

DEPT. NAT. RES & ENV
PE800698

HYDROCARBON REPORTS

TERMINI-1

NYC BAK

PETROLEUM DIVISION

47 Woodforde Road, Magill,
South Australia, 5072
P.O. Box 410,
Magill, South Australia, 5072



25 OCT 1990

Fax: 364 1500
Telex: AA88214
Tel: (08) 364 1500
(08) 333 0787

Reservoir Fluid and Core Services, Laboratory Consulting and Analysis

Adelaide, July 24 1990
P. O. Box 410
Magill
S. A. 5072

Esso Australia Ltd.
Esso House
127 Kent Street
Sydney, N.S.W. 2000

Subject: Reservoir Fluid Study
Well : Terakihi # 1
File : E - 90018

Attention: Mr. Henry Irrgang

Dear Sirs,

Please find enclosed results of reservoir fluid analyses performed on bottom hole samples collected in subject well.

The samples, taken with Schlumberger's RFT tool, were transferred under pressure, to ensure single phase, into high pressure storage cylinders.

The validity of the samples was determined by measuring their bubble point pressures at elevated room temperature since crude was observed to be waxy. This crude is also slightly sour and small amounts of H₂S were found during subsequent analyses.

The compositions of the high pressure liquids were determined with the help of an atmospheric flash. The evolved stock tank gas and liquid from the flash were analysed for composition, some physical properties and the ratio in which they were produced. A mathematical recombination of these products resulted in the desired reservoir fluid composition.

High temperature distillations on flashed stock tank liquids were performed to extend the liquid compositions to C-12 plus.

On the fluid obtained from the greater depth this completed the analysis program. With the reservoir fluid obtained ten meters higher we continued with a complete black oil PVT study.

The saturation pressure of this reservoir fluid was determined in a high pressure P V T cell while performing a constant mass study and found to be 2441 psig, measured at the reservoir temperature of 154 °F.

The reservoir depletion was then simulated in the P V T cell, using the differential vaporization process.

During this experiment, a total of 1638 standard cubic feet of solution gas were liberated from every barrel of residual oil at 60 °F. The associated relative oil volume factor was measured to be 1.9381 barrels of saturated fluid per barrel of residual oil.

During a similar pressure depletion at the reservoir temperature of 154 °F, the viscosity of the oil phase of the reservoir fluid was determined in a rolling ball viscosimeter. The viscosity of the fluid was found to vary from a minimum of 0.246 centipoise at the bubble point to a maximum of 0.888 at atmospheric pressure.

We concluded the study with two single stage separator tests, simulating the production of the recombined reservoir fluid through surface separation equipment at different pressure and temperature conditions.

We thank Esso Australia Ltd. for the opportunity to be of service. If there remain any questions or if we can assist you in any other way please do not hesitate in contacting us.

Sincerely Yours,

A handwritten signature in black ink, appearing to be 'Jan G. Bon', written in a cursive style.

Jan G. Bon
Manager.

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

File: E 90018

REPORT INDEX

	Page
Transfer Summary Of RFT Samples.....	1
Summary Of Results RFT Chamber # RFS AD-1116....	2
Field and Well Characteristics	3

R F T # RFS AD-1131

Room Temperature Validity Checks	4-6
Compositional Analyses.....	7-8

R F T # RFS AD-1116

Room Temperature Validity Checks	9-11
Compositional Analyses.....	12-13
Constant Mass Study.....	14
Differential Vaporization.....	15-18
Gases Liberated During Differential Vaporization.	19
Separator Tests.....	20
Gases Liberated During Separator Tests.....	21-22

PLOTS:

Relative Volume.....	23
Oil Compressibility.....	24
Y-Function.....	25
Oil Thermal Expansion.....	26
Solution Gas-Oil Ratio.....	27
Oil Formation Volume Factor.....	28
Total Formation Volume Factor.....	29
Oil Density.....	30
Oil Viscosity.....	31
Gas Formation Volume Factor.....	32
Gas Expansion Factor.....	33
Z-Factor.....	34
Gas Gravity.....	35
Gas Viscosity.....	36

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 1 of 36
File: E 90018

SUMMARY OF RESULTS

R F T # 1

Seat # : 1-9
Depth : 2841 m MDKB
RFT Chamber # : RFS AD 1116
Sampling Temp and Press : 147 deg F / 4017.6 psia
Reservoir Temperature : 154 deg F
Capacity : 1 Gallon
Opening Pressure : 1900 psig @ 22 deg C

Warmed up RFT chamber
Injected 95 cc's of mercury in chamber to stir up sample.
Compressed to 6500 psig with 75 cc's of water behind piston.
Transferred 1800 cc's into Petrolab cylinders # 098,107 and 109
@ 6500 psig. Flashed rest of sample to atmosphere.
Recovered back almost all mercury, an additional 900 cc's of oil
and approximately 100 cc's of water.

Bubble Point Pressure (psig)

CYL. # 098	2105 @ 31 deg C
CYL. # 107	2100 @ 31 deg C
CYL. # 109	2075 @ 31 deg C

R F T # 2

Seat # : 2-1
Depth : 2851 m MDKB
RFT Chamber # : RFS AD 1131
Sampling Temp and Press : 151 deg F / 4026.3 psia
Reservoir Temperature : 154 deg F
Capacity : 1 Gallon
Opening Pressure : 1800 psig @ 20 deg C

Warmed up RFT chamber
Injected 95 cc's of mercury in chamber to stir up sample.
Compressed to 6500 psig with 275 cc's of water behind piston.
Transferred 1800 cc's into Petrolab cylinders # 105,108 and 126
@ 6500 psig. Flashed rest of sample to atmosphere.
Recovered back almost all mercury, an additional 900 cc's of oil
and approximately 120 cc's of water.

Bubble Point Pressure (psig)

CYL. # 105	2010 @ 31 deg C
CYL. # 108	2010 @ 31 deg C
CYL. # 126	2025 @ 31 deg C

Crude is waxy and bubble points were run at elevated temperature.

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 2 of 36
File: E 90018

SUMMARY OF RESULTS

R F T # RFS AD-1116

CONSTANT MASS DATA:

Saturation Pressure (psig): 2441 @ 154 deg F
Thermal Expansion @ 2441 psig (1/°C): 0.001786
(1/°F): 0.000992
Compressibility of saturated oil @ : 154 deg F
@ 2441 psig (1/psi) : 28.68 * 10⁻⁶

DIFFERENTIAL DATA:

SATURATED OIL @ 2441 PSIG AND 154 °F:
Solution GOR (SCF/bbl): 1638
Formation Volume Factor: 1.9381
Oil density (gm/cc): 0.5797
Specific Volume (ft³/lb): 0.02763
Viscosity (cp): 0.246

RESIDUAL OIL:
API Gravity @ 60 °F: 48.5
Density @ 257 °F (gm/cc): 0.7459
Viscosity @ 257 °F (cp): 0.888

FLASH DATA:

Separator Pressure (psig):	1200	300
Separator Temperature (°F):	140	140
Stock Tank Pressure (psig):	0	0
Stock Tank Temperature (°F):	66	63
Oil Volume Factor (rbbl/stbbl):	1.999	1.925
Separator GOR (scf/bbl):	801	1351
Stock Tank GOR (scf/bbl):	911	246
Total GOR (scf/bbl):	1712	1597
Separator Gas Gravity (Air=1):	0.767	0.859
Stock Tank Gas Gravity (Air=1):	1.189	1.401
Stock Tank Oil Gravity (°API):	46.7	46.0
Stock Tank Oil Density (gm/cc):	0.7932	0.7963

Stock Tank Oil Wax content U O P Method 46-64 (wt %) : 8.00
Stock Tank Oil Pour Point A S T M Method D 97-66 (°C): 21.5

DIFFERENTIAL DATA CORRECTED WITH FLASH DATA:

Separator Test @ 1200 psig and 140 deg F

UNDERSATURATED OIL @ 4003 PSIG AND 154 °F:

Solution GOR (SCF/bbl)
Rs : 1712
Formation Volume Factor
Bo : 1.926

Separator Test @ 300 psig and 140 deg F

UNDERSATURATED OIL @ 4003 PSIG AND 154 °F:

Solution GOR (SCF/bbl)
Rs : 1597
Formation Volume Factor
Bo : 1.855

P E T R O L A B

Company: Esso Australia Ltd.	Page :	3 of 36
Well : Terakihi # 1	File :	E 90018
Field : Wildcat	State :	Victoria
Sampled: April 15 1990	Country:	Australia

FIELD CHARACTERISTICS

	RFT # 1	RFT # 2
Formation Name	: Top of Latrobe	Top of Latrobe
Date first well completed	: --	--
Original reservoir pressure (psia)	: 4026.3	4017.6
@ datum (mTVDss)	: 2830	2820
Original Gas-Liquid Ratio (SCF/STB)	: --	--
Separator pressure (psig)	: --	--
Separator temperature (deg F)	: --	--
Liquid gravity (deg API @ 60 F)	: --	--

WELL CHARACTERISTICS

Depth datum	: --	--
Elevation above MSL (m)	: --	--
Total depth (m KB)	: --	--
Tubing size (inch)	: --	--
Tubing shoe (mKB)	: --	--
Reservoir temperature (deg F)	: 154	154
Last reservoir pressure (psia)	: 4026.3	4017.6
@ datum (m TVD ss)	: 2830	2820
date	: April 15 1990	April 15 1990

BOTTOM HOLE SAMPLING CONDITIONS

	RFT # 1	RFT # 2
RFT seat No.	: 2-1	1-9
Depth sampled (m MDKB)	: 2851	2841
Date sampled	: April 15 1990	April 15 1990
RFT chamber No.	: RFS-AD 1131	RFS-AD 1116
Chamber size	: 1 Gallon	1 Gallon
Sampling pressure (psig)	: 4012	4003
Sampling temperature (deg F)	: 151	147
Reservoir temperature (deg F)	: 154	154

PETROLAB

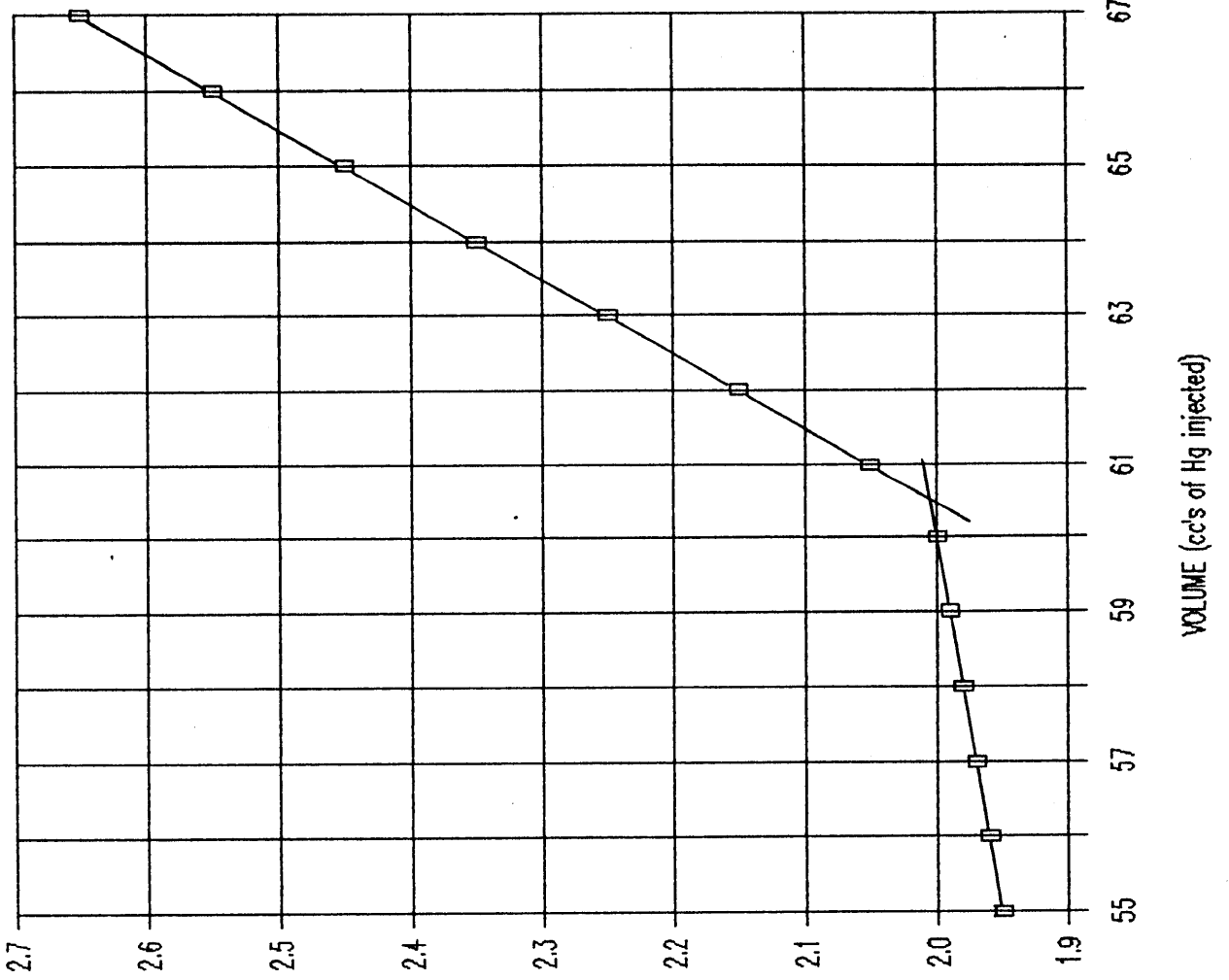
Company : Esso Australia Ltd.
 Well : Terakihi # 1
 File : E-90018

RFT # 1
 Sample # 1

Sampling Conditions

Seat : 2-1
 Depth : 2851 m MOKB
 R F T Chamber No : RFS AD 1131
 Capacity : 1 Gallon
 Sampling Pressure : 4012 psig
 Temperature : 151 deg F
 Opening Pressure : 1800 psig
 Temperature : 20 deg C
 Transferred to : Cylinder # L - 105

Pressure (psig) (x 1000)



Volume (cc's)	Pressure (psig)
55.00	1950
56.00	1960
57.00	1970
58.00	1980
59.00	1990
60.00	2000
61.00	2050
62.00	2150
63.00	2250
64.00	2350
65.00	2450
66.00	2550
67.00	2650

Saturation Pressure : 2010 psig @ 31 deg C

PETROLAB

Company : Esso Australia Ltd.
 Well : Terakihi # 1
 File : E-90018

RFT # 1

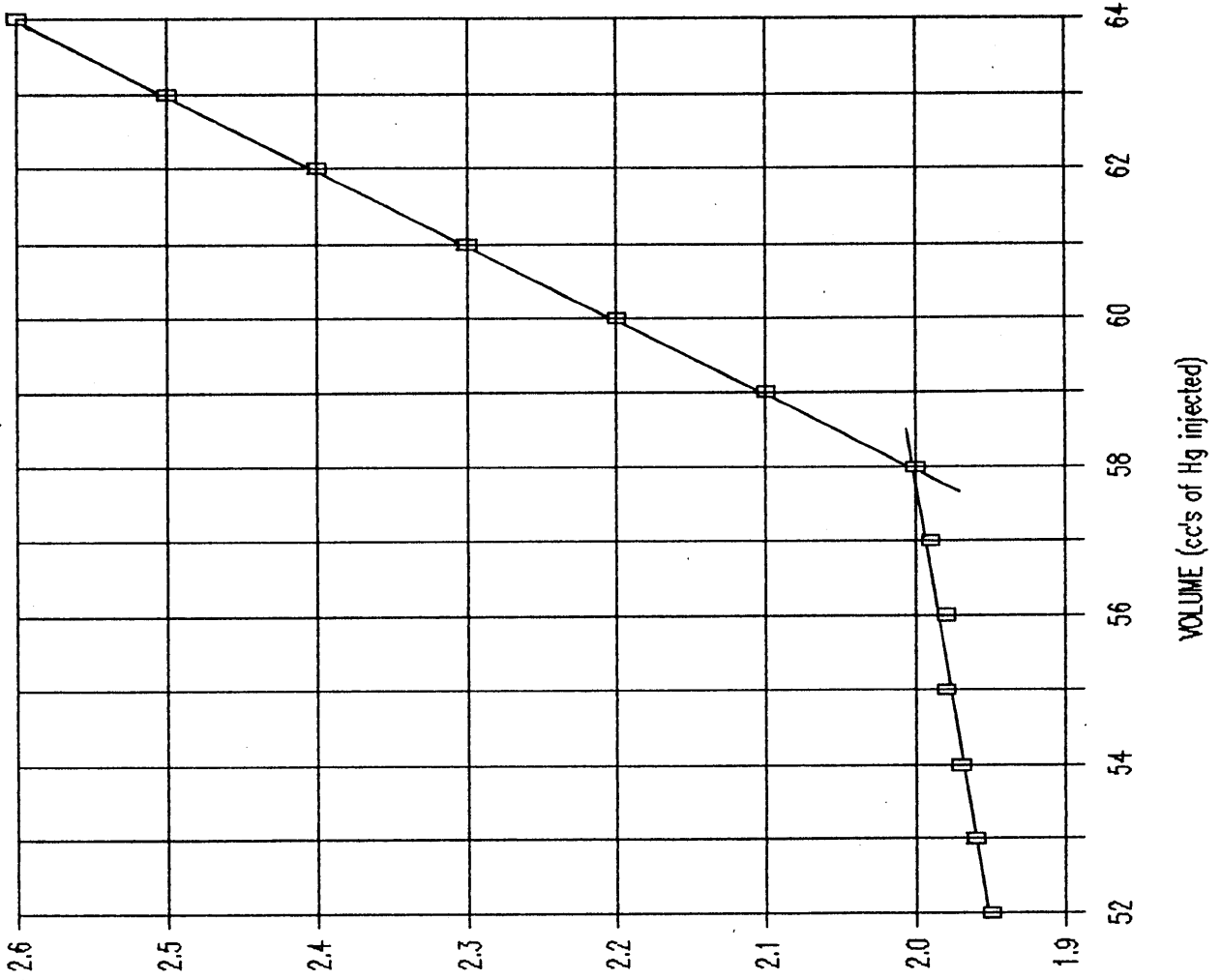
Sample # 2

Sampling Conditions

Seat : 2-1
 Depth : 2851 m MKKB
 R F T Chamber No : RF5 AD 1131
 Capacity : 1 Gallon
 Sampling Pressure : 4012 psig
 Temperature : 151 deg F
 Opening Pressure : 1800 psig
 Temperature : 20 deg C
 Transferred to : Cylinder # L - 108

Volume (cc's)	Pressure (psig)
52.00	1950
53.00	1960
54.00	1970
55.00	1980
56.00	1980
57.00	1990
58.00	2000
59.00	2100
60.00	2200
61.00	2300
62.00	2400
63.00	2500
64.00	2600

Saturation Pressure : 2010 psig @ 31 deg C



PETROLAB

Company : Esso Australia Ltd.
 Well : Terakihi # 1
 File : E-90018

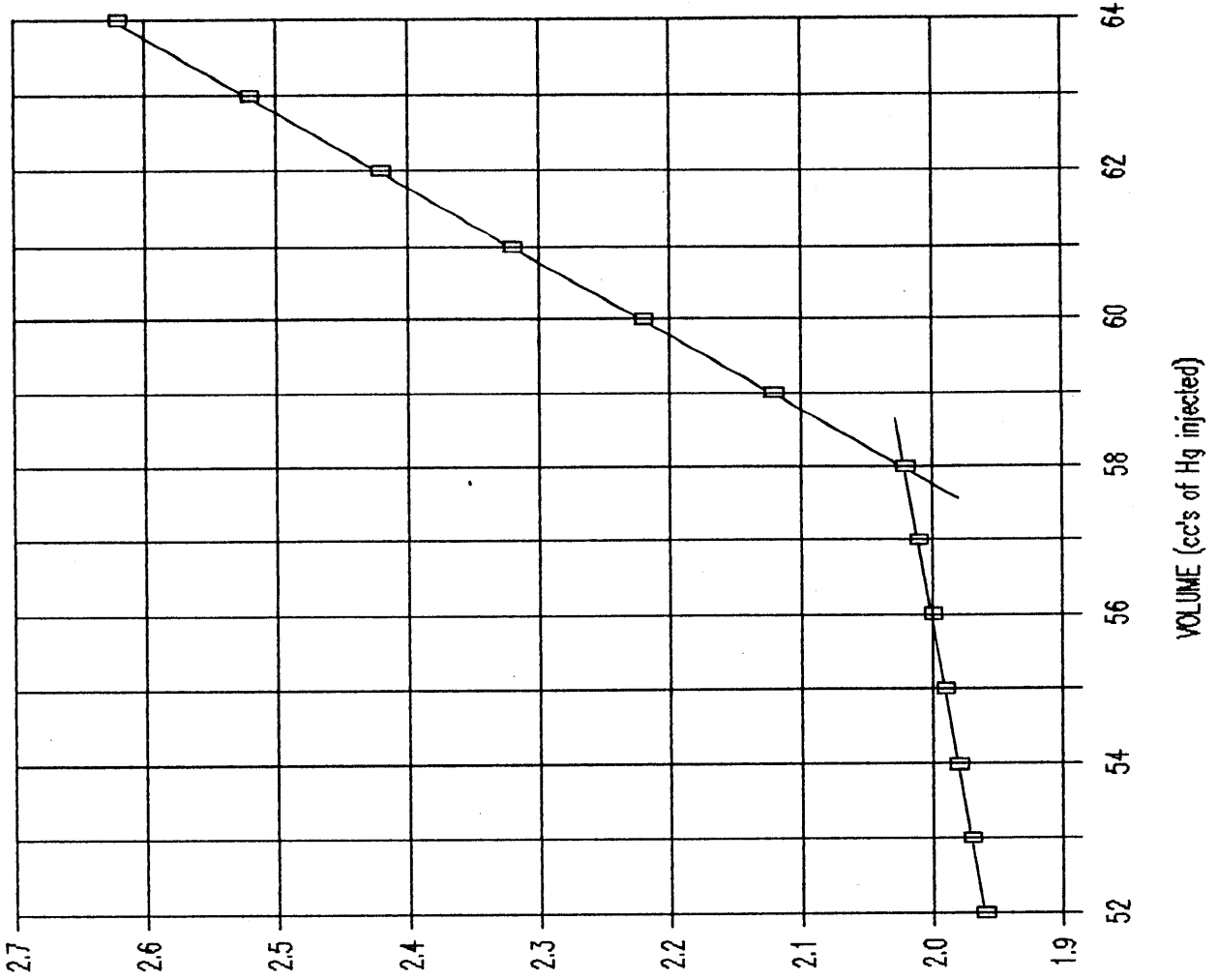
RFT # 1
 Sample # 3

Sampling Conditions

Seat : 2-1
 Depth : 2851 m MKB
 R F T Chamber No : RFS AD 1131
 Capacity : 1 Gallon
 Sampling Pressure : 4012 psig
 Temperature : 151 deg F
 Opening Pressure : 1800 psig
 Temperature : 20 deg C
 Transferred to : Cylinder # L - 126

Volume (cc's)	Pressure (psig)
52.00	1960
53.00	1970
54.00	1980
55.00	1990
56.00	2000
57.00	2010
58.00	2020
59.00	2120
60.00	2220
61.00	2320
62.00	2420
63.00	2520
64.00	2620

Saturation Pressure : 2025 psig @ 31 deg C



P E T R O L A B

Page : 7 of 36
File : E-90018

Company : Esso Australia Ltd.
Well : Terakihi # 1

HIGH TEMPERATURE DISTILLATION OF STOCK TANK LIQUID SAMPLE
(Hexanes to Dodecanes Plus)
Flashed from RFT chamber # RFS AD-1131

	Cut (Deg C)	Mol %	Mol Weight	Weight %	Density (gm/cc)	Volume %	API Gravity
Hexanes	59 - 84	11.43	83	6.32	0.6675	7.65	80.3
Heptanes	85 - 112	13.93	91	8.43	0.7398	9.19	59.6
Octanes	113 - 138	12.38	102	8.41	0.7649	8.87	53.3
Nonanes	139 - 162	10.04	110	7.34	0.7819	7.58	49.3
Decanes	163 - 185	6.34	123	5.18	0.7968	5.25	45.9
Undecanes	186 - 206	4.85	129	4.17	0.7990	4.21	45.4
Dodecanes Plus	> 206	41.03	220	60.15	0.8478	57.25	35.2
		100.00		100.00		100.00	

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 8 of 36
File: E 90018

COMPOSITIONAL ANALYSIS OF BOTTOM HOLE SAMPLE

Cylinder # L-108 transferred from RFS # AD-1131

Component	Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide H2S	0.00	0.06	0.04
Carbon Dioxide CO2	0.01	0.35	0.25
Nitrogen N2	0.00	0.42	0.29
Methane C1	0.30	51.38	35.93
Ethane C2	0.58	16.84	11.92
Propane C3	1.67	13.39	9.85
Iso-Butane iC4	1.01	3.20	2.54
N-Butane nC4	2.47	5.43	4.53
Iso-Pentane iC5	2.12	1.76	1.87
N-Pentane nC5	2.93	1.90	2.21
Hexanes C6	10.16	1.94	4.43
Heptanes C7	12.38	1.91	5.08
Octanes C8	11.01	0.72	3.83
Nonanes C9	8.93	0.50	3.05
Decanes C10	5.64	0.12	1.79
Undecanes C11	4.31	0.08	1.36
Dodecanes Plus C12+	36.48	0.00	11.03
TOTAL	100.00	100.00	100.00
<u>Ratios</u>			
Molar Ratio :	0.3024	0.6976	1.0000
Mass Ratio :	0.6533	0.3467	1.0000
Liquid Ratio (bbl/bbl) :	1.0000 @ SC	--	1.9905 @ PT*
Gas Liquid Ratio :	1.0000 bbl @ SC	1733 SCF	--
<u>Stream Properties</u>			
Molecular Weight :	140.3	32.28	64.9
Density obs. (gm/cc) :	0.7924 @ 60 F	--	0.6116 @ PT*
Gravity (AIR = 1.000) :	46.9 API @60F	1.125	--
GHV (BTU/scf) :	--	1884.0	--
<u>Hexanes Plus Properties</u>			
Mol % :	88.91	5.27	30.57
Molecular Weight :	150.3	97.1	143.9
Density (gm/cc @ 60 F) :	0.8070	0.6852	0.7955
Gravity (API @ 60 F) :	43.7	74.8	46.2
<u>Heptanes Plus Properties</u>			
Mol % :	78.75	3.33	26.14
Molecular Weight :	159.0	104.7	154.2
Density (gm/cc @ 60 F) :	0.8185	0.6952	0.8099
Gravity (API @ 60 F) :	41.2	71.8	43.1
<u>Decanes Plus Properties</u>			
Mol % :	46.43	0.20	14.18
Molecular Weight :	200.1	139.2	198.1
Density (gm/cc @ 60 F) :	0.8407	0.7328	0.8407
Gravity (API @ 60 F) :	36.7	61.4	36.7
<u>Undecanes Plus Properties</u>			
Mol % :	40.80	0.08	12.39
Molecular Weight :	210.7	147.0	209.8
Density (gm/cc @ 60 F) :	0.8444	0.7400	0.8444
Gravity (API @ 60 F) :	35.9	59.5	35.9
<u>Dodecanes Plus Properties</u>			
Mol % :	36.48	0.00	11.03
Molecular Weight :	220.3	--	220.4
Density (gm/cc @ 60 F) :	0.8478	--	0.8478
Gravity (API @ 60 F) :	35.2	--	35.2

* (P)ressure 4012 psig, (T)emperature 67.8 deg C.

PETROLAB

Company : Esso Australia Ltd.
 Well : Terakihi # 1
 File : E-90018

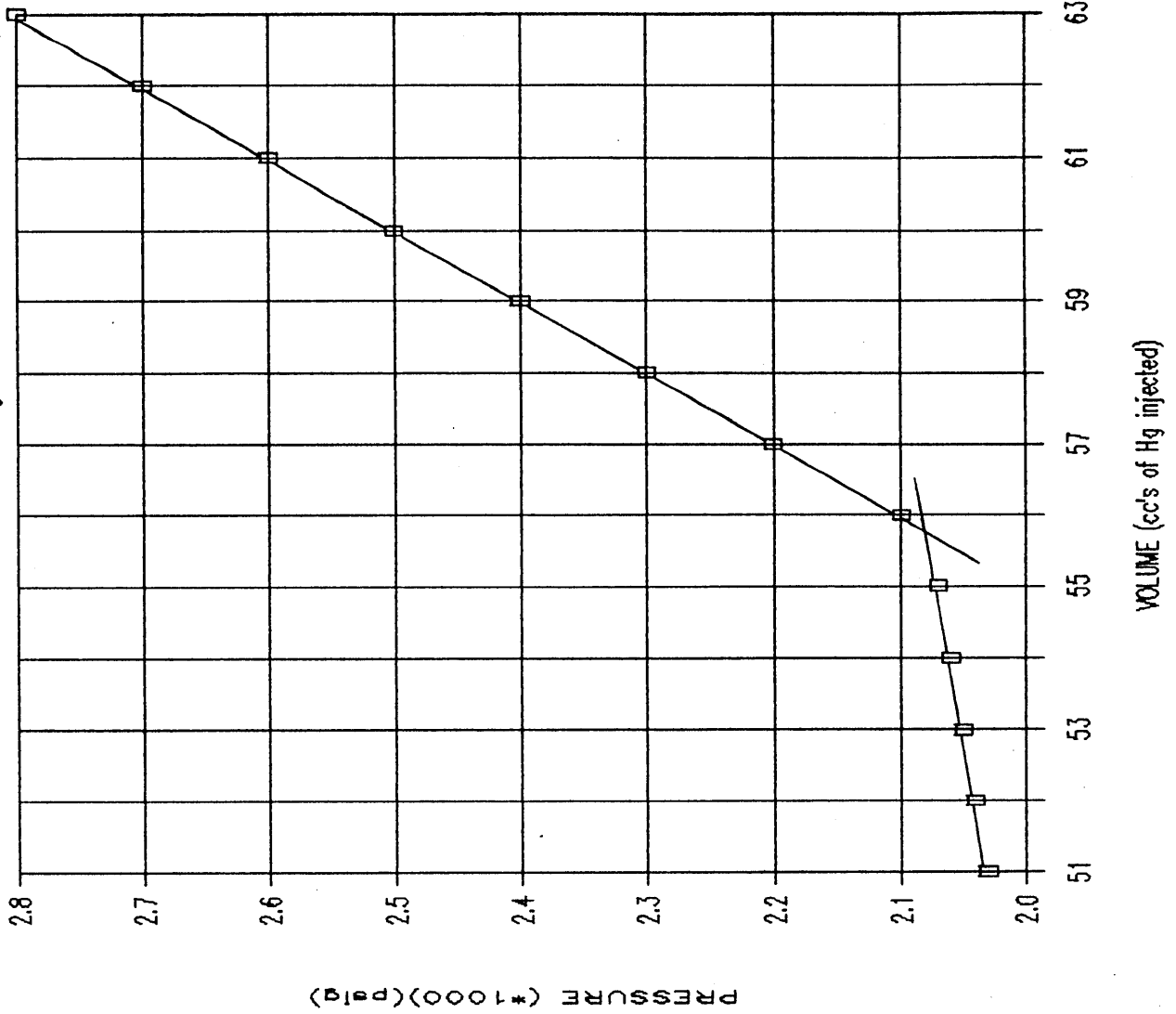
RFT # 2
 Sample # 1

Sampling Conditions

Seat : 1-9
 Depth : 2841 m MDKB
 R F T Chamber No : RFS AD 1116
 Capacity : 1 Gallon
 Sampling Pressure : 4003 psig
 Temperature : 147 deg F
 Opening Pressure : 1900 psig
 Temperature : 22 deg C
 Transferred to : Cylinder # L - 098

Volume (cc's)	Pressure (psig)
51.00	2030
52.00	2040
53.00	2050
54.00	2060
55.00	2070
56.00	2100
57.00	2200
58.00	2300
59.00	2400
60.00	2500
61.00	2600
62.00	2700
63.00	2800

Saturation Pressure : 2105 psig @ 31 deg C



PETROLAB

Company : Esso Australia Ltd.
 Well : Terakihi # 1
 File : E-90018

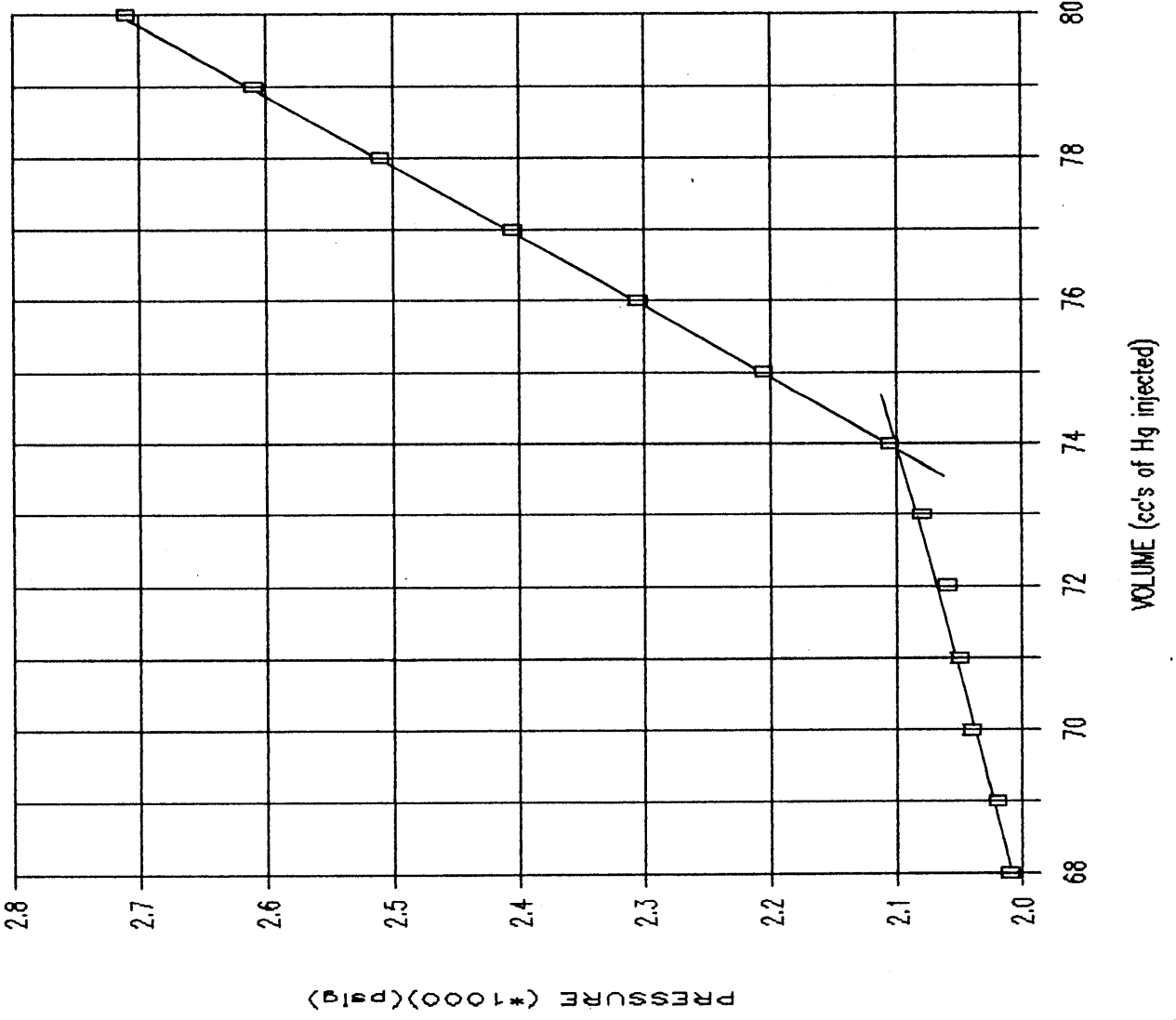
RFT # 2
 Sample # 2

Sampling Conditions

Seat : 1-9
 Depth : 2841 m MDKB
 R F T Chamber No : RFS AD 1116
 Capacity : 1 Gallon
 Sampling Pressure : 4003 psig
 Temperature : 147 deg F
 Opening Pressure : 1900 psig
 Temperature : 22 deg C
 Transferred to : Cylinder # L - 107

Volume (cc's)	Pressure (psig)
68.00	2010
69.00	2020
70.00	2040
71.00	2050
72.00	2060
73.00	2080
74.00	2105
75.00	2205
76.00	2305
77.00	2405
78.00	2510
79.00	2610
80.00	2710

Saturation Pressure : 2100 psig @ 31 deg C



PETROLAB

Company : Esso Australia Ltd.
 Well : Terakihi # 1
 File : E-90018

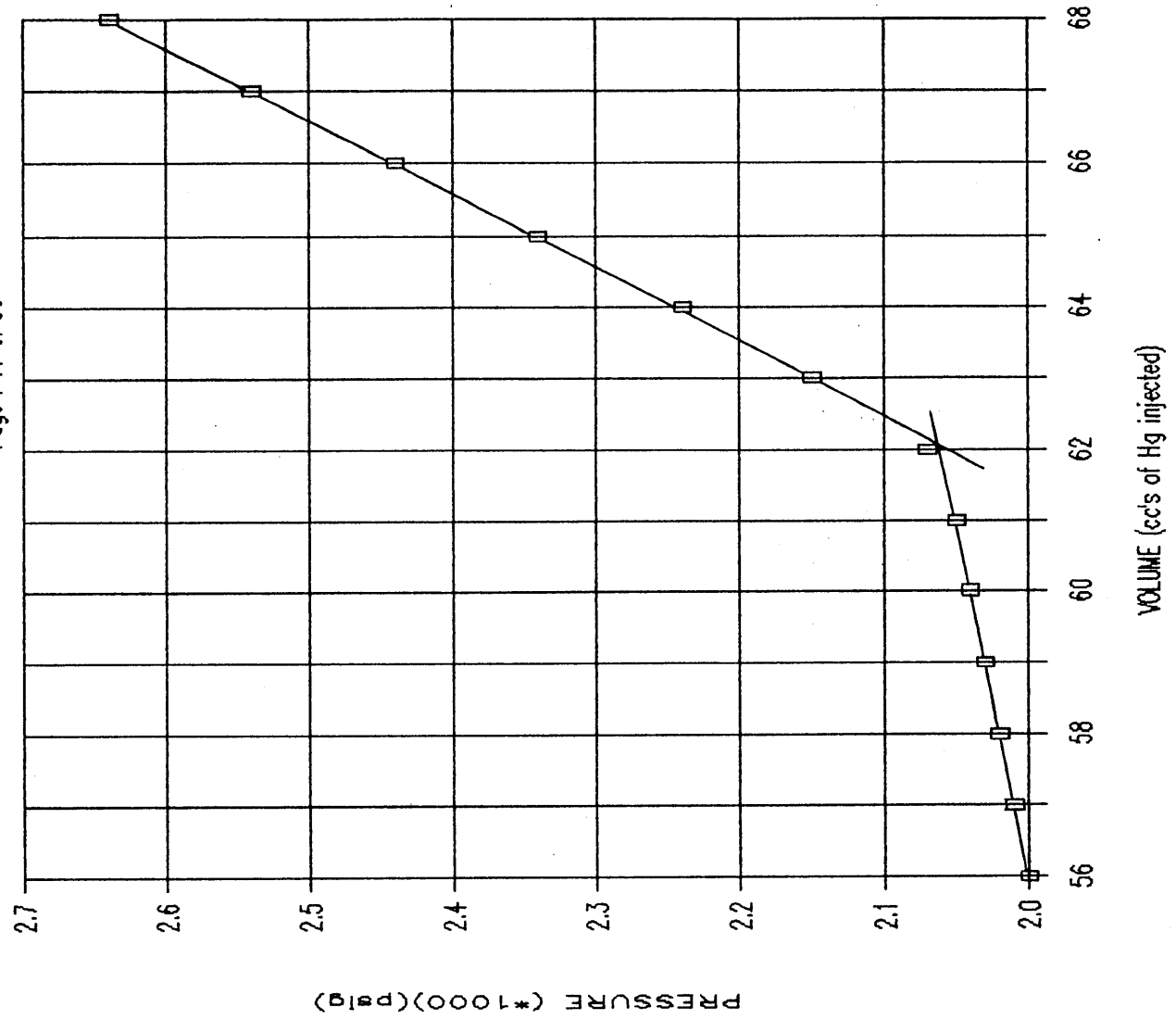
RFT # 2
 Sample # 3

Sampling Conditions

Seat : 1-9
 Depth : 2841 m MDKB
 R F T Chamber No : RFS AD 1116
 Capacity : 1 Gallon
 Sampling Pressure : 4003 psig
 Temperature : 147 deg F
 Opening Pressure : 1900 psig
 Temperature : 22 deg C
 Transferred to : Cylinder # L - 109

Volume (cc's)	Pressure (psig)
56.00	2000
57.00	2010
58.00	2020
59.00	2030
60.00	2040
61.00	2050
62.00	2070
63.00	2150
64.00	2240
65.00	2340
66.00	2440
67.00	2540
68.00	2640

Saturation Pressure : 2075 psig @ 31 deg C



P E T R O L A B

Company : Esso Australia Ltd.
Well : Terakihi # 1

Page : 12 of 36
File : E-90018

HIGH TEMPERATURE DISTILLATION OF STOCK TANK LIQUID SAMPLE
(Hexanes to Dodecanes Plus)
Flashed from RFT chamber # RFS AD-1116

Cut (Deg C)	Mol		Density (gm/cc)	API	
	Mol %	Weight %		Volume %	Gravity
59 - 84	10.42	84	0.6781	6.78	77.0
85 - 112	13.56	95	0.7388	9.16	59.8
113 - 138	12.09	104	0.7637	8.65	53.6
139 - 162	11.35	110	0.7841	8.36	48.8
163 - 185	6.81	121	0.7960	5.44	46.1
186 - 206	4.34	133	0.8005	3.79	45.1
> 206	41.43	226	0.8496	57.82	34.9
-----			-----		
100.00			100.00		

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 13 of 36
File: E 90018

COMPOSITIONAL ANALYSIS OF
BOTTOM HOLE SAMPLE

Cylinder # L-098 transferred from RFS # AD-1116

Component	Stock Tank Liquid Mol %	Stock Tank Gas Mol %	Reservoir Fluid Mol %
Hydrogen Sulphide H2S	0.00	0.04	0.03
Carbon Dioxide CO2	0.01	0.35	0.26
Nitrogen N2	0.00	0.69	0.50
Methane C1	0.31	52.30	38.10
Ethane C2	0.58	16.76	12.34
Propane C3	1.67	13.33	10.14
Iso-Butane iC4	0.97	3.07	2.50
N-Butane nC4	2.29	5.04	4.29
Iso-Pentane iC5	1.97	1.64	1.73
N-Pentane nC5	2.73	1.77	2.03
Hexanes C6	9.32	1.83	3.88
Heptanes C7	12.13	1.81	4.63
Octanes C8	10.82	0.68	3.45
Nonanes C9	10.16	0.46	3.11
Decanes C10	6.09	0.13	1.76
Undecanes C11	3.88	0.10	1.13
Dodecanes Plus C12+	37.07	0.00	10.12
<hr/>			
TOTAL	100.00	100.00	100.00
<hr/>			
<u>Ratios</u>			
Molar Ratio :	0.2731	0.7269	1.0000
Mass Ratio :	0.6307	0.3693	1.0000
Liquid Ratio (bbl/bbl) :	1.0000 @ SC	--	2.1860 @ PT*
Gas Liquid Ratio :	1.0000 bbl @ SC	1955 SCF	--
<hr/>			
<u>Stream Properties</u>			
Molecular Weight :	144.2	31.72	62.4
Density obs. (gm/cc) :	0.7963 @ 60 F	--	0.5797 @ PT*
Gravity (AIR = 1.000) :	46.0 API @ 60 F	1.105	--
GHV (BTU/scf) :	--	1849.0	--
<hr/>			
<u>Hexanes Plus Properties</u>			
Mol % :	89.48	5.01	28.08
Molecular Weight :	154.2	97.4	146.8
Density (gm/cc @ 60 F) :	0.8101	0.6856	0.7976
Gravity (API @ 60 F) :	43.0	74.7	45.7
<hr/>			
<u>Heptanes Plus Properties</u>			
Mol % :	80.15	3.18	24.20
Molecular Weight :	162.3	105.1	156.9
Density (gm/cc @ 60 F) :	0.8197	0.6957	0.8104
Gravity (API @ 60 F) :	41.0	71.7	42.9
<hr/>			
<u>Decanes Plus Properties</u>			
Mol % :	47.05	0.23	13.01
Molecular Weight :	204.3	139.7	201.7
Density (gm/cc @ 60 F) :	0.8425	0.7333	0.8425
Gravity (API @ 60 F) :	36.3	61.3	36.3
<hr/>			
<u>Undecanes Plus Properties</u>			
Mol % :	40.95	0.10	11.25
Molecular Weight :	217.0	147.0	215.7
Density (gm/cc @ 60 F) :	0.8465	0.7400	0.8465
Gravity (API @ 60 F) :	35.5	59.5	35.5
<hr/>			
<u>Dodecanes Plus Properties</u>			
Mol % :	37.07	0.00	10.12
Molecular Weight :	225.5	--	225.6
Density (gm/cc @ 60 F) :	0.8496	--	0.8496
Gravity (API @ 60 F) :	34.9	--	34.9

* (P)ressure 2441 psig, (T)emperature 67.8 deg C.

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 14 of 36
File: E 90018

CONSTANT MASS STUDY
@ 154 deg F

ON BOTTOM HOLE SAMPLE EX RFT CHAMBER # RFS AD-1116

Pressure (psig)	Relative Volume (V/Vsat)(x 10 ⁻⁶)(psig ⁻¹) (1)	Oil Compressibility (psig ⁻¹) (2)	Y Function (3)	Thermal Expansion (x10 ⁻⁴)(degF ⁻¹) (4)
5000	0.9463	15.65		7.57
4500	0.9545	17.24		7.83
4003 *	0.9637	19.02		8.22
3500	0.9739	20.88		8.71
3250	0.9793	22.27		8.98
3000	0.9851	23.60		9.27
2800	0.9901	25.04		9.50
2600	0.9954	26.79		9.73
2441 **	1.0000	28.68		9.92
2380	1.0117		2.185	
2278	1.0338		2.116	
2163	1.0630		2.041	
1978	1.1217		1.924	
1772	1.2100		1.798	
1541	1.3483		1.677	
1293	1.5743		1.546	
1070	1.8867		1.445	
812	2.5084		1.330	
700	2.9615		1.268	
560	3.7921		1.203	

* Reservoir pressure
** Saturation pressure

(1) Barrels at indicated pressure per barrel at saturation pressure.

(2) Oil Compressibility = - (1/V) * (dV/dP)

(3) Y Function = (Psat - P) / (P)*(V/Vsat-1)

(4) Thermal Expansion = - (1/V) * (dV/dT)

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 15 of 36
File: E 90018

DIFFERENTIAL VAPORIZATION
@ 154 deg F

Pressure (psig)	Gas-Oil Ratio (SCF/Bbl) (1)	Formation Volume Factor		Oil Density (gm/cc)	Oil Viscosity (Centipoise)
		(Bo) (2)	(Bt) (3)		
5000	1638	1.8340	1.8340	0.6126	0.287
4500	1638	1.8499	1.8499	0.6073	0.277
4003 *	1638	1.8677	1.8677	0.6015	0.269
3500	1638	1.8875	1.8875	0.5952	0.261
3000	1638	1.9092	1.9092	0.5885	0.254
2441 **	1638	1.9381	1.9381	0.5797	0.246
2204	1430	1.8278	2.0401	0.5947	0.258
1900	1208	1.7153	2.2330	0.6114	0.275
1605	1020	1.6210	2.5247	0.6272	0.291
1311	851	1.5377	3.0053	0.6427	0.313
1003	692	1.4578	3.8537	0.6590	0.336
701	543	1.3866	5.5387	0.6735	0.364
397	389	1.3105	10.0018	0.6893	0.409
225	273	1.2448	18.1049	0.7039	0.459
0	0	1.0528		0.7459	0.888

* Reservoir pressure
** Saturation pressure

- (1) Cubic feet of gas at 14.696 psia and 60 deg F per barrel of residual oil at 60 deg F
- (2) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 deg F
- (3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 deg F

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 16 of 36
File: E 90018

Bo and Rs

Corrected from Differential to Separator Conditions

SEPARATOR: Pressure (psig): 1200 Temperature (deg F): 14
(Bofb): 1.999 (Rsfb): 171

DIFFERENTIAL: (Bodb): 1.938 (Rsdb): 163

(2) $Bo = Bod * (Bofb / Bodb)$

(4) $Bt = Btd * (Bofb / Bodb)$

(6) $Rs = Rsfb - (Rsdb - Rsd) * (Bofb / Bodb)$

Pressure (psig)	(Bod) (1)	(Bo) (2)	(Btd) (3)	(Bt) (4)	(Rsd) (SCF/Bbl) (5)	(Rs) (SCF/Bbl) (6)
4003 *	1.868	1.926	1.868	1.926	1638	1712
2441 **	1.938	1.999	1.938	1.999	1638	1712
2204	1.828	1.885	2.040	2.104	1430	1497
1900	1.715	1.769	2.233	2.303	1208	1268
1605	1.621	1.672	2.525	2.604	1020	1075
1311	1.538	1.586	3.005	3.100	851	900
1003	1.458	1.504	3.854	3.975	692	736
701	1.387	1.430	5.539	5.713	543	583
397	1.311	1.352	10.002	10.316	389	424
225	1.245	1.284	18.105	18.674	273	304
0	1.053	1.086			0	0

* Reservoir pressure
** Saturation pressure

- (1) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 deg F
- (2) Barrels of oil at indicated pressure and temperature per barrel of stock tank oil at 60 deg F
- (3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 deg F
- (4) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of stock tank oil at 60 deg F
- (5) Cubic feet of gas at 14.696 psia and 60 deg F per barrel of residual oil at 60 deg F
- (6) Cubic feet of gas at 14.696 psia and 60 deg F per barrel of stock tank oil at 60 deg F

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 17 of 36
File: E 90018

Bo and Rs

Corrected from Differential to Separator Conditions

SEPARATOR: Pressure (psig): 300 Temperature (deg F): 14
(Bofb): 1.925 (Rsfb): 159

DIFFERENTIAL: (Bodb): 1.938 (Rsdb): 163

(2) $Bo = Bod * (Bofb / Bodb)$

(4) $Bt = Btd * (Bofb / Bodb)$

(6) $Rs = Rsfb - (Rsdb - Rsd) * (Bofb / Bodb)$

Pressure (psig)	(Bod) (1)	(Bo) (2)	(Btd) (3)	(Bt) (4)	(Rsd) (SCF/Bbl) (5)	(Rs) (SCF/Bbl) (6)
4003 *	1.868	1.855	1.868	1.855	1638	1597
2441 **	1.938	1.925	1.938	1.925	1638	1597
2204	1.828	1.815	2.040	2.026	1430	1390
1900	1.715	1.704	2.233	2.218	1208	1170
1605	1.621	1.610	2.525	2.508	1020	983
1311	1.538	1.527	3.005	2.985	851	815
1003	1.458	1.448	3.854	3.828	692	657
701	1.387	1.377	5.539	5.501	543	509
397	1.311	1.302	10.002	9.934	389	356
225	1.245	1.236	18.105	17.983	273	241
0	1.053	1.046			0	0

* Reservoir pressure
** Saturation pressure

- (1) Barrels of oil at indicated pressure and temperature per barrel of residual oil at 60 deg F
- (2) Barrels of oil at indicated pressure and temperature per barrel of stock tank oil at 60 deg F
- (3) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of residual oil at 60 deg F
- (4) Barrels of oil plus liberated gas at indicated pressure and temperature per barrel of stock tank oil at 60 deg F
- (5) Cubic feet of gas at 14.696 psia and 60 deg F per barrel of residual oil at 60 deg F
- (6) Cubic feet of gas at 14.696 psia and 60 deg F per barrel of stock tank oil at 60 deg F

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 18 of 36
File: E 90018

DIFFERENTIAL VAPORIZATION
@ 154 deg F

Pressure (psig)	Formation Volume Factor (Bg) (1)	Gas Expansion Factor (E) (2)	Deviation Factor (Z)	Gas Gravity (Air=1.00)	Gas Viscosity (Centipoise) (3)
2441 *					
2204	0.00573	174.43	0.733	0.806	0.0205
1900	0.00676	147.91	0.746	0.794	0.0183
1605	0.00821	121.85	0.766	0.783	0.0166
1311	0.01047	95.50	0.800	0.784	0.0151
1003	0.01422	70.32	0.834	0.793	0.0139
701	0.02129	46.98	0.878	0.827	0.0129
397	0.03907	25.59	0.927	0.908	0.0119
225	0.06935	14.42	0.958	1.073	0.0110
0			1.000	1.533	0.0092

* Saturation pressure

- (1) Cubic feet of gas at indicated pressure and temperature per cubic foot at 14.696 psia and 60 deg F
- (2) Cubic feet of gas at 14.696 psia and 60 deg F per cubic foot at indicated pressure and temperature
- (3) Calculated from correlation of Lee, Gonzales and Eakin

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 19 of 36
File: E 90018

COMPOSITIONAL ANALYSIS OF
GASES LIBERATED DURING DIFFERENTIAL VAPORIZATION @ 154 deg F.

Component	2204	1900	1605	1311	1003	701	397	225	0
	Mol	Mol %	Mol %	Mol %	Mol %	Mol %	Mol %	Mol %	Mol %
Hydrogen Sulphide	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.04	0.04
Carbon Dioxide	0.32	0.33	0.33	0.36	0.38	0.40	0.44	0.44	0.19
Nitrogen	0.87	0.72	0.61	0.49	0.35	0.20	0.08	0.04	0.02
Methane	73.90	74.43	74.62	73.90	72.03	67.47	57.42	40.18	8.97
Ethane	12.41	12.66	13.09	13.86	15.36	18.02	23.37	30.14	26.15
Propane	6.69	6.55	6.59	6.80	7.37	8.87	12.32	18.85	35.74
Iso-Butane	1.18	1.11	1.07	1.06	1.12	1.33	1.80	2.90	8.13
N-Butane	1.76	1.68	1.56	1.57	1.60	1.87	2.49	4.15	12.76
Iso-Pentane	0.50	0.46	0.41	0.40	0.38	0.42	0.52	0.89	2.67
N-Pentane	0.52	0.48	0.42	0.40	0.38	0.42	0.50	0.87	2.49
Hexanes	0.61	0.50	0.41	0.36	0.32	0.33	0.42	0.68	1.62
Heptanes	0.54	0.48	0.40	0.36	0.32	0.31	0.31	0.50	0.89
Octanes	0.24	0.21	0.18	0.17	0.15	0.14	0.13	0.16	0.23
Nonanes	0.23	0.19	0.15	0.13	0.11	0.09	0.08	0.07	0.07
Decanes	0.12	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.01
Undecanes	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.01
Dodecanes Plus	0.06	0.05	0.03	0.02	0.02	0.01	0.01	0.01	0.01
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Molecular Weight :	23.3	22.9	22.6	22.6	22.9	23.8	26.1	30.8	43.6
Heptanes Plus Properties									
Mol % :	1.23	1.07	0.88	0.79	0.7	0.65	0.62	0.82	1.22
Molecular Weight :	111.6	111.2	110.4	109.8	110.0	108.9	108.3	104.9	100.8
Density (gm/cc) :	0.7036	0.7032	0.7021	0.7014	0.7016	0.7004	0.6997	0.6955	0.6901

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 20 of 36
File: E 90018

SEPARATOR TESTS OF
RESERVOIR FLUID SAMPLE
From bottom hole sample ex RFT Chamber # RFS AD-1116

Separator Pressure (psig)	Temp. (Deg.F)	Gas/Oil Ratio (1)	Density (@ 60 Deg.F) (API gm/cc)	Volume Factor (2)	Shrinkage Factor (3)	Gas Gravity
1200	140	801			0.656	0.767 *
TO						
0	66	911	46.7	0.7932	1.999	1.189 *
300	140	1351			0.846	0.859 **
TO						
0	63	246	47.9	0.7880	1.925	1.401 **
0	73	1955	46.0	0.7963	2.186	1.105 ***

* Composition reported on page 21

** Composition reported on page 22

*** Composition reported on page 13

- (1) Gas/Oil Ratio is reported as cubic feet of gas at 14.696 psia and 60 deg F per barrel of stock tank oil at 60 deg F
- (2) Formation Volume Factor is reported as barrels of saturated oil at 2441 psig and 154 deg F per barrel of stock tank oil at 60 deg F
- (3) Shrinkage factor is reported as barrels of stock tank oil at 60 deg F per barrel of separator liquid at separator conditions

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 21 of 36
File: E 90018

COMPOSITIONAL ANALYSIS OF

Gases liberated during separator test @ 1200 psig and 140 deg

	Separator	Stock tank
Pressure (psig):	1200	0
Component	Mol %	Mol %
<hr/>		
Hydrogen Sulphide	0.01	0.03
Carbon Dioxide	0.34	0.31
Nitrogen	0.64	0.26
Methane	75.21	39.03
Ethane	13.29	21.63
Propane	6.35	20.30
Iso-Butane	0.99	4.51
N-Butane	1.43	7.43
Iso-Pentane	0.36	1.91
N-Pentane	0.36	1.90
Hexanes	0.36	1.42
Heptanes	0.32	0.92
Octanes	0.14	0.25
Nonanes	0.11	0.10
Decanes	0.06	0.00
Undecanes	0.01	0.00
Dodecanes Plus	0.02	0.00
<hr/>		
TOTAL	100.00	100.00
<hr/>		
<u>Stream Properties</u>		
Molecular Weight :	22.14	34.09
Gravity (AIR = 1.000) :	0.767	1.189
Gross HV (BTU/SCF) :	1327	1991
Nett HV (BTU/SCF) :	1205	1825
Wobbe Index :	1515	1826
Critical Pressure (psia) :	661.9	637.7
Critical Temperature (R) :	411.1	537.9
<u>G P M Content</u>		
Ethane Plus :	6.791	17.700
Propane Plus :	3.234	11.911
Butanes Plus :	1.483	6.313
Pentanes Plus :	0.708	2.491
<hr/>		
<u>Hexanes Plus Properties</u>		
Mol % :	1.02	2.69
Molecular Weight :	100.0	91.6
Density (gm/cc @ 60 F) :	0.741	0.731
Gravity (API @ 60 F) :	59.3	62.0
<hr/>		
<u>Heptanes Plus Properties</u>		
Mol % :	0.66	1.27
Molecular Weight :	108.7	100.1
Density (gm/cc @ 60 F) :	0.751	0.741
Gravity (API @ 60 F) :	56.8	59.3
<hr/>		
<u>Decanes Plus Properties</u>		
Mol % :	0.09	0.00
Molecular Weight :	141.4	--
Density (gm/cc @ 60 F) :	0.782	--
Gravity (API @ 60 F) :	49.3	--
<hr/>		
<u>Undecanes Plus Properties</u>		
Mol % :	0.03	0.00
Molecular Weight :	156.3	--
Density (gm/cc @ 60 F) :	0.794	--
Gravity (API @ 60 F) :	46.6	--
<hr/>		
<u>Dodecanes Plus Properties</u>		
Molecular Weight :	161.0	--
Density (gm/cc @ 60 F) :	0.797	--
Gravity (API @ 60 F) :	45.9	--

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 22 of 36
File: E 90018

COMPOSITIONAL ANALYSIS OF

Gases liberated during separator test @ 300 psig and 140 deg F.

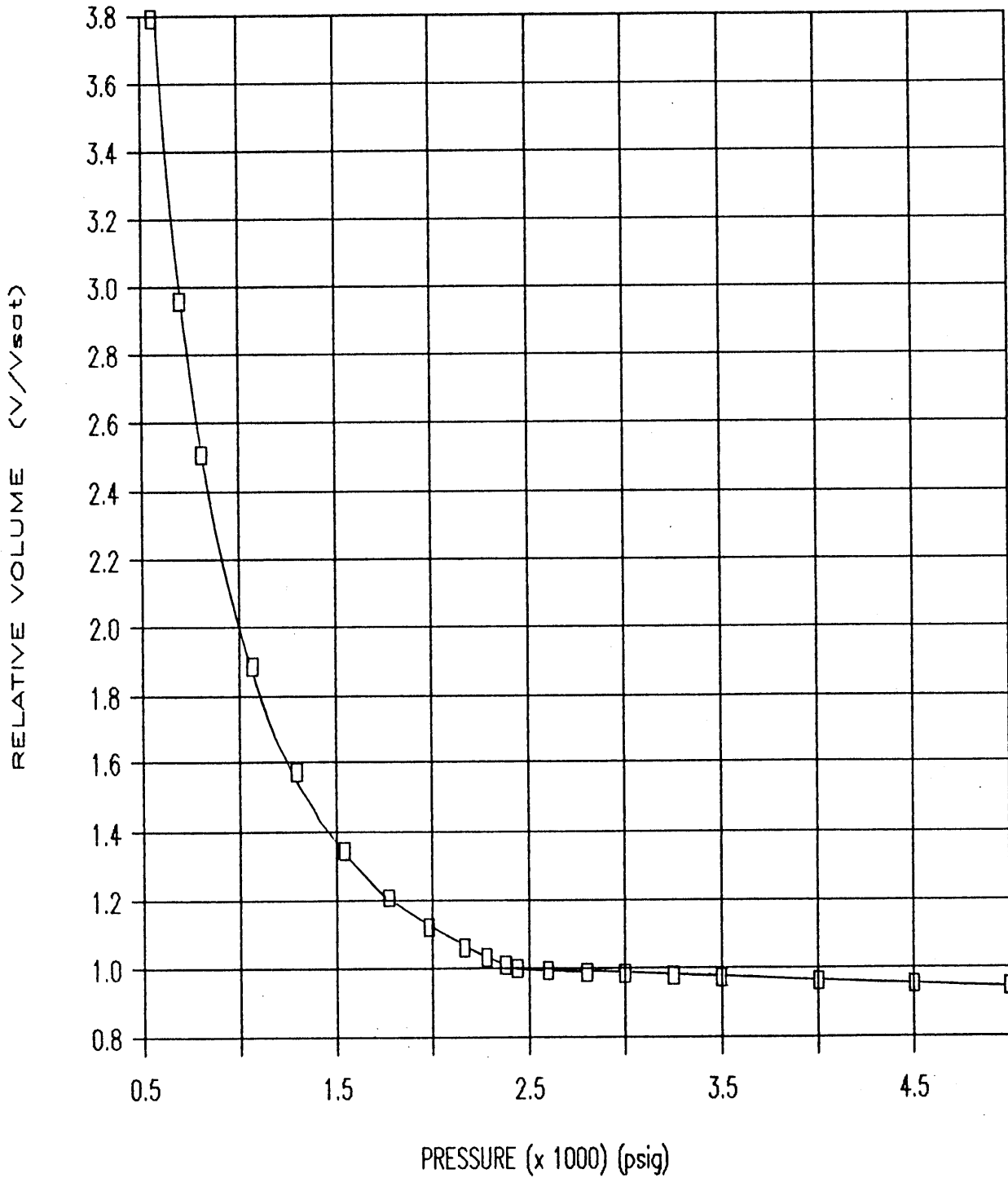
	Separator	Stock tank
Pressure (psig):	300	0
Component	Mol %	Mol %
Hydrogen Sulphide	0.02	0.05
Carbon Dioxide	0.35	0.23
Nitrogen	0.46	0.07
Methane	65.07	21.93
Ethane	17.34	22.64
Propane	10.48	29.38
Iso-Butane	1.72	6.97
N-Butane	2.53	11.15
Iso-Pentane	0.56	2.45
N-Pentane	0.54	2.31
Hexanes	0.38	1.52
Heptanes	0.25	0.90
Octanes	0.10	0.25
Nonanes	0.10	0.12
Decanes	0.05	0.01
Undecanes	0.03	0.01
Dodecanes Plus	0.02	0.01
TOTAL	100.00	100.00
<u>Stream Properties</u>		
Molecular Weight	: 24.76	39.98
Gravity (AIR = 1.000)	: 0.859	1.401
Gross HV (BTU/SCF)	: 1473	2326
Nett HV (BTU/SCF)	: 1342	2138
Wobbe Index	: 1589	1965
Critical Pressure (psia):	659.1	623.9
Critical Temperature (R):	441.9	600.3
<u>G P M Content</u>		
Ethane Plus	: 9.699	22.856
Propane Plus	: 5.058	16.797
Butanes Plus	: 2.168	8.695
Pentanes Plus	: 0.807	2.894
<u>Hexanes Plus Properties</u>		
Mol %	: 0.93	2.82
Molecular Weight	: 100.1	92.1
Density (gm/cc @ 60 F)	: 0.741	0.731
Gravity (API @ 60 F)	: 59.3	61.8
<u>Heptanes Plus Properties</u>		
Mol %	: 0.55	1.30
Molecular Weight	: 111.2	101.6
Density (gm/cc @ 60 F)	: 0.753	0.743
Gravity (API @ 60 F)	: 56.1	58.8
<u>Decanes Plus Properties</u>		
Mol %	: 0.10	0.03
Molecular Weight	: 143.3	147.3
Density (gm/cc @ 60 F)	: 0.783	0.787
Gravity (API @ 60 F)	: 49.0	48.2
<u>Undecanes Plus Properties</u>		
Mol %	: 0.05	0.02
Molecular Weight	: 152.6	154.0
Density (gm/cc @ 60 F)	: 0.791	0.792
Gravity (API @ 60 F)	: 47.3	47.0
<u>Dodecanes Plus Properties</u>		
Molecular Weight	: 161.0	161.0
Density (gm/cc @ 60 F)	: 0.797	0.797
Gravity (API @ 60 F)	: 45.9	45.9

P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 23 of 36
File: E 9001B

RELATIVE VOLUME

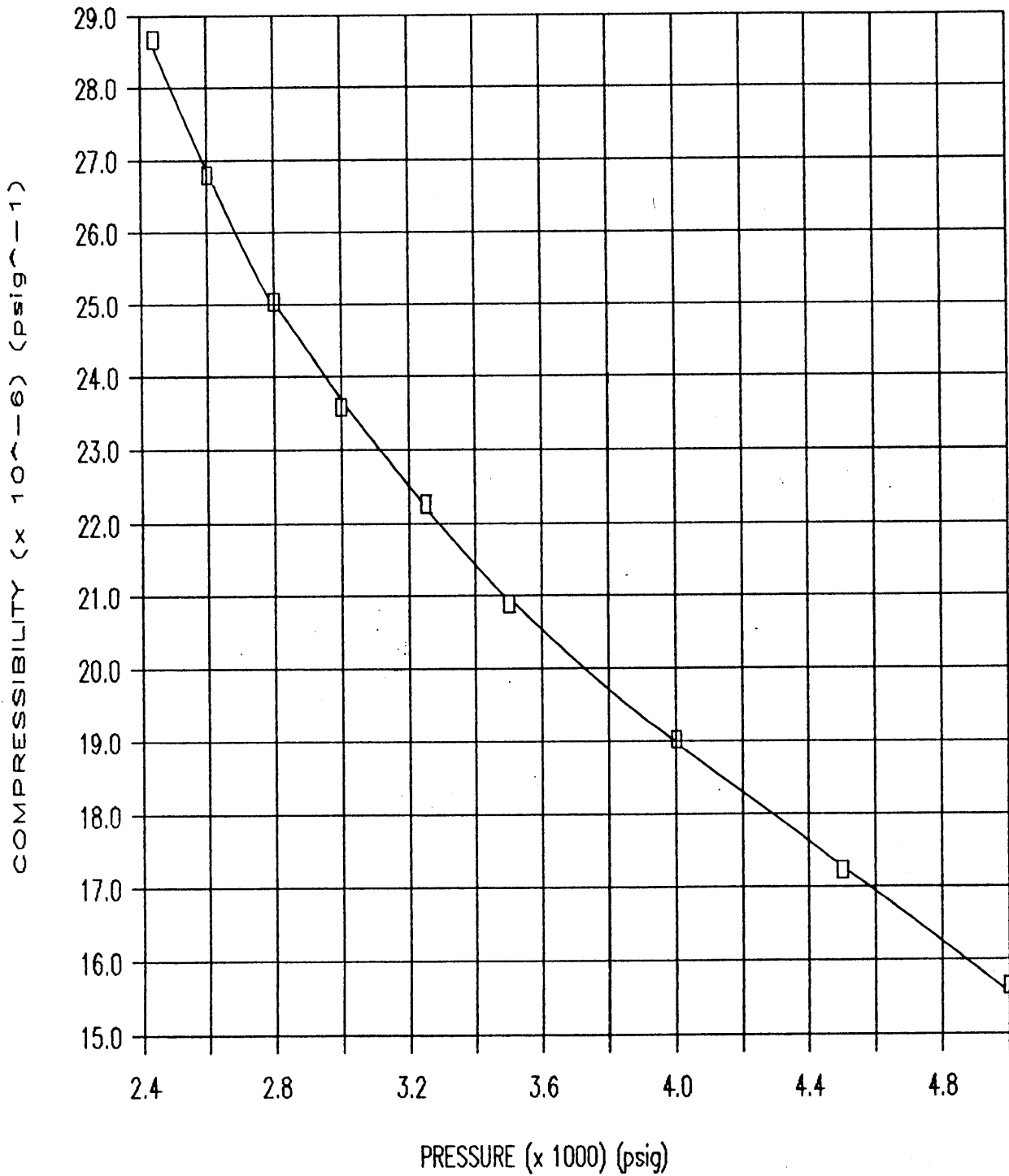


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 24 of 36
File: E 90018

OIL COMPRESSIBILITY

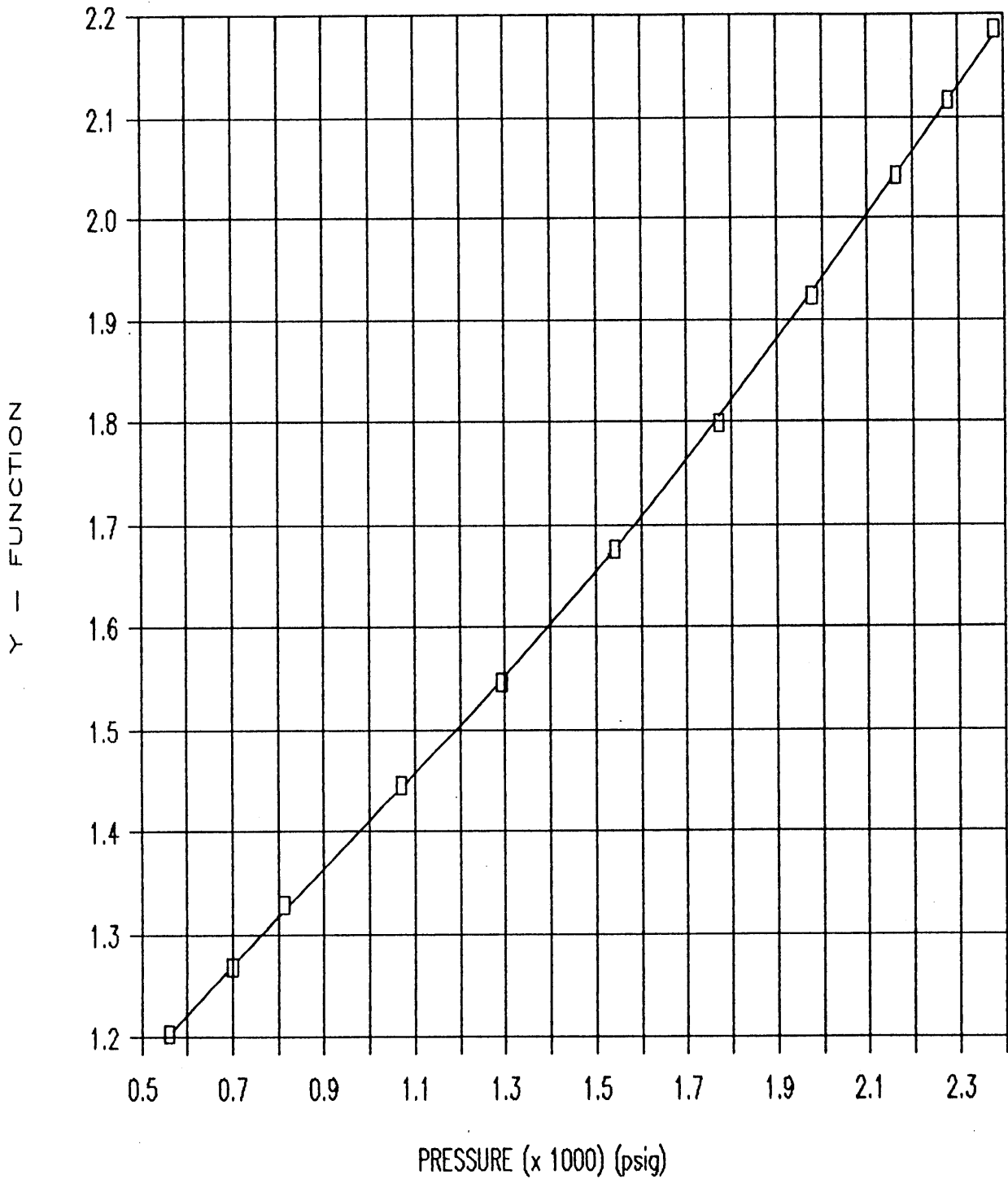


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 25 of 36
File: E 9001B

Y - FUNCTION

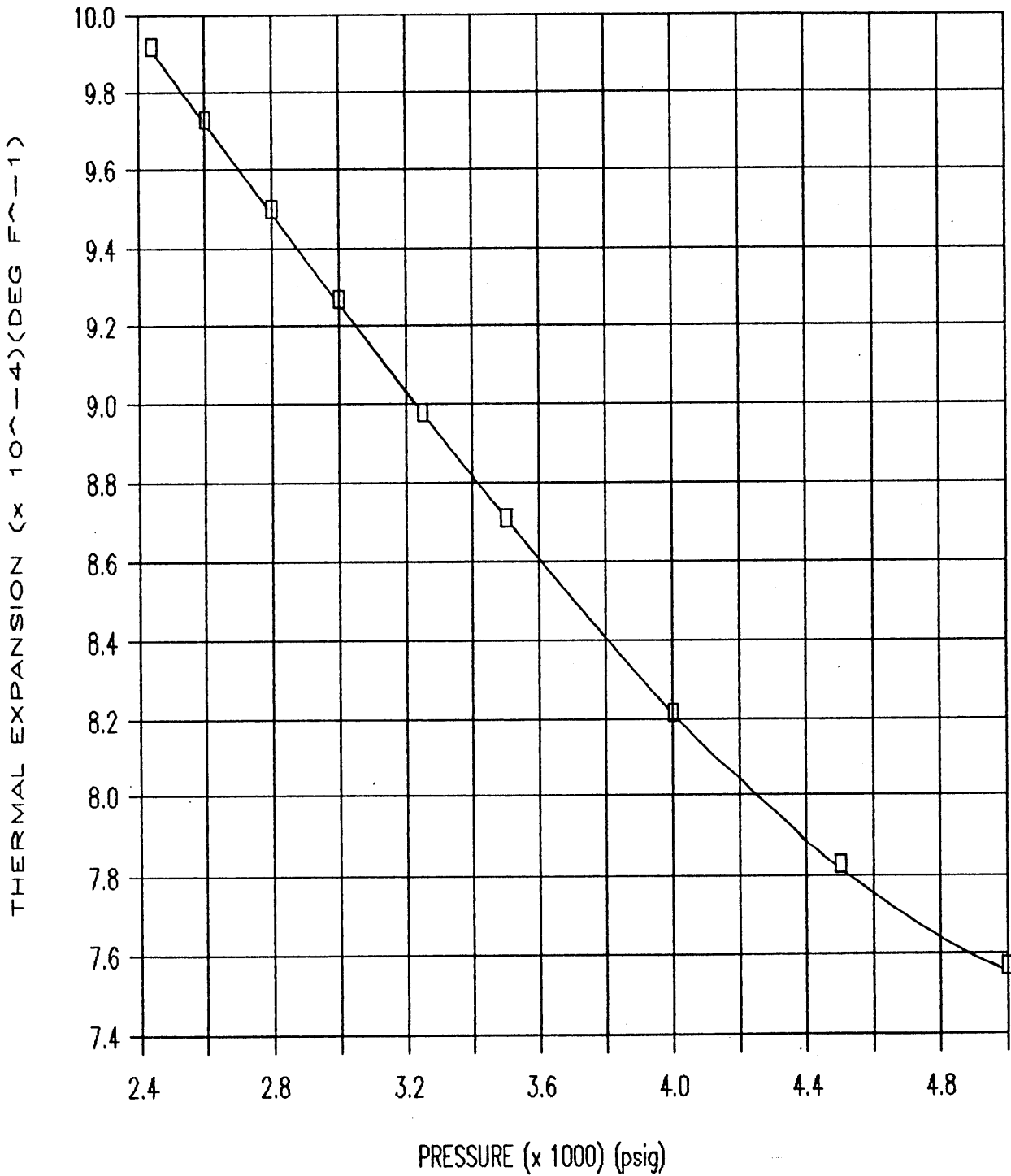


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 26 of 36
File: E 90018

OIL THERMAL EXPANSION

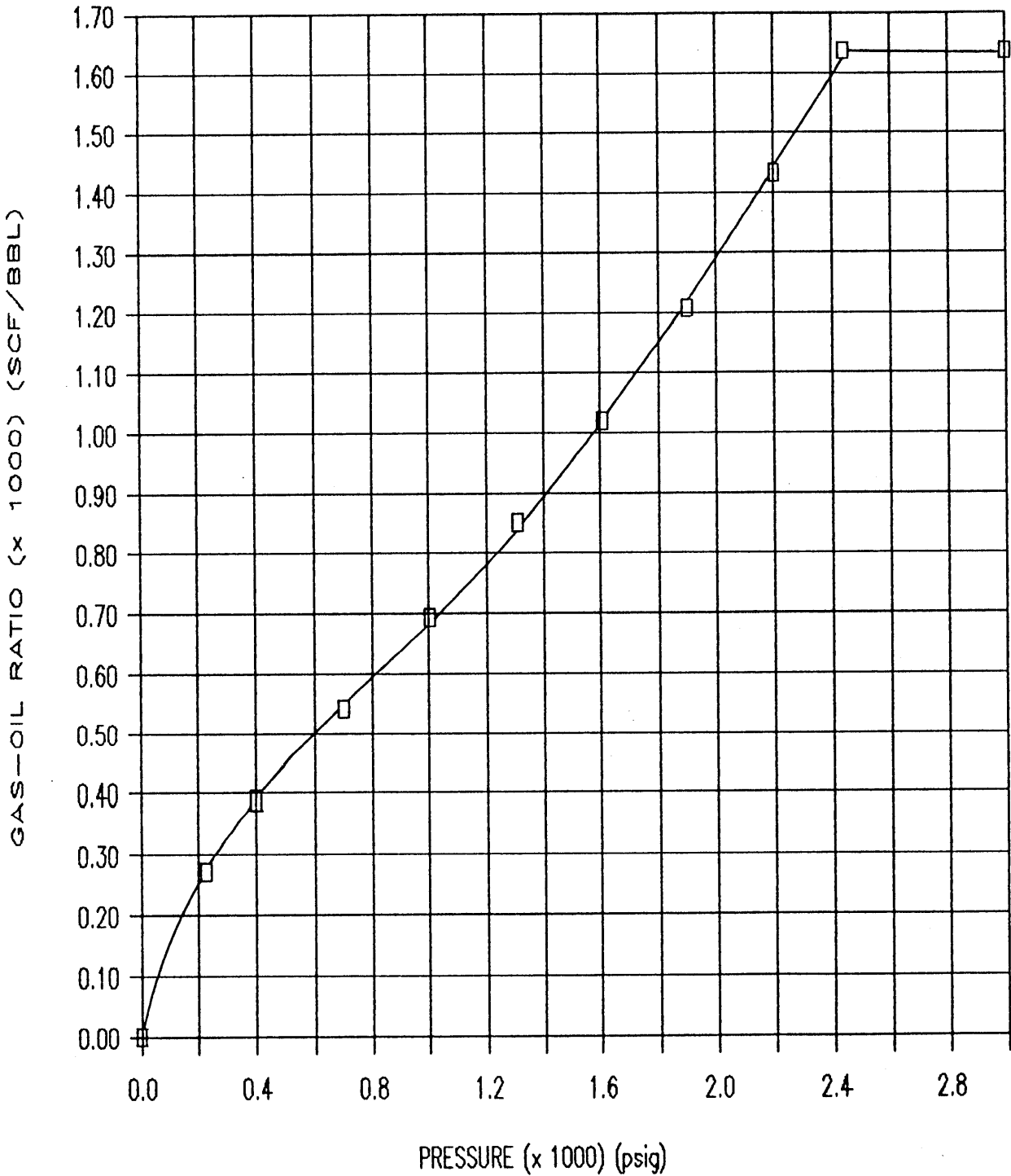


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 27 of 36
File: E 90018

GAS - OIL RATIO

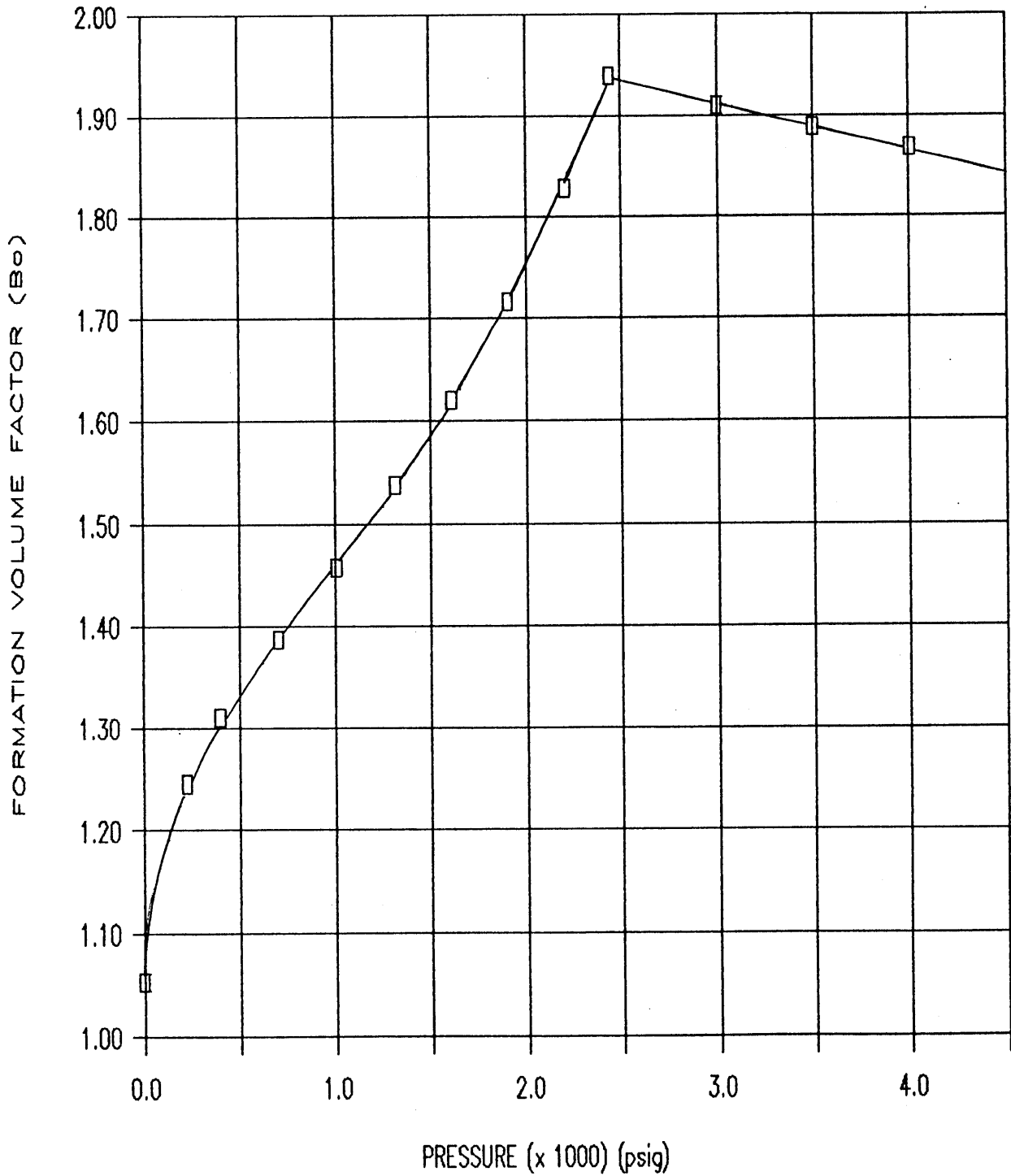


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 28 of 36
File: E 90018

OIL FORMATION VOLUME FACTOR

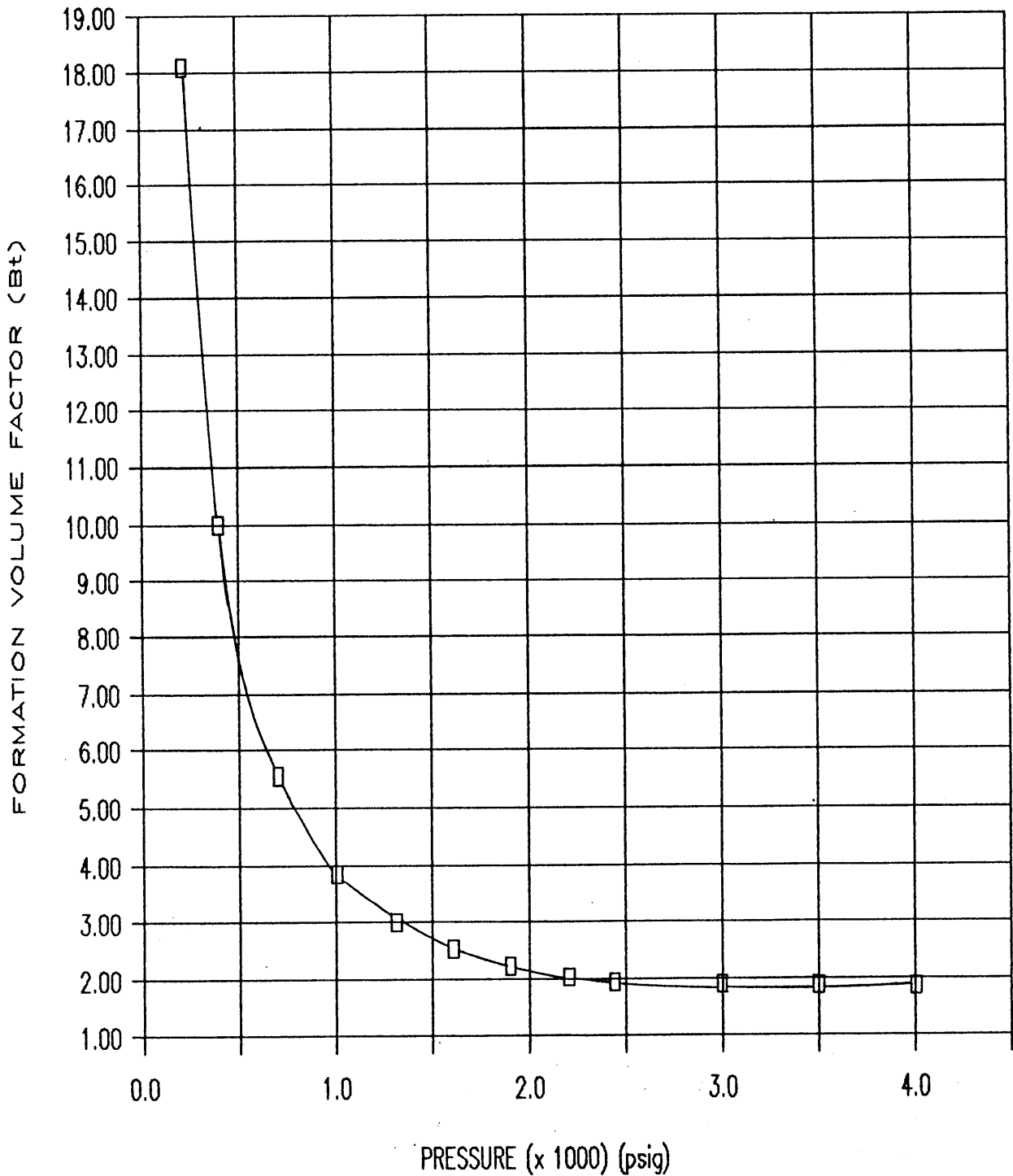


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 29 of 36
File: E 90018

TOTAL FORMATION VOLUME FACTOR

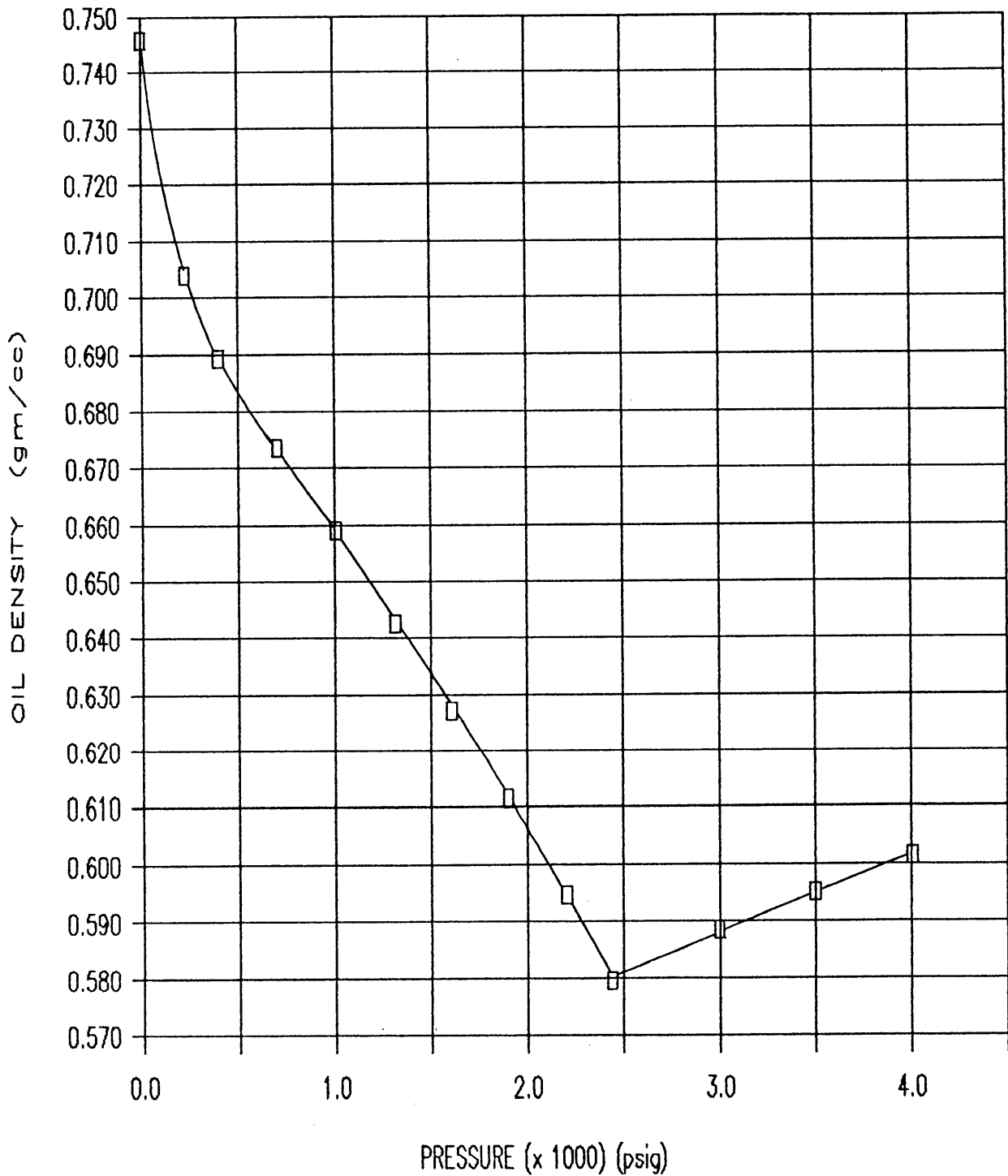


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 30 of 36
File: E 90018

OIL DENSITY

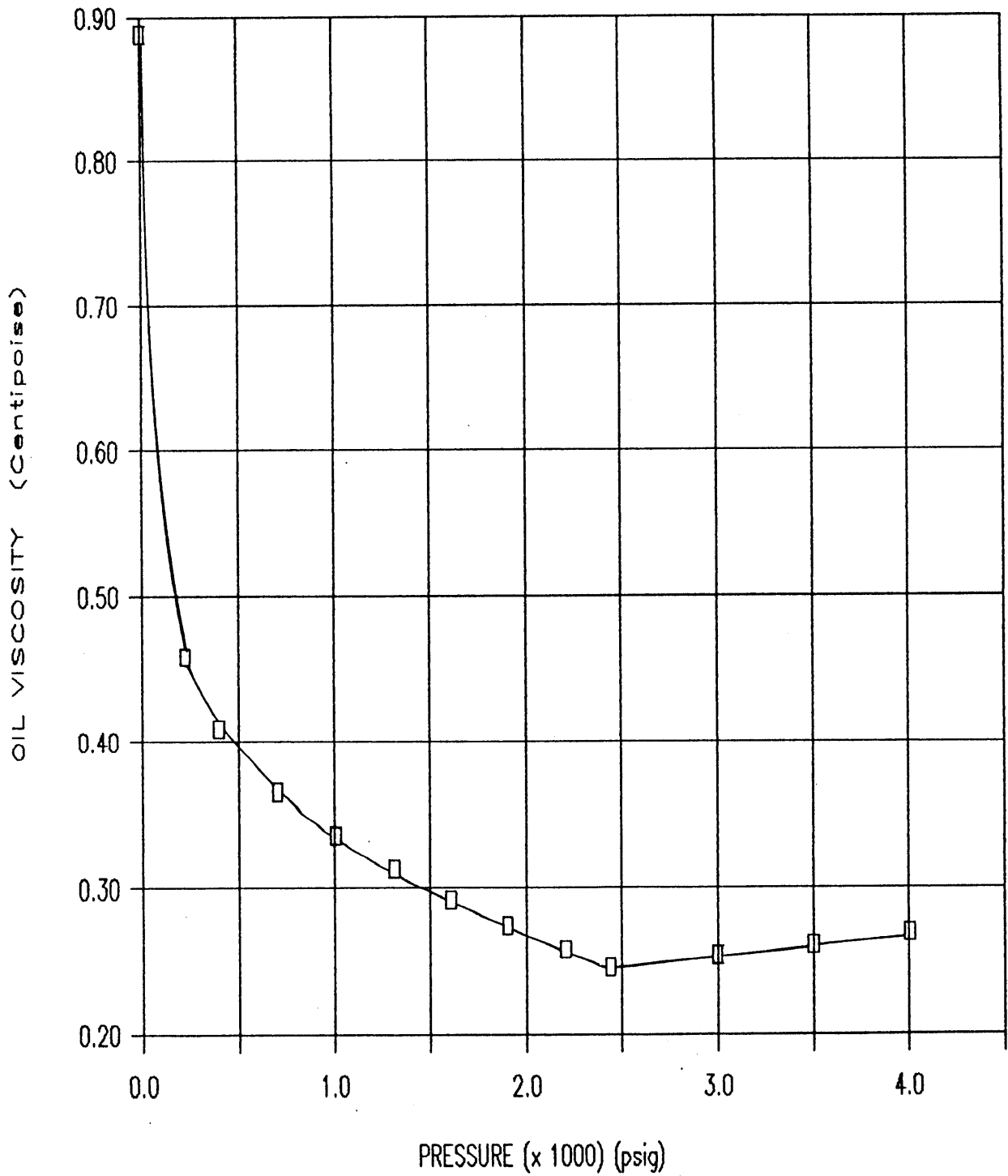


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 31 of 36
File: E 90018

OIL VISCOSITY

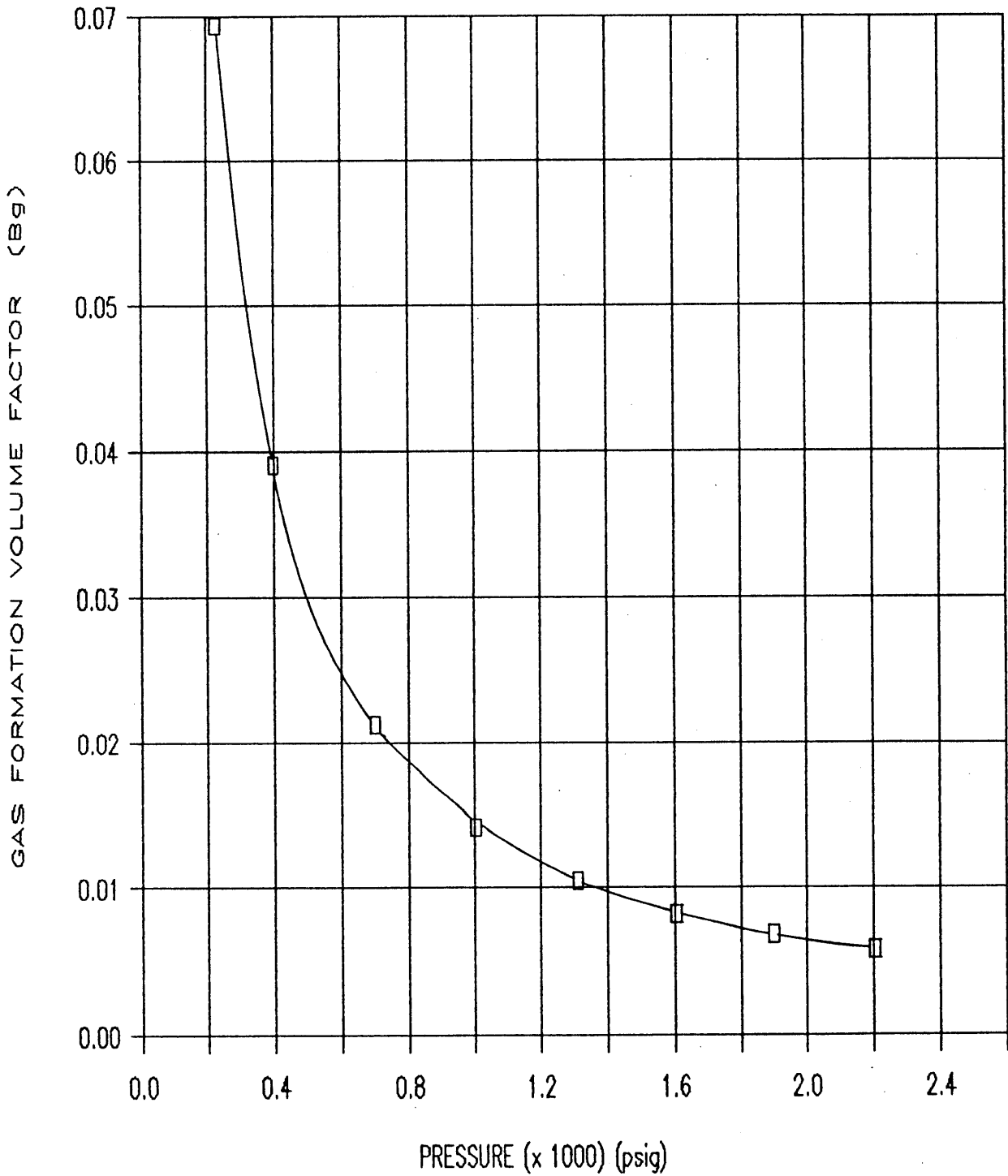


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 32 of 36
File: E 9001B

GAS FORMATION VOLUME FACTOR

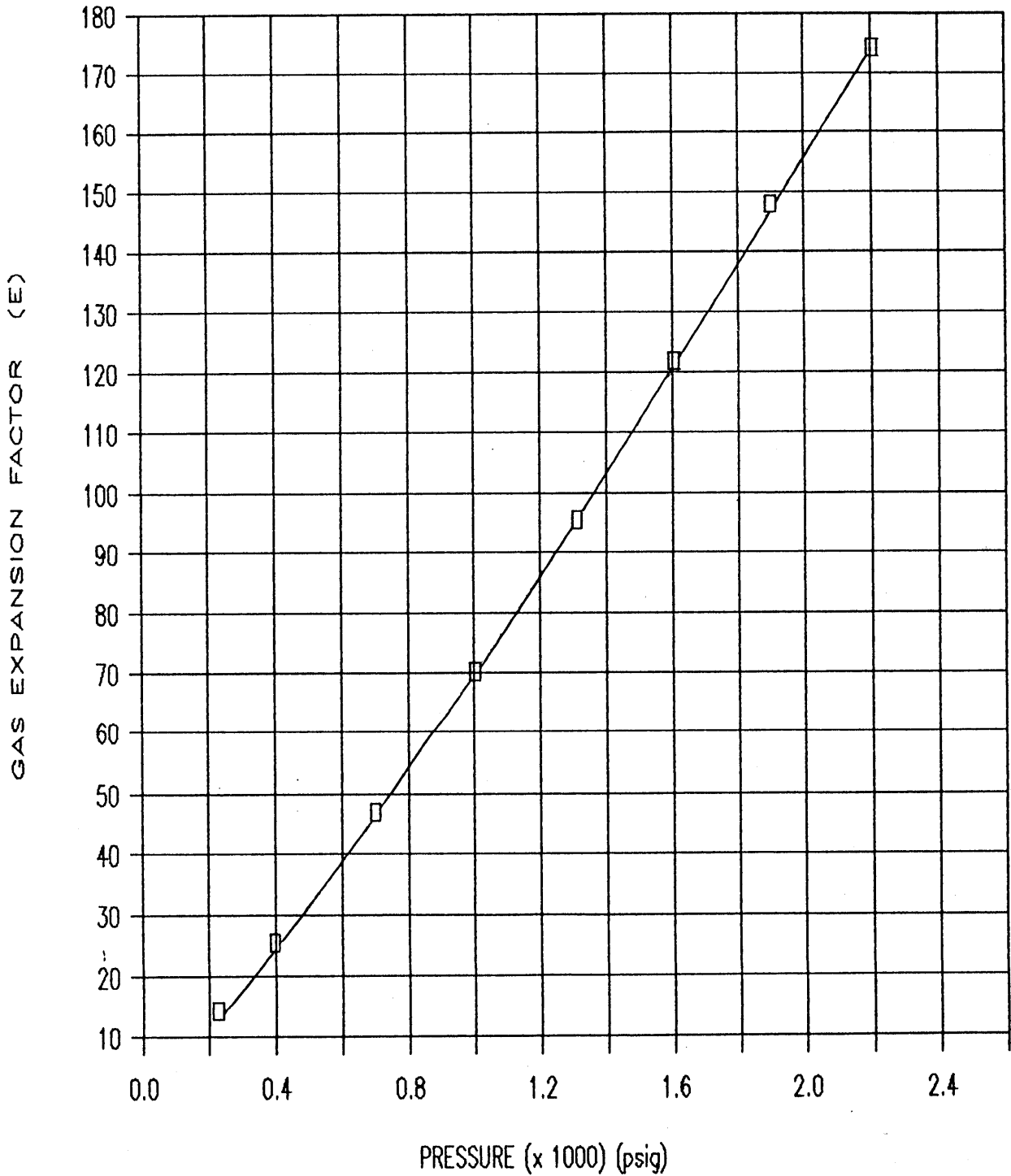


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 33 of 36
File: E 90018

GAS EXPANSION FACTOR

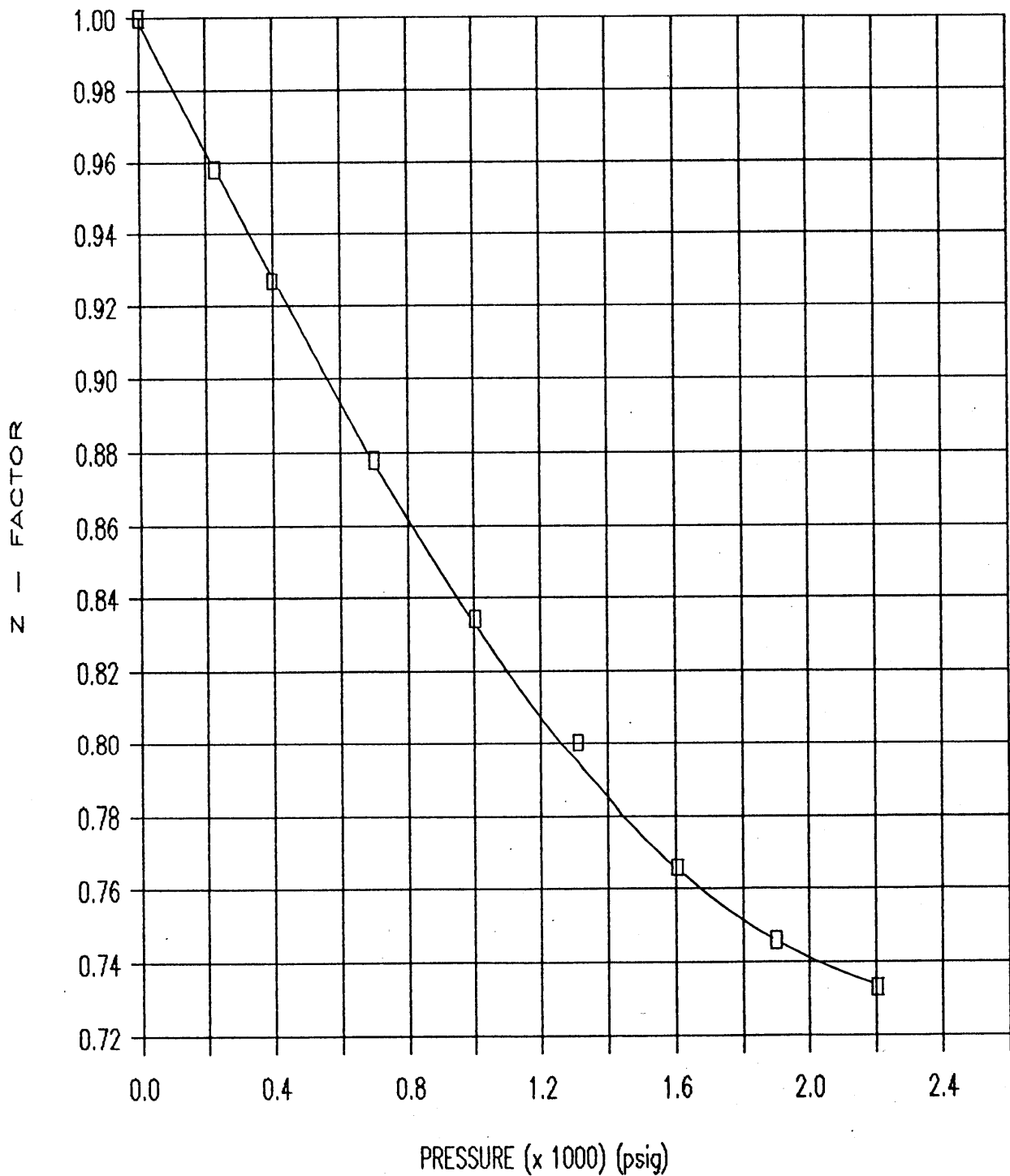


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 34 of 36
File: E 90018

GAS DEVIATION FACTOR

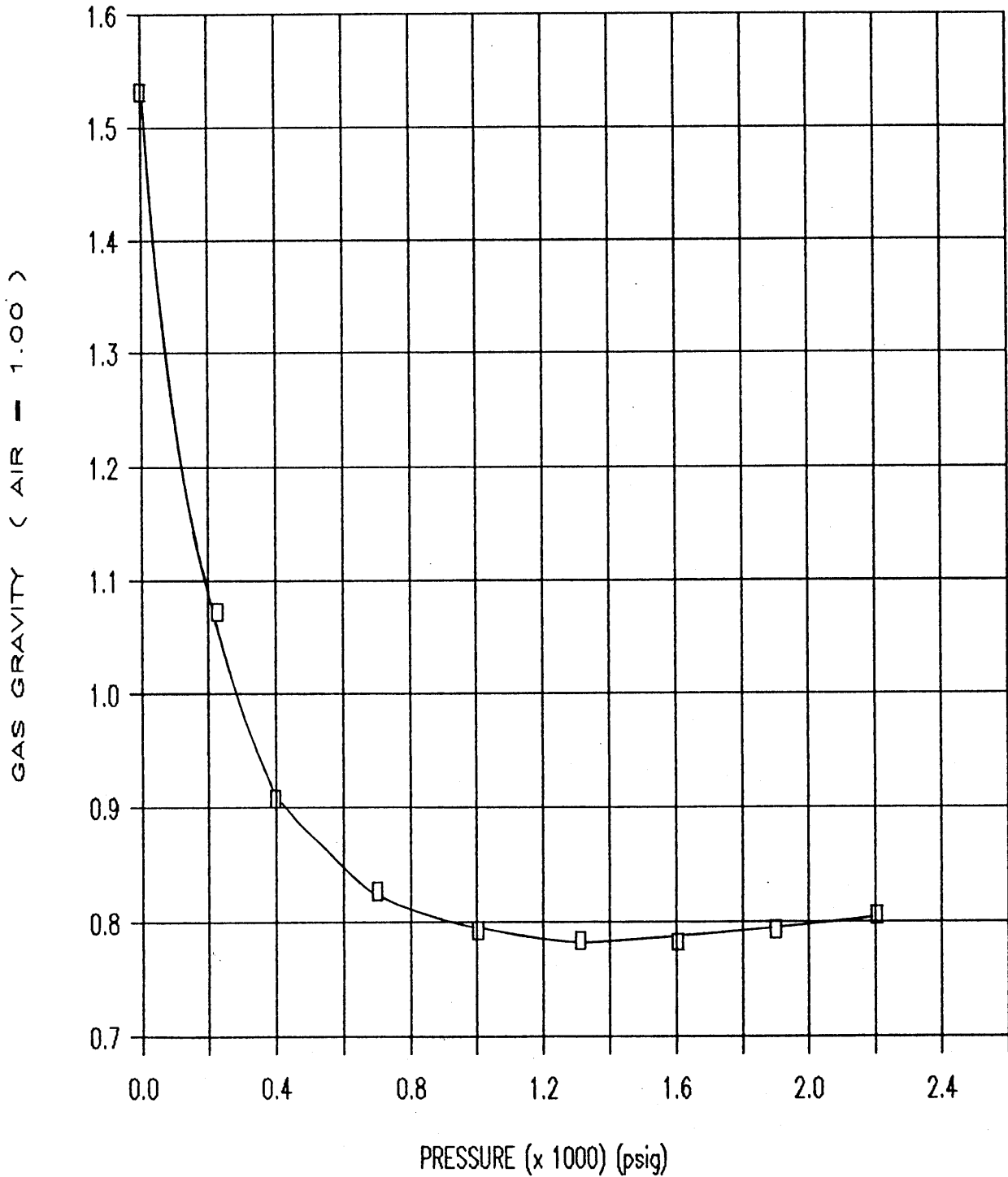


P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 35 of 36
File: E 90018

GAS GRAVITY



P E T R O L A B

Company: Esso Australia Ltd.
Well : Terakihi # 1

Page: 36 of 36
File: E 90018

GAS VISCOSITY

