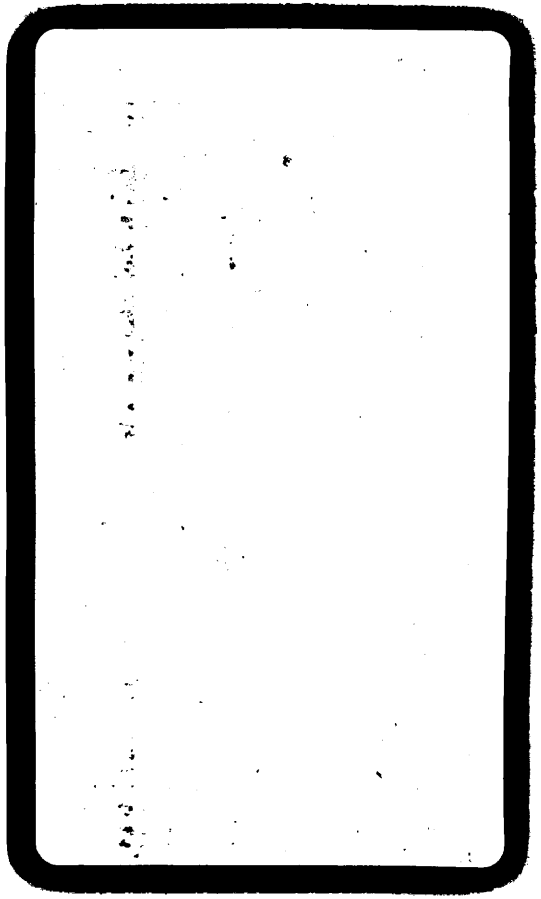
HYDROCARBON REPORT.
GIPPSLAND BASIN.

BREAM - 5.
CORE LAB

H/C Bon. BAYA



CORE LAB
RESERVOIR ANALYSIS

RESERVOIR FLUID STUDY
ESSO AUSTRALIA LTD
BREAM 5
SFL 82239

24A LIM TECK BOO ROAD, SINGAPORE 1953. TELEX: RS21423 TEL: 282 1222

CORE LABORATORIES
Reservoir Fluid Division

M/S ESSO AUSTRALIA LTD
127 Kent Street
Sydney
New South Wales 2000
AUSTRALIA

February 7, 1983

ATTENTION: MR A K KHURANA

SUBJECT: RESERVOIR FLUID STUDY
BREAM 5
AUSTRALIA
SFL 82239

Gentlemen

A subsurface fluid sample was collected from the subject well and this sample was forwarded to our laboratory for use in a reservoir fluid study. Presented in the following report are the results of this study as requested by M/s Esso Australia Ltd.

As a quality check, the room temperature bubble point pressure of the sample was initially determined. At 70°F, the subsurface fluid in cylinder 74A 1886 was found to have a bubble point pressure of 1967 psig. The results of the preliminary quality checks are reported on page two of this report.

The hydrocarbon composition of the subsurface fluid was determined through heptanes plus using low temperature fractional distillation along with gas chromatography. The heptanes plus fraction was collected at the end of this distillation and its physical properties were analysed. The compositional analysis of the subsurface fluid in terms of both mol percent and weight percent and tabulated on page three.

A known quantity of the reservoir fluid was charged to a high pressure visual cell and thermally expanded to the reported reservoir temperature of 190°F. During a constant composition expansion at this temperature, the fluid was found to have a bubble point pressure of 2586 psig. The volumetric data and the pressure-volume measurement of the fluid at the reservoir temperature can be found on pages four and five respectively.

When subjected to a differential pressure depletion at the reservoir temperature of 190°F, the fluid evolved a total of 992 cubic feet of gas at 14.73 psia and 60°F per barrel of residual oil at 60°F. The associated relative oil volume factor was 1.605 barrels of saturated fluid per barrel of residual oil. The oil density and the properties of the evolved gases were measured at each point during the differential pressure depletion and these data are included in the summary of the differential depletion data on page six.

cont..2/-

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The viscosity of the reservoir fluid was measured over a wide range of pressures at the reservoir temperature of 190°F in a rolling ball viscosimeter. The viscosity of the fluid was found to vary from a minimum of 0.290 centipoise at the bubble point pressure of 2586 psig to a maximum of 1.102 centipoises at atmospheric pressure. The results of the viscosity measurements are tabulated on page seven and is shown graphically on page fifteen.

Three single-stage separator tests were performed on the subsurface fluid at 140°F to determine the effect of separator pressure upon gas-oil ratio, stock tank oil gravity and formation volume factor. The results of these separator tests are tabulated on page eight. The resulting first stage gas from the above separator test at 1000 psig was collected and analysed through heptanes plus using gas chromatography. The composition of this separator gas is tabulated on page nine.

The subsurface fluid was then subjected to an atmospheric flash. The fluid which was in a cylinder maintained at a pressure above the bubble point pressure was flashed to 0 psig at normal laboratory temperature of 70°F. The resultant gas-oil ratio, stock tank oil gravity and formation volume factor are reported on page ten.

We were requested to perform a viscosity on the subsurface fluid at 140°F by M/s Esso Australia Ltd. The viscosity of the reservoir fluid, to be reported in centipoise at 140°F, requires the viscosity data obtained in a rolling ball viscosimeter to be used in conjunction with the pressure-volume relations of the fluid at 140°F. Thus, a pressure-volume relationship of the subsurface fluid at 140°F was found essential to be performed prior to the viscosity measurements in a rolling ball viscosimeter.

Hence, a known quantity of the subsurface fluid was charged to a high pressure visual cell and thermally expanded to 140°F. During a constant composition expansion at this temperature, the bubble point pressure of the fluid was observed to be 2385 psig. The pressure-volume relation measurements of the fluid at 140°F is tabulated on page eleven.

cont..3/-

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Subsequently, the viscosity of the fluid was measured over a wide range of pressures at 140°F in a rolling ball viscosimeter. The viscosity was found to vary from a minimum of 0.372 centipoise at the bubble point pressure of 2385 psig to a maximum of 1.21 centipoises at atmospheric pressure. The results of the viscosity measurements of the fluid at 140°F can be found on page twelve and is depicted graphically on page sixteen.

We wish to thank M/s Esso Australia Ltd for this opportunity to be of service. Please do not hesitate to contact us should you require further information.

Very truly yours

John Savickas

JOHN SAVICKAS
Manager
Singapore Reservoir Fluid Laboratory

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JS/pv/mh

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Petroleum Reservoir Engineering

Company ESSO AUSTRALIA LTD Date Sampled

Well BREAM 5 State

Field BREAM Country AUSTRALIA

FORMATION CHARACTERISTICS

Formation Name	
Date First Well Completed	19
Original Reservoir Pressure	PSIG @ FT
Original Produced Gas-Oil Ratio	SCF/Bbl
Production Rate	Bbl/Day
Separator Pressure and Temperature	PSIG °F
Oil Gravity at 60°F	°API
Datum	Ft Subsea
Original Gas Cap	

WELL CHARACTERISTICS

Elevation	FT
Total Depth	FT
Producing Interval	FT
Tubing Size and Depth	In to FT
Productivity Index	Bbl/D/PSI @ Bbl/Day
Last Reservoir Pressure	2737 PSIG @ 1940 M MDKB
Date	19
Reservoir Temperature	190 °F @ 1940 M MDKB
Status of Well	SHUT-IN
Pressure Gauge	
Normal Production Rate	Bbl/Day
Gas-Oil Ratio	SCF/STB
Separator Pressure and Temperature	PSIG °F
Base Pressure	PSIA
Well Making Water	% Cut

SAMPLING CONDITIONS

Sampled at	FT
Status of Well	
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG °F
Tubing Pressure	PSIG
Casing Pressure	PSIG
Sampled by	
Type Sampler	

REMARKS:

SUMMARY OF SAMPLES RECEIVED IN LABORATORY

Bottomhole sample in the following cylinder was delivered to our laboratory : -

Cylinder number 74A 1886 :

Opening pressure	:	1350 psig at 70°F
Water recovered	:	292 cc
Bubble point	:	1967 psig at 70°F
Approximate sample volume	:	3437 ccs

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Petroleum Reservoir Engineering

HYDROCARBON ANALYSIS OF RESERVOIR FLUID SAMPLE

Component	Mol Percent	Weight Percent	Density Gm/Cc @ 60°F	°API @ 60°F	Molecular Weight
Hydrogen Sulfide	0.00	0.00			
Carbon Dioxide	1.49	0.90			
Nitrogen	0.35	0.13			
Methane	44.29	9.77			
Ethane	6.25	2.59			
Propane	5.68	3.45			
Iso-Butane	1.35	1.08			
N-Butane	2.77	2.22			
Iso-Pentane	1.18	1.17			
N-Pentane	1.65	1.64			
Hexanes	1.09	1.29			
Heptanes plus	33.90	75.76	0.8118	42.6	163
	100.00	100.00			

VOLUMETRIC DATA OF RESERVOIR FLUID SAMPLE

1 Saturation pressure (bubble-point pressure) 2586 PSIG @ 190 °F

2 Specific volume at saturation pressure : ft 3/lb 0.02557 @ 190 °F

3 Thermal expansion of saturated oil @ 5000 PSIG = $\frac{V@\ 190\ °F}{V@\ 76\ °F}$ = 1.08891

4 Compressibility of saturated oil @ reservoir temperature : Vol/Vol/PSI:

From 5000 PSIG to 4000 PSIG = 14.17×10^{-6}

From 4000 PSIG to 3000 PSIG = 15.99×10^{-6}

From 3000 PSIG to 2586 PSIG = 18.43×10^{-6}

From _____ PSIG to _____ PSIG = _____

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PRESSURE VOLUME RELATIONS AT 190°F

Pressure PSIG		Relative Volume (1)	Y Function(2)
5000		0.9627	
4000		0.9765	
3000		0.9925	
2900		0.9941	
2800		0.9960	
2700		0.9979	
2600		0.9998	
2586	Bubble Point Pressure	1.0000	
2502		1.0142	
2469		1.0201	
2417		1.0299	
2323		1.0494	2.281
2197		1.0788	2.230
2055		1.1180	2.173
1880		1.1770	2.103
1700		1.2558	2.021
1520		1.3544	1.959
1358		1.4730	1.892
1212		1.6114	1.832
1082		1.7697	1.781
968		1.9480	1.737
789		2.3442	1.662
620		2.9390	1.597
459		3.9311	1.529

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

(2) $Y\ Function = \frac{(Psat-P)}{(Pabs)(V/Vsat-1)}$

DIFFERENTIAL VAPORIZATION AT 190 °F

Pressure PSIG	Solution Gas/Oil Ratio(1)	Relative Oil Volume (2)	Relative Oil Volume (3)	Oil Density Gm/Cc	Deviation Factor Z	Gas Formation Volume Factor(4)	Incremental Gas Gravity
2586	992	1.605	1.605	0.6264			
2350	886	1.552	1.677	0.6370	0.851	0.00663	0.733
2050	772	1.494	1.794	0.6495	0.857	0.00764	0.733
1750	663	1.442	1.973	0.6608	0.868	0.00906	0.735
1450	563	1.394	2.242	0.6719	0.883	0.01110	0.740
1150	467	1.350	2.680	0.6823	0.900	0.01422	0.750
850	376	1.306	3.455	0.6933	0.920	0.01958	0.765
550	284	1.263	5.130	0.7040	0.941	0.03066	0.813
250	185	1.211	10.848	0.7172	0.965	0.06705	0.951
122	132	1.180	21.334	0.7255	0.979	0.13158	1.100
0	0	1.069		0.7555			1.676
	at 60°F =	1.000					

Gravity of residual oil = 43.5°API at 60°F.

(1) Cubic feet of gas at 14.73 psia and 60°F per barrel of residual oil at 60°F.
(2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60°F.
(3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60°F.
(4) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.73 psia and 60°F.

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VISCOSITY DATA AT 190°F

Pressure PSIG		Oil Viscosity Centipoise
5000		0.337
4500		0.328
4000		0.318
3500		0.308
3000		0.299
2586	Bubble Point Pressure	0.290
2350		0.304
2050		0.325
1750		0.348
1450		0.374
1150		0.402
850		0.441
550		0.489
250		0.552
122		0.618
0		1.102

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SEPARATOR TESTS OF RESERVOIR FLUID SAMPLE

Separator Pressure PSIG	Temp °F	Gas/Oil Ratio (1)	Gas/Oil Ratio (2)	Tank Oil Gravity °API @ 60°F	Formation Volume Factor(3)	Separator Volume Factor(4)	Gas Gravity
1000	140	381	501			1.315	0.689*
to			926				
0	140	466	485	43.6	1.603	1.041	1.219
600	140	515	634			1.230	0.708
to			954				
0	140	307	320	44.0	1.579	1.042	1.320
400	140	598	706			1.180	0.729
to			934				
0	140	219	228	44.3	1.563	1.042	1.388

*This gas was collected and analysed by chromatography.

(1) Gas/Oil Ratio in cubic feet of gas at 14.73 psia and 60°F per barrel of oil at indicated pressure and temperature.
(2) Gas/Oil Ratio in cubic feet of gas at 14.73 psia and 60°F per barrel of stock tank oil at 60°F.
(3) Formation Volume Factor is barrels of saturated oil at 2586 psig and 190 °F per barrel of stock tank oil at 60°F.
(4) Separator Volume Factor is barrels of oil at indicated pressure and temperature per barrel of stock tank oil at 60°F.

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HYDROCARBON ANALYSIS OF SEPARATOR GAS SAMPLE

	1000 PSIG 140°F	
Component	Mol Percent	GPM
Hydrogen Sulfide	0.00	
Carbon Dioxide	2.33	
Nitrogen	0.94	
Methane	83.73	
Ethane	7.25	1.938
Propane	3.65	1.004
Iso-Butane	0.55	0.180
N-Butane	0.92	0.290
Iso-Pentane	0.21	0.077
N-Pentane	0.23	0.083
Hexanes	0.12	0.049
Heptanes plus	0.07	0.033
	100.00	3.654

Calculated gas gravity (air = 1.000): 0.689

Calculated gross heating value (BTU per cubic foot of dry gas at 14.73 psia and 60°F): 1144

ATMOSPHERIC SEPARATOR TEST OF RESERVOIR FLUID SAMPLE

Separator Pressure PSIG	Temp °F	Gas/Oil Ratio (1)	Tank Oil Gravity °API @ 60°F	Formation Volume Factor(2)	Gas Gravity
5000	70				
to					
0	70	971	1.605	43.8	0.930

(1) Gas/Oil Ratio in cubic feet of gas at 14.73 psia and 60°F per barrel of stock tank oil at 60°F.

(2) Formation Volume Factor is barrels of saturated oil at 2586 psig and 190°F per barrel of stock tank oil at 60°F.

PRESSURE-VOLUME RELATIONS AT 140°F

Pressure PSIG		Relative Volume (1)
5000		0.9675
4000		0.9784
3000		0.9909
2700		0.9952
2600		0.9966
2500		0.9982
2400		0.9998
2385	Bubble Point Pressure	1.0000
2331		1.0088
2300		1.0142
2245		1.0243
2145		1.0445
2016		1.0749
1872		1.1156
1700		1.1768
1524		1.2584
1329		1.3812
1165		1.5246
1025		1.6887
886		1.9144
715		2.3220
558		2.9384
410		3.9661

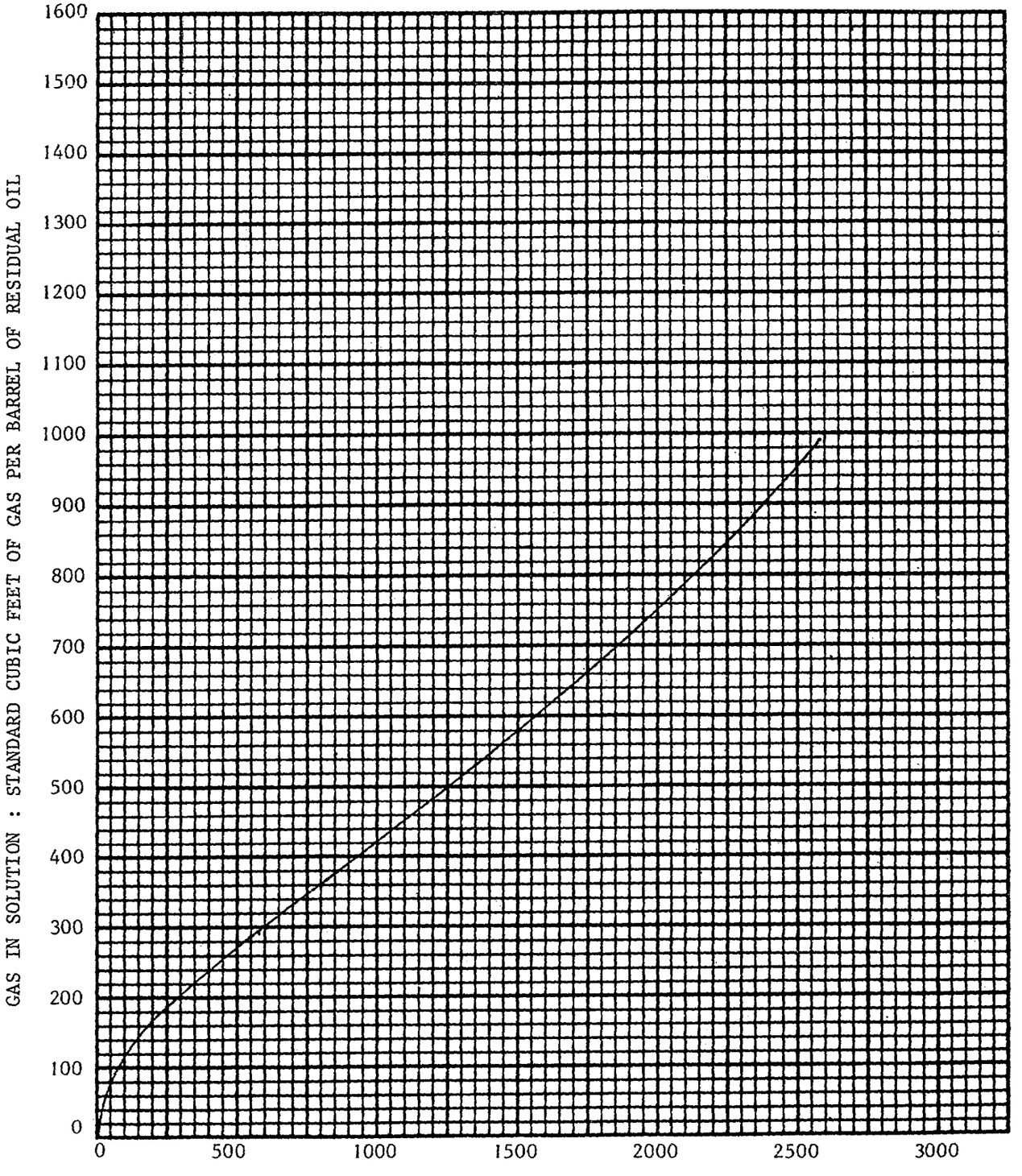
(1) Relative Volume : V/Vsat is barrels at indicated pressure per barrel at saturation pressure.

VISCOSITY DATA AT 140°F

Pressure PSIG		Oil Viscosity Centipoise
5000		0.490
4500		0.469
4000		0.445
3500		0.422
3000		0.400
2385	Bubble Point Pressure	0.372
2250		0.381
2050		0.394
1750		0.418
1450		0.442
1150		0.480
850		0.525
550		0.589
250		0.690
122		0.779
0		1.211

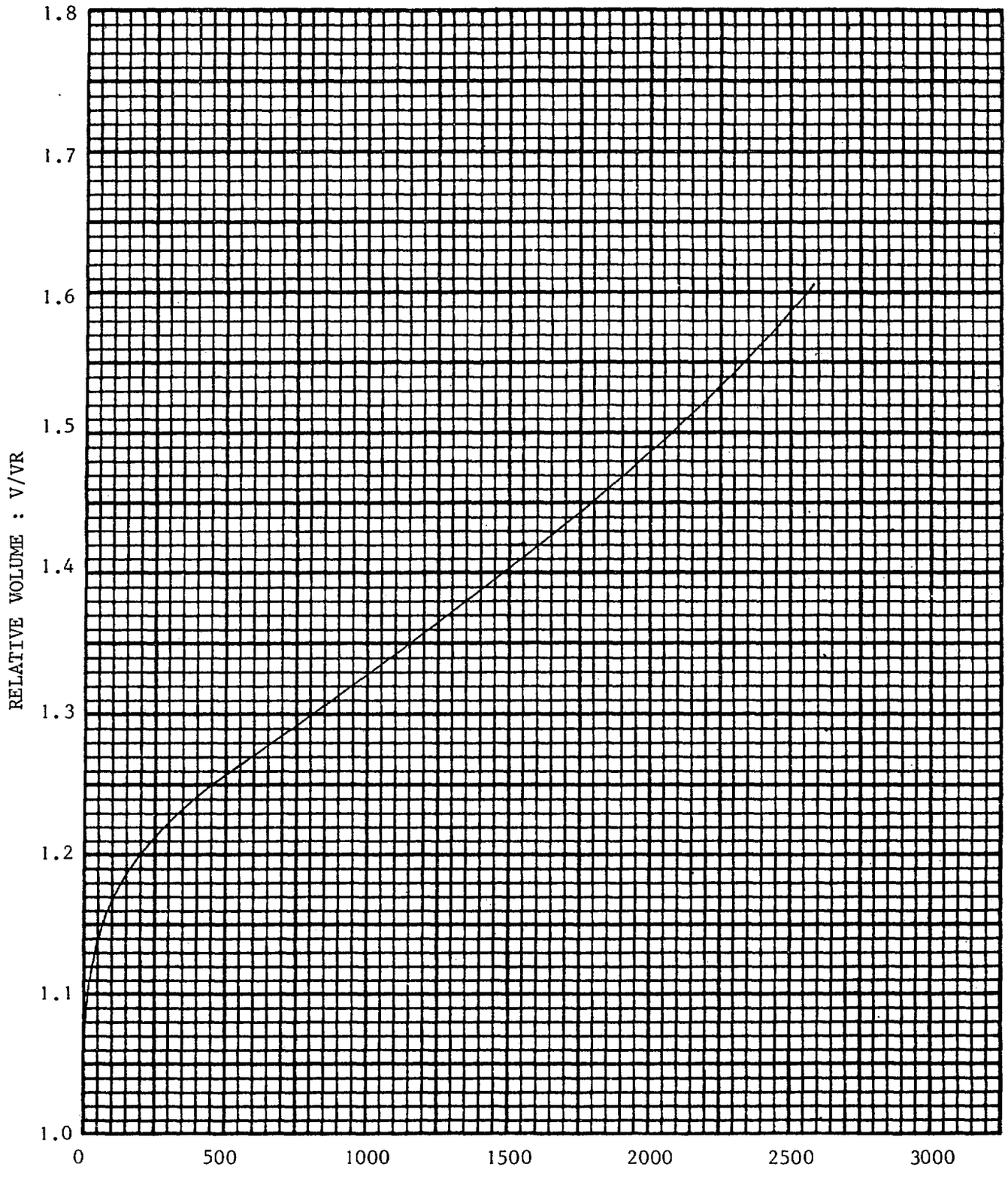
DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID AT 190°F

Company ESSO AUSTRALIA LTD Formation
Well BREAM 5 State
Field BREAM Country AUSTRALIA



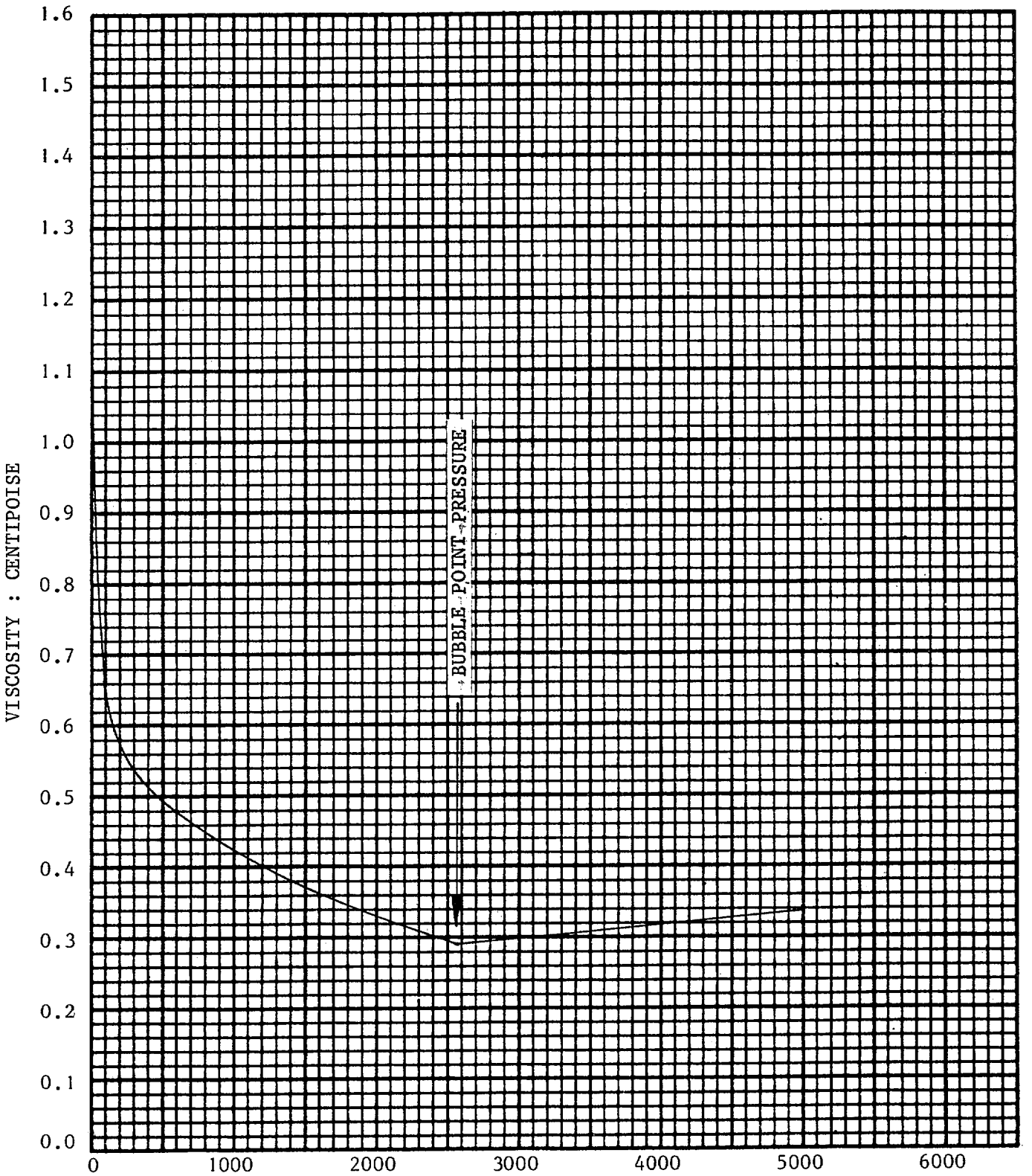
DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID AT 190°F

Company ESSO AUSTRALIA LTD Formation
Well BREAM 5 State
Field BREAM Country AUSTRALIA



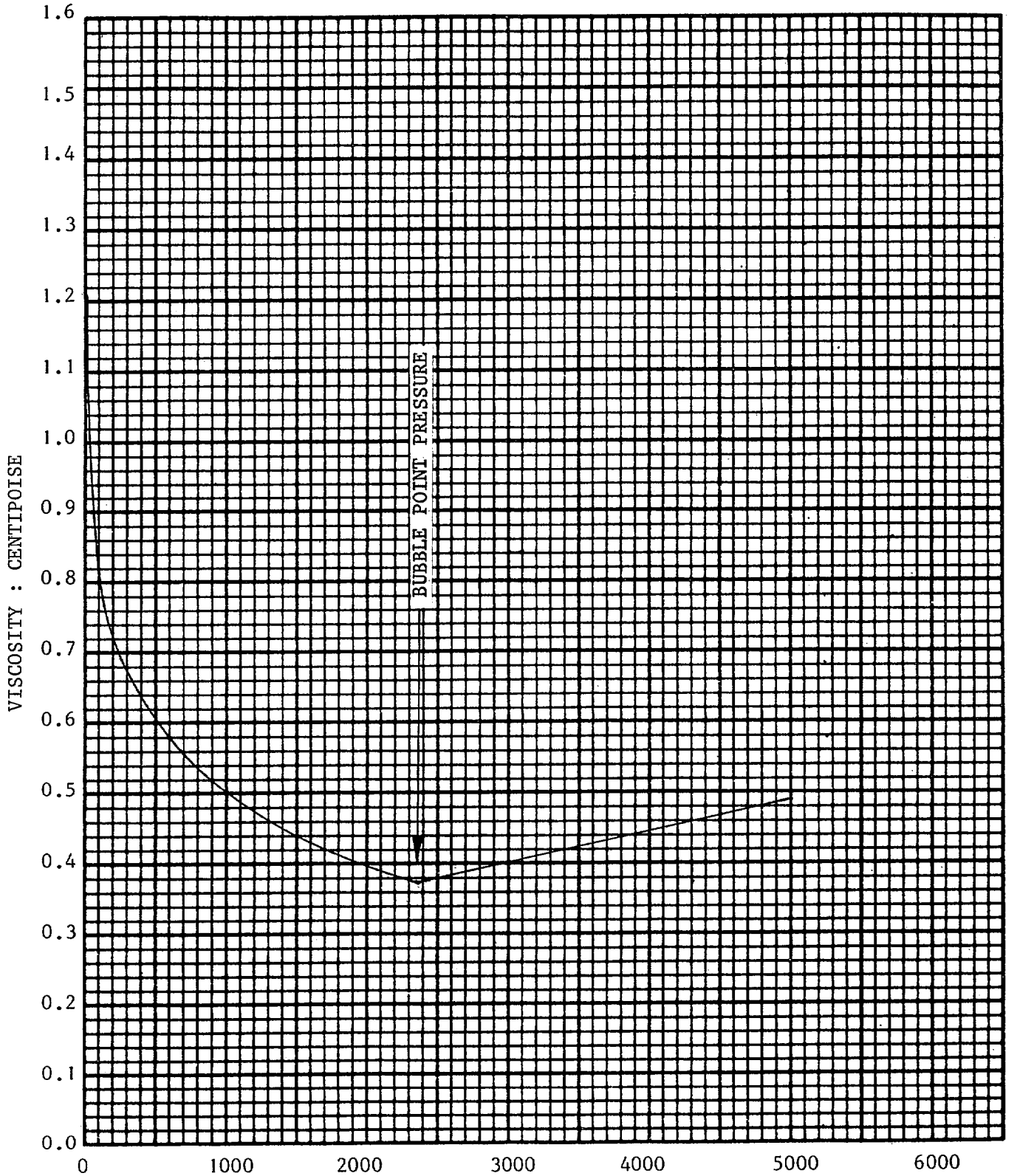
VISCOSITY OF RESERVOIR FLUID AT 190°F

Company ESSO AUSTRALIA LTD Formation
Well BREAM 5 State
Field BREAM Country AUSTRALIA



VISCOSITY OF RESERVOIR FLUID AT 140°F

Company ESSO AUSTRALIA LTD — Formation
Well BREAM 5 — State
Field BREAM — Country AUSTRALIA



COMPOSITIONAL ANALYSIS TO UNDECANES PLUS
ESSO AUSTRALIA LTD
BREAM 5
SFL 82239A

24A LIM TECK BOO ROAD, SINGAPORE 1953 TELEX: RS21423 TEL: 282 1222

CORE LABORATORIES
Reservoir Fluid Division

M/S ESSO AUSTRALIA LTD
127 Kent Street
Sydney NSW 4000
AUSTRALIA

28 February, 1983

ATTENTION: MR A K KHURANA

SUBJECT: COMPOSITIONAL ANALYSIS TO
UNDECANES PLUS
BREAM 5
AUSTRALIA
SFL 82239A

Gentlemen

A subsurface fluid sample was collected from the subject well and was forwarded to our laboratory in Singapore.

A reservoir fluid study was performed on the subsurface fluid as per our report SFL 82239.

The hydrocarbon composition of the subsurface fluid was determined by low temperature fractional distillation through heptanes plus, as reported on page three. After completion of the reservoir fluid study, a larger volume of the subsurface fluid was charged to a high temperature fractional distillation apparatus for an extension of the composition to undecanes plus. During this distillation, the distillate fractions were collected and their physical properties were analysed. The composition of the subsurface fluid to undecanes plus is reported on page four of the report.

We wish to thank you for this opportunity to be of service. Kindly contact us should you require further information.

Very truly yours

John Savickas

JOHN SAVICKAS
Manager
Singapore Reservoir Fluid Laboratory

encl: 7 copies

JS/pv/mh

CORE LABORATORIES
Petroleum Reservoir Engineering

Company	ESSO AUSTRALIA LTD	Date Sampled	
Well	BREAM 5	State	
Field	BREAM	Country	AUSTRALIA

FORMATION CHARACTERISTICS

Formation Name	
Date First Well Completed	19
Original Reservoir Pressure	PSIG @ FT
Original Produced Gas-Oil Ratio	SCF/Bbl
Production Rate	Bbl/Day
Separator Pressure and Temperature	PSIG °F
Oil Gravity at 60°F	°API
Datum	Ft Subsea
Original Gas Cap	

WELL CHARACTERISTICS

Elevation	FT
Total Depth	FT
Producing Interval	FT
Tubing Size and Depth	In to FT
Productivity Index	Bbl/D/PSI @ Bbl/Day
Last Reservoir Pressure	2737 PSIG @ 1940 M MDKB
Date	19
Reservoir Temperature	190 °F @ 1940 M MDKB
Status of Well	SHUT-IN
Pressure Gauge	
Normal Production Rate	Bbl/Day
Gas-Oil Ratio	SCF/STB
Separator Pressure and Temperature	PSIG °F
Base Pressure	PSIA
Well Making Water	% Cut

SAMPLING CONDITIONS

Sampled at	FT
Status of Well	
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG °F
Tubing Pressure	PSIG
Casing Pressure	PSIG
Sampled by	
Type Sampler	

REMARKS:

SUMMARY OF SAMPLES RECEIVED IN LABORATORY

Bottomhole sample in the following cylinder was delivered to our laboratory : -

Cylinder number 74A 1886 :

Opening pressure	:	1350 psig at 70°F
Water recovered	:	292 cc
Bubble point	:	1967 psig at 70°F
Approximate sample volume	:	3437 ccs

CORE LABORATORIES
Petroleum Reservoir Engineering

HYDROCARBON ANALYSIS OF RESERVOIR FLUID SAMPLE

Component	Mol Percent	Weight Percent	Density Gm/Cc @ 60°F	°API @ 60°F	Molecular Weight
Hydrogen Sulfide	0.00	0.00			
Carbon Dioxide	1.49	0.90			
Nitrogen	0.35	0.13			
Methane	44.29	9.77			
Ethane	6.25	2.59			
Propane	5.68	3.45			
Iso-Butane	1.35	1.08			
N-Butane	2.77	2.22			
Iso-Pentane	1.18	1.17			
N-Pentane	1.65	1.64			
Hexanes	1.09	1.29			
Heptanes plus	33.90	75.76	0.8118	42.6	163
	100.00	100.00			

HYDROCARBON ANALYSIS OF RESERVOIR FLUID SAMPLE TO UNDECANES PLUS

Component	Mol Percent	Weight Percent	Density Gm/Cc @ 60°F	°API @ 60°F	Molecular Weight
Hydrogen Sulfide	0.00	0.00			
Carbon Dioxide	1.49	0.90			
Nitrogen	0.35	0.13			
Methane	44.29	9.77			
Ethane	6.25	2.59			
Propane	5.68	3.45			
Iso-Butane	1.35	1.08			
N-Butane	2.77	2.22			
Iso-Pentane	1.18	1.17			
N-Pentane	1.65	1.64			
Hexanes	1.09	1.29			
Heptanes	5.89	7.50	0.7394	59.7	94
Octanes	4.83	6.93	0.7605	54.4	106
Nonanes	3.69	6.14	0.7811	49.5	123
Decanes	2.59	4.86	0.7899	47.5	139
Undecanes plus	16.90	50.33	0.8458	35.6	220
	100.00	100.00			
Properties of heptanes plus			0.8118	42.6	163

24A LIM TECK BOO ROAD, SINGAPORE 1953. TELEX: RS21423 TEL: 282 1222

3 March 1983

CORE LABORATORIES
Chemistry

ANALYSIS REPORT

Company	:	Esso Australia Limited
Well	:	Bream No. 5
Cylinder No	:	74A 1886
Date Received	:	28 February 1983
Date Analysed	:	28 February 1983
Our File Reference	:	SCHO 83020
Sample Code	:	CL 81/83
Analyst	:	RC

Analysis Result

Pour Point ^{o}F	ASTM D 97	+50

LEONG SEE MENG - Chief Chemist