>Component</u>	2400#		2100#	
	<u>Mol Percent</u>	<u>GPM</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00		0.00	
Carbon Dioxide	7.16		7.34	
Nitrogen	0.73		0.68	
Methane	71.69		71.45	
Ethane	9.24	2.465	9.47	2.526
Propane	5.39	1.479	5.55	1.523
iso-Butane	1.18	0.385	1.18	0.385
n-Butane	1.65	0.519	1.65	0.519
iso-Pentane	0.57	0.208	0.55	0.201
n-Pentane	0.50	0.181	0.49	0.177
Hexanes	0.83	0.338	0.77	0.313
Heptanes	0.61	0.480 (C7+)	0.53	0.394 (C7+)
Octanes	0.33		0.28	
Nonanes	0.11		0.06	
Decanes	0.01		trace	
Undecanes plus	trace		trace	
	<u>100.00</u>	<u>6.055</u>	<u>100.00</u>	<u>6.038</u>
Gas gravity (Air = 1.000):	0.837		0.833	
Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F):	1257		1248	

*These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.*

HYDROCARBON ANALYSIS OF DIFFERENTIALLY LIBERATED GASES

<u>Component</u>	<u>1800#</u>		<u>1500#</u>	
	<u>Mol Percent</u>	<u>GPM</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00		0.00	
Carbon Dioxide	7.56		7.78	
Nitrogen	0.60		0.48	
Methane	70.97		69.87	
Ethane	9.74	2.598	10.33	2.755
Propane	5.76	1.581	6.17	1.694
iso-Butane	1.20	0.392	1.25	0.408
n-Butane	1.67	0.525	1.72	0.541
iso-Pentane	0.55	0.201	0.56	0.205
n-Pentane	0.48	0.174	0.49	0.177
Hexanes	0.73	0.297	0.72	0.293
Heptanes	0.46	0.335 (C7+)	0.42	0.285 (C7+)
Octanes	0.24		0.19	
Nonanes	0.04		0.02	
Decanes	trace		trace	
Undecanes plus	trace		trace	
	<u>100.00</u>	<u>6.103</u>	<u>100.00</u>	<u>6.358</u>
Gas gravity (Air = 1.000):	0.834		0.840	
Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F):	1245		1252	

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

HYDROCARBON ANALYSIS OF DIFFERENTIALLY LIBERATED GASES

<u>Component</u>	<u>1200#</u>		<u>900#</u>	
	<u>Mol Percent</u>	<u>GPM</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00		0.00	
Carbon Dioxide	8.06		8.53	
Nitrogen	0.36		0.22	
Methane	68.05		64.97	
Ethane	11.09	2.958	12.27	3.272
Propane	6.84	1.877	7.88	2.163
iso-Butane	1.34	0.437	1.51	0.493
n-Butane	1.83	0.575	2.01	0.632
iso-Pentane	0.59	0.216	0.64	0.234
n-Pentane	0.51	0.184	0.57	0.206
Hexanes	0.73	0.297	0.77	0.313
Heptanes	0.41	0.272 (C7+)	0.43	0.285 (C7+)
Octanes	0.18		0.19	
Nonanes	0.01		0.01	
Decanes	trace		trace	
Undecanes plus	trace		trace	
	<u>100.00</u>	<u>6.816</u>	<u>100.00</u>	<u>7.599</u>
Gas gravity (Air = 1.000):	0.856		0.885	
Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F):	1271		1307	

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

HYDROCARBON ANALYSIS OF DIFFERENTIALLY LIBERATED GASES

<u>Component</u>	<u>600#</u>		<u>300#</u>	
	<u>Mol Percent</u>	<u>GPM</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00		0.00	
Carbon Dioxide	9.02		9.68	
Nitrogen	0.07		0.02	
Methane	59.44		46.05	
Ethane	14.14	3.772	18.68	4.983
Propane	9.86	2.706	14.35	3.939
iso-Butane	1.85	0.604	2.88	0.940
n-Butane	2.43	0.764	3.74	1.176
iso-Pentane	0.77	0.281	1.20	0.438
n-Pentane	0.72	0.260	1.08	0.390
Hexanes	0.92	0.374	1.20	0.488
Heptanes	0.52	0.353 (C7+)	0.72	0.507 (C7+)
Octanes	0.23		0.33	
Nonanes	0.03		0.07	
Decanes	trace		trace	
Undecanes plus	trace		trace	
	<u>100.00</u>	<u>9.114</u>	<u>100.00</u>	<u>12.861</u>
Gas gravity (Air = 1.000):	0.942		1.080	
Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F):	1385		1584	

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

HYDROCARBON ANALYSIS OF DIFFERENTIALLY LIBERATED GASES

<u>Component</u>	<u>Mol Percent</u>	<u>GPM</u>
Hydrogen Sulphide	0.00	
Carbon Dioxide	5.46	
Nitrogen	0.03	
Methane	23.32	
Ethane	19.91	5.311
Propane	28.22	7.745
iso-Butane	6.41	2.092
n-Butane	9.21	2.896
iso-Pentane	2.43	0.887
n-Pentane	2.11	0.763
Hexanes	1.54	0.627
Heptanes	0.75	0.616 (C7+)
Octanes	0.56	
Nonanes	0.05	
Decanes	trace	
Undecanes plus	trace	
	<u>100.00</u>	<u>20.937</u>

Gas gravity (Air = 1.000): 1.369

Gross heating value (BTU per cubic foot of dry gas @ 14.696 psia and 60°F): 2138

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgement of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operation, or profitability of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

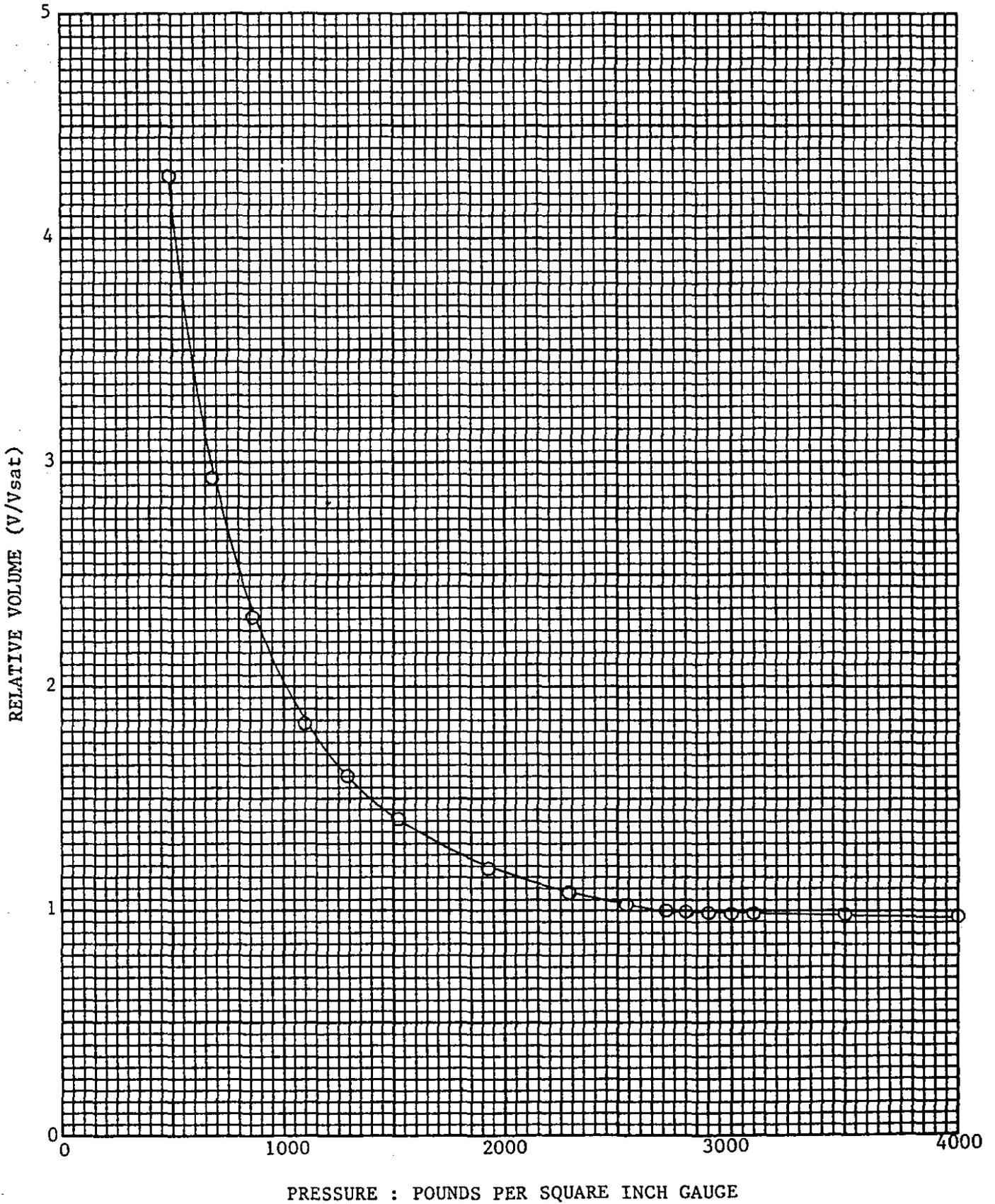
SEPARATOR TESTS OF RESERVOIR FLUID SAMPLE

<u>Separator Pressure, psig</u>	<u>Temp. °F</u>	<u>Gas/Oil Ratio (1)</u>	<u>Gas/Oil Ratio (2)</u>	<u>Tank Oil Gravity, °API @ 60°F</u>	<u>Formation Volume Factor (3)</u>	<u>Separator Volume Factor (4)</u>	<u>Gas Gravity</u>
90	102	862	940			1.091	0.870 *
to							
0	102	88	90	45.8	1.617	1.022	1.537 *

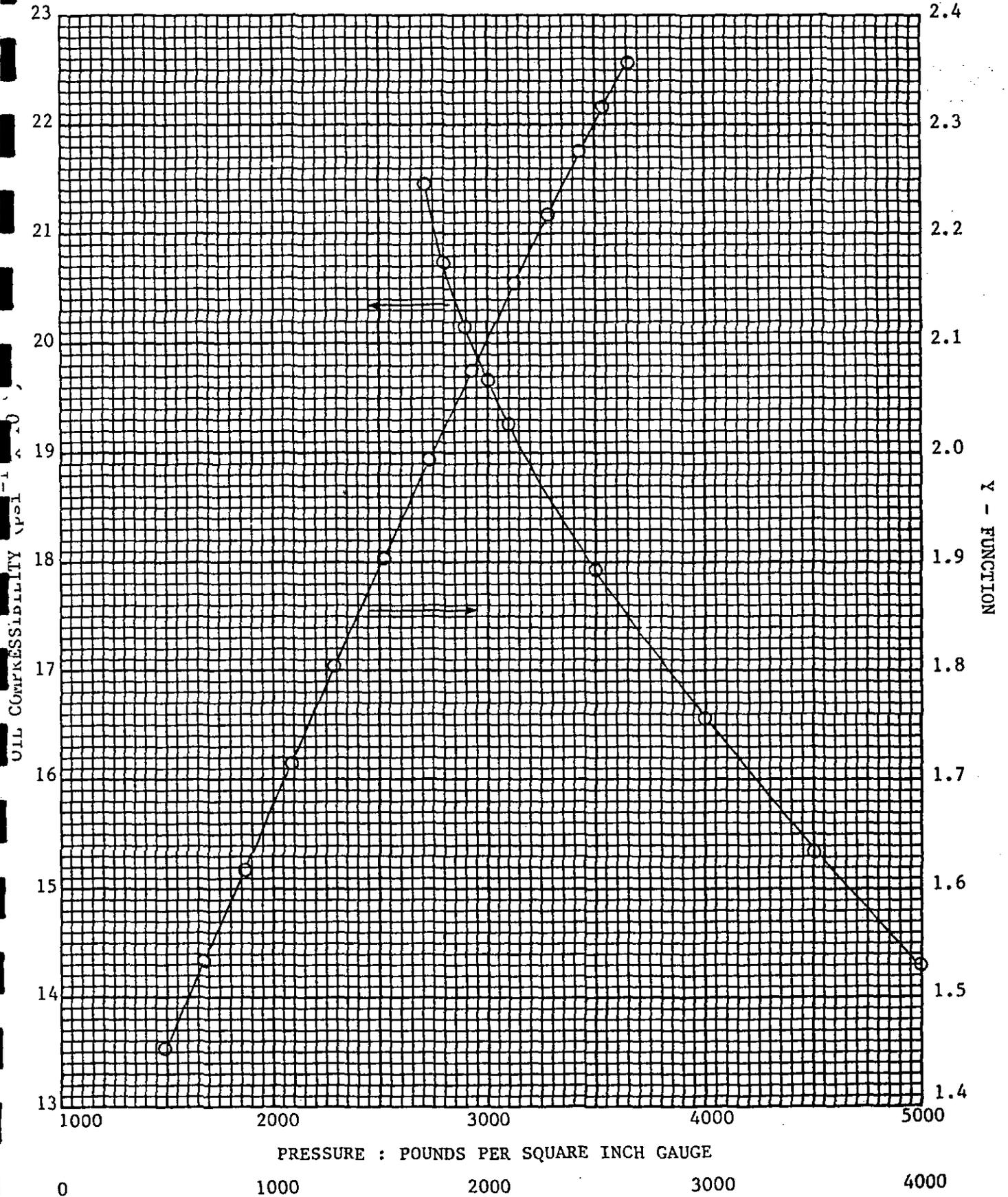
\* This gas was collected and analysed by gas chromatography.

- (1) Gas/Oil Ratio in cubic feet of gas @ 14.696 psia and 60°F per barrel of oil @ indicated pressure and temperature.
- (2) Gas/Oil Ratio in cubic feet of gas @ 14.696 psia and 60°F per barrel of stock tank oil @ 60°F.
- (3) Formation Volume Factor is barrels of saturated oil @ 270 psig and 209°F per barrel of stock tank oil @ 60°F.
- (4) Separator Volume Factor is barrels of oil @ indicated pressure and temperature per barrel of stock tank oil @ 60°F.

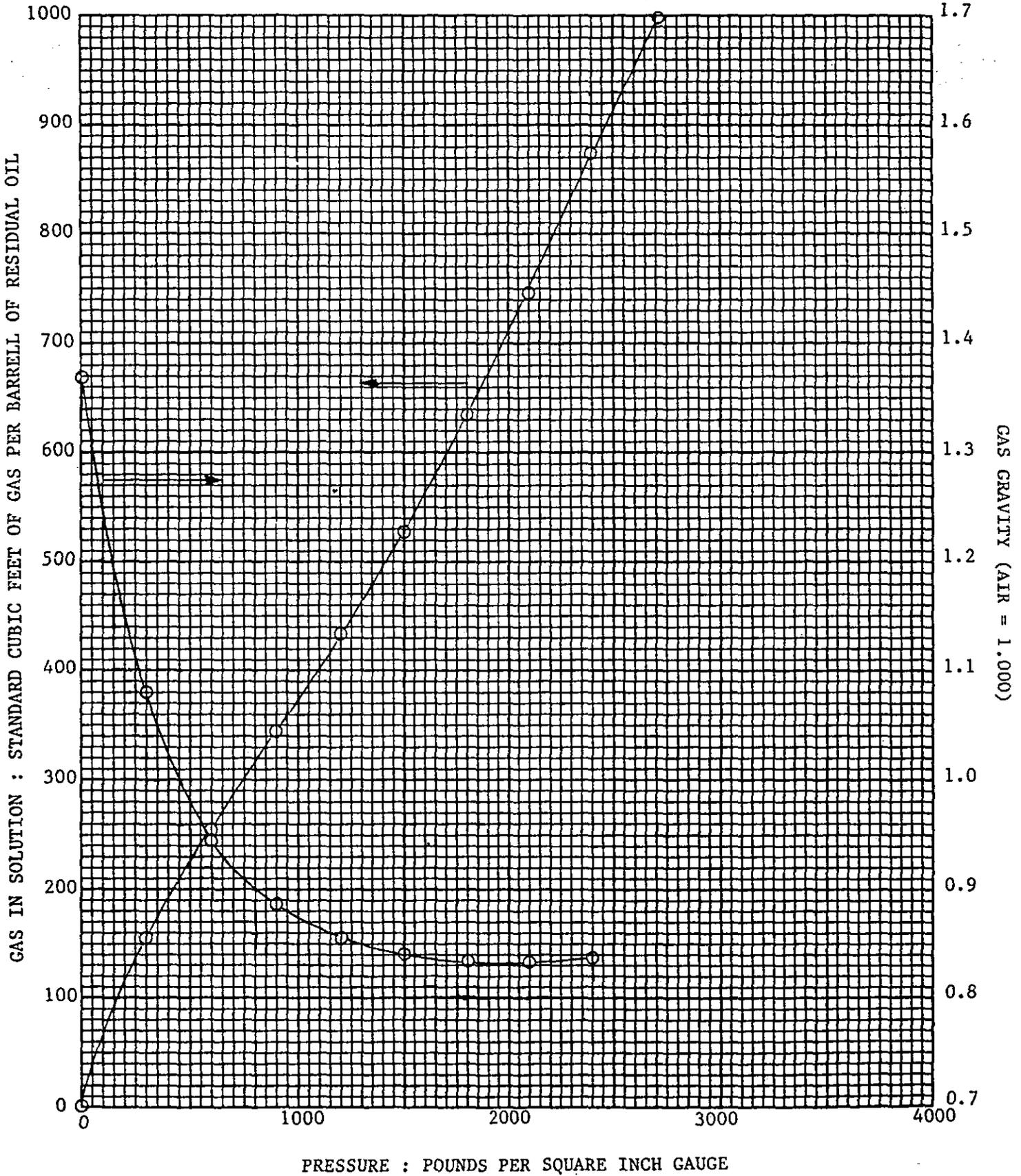
Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia



Company Amoco Australia Petroleum Co. Formation \_\_\_\_\_  
Well Yolla #1, DST 2A State Tasmania  
Field Yolla Country Australia

