Resources Ltd

WELL COMPLETION REPORT

LANGLEY-1

PPL 1

OTWAY BASIN, VICTORIA

compiled by

Kevin Lanigan

January, 1996

VOLUME 2

APPENDICES 5 - 12

Level 6, 6 Riverside Quay, Southbank, Victoria 3006 Telephone: (03) 9684-4888 Facsimile: (03) 9684-4897

APPENDIX 5

APPENDIX 5

GFE RESOURCES LTD

APPENDIX 5

CORE #1 DESCRIPTION AND ANALYSES

5A. WELLSITE CORE DESCRIPTION
5B. SLABBED CORE PHOTOGRAPHS
5C. ROUTINE CORE ANALYSIS
5D. SPECIAL CORE ANALYSIS

LANGLEY-1

APPENDIX 5A

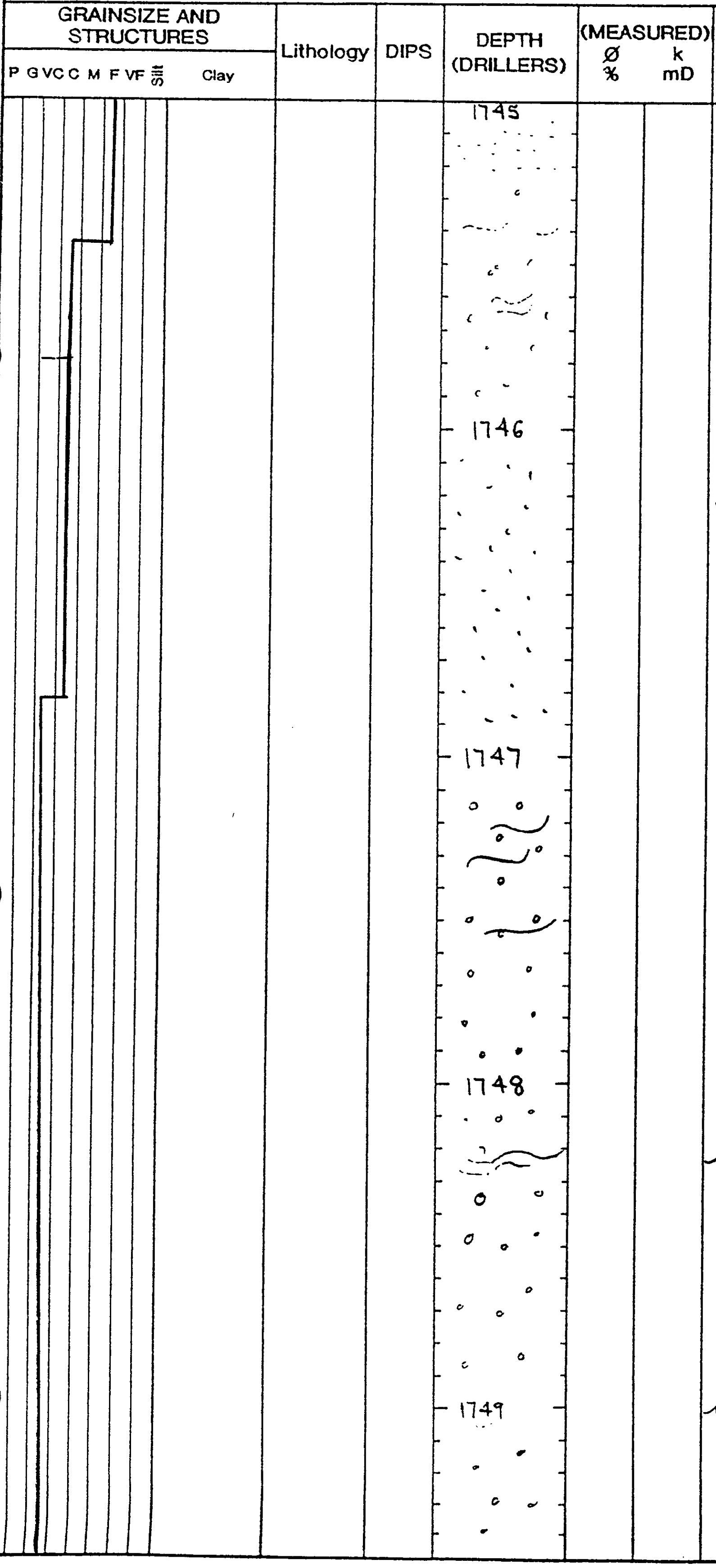
WELLSITE CORE DESCRIPTION

LANGLEY-1

GFE RESOURCES LTD.
CORE DESCRIPTION

WELL : LANGLEY No. 1
CORE No.: 1
PAGE 1 OF 4
DATE : 30·5·1994
INTERVAL : 1745 - 1764
FORMATION : WAARRE
RECOVERY : 83·9%
GEOLOGIST : V. AKBARI

APPENDIX 5A



DESCRIPTION

1745 - 1745·40

Sandstone; light-med. grey; VF - F, dom. F; SA - SR; dom. SA Qtz; mod. sorting; carbonaceous; rare coloured lithics; abd. argill. matrix; no vis. porosity with thin laminae of carb. material.

1745·40 - 1750·10

Sandstone; as for 1745 - 1745.40 becoming coarse - V.C; dom. V.C; SA - SR; dom. S.R; mod sorted; weak calc. cement; good vis. porosity; soft - mod firm.

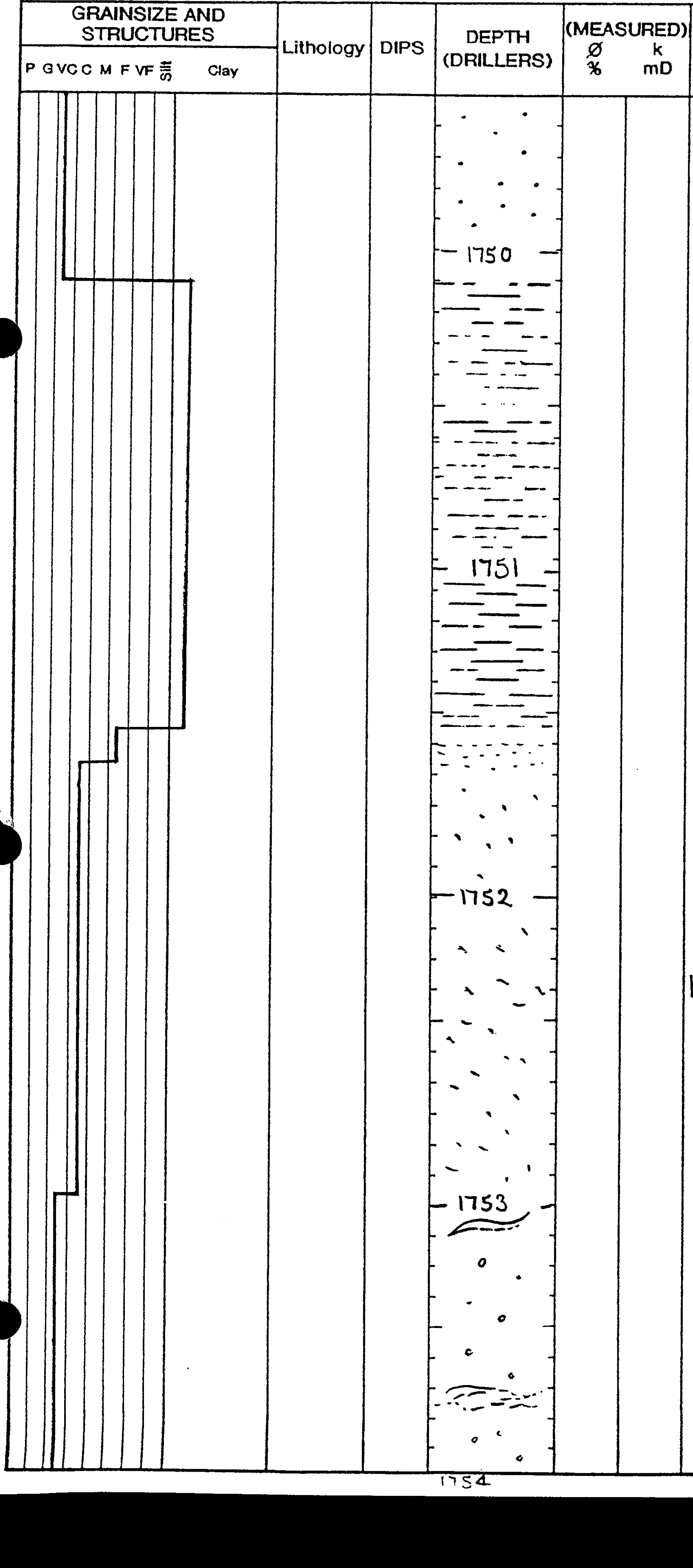
Thin laminae of carb. material

Thin laminae of carb. material

GFE RESOURCES LTD.
CORE DESCRIPTION

WELL : LANGLEY No. 1
DATE : 30·5·1994
FORMATION : WAARRE
GEOLOGIST : V. AKBARI
CORE No.: 1
PAGE 2 OF 4
INTERVAL : 1745 - 1764
RECOVERY : 83·9 %

APPENDIX 5A



DESCRIPTION

1750.10 - 1751·50
Shale; dark grey - black; thinly laminated; highly carbonaceous; micromicaceous; hard

1751·50 - 1751·60
Sandstone; off white, brownish; VF-F; dom. F; SA - SR; dom. SA Qtz; mod. sorting; carb; abd. argill. matrix; no visual porosity; hard.

1751.60 - 1757·90
Sandstone as for 1751·50 - 1751·60, becoming coarse to 1753.0 and V. coarse to 1757.40, + gravelly to 1757.90.

Carb. Laminae

1753.6 Carb. Laminae

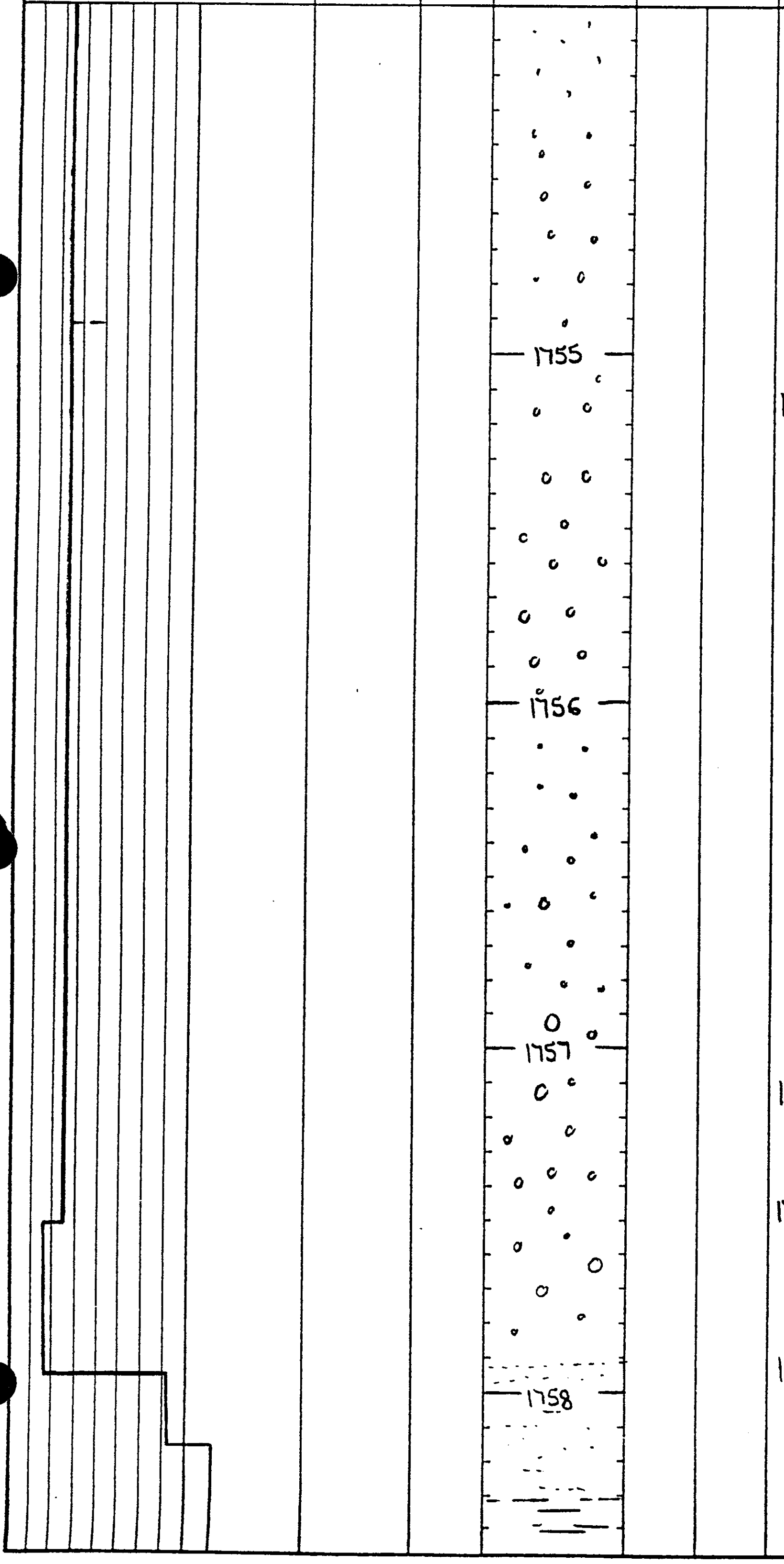
GFE RESOURCES LTD.

CORE DESCRIPTION

WELL : LANGLEY No. 1
CORE No.: 1
PAGE 3 OF 4
DATE : 30·5·1994
INTERVAL : 1745 - 1764
FORMATION : WAARRE
RECOVERY : 83·9%
GEOLOGIST : V. AKBARI

APPENDIX 5A

GRAINSIZE AND STRUCTURES P G VC C M F VF Silt Clay	Lithology	DIPS	DEPTH (DRILLERS)	(MEASURED) Ø %	k mD	DESCRIPTION



1755.2 Thinly laminated Carbonaceous and/or argill. coal

1757.40 Sandstone becomes very coarse to gravelly

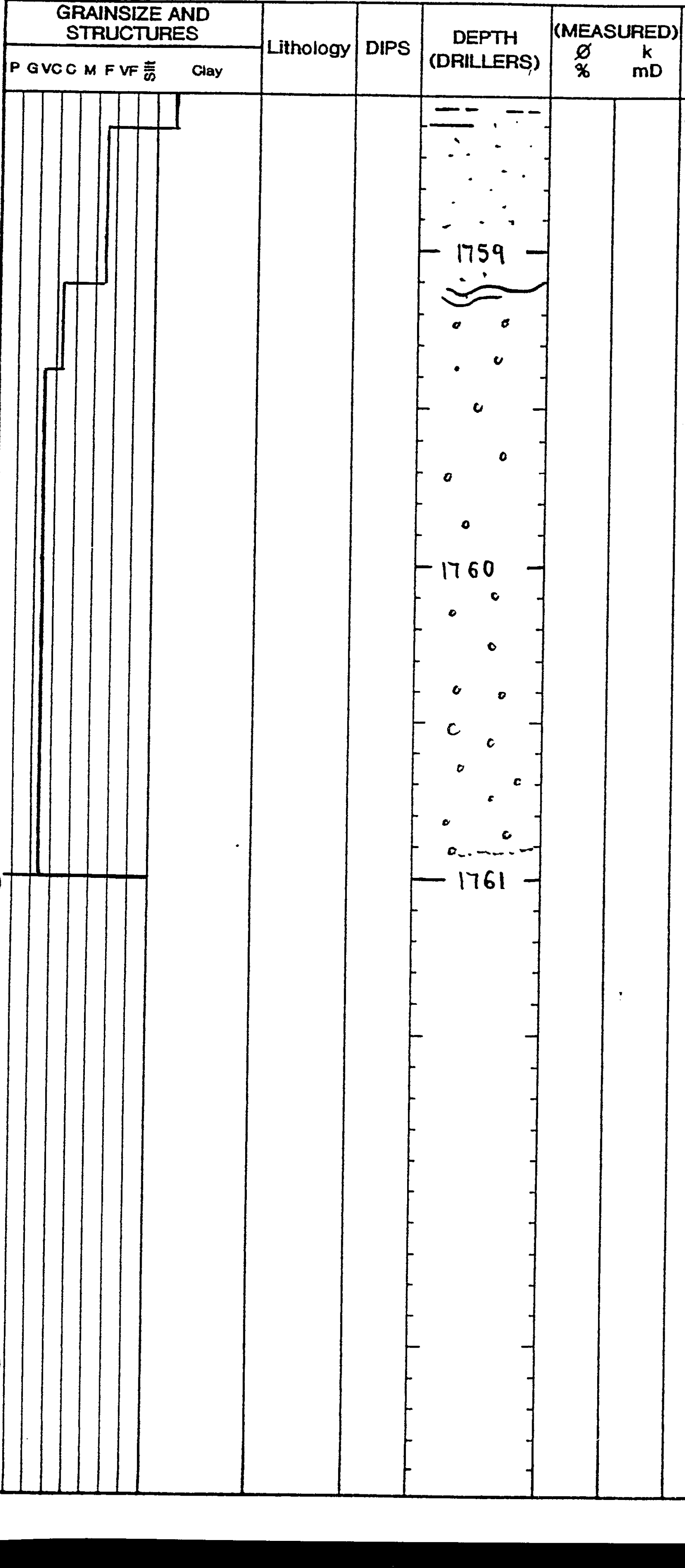
1757.90 - 1758 Sandstone, off white to brownish; V.F.; grading into siltstone

1758 - 1758.60 Shale, dark grey; V. carb; micromica, hard.

GFE RESOURCES LTD.
CORE DESCRIPTION

WELL : LANGLEY No. 1
CORE No.: 1
PAGE 4 OF 4
DATE : 30.5 1994
INTERVAL : 1745 - 1764
FORMATION : WAARRE
RECOVERY : 83.9%
GEOLOGIST : V. AKBARI

APPENDIX 5A



DESCRIPTION

fissile

1758.60 - 1759.10
Sandstone; colourless - translucent; VF - med; dom. f; SA - SR; dom. SA Qtz; mod. sorted; abd. argill. matrix - trace, carb. material. Thin laminae of carb. material, no visual porosity; becoming med - C to 1759.10 + V. coarse below 1759.40m.

Base of the core 1760.94 m.

APPENDIX 5B

SLABBED CORE PHOTOGRAPHS

LANGLEY-1

PE906687

This is an enclosure indicator page.
The enclosure PE906687 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906687 has the following characteristics:

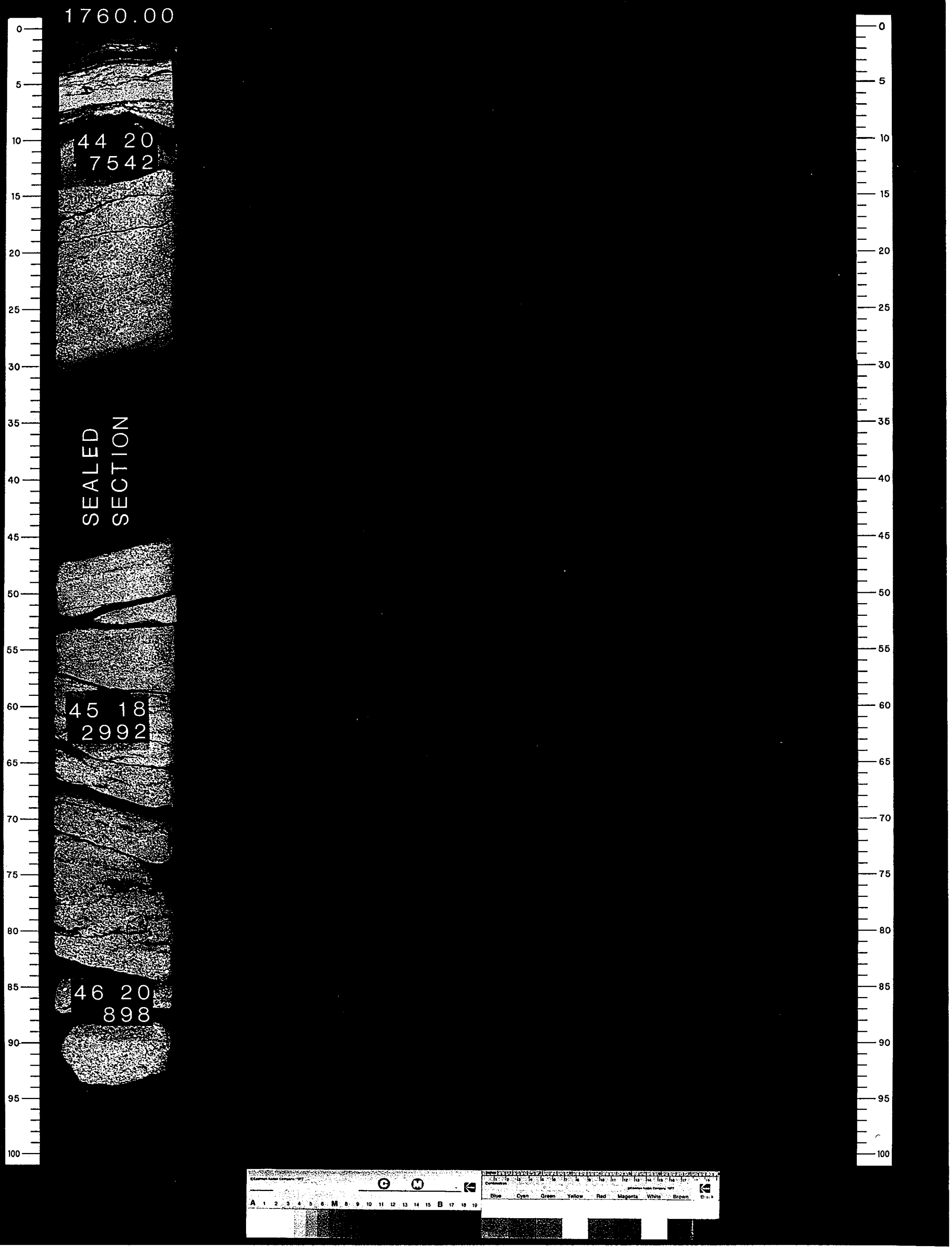
ITEM_BARCODE = PE906687
CONTAINER_BARCODE = PE900950
NAME = Core Photographs, 1 of 4
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = CORE_PHOTOS
DESCRIPTION = Core Photographs, 1 of 4, of Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

GFE RESOURCES LTD

LANGLEY No.1

CORE No.1



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CONTAINER_BARCODE = PE900950
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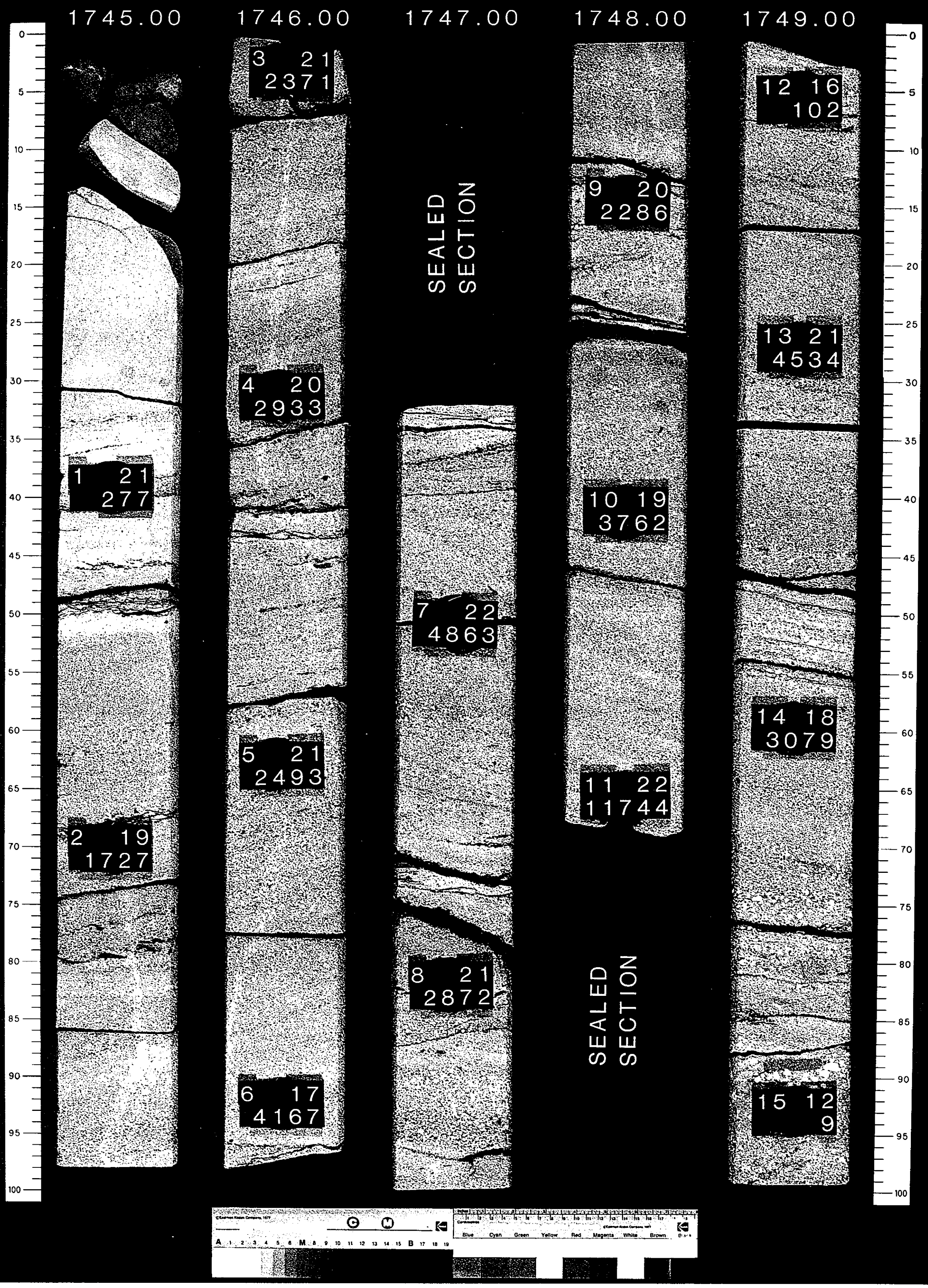
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = CORE_PHOTOS
DESCRIPTION = Core Photographs, 2 of 4, of Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

GFE RESOURCES LTD

LANGLEY No.1

CORE No.1



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CONTAINER_BARCODE = PE900950
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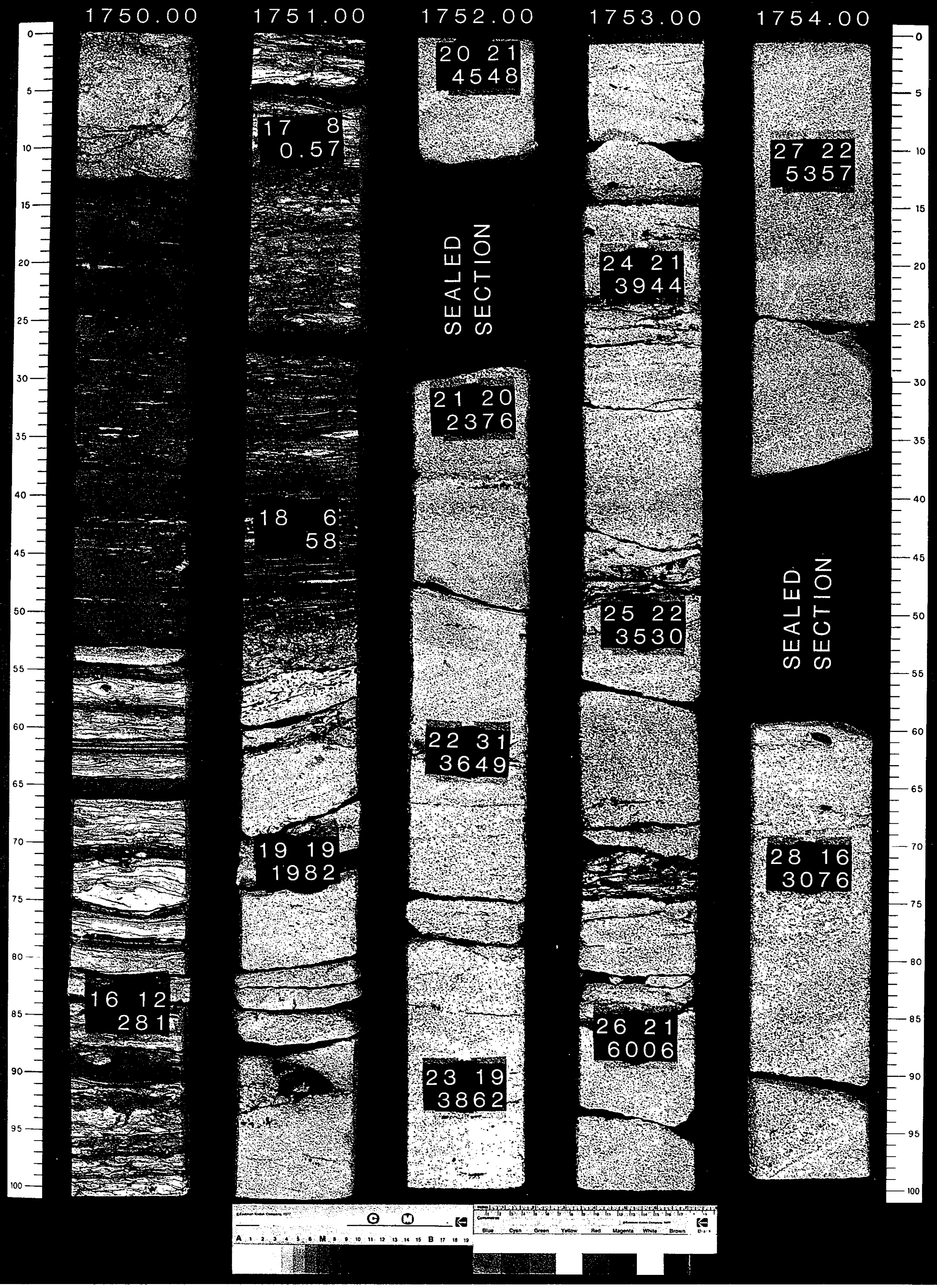
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = CORE_PHOTOS
DESCRIPTION = Core Photographs, 3 of 4, of Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

GFE RESOURCES LTD

LANGLEY No.1

CORE No.1



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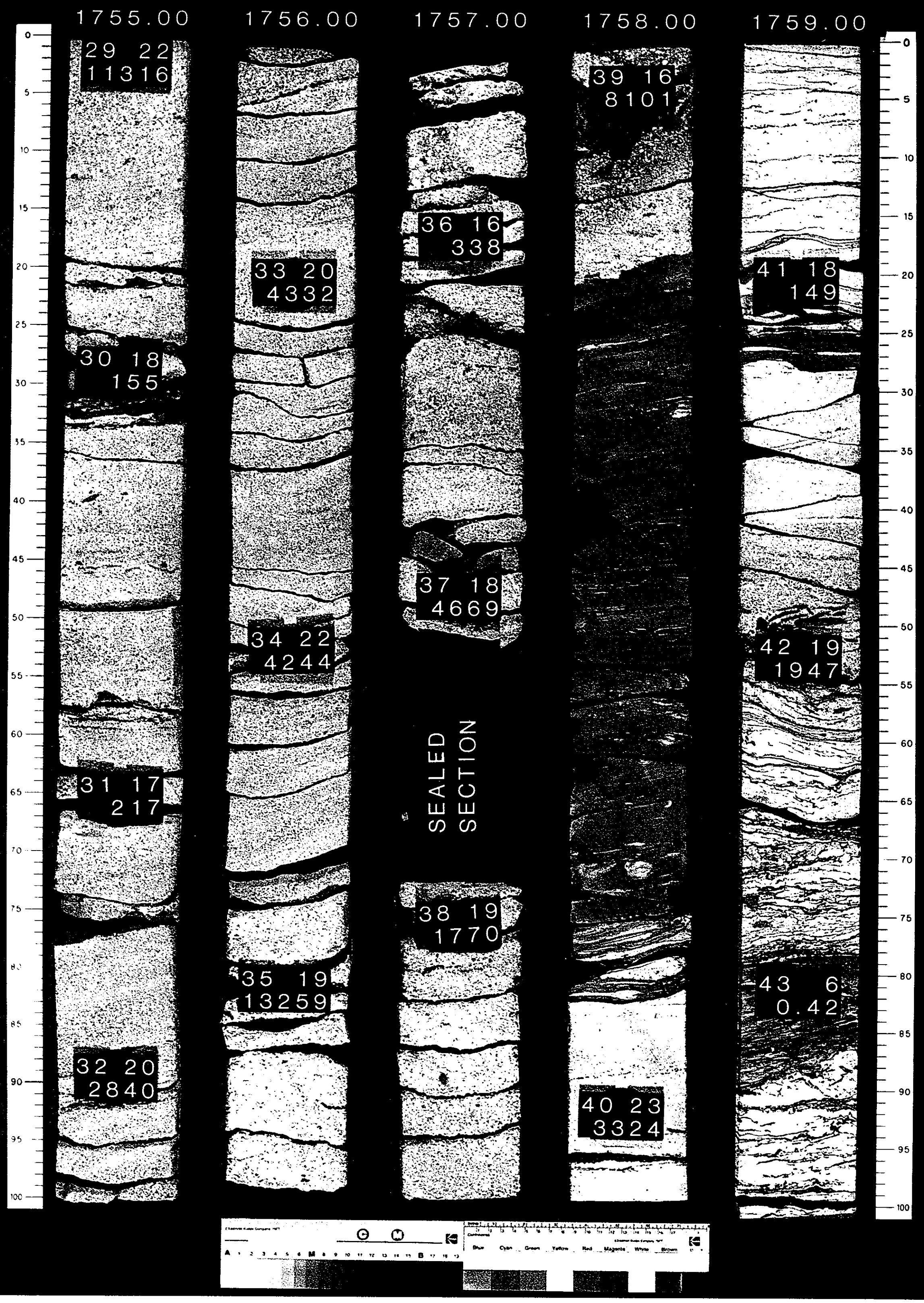
CONTAINER_BARCODE = PE900950
NAME = Core Photographs, 4 of 4
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = CORE_PHOTOS
DESCRIPTION = Core Photographs, 4 of 4, of Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

GFE RESOURCES LTD
LANGLEY No. 1
CORE No. 1



APPENDIX 5C

ROUTINE CORE ANALYSIS

LANGLEY-1

GFE RESOURCES LIMITED

WELL: LANGLEY No.1

ROUTINE CORE ANALYSIS REPORT

ACS
LABORATORIES
AUSTRALIA

9 September, 1994

GFE Resources Limited
Level 6, 6 Riverside Quay
SOUTH MELBOURNE VIC 3205

Attention: Kevin Lanigan

REPORT: 005-208 - LANGLEY No.1

CLIENT REFERENCE: Purchase Order No. 3333

MATERIAL: Core

LOCALITY: Otway Basin

WORK REQUIRED: Routine Core Analysis

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

for
Warren Farley
General Manager
on behalf of ACS Laboratories Pty. Ltd.

Address: P.O. Box 396, Chermside, Qld. 4032 Australia
Telephone: 61 7 350 1222 Facsimile: 61 7 359 0666
ACS Laboratories Pty. Ltd.
ACN: 008 273 005

ACS
LABORATORIES
AUSTRALIA

GFE Resources Limited
Level 6, 6 Riverside Quay
SOUTH MELBOURNE VIC 3205

Attention: Kevin Lanigan

FINAL DATA REPORT - ROUTINE CORE ANALYSIS

REPORT: 005-208 WELL NAME: LANGLEY No.1

LOGISTICS

Core No. 1, 1745.00 - 1760.94 m (15.94m) was delivered to the Adelaide laboratory of ACS on 31st of May, 1994.

INTRODUCTION

The following report includes tabular data of permeability to air, helium injection porosity and density determinations. Data presented graphically includes a continuous core gamma log, a core log plot and a porosity versus permeability to air plot.

The analyses were performed with the following aims:

1. To provide depth correlation through provision of a continuous core gamma log over the cored interval.
2. To provide air permeability, helium injection porosity and density data.
3. To determine the effect of overburden stress on air permeability and helium injection porosity data.

SAMPLING

The core was sampled as follows:

A. 1.5 " diameter core plugs were drilled from the whole core at 30cm intervals using tap water as the bit lubricant. The core was orientated such that the plugs were drilled parallel to the bedding.

B. All plugs were trimmed and offcuts retained. The offcuts were dispatched to GFE RESOURCES for viewing and possible selection of petrology/palaeontology samples.

The core was sampled and analysed as follows:

1. CONTINUOUS CORE GAMMA

The core was laid out according to depth markings, and a continuous core gamma trace produced by passing the core beneath a gamma radiation detector. The detector is protected from extraneous radiation by a lead tunnel. The detector signal is amplified and digitised to produce a gamma trace for comparison with the downhole log.

2. SAMPLE EXTRACTION AND DRYING

After sampling as described earlier the plugs were initially dried at 80°C for 2 hours. The plugs were then placed in a Soxhlet extractor to remove hydrocarbons. When the toluene in the Soxhlet was no longer discoloured, the core plugs were removed and checked under ultraviolet light to ensure all hydrocarbons had been removed.

After cleaning, all plugs were dried in a controlled humidity environment at 60°C and 40% relative humidity. The plugs were stored in an airtight plastic container and allowed to cool to room temperature before analysis.

3. AIR PERMEABILITY

The plugs are placed in a Hassler cell at a confining pressure of 250 psig (1720 kpa). This pressure is used to prevent bypassing of air around the sample when the measurement is made.

During the measurement a known air pressure is applied to the upstream face of the sample, creating a flow of air through the sample. Permeability for each sample is then calculated using Darcy's Law through knowledge of the upstream pressure and flow rate during the test, the viscosity of air and the plug dimensions.

4. HELIUM INJECTION POROSITY

The plugs were sealed in a matrix cup and a known volume of Helium at 100psi reference pressure introduced to the cup. From the resultant pressure the unknown volume i.e. the grain volume was calculated using Boyles law, where $P_1V_1 = P_2V_2$

The bulk volume of the plugs was determined by mercury immersion. The difference between the grain volume and the bulk volume is the pore volume and from this the porosity is calculated as the volume percentage of pore space with respect to the bulk volume. The porosity calculated using this technique is an effective porosity.

5. APPARENT GRAIN DENSITY

The apparent grain density is determined by dividing the weight of the plug by the grain volume determined from the helium injection porosity measurement.

6. POROSITY AND PERMEABILITY AT OVERBURDEN PRESSURE

To determine the porosity and permeability of the core plug at overburden pressure, the sample is placed in a heavy duty Hassler sleeve. The assembly is loaded into a thick walled hydrostatic cell capable of withstanding the simulated reservoir overburden stress. After loading, helium injection porosity and air permeability was determined at simulated reservoir load conditions. The overburden stress values used in these measurements were supplied by GFE Resources.

7. ROLLING AND SPECIFIED AVERAGES

These averages of both Helium injection porosity and permeability are obtained by using a "rolling" three (3) point method. In the case of porosity a weighted arithmetic average is used:

$$\phi\, av_{(i+1)} = [\phi_i + 2\phi_{(i+1)} + \phi_{(i+2)}]/4$$

In the case of permeability a weighted geometric average is used:

$$K\, av_{(i+1)} = 10^{[(\log_{10} K_i + 2\log_{10} K_{(i+1)} + \log_{10} K_{(i+2)})/4]}$$

At any sample point, excluding the first and last, a rolling average is obtained by using the value at the specified sample point, the value before it and the value of the sample point after it. In the cases of the first and last sample points, only 2 sample points are used.

Using porosity as an example, the average of the first data point is obtained from the formula:

$$\phi\, av_{(i)} = [2\phi_i + \phi_{(i+1)}]/3$$

The average at the final data point is obtained by:

$$\phi\, av_{(f)} = [\phi_{(f-1)} + 2\phi_{(f)}]/3$$

The same method is used for permeability averages. At any break in the data the rolling averages are "re-started".

Data Key:
ϕ = porosity
K = permeability
i = initial
av = average
f = final

Specified averages are normal arithmetic averages which can be taken over any specified section of the core, as well as over the whole core.

On completion of the analysis the core was slabbed into 1/3, 2/3 portions using water as the lubricating medium. The 2/3 portion of the slabbed core was photographed under white-light, in a five metre format, before being sent to GFE Resources core store. The other 1/3 portion was sent to the Victorian Mines Department.

The core plugs used in routine core analysis are currently stored with ACS Laboratories Pty Ltd in our Adelaide Laboratory.

We have enjoyed working for GFE Resources Limited on this project and look forward to working with you in the near future.

END OF REPORT

SAMPLE DESCRIPTIONS

Sample #		Sample Description
1	Sst	lt gry, f gn, wl srt, sbang, Cl Mtrx, carb lam & stks, assoc Py
2	Sst	lt gry, med-crs gn, wl srt, ang-sbang, abd intrst Cl, Cl cmt, cab lams, tr assoc Py
3	Sst	lt gry, med-crs gn, wl srt, ang-sbang, intrst Cl, Qtz Cmt I.P., tr Py
4	Sst	lt gry, med-crs gn, wl srt, ang-sbang, Qtz cmt, mod intrst diss Py
5	Sst	lt gry, med-crs gn, wl srt, ang-sbang, Qtz Cmt, tr intrst Cl, tr Py
6	Sst	lt gry, med-v crs gn, mod srt, ang-sbang, Qtz cmt, tr intrst Cl & Py
7	Sst	lt gry, med-crs gn, mod srt, ang-sbang, Qtz cmt, tr intrst Cl, tr Py
8	Sst	lt gry, med-v crs gn, mod srt, sbang, Qtz Cmt I.P., carb lam w/ assoc Py, tr intrst Cl
9	Sst	as in 8
10	Sst	lt gry, crs gn, wl srt, ang-sbang, Qtz Cmt, tr Carb, tr Py, tr intrst Cl
11	Sst	as in 10
12	Sst	lt gry, crs gn, wl srt, ang-sbang, Qtz Cmt, mod amt intrst Cl, tr Py, carb Md lams, carb stks
13	Sst	as in 10
14	Sst	as in 10
15	Sst	lt gry, f-v crs gn, prly srt, sbang, Qtz Cmt, intrst Cl & carb Md, tr Py, Qtz gran, v hd, tr carb stks
16	Sst	v lt gry, vf gn, wl srt, ang-sbang, Cl Mtrx, abd carb Md lent lams, tr Py, Frac

SAMPLE DESCRIPTIONS

Sample #	Sample Description	
17	Sst	as in 16 w/ lge nod of dissem Py
18	Mdst	dk gry, f len & lam of vf gn Sd, tr Py, Frac
19	Sst	lt gry, med-v crs gn, prly srt, ang-sbang, Cl Cmt, intrst Cl, tr carb, tr dissem Py - Mounted sample
20	Sst	lt gry, med-crs gn, mod srt, ang-sbang, Qtz cmt I.P., tr intrst cl, tr carb & Py
21	Sst	as in 20 w/ th carb lam
22	Sst	lt gry, crs-v crs gn, mod srt, ang-sbang, Qtz cmt I.P., carb lam, tr Py, tr intrst Cl
23	Sst	lt gry, crs gn, wl srt, ang-sbang, Qtz Cmt, tr Py & carb, tr Qtz gran
24	Sst	as in 23
25	Sst	lt gry, crs gn, prly srt, ang-sbang, Qtz Cmt I.P., carb lam, tr carb, tr Py, tr intrst Cl
26	Sst	as in 25
27	Sst	lt gry, crs-v crs gn, wl srt, ang-sbang, rel cln Sd, Qtz Cmt I.P., tr carb & Cl
28	Sst	lt gry, crs-v crs gn, prly srt, ang-sbang, Qtz Cmt, tr intrst Cl, Qtz Gran
29	Sst	as in 28
30	Sst	as in 28 - Mounted sample
31	Sst	as in 28 - Mounted sample
32	Sst	as in 28 w/ carb lam
33	Sst	as in 28

SAMPLE DESCRIPTIONS

Sample #		Sample Description		
34	Sst	lt gry, crs gn, mod srt, ang-sbang, rel cln Sd, Qtz Cmt		
35	Sst	as in 28	-	Mounted sample
36	Sst	as in 28	-	Mounted sample
37	Sst	as in 28	-	Mounted sample
38	Sst	as in 28	-	Mounted sample
39	Sst	as in 28	-	Mounted sample
40	Sst	lt gry, med-crs gn, mod srt, sbang, tr carb, tr Py, tr intrst Cl		
41	Sst	v lt gry, vf gn, wl srt, ang-sbang, carb Md len lam, intrst Cl, tr Py		
42	Sst	as in 41 w/ C lam, Qtz Gran, lge Agg Py nods		
43	Sst	dk gry, f len lam of vf gn Sd, tr Py		
44	Sst	as in 40		
45	Sst	as in 40 w/ carb Md lam	-	Mounted sample
46	Sst	lt gry, v crs gn, mod srt, ang-sbang, rel cln Sd, tr intrst Cl, f carb lam w/ assoc Py	-	Mounted sample

PE906691

This is an enclosure indicator page.
The enclosure PE906691 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906691 has the following characteristics:
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CONTAINER_BARCODE = PE900950
NAME = Core Plot, 1 of 2
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Core Plot, 1 of 2, Porosity/Permeability, Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = ACS LABORATORIES PTY LTD
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

ACS LABORATORIES PTY. LTD.
ACN: 008 273 005
Petroleum Reservoir Engineering Data

CORE ANALYSIS FINAL REPORT

Company : GFE RESOURCES LIMITED
Well : Langley No.1
Field : WC
Core Int. : 1745.00 - 1760.94 M
Core Int. :
Core Int. :

Date : 01/06/94
File : 5-208
Location : OTWAY BASIN
ACS Lab. : ADELAIDE
Analyst : NK\PNC

Sample Number	Depth	Porosity %		Density		Permeability (md)		Summation of Fluids			Remarks
		HeInj	Roll Ø	ND	GD	KH	Roll KH	Ø	Oil%	H20%	
1	1745.40	20.9	20.4		2.61	277	510				
2	1745.70	19.3	20.2		2.63	1727	1183				
3	1746.00	21.1	20.5		2.64	2371	2310				
4	1746.30	20.3	20.6		2.69	2933	2670				
5	1746.60	20.5	19.7		2.64	2493	2952				
6	1746.90	17.3	19.2		2.65	4167	3809				
7	1747.50	21.8	20.4		2.64	4863	4102				
8	1747.80	20.6	20.8		2.65	2872	3095				
9	1748.15	20.1	20.0		2.63	2286	2741				
10	1748.45	19.3	20.3		2.64	3762	4415				
11	1748.60	22.4	20.1		2.64	11744	2695				
12	1749.00	16.2	18.9		2.62	102	861				
13	1749.30	20.6	18.9		2.64	4534	1593				
14	1749.60	18.3	17.2		2.64	3079	791				
15	1749.90	11.7	13.5		2.64	9.1	92.0				
16	1750.85	12.1	11.1		2.63	281	25.2				VF
17	1751.10	8.3	8.6		2.68	0.57	8.5				
18	1751.45	5.5	9.6		2.62	58.2	44.2				VF
19	1751.75	19.2	16.3		2.63	1982	1010				MP
20	1752.05	21.4	20.6		2.64	4548	3142				
21	1752.35	20.3	20.8		2.64	2376	3111				
22	1752.65	21.0	20.3		2.60	3649	3325				
23	1752.95	18.9	20.0		2.63	3862	3828				
24	1753.25	21.2	20.7		2.63	3944	3816				
25	1753.55	21.6	21.4		2.63	3530	4145				
26	1753.90	21.2	21.5		2.62	6006	5110				
27	1754.15	22.1	20.4		2.64	5357	4799				
28	1754.70	16.0	18.9		2.64	3076	4894				
29	1755.00	21.5	19.2		2.65	11316	2794				
30	1755.30	17.7	18.4		2.64	155	493				MP
31	1755.75	16.8	17.8		2.64	217	379				MP
32	1755.90	19.7	19.2		2.63	2840	1659				
33	1756.20	20.4	20.7		2.64	4332	3878				
34	1756.55	22.4	21.0		2.63	4244	5671				
35	1756.85	18.6	19.0		2.66	13259	3985				MP
36	1757.25	16.3	17.3		2.66	338	1631				MP
37	1757.45	18.1	17.9		2.64	4669	1900				MP
38	1757.75	19.0	18.0		2.63	1770	3299				MP
39	1758.00	16.0	18.6		2.65	8101	4433				MP,VF
40	1758.95	23.4	20.2		2.64	3324	1913				
41	1759.25	17.9	19.6		2.63	149	617				
42	1759.55	19.0	15.5		2.70	1947	124				
43	1759.85	6.0	12.8		2.64	0.42	40.1				

GFE RESOURCES LIMITED :
Langley No.1 : Analysis by
ACS LABORATORIES PTY. LTD.

Sample	Depth	Porosity %		Density		Permeability (md)		Summation of Fluids			Remarks
Number		HeInj	Roll Ø	ND	GD	KH	Roll KH	Ø	Oil%	H2O%	
44	1760.10	20.2	16.1		2.64	7542	517				
45	1760.60	17.8	18.9		2.62	2992	2790				MP
46	1760.90	19.6	19.0		2.64	898	1341				MP

VF = Vertical Fracture; HF = Horizontal Fracture; MP = Mounted Plug; SP= Short Plug
C# = Top of Core; B# = Bottom of Core; OWC = Probable Oil/Water Contact
Tr = Probable Transition Zone; GC = Probable Gas Cap; NS = Not suitable for SCAL

ACS LABORATORIES PTY. LTD.
ACN: 008 273 005
Petroleum Reservoir Engineering Data

OVERBURDEN ANALYSIS FINAL REPORT

Company	:	GFE RESOURCES LIMITED	Date	:	01/06/94
Well	:	Langley No.1	File	:	5-208
Field	:	WC	Location	:	OTWAY BASIN
Core Int.	:	1745.00 - 1760.94 M	ACS Lab.	:	ADELAIDE
Core Int.	:		Analyst	:	NK\PNC
Core Int.	:				

		POROSITY at OVERBURDEN Pressures					Porosity	PERMEABILITY at OVERBURDEN Pressures					PERM.
SAMPLE NUMBER	DEPTH	Ambient Porosity	psi 2200	psi 0	psi 0	psi 0	Rolling Average	Ambient Permeability	psi 2200	psi 0	psi 0	psi 0	Rolling Average
							2200						2200
3	1746.00	21.1	19.9				20.2	2371	1461				1827
7	1747.50	21.8	20.9				20.2	4863	2859				2034
9	1748.15	20.1	18.9				19.2	2286	1434				1775
10	1748.45	19.3	18.0				19.0	3762	1686				2164
11	1748.60	22.4	20.9				18.7	11744	5374				1178
12	1749.00	16.2	14.9				16.9	102	39.6				331
14	1749.60	18.3	16.8				15.8	3079	1418				577
28	1754.70	16.0	14.5				16.5	3076	1397				1889
29	1755.00	21.5	20.0				18.2	11316	4599				2577
32	1755.90	19.7	18.2				19.4	2840	1493				2136
34	1756.55	22.4	21.0				20.6	4244	2029				1978
40	1758.95	23.4	22.3				20.7	3324	2492				1085
41	1759.25	17.9	17.1				18.8	149	110				593
44	1760.10	20.2	18.7				18.2	7542	4107				1228

PE906692

This is an enclosure indicator page.
The enclosure PE906692 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906692 has the following characteristics:
ITEM_BARCODE = PE906692
CONTAINER_BARCODE = PE900950
NAME = Core Plot, 2 of 2
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Core Plot, 2 of 2, Overburden Poros/Perm, Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = ACS LABORATORIES PTY LTD
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 5D

SPECIAL CORE ANALYSIS

LANGLEY-1

ACS
LABORATORIES
PTY. LTD.

10 February, 1995

RECEIVED
15 FEB 1995
9576
GFE RESOURCES LTD

FILE COPY

GFE Resources Ltd
Level 6
6 Riverside Quay
SOUTH MELBOURNE VIC 3205

Attention: Kevin Lanigan

FINAL REPORT: 008-282

CLIENT REFERENCE: Purchase Order 3333

MATERIAL: Core Plugs

LOCALITY: Langley 1

WORK REQUIRED: Formation Factor, Resistivity Index & Trapped Gas Saturation

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

KEVIN H FLYNN
Manager
Special Core Analysis

ANTHONY M DRAKE
Laboratory Supervisor
Special Core Analysis

Brisbane Laboratory
P.O. Box 396, Chermside, Qld. 4032, Australia
Telephone: 61 7 350 1222 Facsimile: 359 0666
ACS Laboratories Pty Ltd
ACN: 008 273 005

SPECIAL CORE ANALYSIS REPORT
of
LANGLEY 1
for
GFE RESOURCES LTD
by
ACS LABORATORIES PTY LTD

CONTENTS

CHAPTERS **PAGE**

CHAPTER 1

Introduction

1. INTRODUCTION

This final report presents data in both tabular and graphical form from a series of Special Core Analyses on five (5) 1½" diameter plug samples from Langley 1.

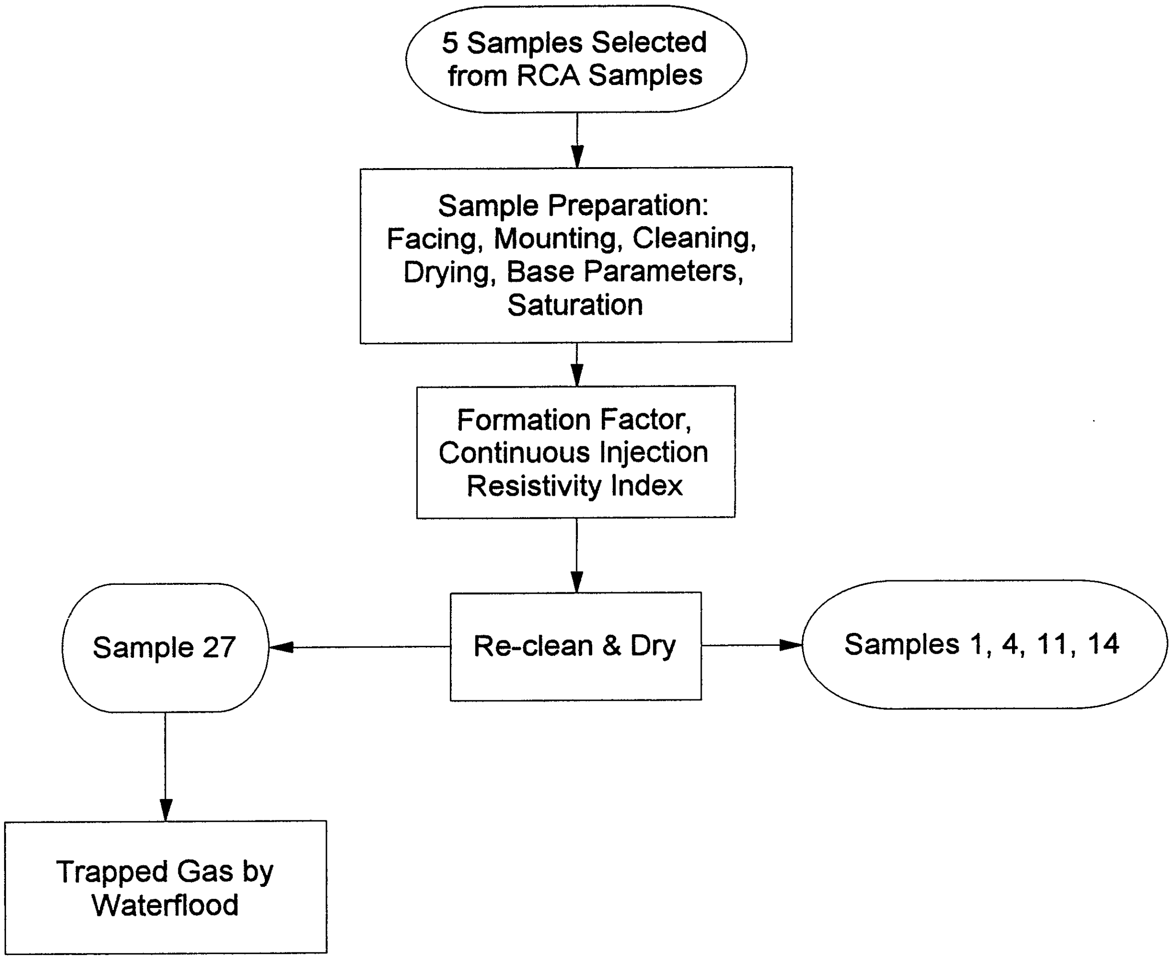
A purchase order was presented by GFE Resources which encompassed both routine core analysis and special core analysis. Following discussions between ACS and GFE personnel, the original analysis covered by order number 3333 was altered such that analyses would include that which is summarised in Chapter 2.

Chapter 3 encompasses sample preparation and base parameter determinations.

Chapters 4 and 5 contain descriptions of procedures and results.

CHAPTER 2

Test Schedule Chart


5 Samples Selected from RCA Samples
Sample Preparation: Facing, Mounting, Cleaning, Drying, Base Parameters, Saturation
Formation Factor, Continuous Injection Resistivity Index
Re-clean & Dry
Sample 27
Samples 1, 4, 11, 14
Trapped Gas by Waterflood

CHAPTER 3

Sample Preparation and Base Parameter Determinations

3.1 SAMPLE PREPARATION

All samples selected for analyses were previously used for routine core analysis. This analysis was performed by ACS Laboratories and is presented in report number 005-208 (dated 29 June 1994).

The friable and slightly irregular nature of these samples required that they be faced square and mounted in heat shrink teflon tubing prior to special core analysis. Facing samples will consequently change sample's dimension and therefore potentially base parameters.

3.1.1 Cleaning

Following facing square (to form right cylinder) and mounting, samples were cleaned as a precautionary measure. This cleaning was performed by refluxing in Soxhlet glassware with an azeotrope of chloroform and methanol. All samples were then dried to constant weights in a humidity oven at 50°C and 50% relative humidity.

Sample 27 was cleaned and dried in the same manner, following electrical property analyses in preparation for trapped gas testing.

All samples were cleaned after analyses prior to storage.

3.1.2 Base Parameter Determinations

Although these values were determined in routine core analyses, these tests were performed as part of the special core analysis program as a quality control check.

Gas permeability measurements were made on the clean and dry plug samples, individually loaded in a Hassler core holder with an overburden pressure of 2200 psi. Dry air was flowed through the sample and the differential pressure (across the sample) was measured. The permeability value was calculated by application of Darcy's Law.

Porosity values are determined indirectly by the following stages:

i) The grain volume of each sample was measured by expansion of helium gas from standard volumes into the sample contained in the matrix cup. Pressure valves were monitored by electronic transducer. By applying Boyle's Law to the data, grain volume was determined.

ii) Complete saturation of the five samples was achieved in two stages. Firstly the samples were loaded into an airtight pressure vessel and the system evacuated. Brine was then introduced to the system and then pressured up to 2000 psi for approximately 24 hours. Upon releasing the pressure the samples were weighed and from this the pore volume determined.

iii) From the grain volume and pore volume porosity values can be calculated thus:

$$\Phi = \frac{\text{Pore Volume}}{\text{Pore Volume} + \text{Grain Volume}} \times 100\%$$

CHAPTER 4

Formation Factor & Resistivity Index

4.1 FORMATION FACTOR AT OVERBURDEN

Test Calculation and Procedures

On completion of base parameter testing and saturation with 8,500 ppm NaCl equivalent brine, 5 samples were selected for these analyses.

Samples were placed on the cell electrodes with a thin silver leaf between the plug endfaces and electrode, to ensure electrical contact. A strongly hydrophilic filter was placed at the bottom end of the sample. This assembly was then loaded into a Hassler type core holder. A pressure of 2200 psi was applied as an effective overburden pressure.

Brine was slowly flowed through the samples and electrical resistivity readings monitored until stable. The samples were then left to stand for a further 24 hours and readings repeated to ensure that ionic equilibrium had been attained.

Using the sample and brine resistances, cross sectional area and the electrode gap, the Ro value was calculated thus:

$$Ro = \frac{A/L \times Rc}{Rw \times 100}$$

where Rc = sample resistance
L = electrode gap (sample length)
A = cross sectional area
and Rw = brine resistivity

Formation factor was calculated using the following equations:

$$FF = \frac{a}{\Phi^m}$$

$$\text{and} \quad FF = \frac{Ro}{Rw}$$

where a = intercept (assumed = 1)
m = cementation exponent
and Φ = porosity

FORMATION FACTOR

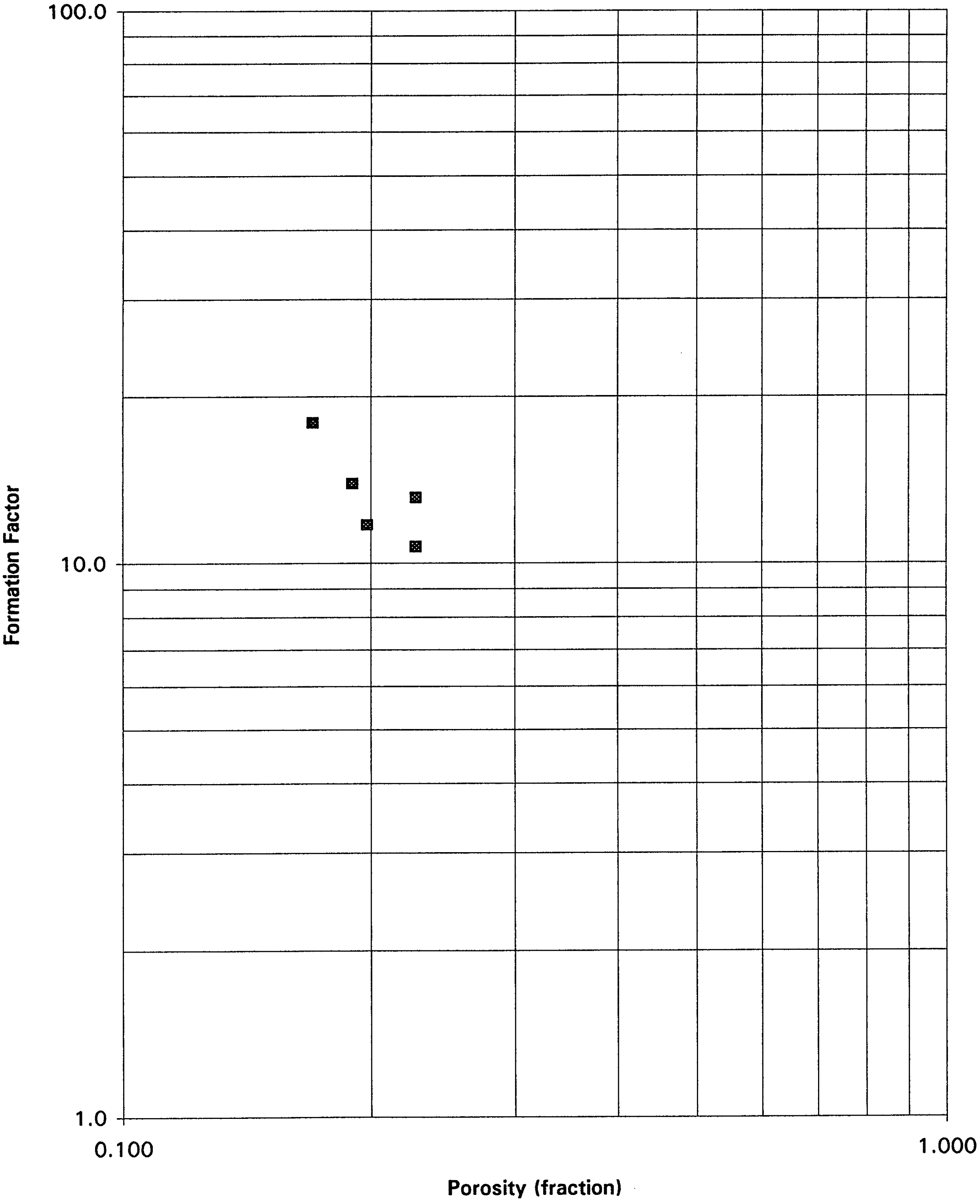
Company	GFE Resources	
Well	Langley 1	
Saturant	8,500	ppm brine
Rw of Saturant	0.712	ohm-m @ 25°C
Overburden Pressure	2200	psi

Sample Number	Depth, metres	Overburden Permeability to Air, milliDarcy's	Overburden Porosity, percent	Formation Factor (FF)	Cementation Exponent, 'm'
1	1745.40	261	22.7	10.7	1.60
4	1746.30	2270	22.7	13.1	1.74
11	1748.60	8657	19.8	11.7	1.52
14	1749.60	2178	17.0	17.9	1.63
27	1754.15	4205	19.0	13.9	1.59

Formation Factor

Company: GFE Resources
Well: Langley 1

Overburden Pressure: 2200 psi



4.2 RESISTIVITY INDEX

Test Calculation and Procedures

On completion of formation factor analyses, a graduated collection tube was attached to the bottom end face end stem and deactivated kerosene was flowed through the sample. The flow rate was set such that the maximum brine displacement would occur over approximately 2 weeks.

As brine was displaced and collected in the graduated collection tube, resistivity values were also collected. Water saturation (Sw) of the samples, was calculated as such:

$$Sw = \frac{\text{Pore Volume - Brine Expelled}}{\text{Pore Volume}} \times 100\%$$

The ratios of Rt (sample resistivity) values to the previously determined Ro values (at 100% brine saturation) were used to calculate RI values, that is:

$$RI = \frac{Rt}{Ro}$$

Saturation exponent (n) is calculated using the following equation:

$$RI = \frac{1}{Sw^n}$$

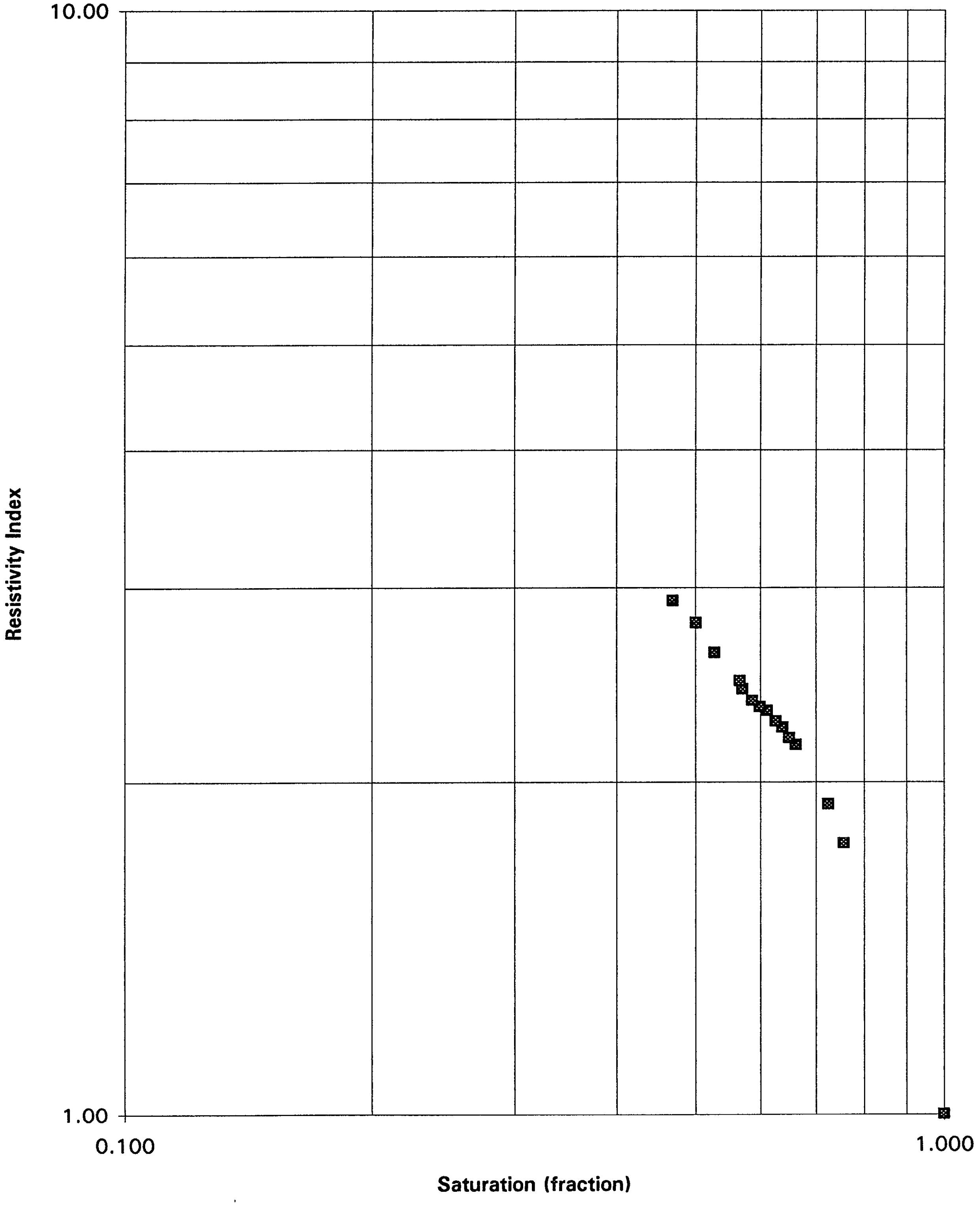
RESISTIVITY INDEX

Company	GFE Resources	
Well	Langley 1	
Saturant	8500	ppm brine
Rw of Saturant	0.712	ohm-m @ 25°C
Overburden Pressure	2200	psi

Sample Number	Depth, metres	Overburden Permeabiliity to Air, milliDarcy's	Overburden Porosity, percent	Formation Factor (FF)	Brine Saturation, percent	Resistivity Index (RI)	Saturation Exponent 'n'
1	1745.40	261	22.7	10.7	100.0	1.00	
					75.6	1.76	
					72.4	1.91	
					66.2	2.16	
					65.0	2.19	
					63.8	2.24	
					62.6	2.27	
					61.1	2.32	
					59.9	2.34	
					58.7	2.37	
					57.1	2.43	
					56.7	2.47	
					52.8	2.62	
					50.1	2.79	
					46.9	2.92	1.70

Resistivity Index

Company: GFE Resources
Well: Langley 1
Sample: 1
'n' = 1.70



RESISTIVITY INDEX

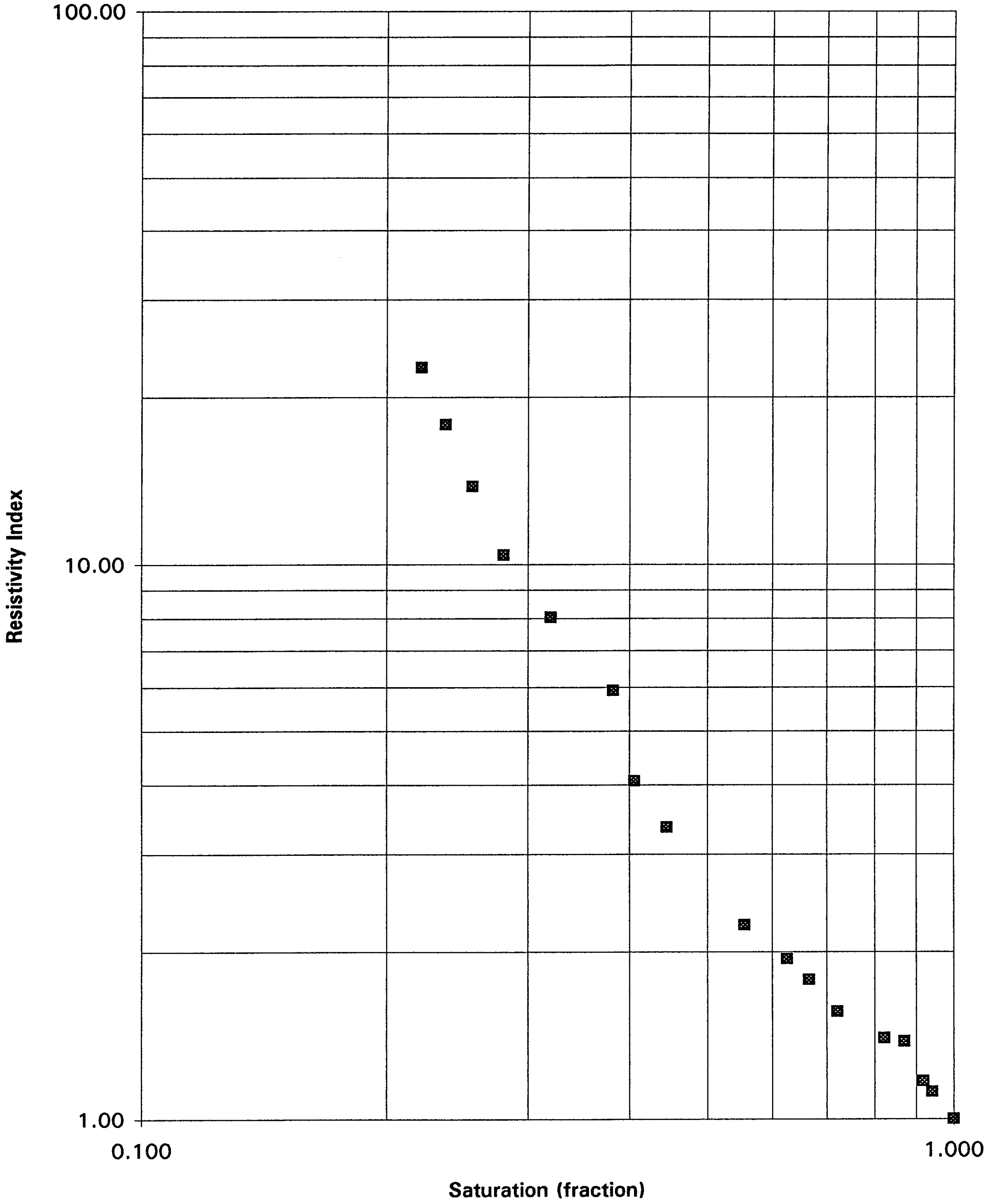
Company	GFE Resources
Well	Langley 1

Saturant	8,500	ppm brine
Rw of Saturant	0.712	ohm-m @ 25°C
Overburden Pressure	2200	psi

Sample Number	Depth, metres	Overburden Permeabiliity to Air, milliDarcy's	Overburden Porosity, percent	Formation Factor (FF)	Brine Saturation, percent	Resistivity Index (RI)	Saturation Exponent 'n'
4	1746.30	2270	22.7	13.1	100.0	1.00	
					94.1	1.12	
					91.8	1.17	
					87.1	1.38	
					82.3	1.4	
					72.1	1.56	
					66.6	1.78	
					62.6	1.94	
					55.5	2.24	
					44.5	3.35	
					40.6	4.06	
					38.2	5.92	
					32.0	8.04	
					28.0	10.40	
					25.6	13.82	
					23.7	17.84	
					22.1	22.65	1.75

Resistivity Index

Company: GFE Resources
Well: Langley 1
Sample: 4
'n' = 1.75



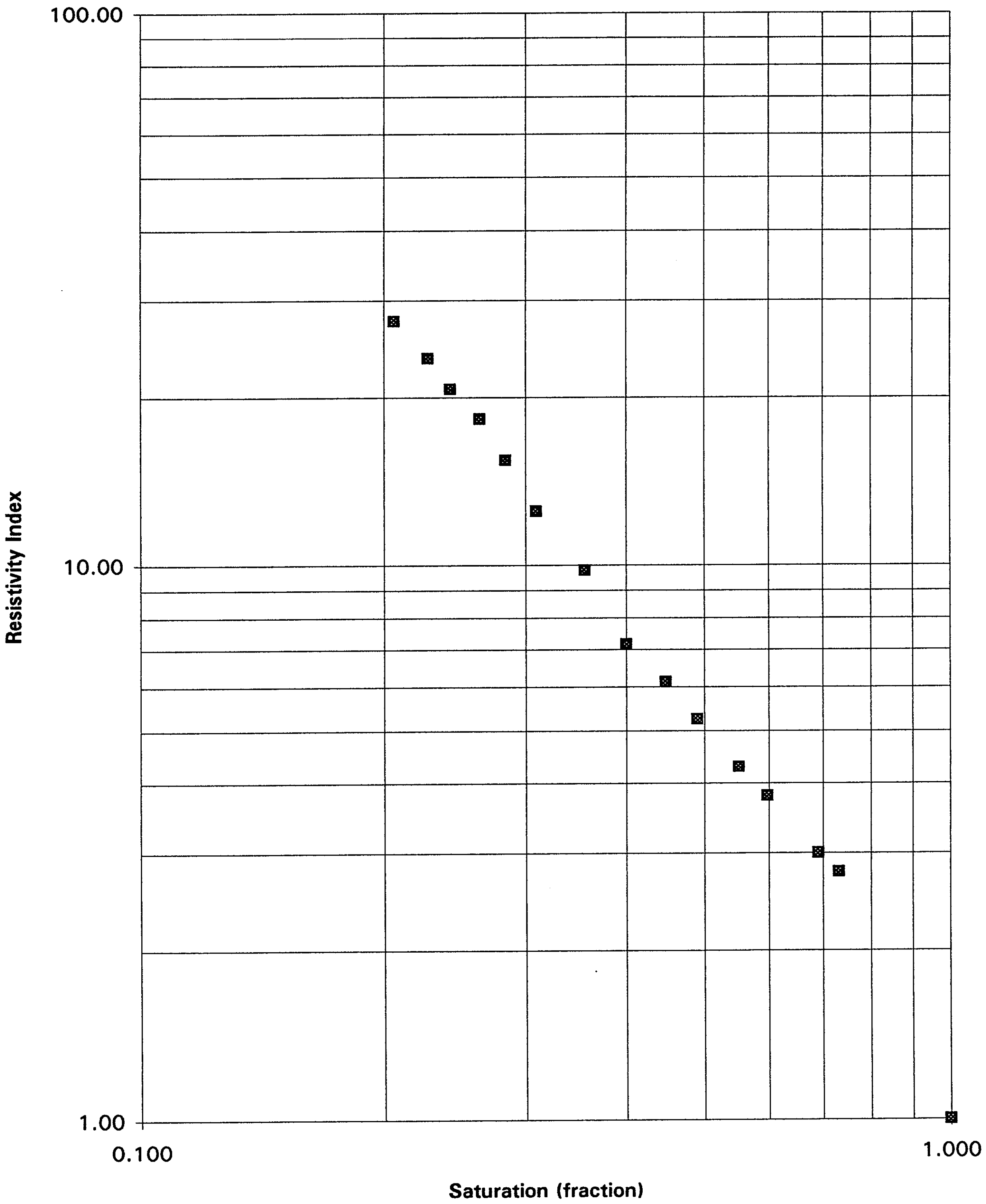
RESISTIVITY INDEX

Company	GFE Resources	
Well	Langley 1	
Saturant	8,500	ppm brine
Rw of Saturant	0.712	ohm-m @ 25°C
Overburden Pressure	2200	psi

Sample Number	Depth, metres	Overburden Permeabiliity to Air, milliDarcy's	Overburden Porosity, percent	Formation Factor (FF)	Brine Saturation, percent	Resistivity Index (RI)	Saturation Exponent 'n'
11	1748.60	8657	19.8	11.7	100.0	1.00	
					73.2	2.77	
					69.1	3.00	
					59.8	3.80	
					55.1	4.29	
					49.0	5.25	
					44.8	6.12	
					40.0	7.17	
					35.5	9.78	
					30.9	12.49	
					28.3	15.43	
					26.3	18.29	
					24.2	20.71	
					22.7	23.50	
					20.6	27.49	2.18

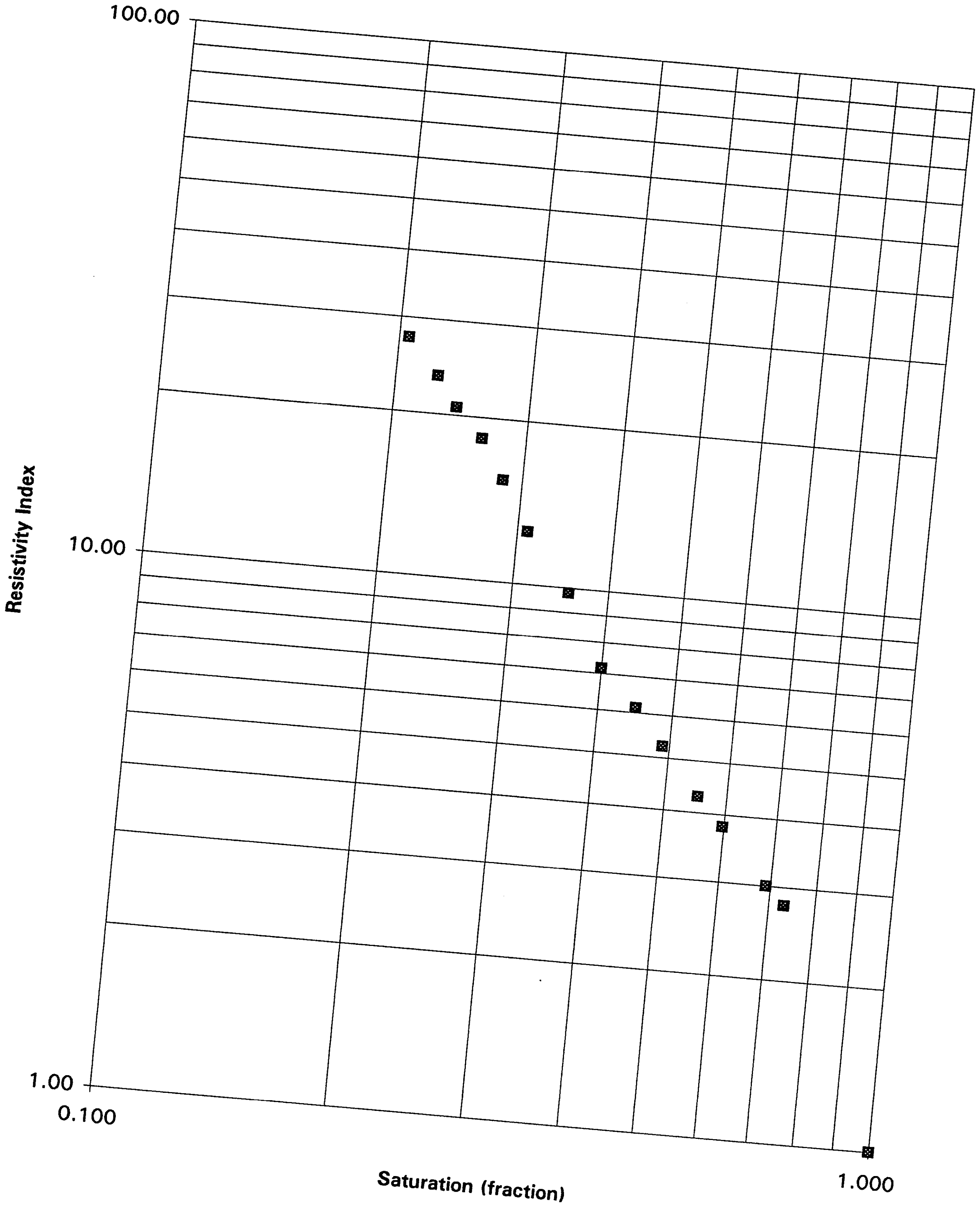
Resistivity Index

Company: GFE Resources
Well: Langley 1
Sample: 11
'n' = 2.18



Resistivity Index

Company: GFE Resources
Well: Langley 1
Sample: 11
'n' = 2.18



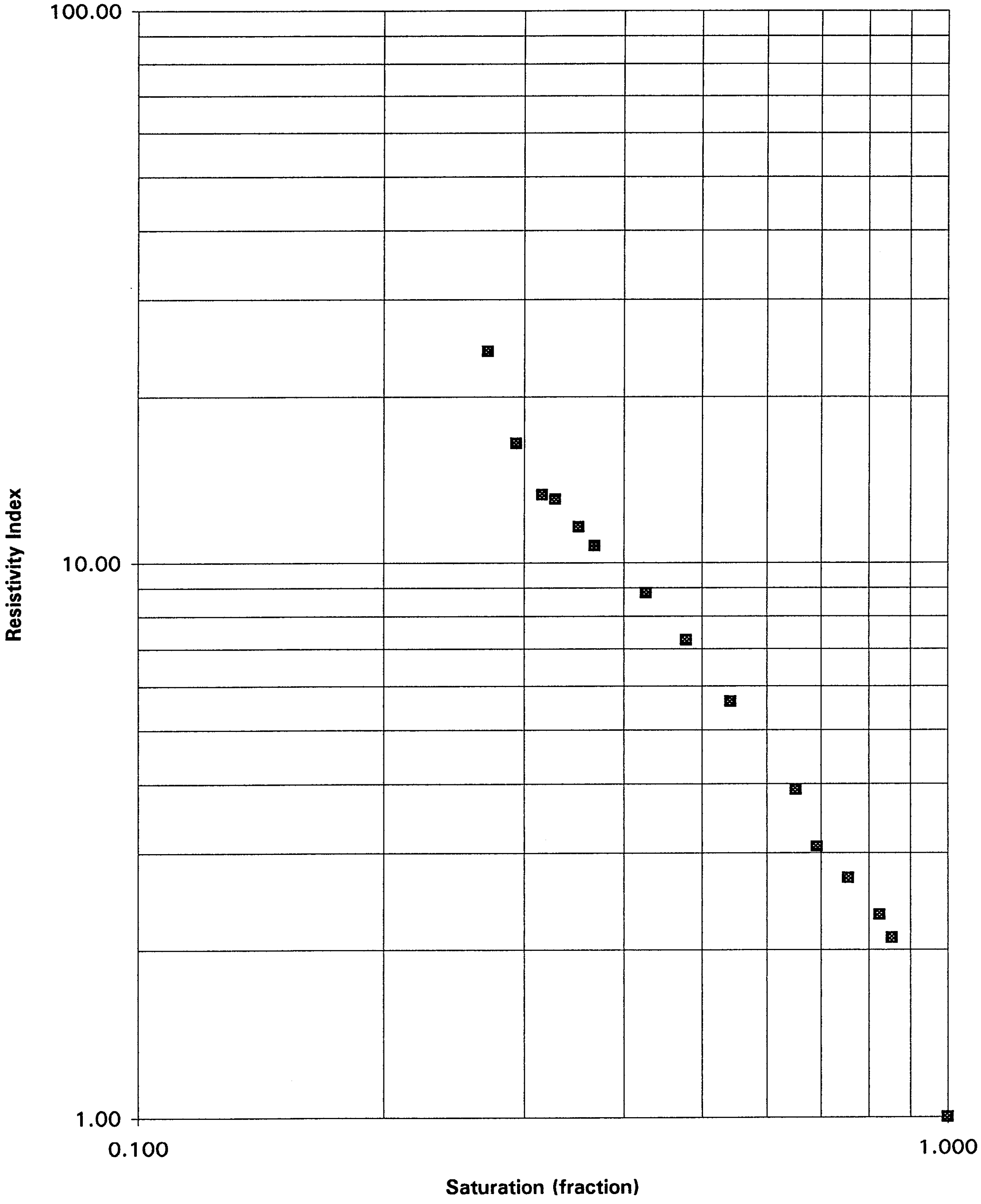
RESISTIVITY INDEX

Company	GFE Resources	
Well	Langley 1	
Saturant	8,500	ppm brine
Rw of Saturant	0.712	ohm-m @ 25°C
Overburden Pressure	2200	psi

Sample Number	Depth, metres	Overburden Permeabiliity to Air, milliDarcy's	Overburden Porosity, percent	Formation Factor (FF)	Brine Saturation, percent	Resistivity Index (RI)	Saturation Exponent 'n'
14	1749.60	2178	17.0	17.9	100.0	1.00	
					85.4	2.10	
					82.5	2.31	
					75.6	2.70	
					69.2	3.08	
					65.2	3.91	
					54.2	5.62	
					47.8	7.25	
					42.6	8.80	
					36.8	10.73	
					35.1	11.62	
					32.8	13.02	
					31.6	13.26	
					29.3	16.41	
					27.0	24.16	2.25

Resistivity Index

Company: GFE Resources
Well: Langley 1
Sample: 14
'n' = 2.25



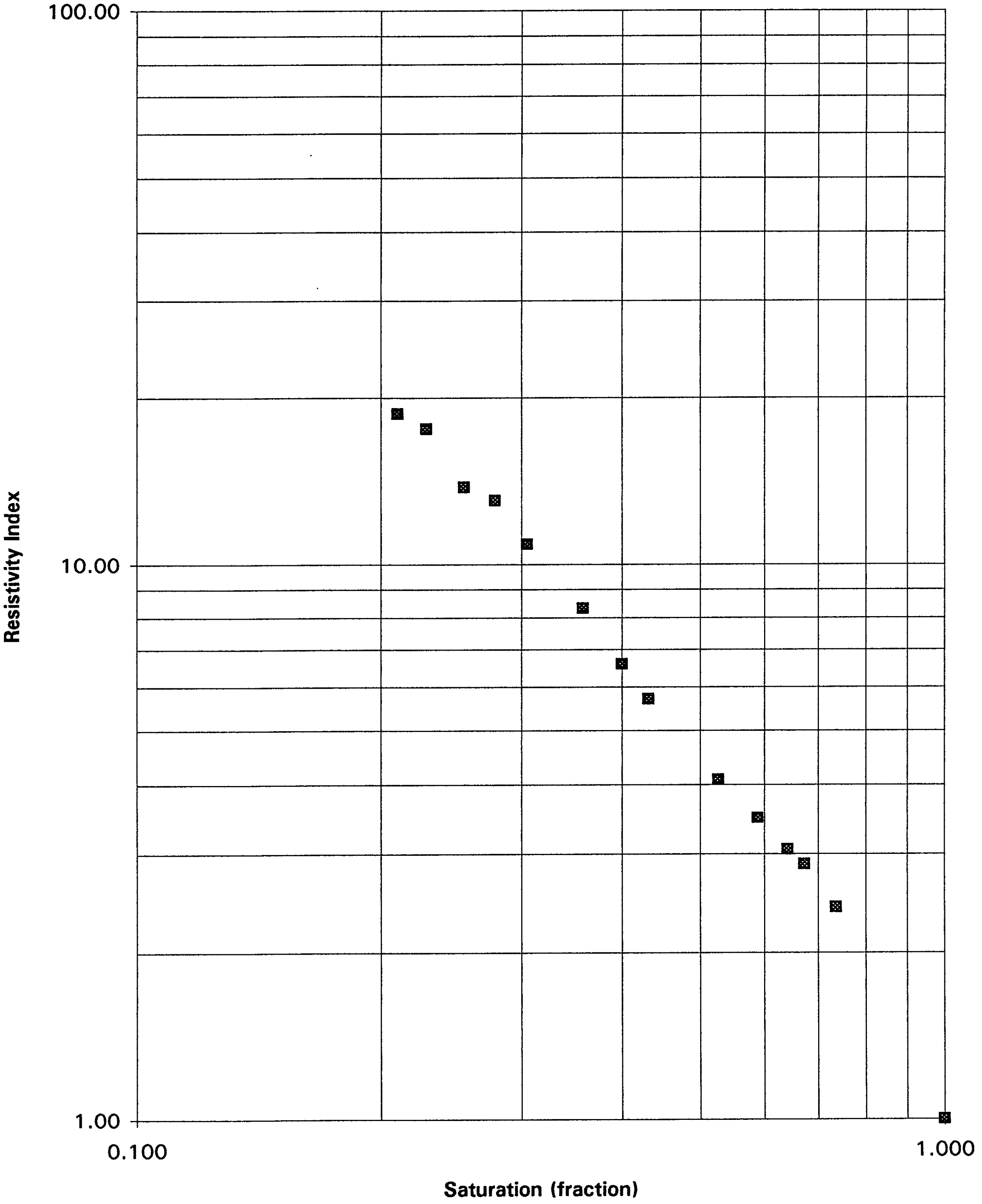
RESISTIVITY INDEX

Company	GFE Resources	
Well	Langley 1	
Saturant	8,500	ppm brine
Rw of Saturant	0.712	ohm-m @ 25°C
Overburden Pressure	2200	psi

Sample Number	Depth, metres	Overburden Permeabiliity to Air, milliDarcy's	Overburden Porosity, percent	Formation Factor (FF)	Brine Saturation, percent	Resistivity Index (RI)	Saturation Exponent 'n'
27	1754.15	4205	19.0	13.9	100.0	1.00	
					73.6	2.41	
					67.3	2.87	
					64.2	3.05	
					58.9	3.48	
					52.6	4.08	
					43.1	5.70	
					40.0	6.60	
					35.8	8.32	
					30.5	10.88	
					27.8	13.09	
					25.4	13.81	
					22.8	17.59	
					21.0	18.70	1.95

Resistivity Index

Company: GFE Resources
Well: Langley 1
Sample: 27
'n' = 1.95



CHAPTER 5

Residual Gas Saturation

5. RESIDUAL GAS SATURATION

Test Calculation and Procedures

A single sample was selected for this analysis by GFE Resources. The sample was desaturated to an irreducible brine saturation level (Swir) by placing on a 15 bar porous plate. The sample was then loaded into a Hassler type holder and flushed with humidified gas. At this stage permeability to gas was measured.

The residual gas saturation of the samples was then established by performing a low rate (4 cc/hour) constant flow waterflood. The differential pressure across the sample was monitored using electronic transducers.

The flood was continued until there was no further removal of gas and at this point the permeability to brine was measured.

WATERFLOOD TRAPPED GAS

Company GFE Resources
Well Langley 1

Overburden Pressure 2200 psi

				INITIAL CONDITIONS		FINAL CONDITIONS		RECOVERY	
Sample Number	Depth, metres	Porosity, percent	Permeability to Air, milliDarcy's	Water Saturation, percent P.V.	Permeability to Gas, milliDarcy's	Permeability to Water, milliDarcy's	Gas Saturation, percent P.V.	Percent Gas in Place	Percent Pore Space
27	1754.15	19.0	4205	9.3	2020	560	25.2	65.5	72.2

APPENDIX I

Fluids

BRINE:

Composition 8500 ppm NaCl equivalent

Density = 1.003 g/ml

Viscosity = 0.99 cp

Rw = 0.712 ohm.m @ 25°C

APPENDIX 6

GFE RESOURCES LTD

APPENDIX 6

SIDEWALL CORE DESCRIPTIONS

LANGLEY-1

GFE Resources Ltd

APPENDIX 6

LANGLEY-1 SIDEWALL CORE DESCRIPTIONS

SWC No.	DEPTH (m)	REC'D (mm)	DESCRIPTION
1	1990.0	-	No recovery
2	1989.0	20	**Claystone**: medium olive grey, homogeneous, slightly silty, slightly calcareous, soft, slightly subfissile.
3	1969.0	45	**Sandstone**: off white to dark grey (slightly greenish), very fine to fine, dominantly very fine, subangular, moderately to well sorted, planar laminated, weak silica cement, common to abundant white argillaceous matrix, abundant black carbonaceous detritus in part grading to very fine carbonaceous laminae, common to abundant partly altered feldspars, common mica and grey green lithics, trace reddish brown lithics, friable, very poor visual porosity. **Fluorescence**: trace pin-point dull yellow fluorescence.
4	1957.0	30	**Sandstone**: light grey, very fine, subangular, moderately to well sorted, moderate silica cement, abundant light grey argillaceous and silt matrix, common to abundant partly altered feldspars, common very fine grey green and brown lithics, trace fine brown mica flakes, trace black carbonaceous detritus, friable to moderately hard, no visual porosity, locally grading to siltstone and finely planar laminated carbonaceous silty mudstone.
5	1924.5	40	**Sandstone**: light green grey to light grey, very fine to silty, subangular, moderately well sorted, weak silica cement, abundant white argillaceous and silt matrix, trace grey green and brown lithics, trace black carbonaceous laminae, common to abundant partly altered feldspar grains, friable, no visual porosity, grading in part to medium to dark grey silty mudstone.
6	1884.0	35	**Sandstone**: Light green grey to medium green grey, very fine to coarse, dominantly fine to medium, moderate to good sorting, very angular to well rounded, dominantly subrounded, poor to moderate chorite (and minor silica?) cement, common white argillaceous and silty matrix, common to abundant greenish to reddish brown lithics, trace fine brown mica flakes, soft to moderately hard, no visual porosity.
7	1882.0	-	No recovery.
8	1878.5	40	**Claystone**: medium to dark green grey (slightly bluish), very silty, trace micromica, firm, non-fissile.
9	1876.5	-	No recovery.
10	1870.0	30	**Claystone**: medium to dark green grey (slightly bluish), very silty, very thin discontinuous carbonaceous laminae in part, trace micromica, firm, non-fissile
11	1855.5	35	**Silty Mudstone**: medium to dark green grey (slightly bluish), commonly to moderately argillaceous, trace very fine off white partly altered feldspar grains, trace micromica, firm, non-fissile. **Fluorescence**: trace pin-point dull yellow fluorescence.
12	1853.0	30	**Sandstone**: medium to dark bluish-green grey, very fine to medium, dominantly fine, silty in part, subangular, poorly to moderately sorted, weak silica cement, abundant light green argillaceous matrix, abundant partly altered feldspar grains and mica, common grey green lithics, friable, very poor visual porosity.

SWC No.	DEPTH (m)	REC'D (mm)	DESCRIPTION PAGE: 2
13	1836.5	40	**Sandstone**: medium bluish grey, very fine to coarse, dominantly medium, poorly to moderately sorted, subrounded, weak silica cement, abundant light green argillaceous matrix, abundant partially altered feldspar grains and green to brown lithics, trace mica, trace calcite(?), moderately firm to friable, no visual porosity.
14	1827.0	30	**Sandstone**: light to medium bluish-green grey, very fine to dominantly fine, locally silty, subangular, poorly to moderately well sorted, moderate calcareous cement, abundant light green argillaceous matrix, abundant very fine to fine partly altered feldspar grains, common green lithics, friable, very poor visual porosity
15	1825.5	20	**Sandstone**: light bluish-green grey, very fine to coarse, dominantly medium, angular, poorly sorted, patchy argillaceous matrix, common green lithics, sparse coaly detritus and amber, moderately firm to friable, minor patchy visual porosity. **Fluorescence**: trace to sparse pin-point dull yellow to moderately bright blue-white fluorescence from amber grains. Interbedded with minor **Claystone**: dark grey to brownish black, very silty, abundant black coaly detritus and laminae, common very fine partly altered feldspar grains, trace very fine sands grains in wavy discontinuous lenses, firm to moderately hard, non-fissile.
16	1824.0	35	**Claystone**: very dark grey, moderately silty, moderately carbonaceous, trace micromica, firm, slightly subfissile, with sparse discontinuous microlaminae of light grey siltstone. **Fluorescence**: trace pin-point very dull yellow fluorescence with very weak green-yellow cut in siltstone.
17	1822.5	15	**Claystone**: very dark grey, moderately silty, trace very fine partly altered feldspar grains, common black carbonaceous flecks, trace micromica, firm, non-fissile, with thin interlaminae of **Sandstone**: light grey, fine to medium, moderately sorted, subangular, argillaceous.
18	1821.0	35	**Claystone**: dark brown grey, very silty, common very fine to silt-sized partly altered feldspar grains, common black carbonaceous flecks, trace micromica, firm, non-fissile, with thin interlaminae of **Sandstone**: light grey, fine to medium, moderately sorted, subangular, argillaceous.
19	1818.5	30	**Sandstone**: light grey, very fine to medium, mostly fine, moderately to well sorted, angular to rounded, mostly subrounded, common to patchy argillaceous matrix, patchy silica and trace carbonate cements, sparse coaly fragments, sparse mica, trace altered feldspar and lithic grains, friable, poor visual porosity. **Fluorescence**: trace pin-point dull yellow fluorescence.
20	1814.5	30	**Sandstone**: light brown grey, very fine to dominantly fine, subangular, moderately sorted, moderate silica cement, abundant white argillaceous matrix, abundant partly altered feldspar grains, trace grey green and brown lithics, trace discontinuous black carbonaceous laminae and very fine grains, friable, very poor visual porosity. **Fluorescence**: trace to sparse pin-point dull yellow fluorescence.
21	1810.5	40	**Sandstone**: light brown grey, very fine to fine, dominantly very fine, subangular, moderately sorted, moderate silica cement, abundant white argillaceous matrix, abundant partly altered feldspar grains, sparse clasts of soft dark grey claystone, trace grey green and brown lithics, trace fine black carbonaceous detritus, friable, very poor visual porosity. **Fluorescence**: trace to sparse pin-point dull yellow fluorescence.
22	1808.0	30	**Sandstone**: light brownish grey, very fine to medium, dominantly fine, moderately well sorted, subangular to well rounded, common silica and patchy carbonate cements, patchy argillaceous matrix, sparse mica, trace altered feldspar and lithic grains, friable, poor visual porosity. **Fluorescence**: trace pin-point very dull yellow-white fluorescence.
23	1804.5	30	**Sandstone**: very light brownish grey, very fine to coarse, dominantly very fine to fine, subangular, poorly sorted, weak silica and calcareous cements, abundant white argillaceous matrix - matrix supported, trace black coal detritus, friable, very poor visual porosity. **Fluorescence**: trace pin-point very dull yellow fluorescence.

SWC No.	DEPTH (m)	REC'D (mm)	DESCRIPTION PAGE: 3
24	1803.5	45	**Sandstone**: very light brownish grey, very fine to medium, dominantly fine, subangular, poorly sorted, weak silica cement, trace white argillaceous matrix, trace to common partly altered feldspar, trace yellow quartz grains, friable, good visual porosity. **Fluorescence**: trace pin-point very dull yellow-white fluorescence.
25	1802.0	25	**Claystone**: very dark grey, slightly silty, non-calcareous, trace silt to very fine grained off white sandstone laminae, trace micromica, moderately hard, non-fissile, with occasional light grey siltstone laminae. **Fluorescence**: very minor trace pin-point dull yellow fluorescence.
26	1799.5	32	**Claystone**: very dark brown grey, moderately to very carbonaceous, slightly silty, non-calcareous, trace micromica, firm to moderately hard, non-fissile, with occasional clasts(?) of very fine light grey sandstone. **Fluorescence**: very minor trace pin-point dull yellow fluorescence.
27	1798.0	30	**Claystone**: very dark brown grey, moderately carbonaceous, trace black coaly detritus, moderately silty, common dispersed very fine to medium clear quartz sand grains, non-calcareous, trace micromica, firm, non-fissile, with sparse very thin siltstone laminae. **Fluorescence**: very minor trace pin-point dull yellow fluorescence.
28	1795.0	30	**Claystone**: very dark brown, moderately silty, moderately carbonaceous, non-calcareous, trace micromica, firm, non-fissile.
29	1789.0	25	**Sandstone**: very light to medium brownish grey, very fine to occasionally medium, dominantly very fine, angular, poor to moderately sorted, weak silica cement, abundant white argillaceous matrix, trace orange lithics, abundant partly altered feldspar grains, trace yellow quartz grains, friable, very poor visual porosity. **Fluorescence**: trace to sparse pin-point dull yellow and white fluorescence with minor very pale instant white cut. Interlaminated with **Claystone**: very dark grey to dark brown grey, moderately silty, moderately calcareous, trace micromica, firm, non-fissile.
30	1784.0	25	**Sandstone**: light to dark brownish grey, very fine to coarse, dominantly medium, moderately sorted, subangular to well rounded, dominantly subrounded, patchy silica and very common carbonate (siderite?) cements, patchy argillaceous matrix, locally muddy with sparse mudstone clasts and laminae, trace feldspar and mica, friable, trace to poor to fair visual porosity. **Fluorescence**: very minor trace pin-point dull yellow fluorescence.
31	1783.0	25	**Muddy Sandstone**: medium to dark brown/orange grey, very fine to coarse, dominantly fine to medium, very poorly sorted, abundant silty/argillaceous matrix, slightly calcareous, trace glauconite(?), patchy iron oxide staining, trace pyrite, trace *Inoceramus*(?), hard, friable, very poor visual porosity.
32	1781.0	30	**Silty Sandstone**: dark green brownish grey, very fine to fine grained, poorly sorted, common to abundant glauconite, sparse partially altered feldspars, non-calcareous, firm, non-fissile.
33	1778.5	40	**Muddy Siltstone**: medium to dark green brownish grey, common very fine sand grains, very poorly sorted, moderately to very argillaceous, common glauconite grains, common to abundant black carbonaceous flecks and detritus, sparse partially altered feldspars, firm, non-fissile. **Fluorescence**: minor trace pin-point dull yellow fluorescence.
34	1776.5	30	**Sandstone**: light grey, very fine, subangular, moderately sorted, weak silica cement, abundant white argillaceous and silty matrix, trace very fine light green glauconite grains, friable, no visual porosity. **Fluorescence**: trace pin-point dull orange fluorescence. Interlaminated with **Claystone**: dark brown grey, moderately silty, non-calcareous, moderately carbonaceous, soft to firm, non-fissile.

SWC No.	DEPTH (m)	REC'D (mm)	DESCRIPTION PAGE: 4
35	1772.0	30	**Claystone**: very dark brown grey, moderately silty, trace black coaly detritus, trace pyrite, firm, non-fissile. Interlaminated with **Sandstone**: light grey, very fine, subangular, well sorted, weak calcareous cement, abundant white argillaceous matrix, moderately hard, no visual porosity.
36	1770.0	30	**Sandstone**: light grey, very fine to coarse, dominantly fine, angular to subangular, poorly sorted, weak silica cement, common white argillaceous matrix, abundant off white partially altered feldspar grains, common black coal detritus, friable, very poor visual porosity. **Fluorescence**: common to abundant dull yellow-orange fluorescence with instant dull milky white-yellow cut. With minor interbedded **Claystone**: dark brown grey, moderately silty, trace coaly detritus.
37	1768.2	30	**Claystone**: medium to very dark grey, sparsely to abundantly silty, non-calcareous, common black carbonaceous flecks, common pyrite, common micromica, moderately hard, slightly subfissile, with sparse interlaminae of light to medium grey fine sandstone.
38	1733.5	35	**Claystone**: very dark grey, moderately silty, non-calcareous, common black carbonaceous flecks, trace pyrite, common micromica, moderately hard, slightly subfissile. Interlaminated with **Sandstone**: light grey (slightly greenish?), very fine to silty, moderately sorted.
39	1732.0	25	**Sandstone**: light brown grey, very fine to grit, dominantly medium to coarse, angular to subangular, very poorly sorted, very weak silica cement, trace white argillaceous matrix, trace partly altered feldspar grains, loose to friable, good visual porosity, with minor interbedded very dark grey mudstone. **Fluorescence**: patchy to common dull white fluorescence with instant white cut.
40	1729.5	45	**Sandstone**: light brown grey, very fine to very coarse, dominantly very fine and coarse - bimodal, angular to subangular, very poorly sorted, weak silica cement, abundant off white to medium brown argillaceous matrix, trace glauconite, trace orange lithics, trace black coal detritus, trace to common pyrite, common partly altered feldspar grains, friable, poor visual porosity.
41	1728.0	40	**Claystone**: medium to very dark brown grey, moderately to very silty, common dispersed very fine to very coarse quartz sand grains, trace to locally common glauconite, trace micromica, trace very fine partially altered feldspar grains, trace shell fragments, firm, non-fissile.
42	1718.0	35	**Claystone**: medium to very dark brown grey, moderately silty, common black carbonaceous flecks, trace dispersed very fine to coarse quartz sand grains, trace micromica, trace pyrite, trace glauconite, non-calcareous, firm, non-fissile. Locally grading to light grey, very fine-grained sandstone.
43	1712.5	40	**Claystone**: very dark brown grey, moderately silty, moderately carbonaceous, common glauconite, non-calcareous, firm, non-fissile.
44	1701.0	47	**Claystone**: very dark brown grey, moderately silty, moderately carbonaceous, common glauconite, non-calcareous, firm, non-fissile.
45	1692.0	50	**Claystone**: very dark brown grey, moderately to abundantly silty, moderately carbonaceous, trace to common glauconite, non-calcareous, firm, non-fissile.
46	1677.0	35	**Claystone**: very dark brown grey, moderately to abundantly silty, moderately carbonaceous, common glauconite, non-calcareous, firm, non-fissile.
47	1634.0	30	**Claystone**: very dark brown grey, moderately to very silty, common glauconite, trace pyrite, trace micromica, non-calcareous, firm, non-fissile.
48	1579.0	50	**Claystone**: very dark brown grey, moderately silty, abundant glauconite, non-calcareous, trace micromica, firm, non-fissile.
49	1541.0	30	**Siltstone**: very dark brown grey, very argillaceous, common very fine off white partially altered feldspar grains, trace micomica, non-calcareous, firm, non-fissile.

SWC No.	DEPTH (m)	REC'D (mm)	DESCRIPTION PAGE: 5
50	1522.0	25	**Sandstone**: medium grey, very fine to medium, dominantly fine, moderately sorted, very angular to well rounded, dominantly subrounded, variably cemented with siderite (patchy to mostly abundant), trace feldspar, trace mica, friable/crumbly to locally hard, fair(?) to very poor visual porosity.
51	1518.5	12	**Sandstone**: off white, very fine to dominantly fine, subangular, moderately sorted, weak calcareous cement, abundant white calcilutite matrix, trace very fine black carbonaceous flecks, friable, very poor visual porosity. **Fluorescence**: very patchy pin-point very dull white fluorescence(?).
52	1516.0	35	**Claystone**: dark brown grey, moderately silty, non-calcareous, trace micromica, firm, non-fissile.
53	1438.0	-	Bullet lost.
54	1375.5	-	No recovery.
55	1325.0	45	**Sandstone**: light brown, silty to very fine, subangular, well sorted, weak to moderate silica cement, common light brown argillaceous matrix, abundant partially altered feldspar grains, common black to brown very fine carbonaceous grains, friable, very poor visual porosity. **Fluorescence**: patchy very dull white fluorescence with very weak slow yellow-white cut (contamination?).
56	1291.0	15	**Sandstone**: light brown, silty to very fine, subangular, well sorted, weak to moderate silica cement, common light brown argillaceous matrix, abundant partially altered feldspar grains, trace very fine green lithics, trace black carbonaceous detritus, friable, very poor visual porosity. **Fluorescence**: abundant dull blue-white fluorescence with weak hydrocarbon odour and very slow blue-white cut (contamination?).
57	1237.0	-	No recovery.
58	916.0	50	**Sandstone**: medium brown, very fine to fine, dominantly fine, subangular, moderately sorted, weak silica cement, common medium brown argillaceous matrix, common partly altered feldspar grains, trace black carbonaceous detritus, friable, very poor visual porosity.
59	895.0	40	**Claystone**: very dark brown, moderately silty, common dispersed very fine to medium quartz sand grains, moderately carbonaceous, non-calcareous, firm, non-fissile.
60	836.0	-	No recovery.

APPENDIX 7

APPENDIX 7

GFE RESOURCES LTD

APPENDIX 7

DRILL STEM TEST DATA

7A. DST-1
7B. DST-2
7C. DST-3

LANGLEY-1

APPENDIX 7A

DST-1

LANGLEY-1

GFE Resources Ltd

DST REPORT

Well: **LANGLEY-1**	Permit: **PPL1**	DST No.: **ONE**	Date: **28/5/94**
Formation: **Waarre**	Total Depth: **1745m**	Interval: **1715.22 - 1745 mKB**	
TEST Co.: **Australian DST**	Test Type: **Conventional Bottom Hole**		

FLUID PROPERTIES	
SOURCE	RESISTIVITY
MAKE-UP WATER	
MUD	
RECOVERY	

TIMES	
FIRST FLOW	07:23:43
FIRST SHUT-IN	07:31:30
SECOND FLOW	08:18:10
SECOND SHUT-IN	09:17
TOTAL FLOW	67 mins.
FORM. TEMP.	70 °C
FORM. DEPTH	1729 mKB

NUMBER OF SAMPLES TAKEN	
GAS	4
OIL	
WATER	
MUD	
GAS SPECIFIC GRAVITY	
OIL GRAVITY (°API)	
MUD WEIGHT	9.3 ppg
MUD VISCOSITY (Sec./qt.)	

DOWNHOLE PRESSURE DATA (psig)				
GAUGE POSITION	**Fluid**	**Inside**	**Outside**	**Inside**
TYPE & SERIAL No.	Mech. 13782	Mech. K338	Mech. 13784	EMP 080-148
DEPTH (mKB)	1701.73	1708.35	1721.47	1711.4
INITIAL HYDROSTATIC		2755.2	2791.1	2756.5
START FIRST FLOW	2.8	1538.4	2367.1	1751.2
END FIRST FLOW	1076.5	1790.5	2386.1	2015.6
FIRST SHUT-IN	635.7	2372.9	2396.6	2383.1
START SECOND FLOW	935.0	2132.3	2389.2	2178.7
END SECOND FLOW	2019.0	2289.6	2391.4	2320.3
SECOND SHUT-IN	46.1	2374.0	2397.7	2385.3
FINAL HYDROSTATIC		2703.1	2722.6	2724.7

FIRST OPENING BLOW DESCRIPTION: 20psi after 1 min. 20 secs., building to 70psi after 4 mins., then opened to flare pit after 5mins. Lost 7.7bbls of mud past packers chasing tool to bottom in fill after opening.

SECOND OPENING BLOW DESCRIPTION: Gas to surface in 3½ mins, mud to surface after 5½ minutes. Settled to a 'steamy' white flow.

SURFACE FLOW DATA **FINAL FLOW:** 4.7 mmcfd, predominately CO_2

BOTTOM CHOKE SIZE (inches): ¾	MANIFOLD CHOKE SIZE & PRESSURE	ORIFICE PLATE SIZE & PRESSURE	FLOWING TIME (minutes)	FINAL FLOW PERIOD DATA	
				TIME (mins.)	PRESSURE(psig)
END FIRST FLOW	1" 300 psig	n/a	7 mins. 47 sec.	5	560 (1" choke)
FINAL FLOW - START	1" 100 psig	n/a	3½ mins.	10	680 (1" choke)
	1" 720 psig	n/a	14 mins.	20	1100 (½" choke)
FINAL FLOW - MIDDLE	½" 1040 psig	n/a	16 mins.	30	1120 (½" choke)
FINAL FLOW - END	½" 1140 psig	n/a	38 mins.	40	1140 (½" choke)
RECOVERY: 1.2 bbls of mud. One sample each of top and bottom of recovery taken.				50	1140 (½" choke)
				60	1140 (½" choke)
REMARKS: Bottom hole choke ¾". Cleaned up with 1" surface choke for 14 minutes, then went through ½" choke for rest of Main Flow.					

GFE Resources Ltd

DST OPERATIONS SHEET

Well: **LANGLEY-1** Permit: **PPL1** DST No.: **ONE** Date: **28/5/95**

Formation: **Waarre** Total Depth: **1745m** Interval: **1715.22 - 1745 mKB**

TEST Co.: **Australian DST** Test Type: **Conventional Bottom Hole**

TIME	EVENT	FLOOR MANIFOLD			PROVER		
		CHOKE (inches)	PRESSURE (psig)	TEMPERATURE (°C)	PLATE (inches)	PRESSURE (psig)	TEMPERATURE (°C)
07:23:43	Open Tool	½" & $^{3}/_{8}$"	20	floor manifold also open through 1"			
07:25:08	Pre-flow	½" & $^{3}/_{8}$"	40	floor manifold also open through 1"			
07:25:30	Pre-flow	½" & $^{3}/_{8}$"	110	floor manifold also open through 1"			
07:26:30	Pre-flow	½" & $^{3}/_{8}$"		floor manifold also open through 1"			
07:27:30	Pre-flow	½" & $^{3}/_{8}$"		floor manifold also open through 1"			
07:28:00	Pre-flow	½" & $^{3}/_{8}$"	300	floor manifold also open through 1"			
07:28:30	Open to F/Pit	½" & $^{3}/_{8}$"	300	floor manifold also open through 1"			
07:29:30	Close Tool	½"					
08:16:30	Open Tool	1"					
08:21:40	Final Flow	1"	100	Gas to Surface			
08:23:40	Final Flow	1"	500	Mud to Surface			
08:25	Final Flow	1"	580				
08:30	Final Flow	1"	700				
08:32	Final Flow	1"	720				
08:34	Final Flow	½"	1040	Go through ½" manual choke			
08:37	Final Flow	½"	1080				
08:38	Final Flow	½"	1100				
08:40	Final Flow	½"	1100	Take Sample #1			
08:42	Final Flow	½"	1120				
08:47	Final Flow	½"	1120				
08:51	Final Flow	½"	1130				
08:56	Final Flow	½"	1140				
09:00	Final Flow	½"	1140	Take Sample #2			
09:02	Final Flow	½"	1140				
09:11	Final Flow	½"	1140	Take Sample #3			

GFE Resources Ltd

DST OPERATIONS SHEET

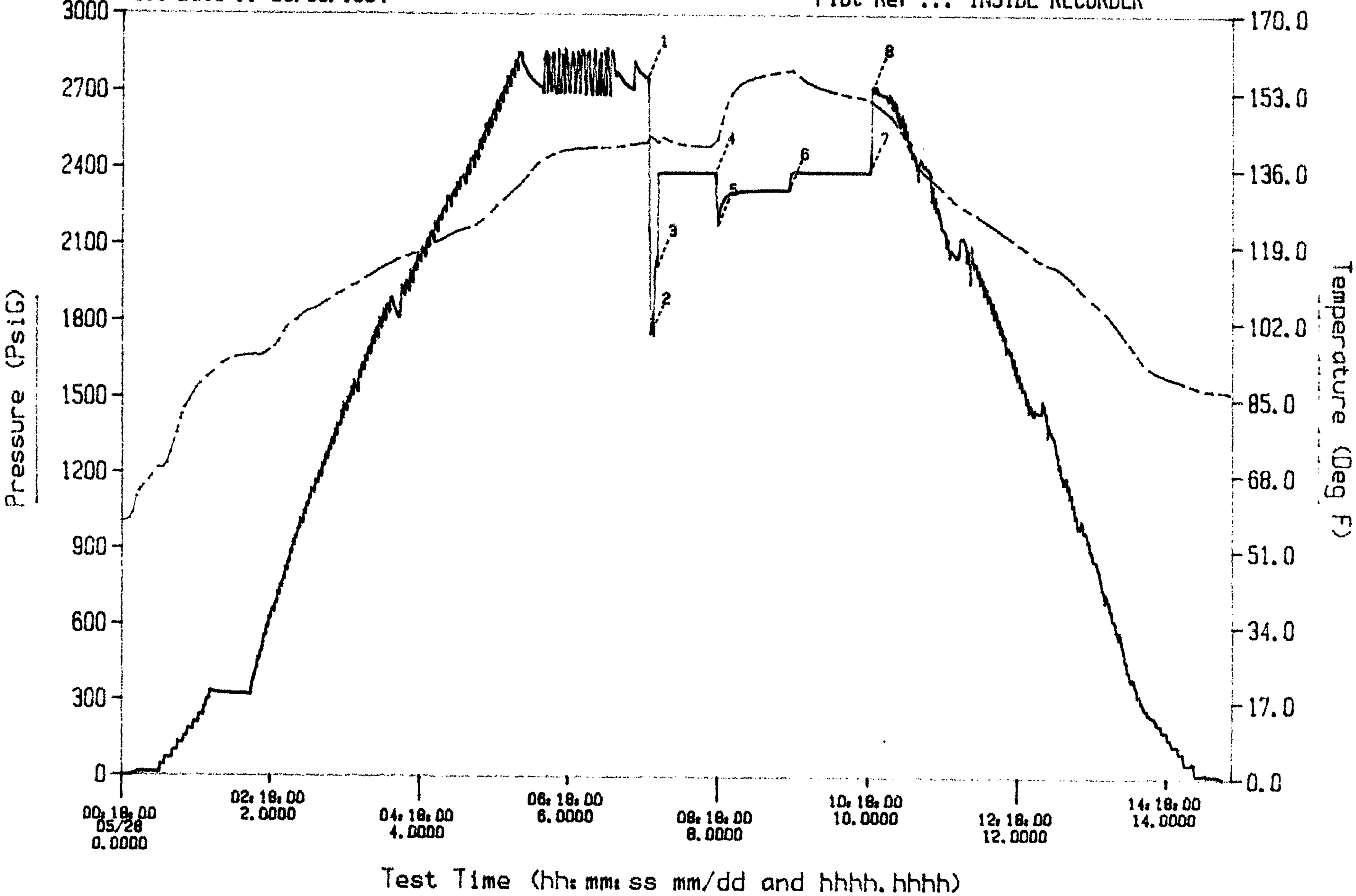
Well: LANGLEY-1
Permit: PPL1
DST No.: ONE
Date: 28/5/95
Formation: Waarre
Total Depth: 1745m
Interval: 1715.22 - 1745 mKB
TEST Co.: Australian DST
Test Type: Conventional Bottom Hole

TIME	EVENT	FLOOR MANIFOLD			PROVER		
		CHOKE (inches)	PRESSURE (psig)	TEMPERATURE (°C)	PLATE (inches)	PRESSURE (psig)	TEMPERATURE (°C)
09:17	Close Tool	½"	1140	Take Sample #4			
10:21		End Final Shut-In					
		Estimate of Final Flow (½" choke, 60°F, 1140psig, SG=1.49)					
		$Q = (CP)/\sqrt{(GT)}$					
		$C = 112.72 \quad P = 1140 + 15 = 1155$psia					
		$G = 1.49$ (Assuming 90% CO_2) $\quad T = 460 + 60 = 520^{o}R$					
		$Q = (112.72 \times 1155)/\sqrt{(520 \times 1.49)}$					
		$= 4.7$mmcfd					

8[illegible]1/01
00:49:43

Company .... GFE RESOURCES LTD
Well .... LANGLEY # 1 PETERBOROUGH PPL 1
Test Date .. 28/05/1994

EMP S/N 080-148
File Ref ... LGY1DST1
Plot Ref ... INSIDE RECORDER



1 - INITIAL HYD; t=7.0678; P=2756.5
2 - INITAL PRE FLOW; t=7.1011; P=1751.2
3 - FINAL PREFLOW; t=7.1844; P=2015.6
4 - INITIAL SHUTIN; t=7.8678; P=2363.1
5 - INITIAL FLOW; t=8.0011; P=2178.7
6 - FINAL FLOW; t=8.8511; P=2320.3
7 - FINAL SHUTIN; t=10.0178; P=2385.3
8 - FINAL HYD; t=10.0678; P=2724.7

PE906693

This is an enclosure indicator page.
The enclosure PE906693 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906693 has the following characteristics:

ITEM_BARCODE = PE906693
CONTAINER_BARCODE = PE900950
NAME = DST 1 Data
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DST
DESCRIPTION = DST 1 Data, Langley-1
REMARKS =
DATE_CREATED = 28/05/94
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

28/05/94.

Kevin,

Results of samples of fluid from DST #1. LANGLEY # 1.

Top Sample.		Bottom Sample.	
WT.	9.5	WT.	9.5
PH.	8.8	PH.	8.8
CL+	17,500	CL+	17,500
KCL %	3.0	KCL %	3.0

These two samples are almost identical to the drilling mud, and have no formation fluid in them.
However they are heavier in weight and contain some sand and are gritty in texture.

Regards,
Clive.

AUSTRALIAN

Telephone
(076) 222 655
(076) 221 150 FAX

AUSTRALIAN D.S.T. CO. PTY. LTD.

DST

COMPANY NAME	GFE Resources Ltd.
WELL NAME	Langley #1
LOCATION	Otway Basin PPL-1
TICKET #	2391
DST #	One

Australian DST Co. Pty. Ltd.

Box 619, Roma, Queensland 4455

FINAL REPORT

CONVENTIONAL BOTTOM HOLE

COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley #1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1715.22 to 1745.00 m (29.78 m)

TICKET # 2391
D.S.T.# One
FORMATION Waarre
DATE 94/05/28

TEST PERIOD MINUTES:

PRE-FLOW :	22	FIRST SHUT-IN :	60
SECONFLOW:	60	SECOND SHUT-IN :	60
THIRDFLOW :		THIRD SHUT-IN :	

RECOVERY DURING FLOW PERIODS

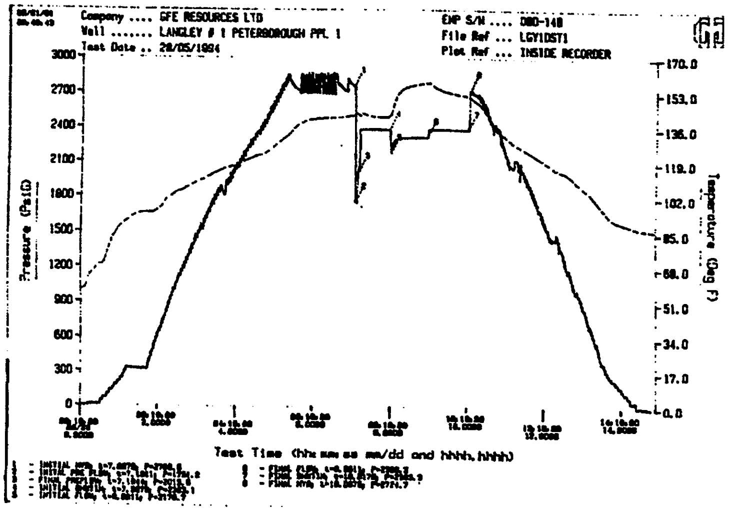
FLUID RECOVERY TOTAL m

m of
m of
m of
m of

The fluid recorder indicates that approximately 1.5 metres of fluid was recovered on this test. Fluid recorder also indicates gas, no measurement provided.

GAS RECOVERY
TIME kPa m^3/DAY

No measurement provided.



DOWNHOLE PRESSURE DATA (PSIG)

ALL MEASSUREMENTS ARE "SI"

RECORDER NUMBER		13782		K338	080-148	13784	
CLOCK HOUR - EMP		24 Hr.		24 Hr.	EMP	24 Hr.	
DEPTH METRES		1701.73		1708.35	1711.40	1721.47	
PRESSURE PORT		FLUID	INSIDE	INSIDE	~~OUTSIDE~~ INSIDE	OUTSIDE	OUTSIDE
INITIAL HYDROSTATIC	(A)			2755.2	2756.5	2791.1	
START FIRST FLOW	(B)	2.8		1538.4	1751.2	2367.1	
END FIRST FLOW	(B1)	1076.5		1790.5	2015.6	2386.1	
FIRST SHUT-IN	(C)	635.7		2372.9	2383.1	2396.6	
START SECONDFLOW	(D)	935.0		2132.3	2178.7	2389.2	
END SECONDFLOW	(E)	2019.0		2289.6	2320.3	2391.4	
SECOND SHUT-IN	(F)	46.1		2374.0	2385.3	2397.7	
FINAL HYDROSTATIC	(G)			2703.1	2724.7	2722.6	
START THIRD FLOW	(H)						
END THIRD FLOW	(I)						
THIRD SHUTIN	(J)						

SEMI-LOG EXTRAPOLATION

RECORDER #

FIRST SHUT-IN : kPa SLOPE kPa^2/10^6 / Log Cycle
SECOND SHUT-IN : kPa SLOPE kPa^2/10^6 / Log Cycle
THIRD SHUT-IN : kPa SLOPE kPa^2/10^6 / Log Cycle

Permeability MD
Draw Down

Skin Factor

Damage Ratio

FIRST FLOW : None given.

SECONDFLOW : None given.

Australian DST Co. Pty. Ltd.

Box 619, Roma, Queensland 4455

FINAL REPORT

GAS - FLOW RATES and GENERAL DATA

COMPANY NAME :	GFE Resources Ltd.
WELL NAME :	Langley #1
LOCATION :	Otway Basin PPL-1
TESTED INTERVAL :	1715.22 to 1745.00 m (29.78 m)

TICKET #	2391
D.S.T.#	One
FORMATION	Waarre
DATE	94/05/28

TIME	ORIFICE SIZE	SURFACE TEMP F	SURFACE PRESSURES PSI	RATE MCF/DAY	LIQUID	REMARKS

ADDITIONAL WELL and TEST INFORMATION:

Time started in	00:30	Hours
Time on bottom	07:00	Hours
Time tool opened	07:18	Hours
Time tool pulled	10:30	Hours
Time out of hole	15:30	Hours
Tool weight	-	lbs
Weight set on packer	-	lbs
Initial String Weight	-	lbs
Weight pulled	-	lbs
Unseated string weight	-	lbs

Mud Type	KCL	
Mud Weight	1102	ft/lb.
Mud Viscosity	55	cp
Water Loss	7.2	
Filter Cake	1.59	mm
Mud Drop	-	m
Tool Skid	-	m
Bottom Choke	19.05	mm
Hole Size	216.00	mm
Reverse Circulated	No	mm
BH. TEMP	65	C
FILL	--	m

ELEVATIONS:		
K.B.	69.7	m
Ground	64.0	m
Total Depth	1745.00	m
PIPE ABOVE TOOLS		
Drill Collar I.D.	-	mm
Drill Pipe I.D.	-	mm
Drill Collar	142.48	m
Drill Pipe	1505.45	m
HWD. Pipe	55.28	m
Packer Size	190.5	mm
No. of Packers	2	

SAMPLES TAKEN:
Bottom Hole sampler
Fluid
Gas
Sent to

Hole Condition	Good
Tester	V.Sale
Representative	Ken Smith
Contractor	Century
Rig Number	11

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

FINAL REPORT

TEST TOOL - CONVENTIONAL

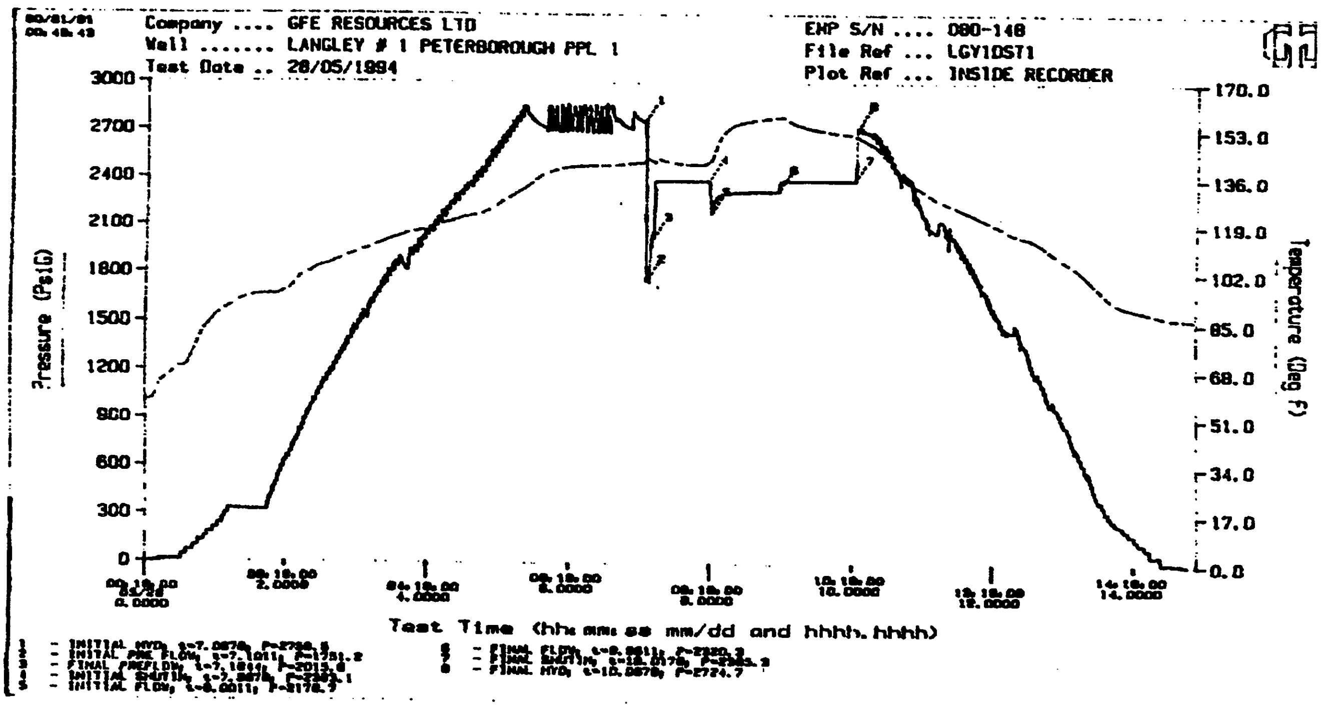
COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley #1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1715.22 to 1745.00 m (29.78 m)
TICKET # 2391
D.S.T.# One
FORMATION Waarre
DATE 94/05/28

TOTAL TOOL TO BOTTOM OF TOP PACKER			14.69
TOOL IN INTERVAL			12.05
BOTTOM PACKER AND ANCHOR			
TOTAL TOOL			26.74
DRILL COLLAR IN INTERVAL			17.73
D.C. ANCHOR	STANDS	SINGLES	
D.P. ANCHOR	STANDS	SINGLES	
TOTAL ASSEMBLY			
D.C. ABOVE TOOLS	STANDS	SINGLES	142.48
H.W.D.P	STANDS	SINGLES	55.28
D.P. ABOVE TOOLS	STANDS	SINGLES	1505.45
TOTAL DRILL COLLARS, DRILL PIPE & TOOLS			1747.68
TOTAL DEPTH			1745.00
TOTAL STICK-UP ABOVE K.B.			2.68

PIPE TALLY

DRILL COLLAR JOINT LENGTH	DRILL PIPE JOINT LENGTH		
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Total 1	Total 2	Total 3	Total 4
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Total 5	Total 6	Total 7	Total 8
1	1	1	DC 1
2	2	2	DP 2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
			11
Total 9	Total 10	Total 11	TOTAL

BO SUB	.30
PO SUB	.30
CO Sub	.30
Fluid Rec.13782	1.52
SHUT-IN TOOL	1.98
SAMPLER	
SAMPLER	
HMV	1.72
REC #	
REC #	
JARS	1.40
REC #338	1.52
REC #080-148	1.83
SAFETY JOINT	.67
PACKER	2.03
PACKER	1.12
DEPTH 1715.22 m	
PERS.	.91
Anchor	3.04
REC.#13784	1.52
RECEIVER SUB	
ANCHOR	5.49
C.O. SUB	.30
DRILL COLLAR	17.73
C.O. SUB	.30
T.COLLAR DEPTH ______ m	
PACKER	
PACKER	
PERFS	
REC #	
C.O. SUB	
DRILL PIPE	
C.O. SUB	
BULL NOSE	.49
T.D. 1745.00 m	


80/01/01
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Company .... GFE RESOURCES LTD
Well .... LANGLEY # 1 PETERBOROUGH PPL 1
Test Date .. 28/05/1994
EMP S/N 080-148
File Ref ... LGY1DST1
Plot Ref ... INSIDE RECORDER
Pressure (PsiG)
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
Temperature (Deg F)
170.0
153.0
136.0
119.0
102.0
85.0
68.0
51.0
34.0
17.0
0.0
00:19:00 05/28 0.0000
02:19:00 2.0000
04:19:00 4.0000
06:19:00 6.0000
08:19:00 8.0000
10:19:00 10.0000
12:19:00 12.0000
14:19:00 14.0000
Test Time (hh:mm:ss mm/dd and hhhh.hhhh)
1
2
3
4
5
6
7
8
1 - INITIAL HYD, t=7.0878, P=2790.5
2 - INITIAL PRE FLOW, t=7.1011, P=1751.2
3 - FINAL PREFLOW, t=7.1844, P=2015.6
4 - INITIAL SHUTIN, t=7.8878, P=2383.1
5 - INITIAL FLOW, t=8.0011, P=2178.7
6 - FINAL FLOW, t=9.8611, P=2320.3
7 - FINAL SHUTIN, t=10.0178, P=2363.3
8 - FINAL HYD, t=10.0878, P=2724.7

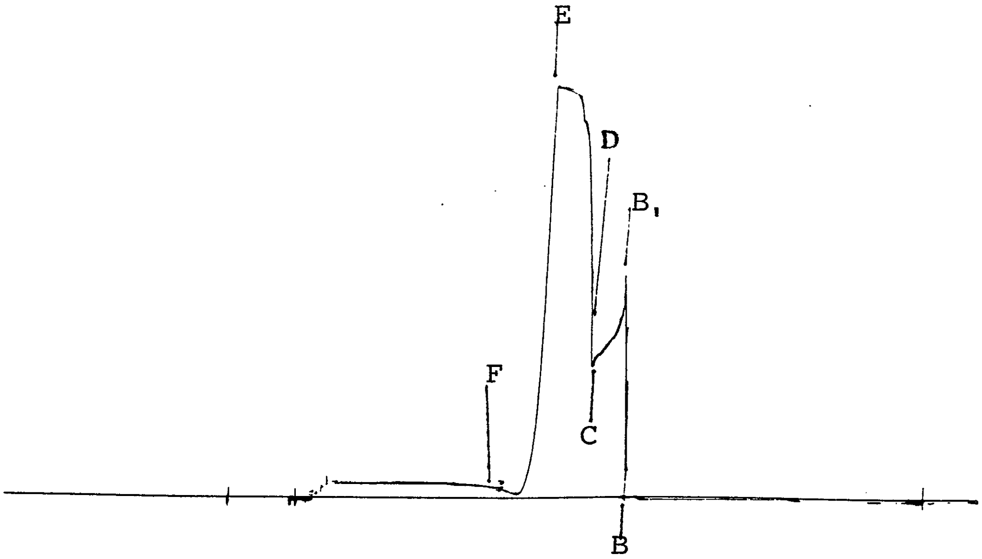
AUSTRALIAN D.S.T. CO. PTY. LTD.

BOX 619, ROMA, QUEENSLAND 4455

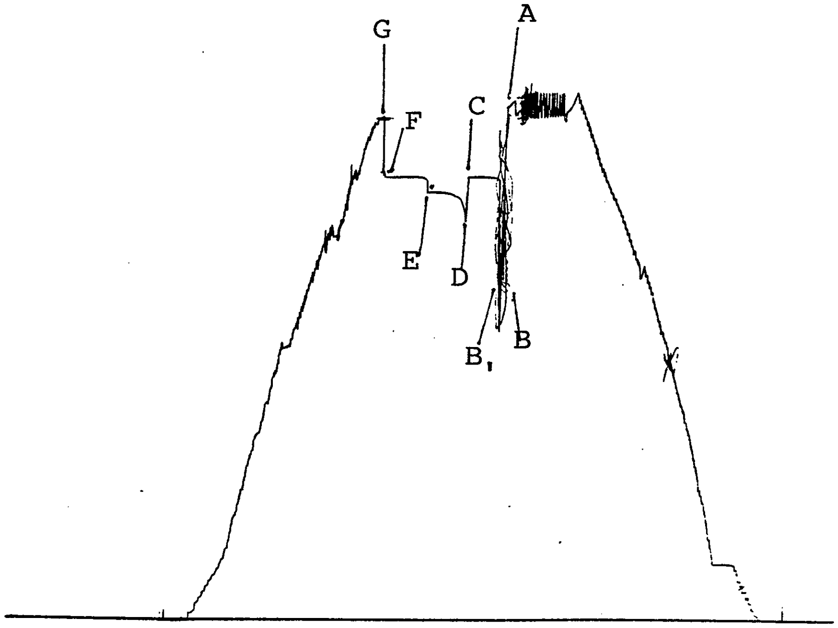
Well Name :Langley #1
Location :Otway Basin PPL-1

Ticket #:2391
DST # :One

Recorder :13782
Depth :1701.73
Port :Fluid
A IN Hydrostatic : 0.0
B Preflow : 2.8
B1 End Preflow : 1076.5
C First Shutin : 635.7
D Second flow : 935.0
E End 2nd flow : 2019.0
F Second Shutin : 46.1
G FL Hydrostatic : 0.0
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0



Recorder :338
Depth :1708.35
Port :Inside
A IN Hydrostatic : 2755.2
B Preflow : 1538.4
1 End Preflow : 1790.5
C First Shutin : 2372.9
D Second flow : 2132.3
E End 2nd flow : 2289.6
F Second Shutin : 2374.0
G FL Hydrostatic : 2703.1
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0



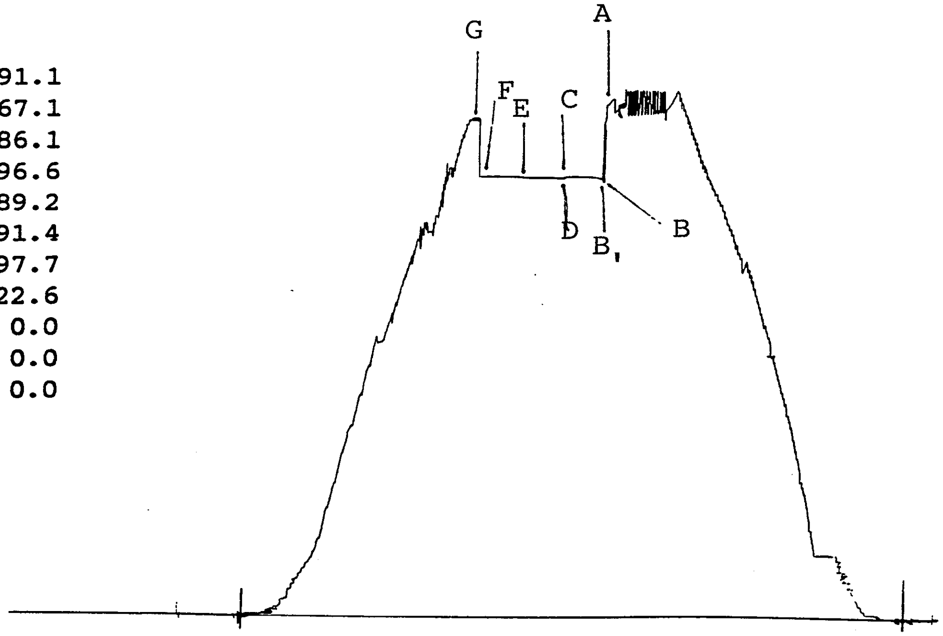
AUSTRALIAN D.S.T. CO. PTY. LTD.
BOX 619, ROMA, QUEENSLAND 4455

Well Name :Langley #1
Location :Otway Basin PPL-1

Ticket #:2391
DST # :One

Recorder :13784
Depth :1721.47
Port :Outside

A IN Hydrostatic : 2791.1
B Preflow : 2367.1
B1 End Preflow : 2386.1
C First Shutin : 2396.6
D Second flow : 2389.2
E End 2nd flow : 2391.4
F Second Shutin : 2397.7
G FL Hydrostatic : 2722.6
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0



GAS AND FUEL CORPORATION OF VICTORIA
SCIENTIFIC SERVICES - LABORATORY REPORT
1136 Nepean Highway, Highett, Victoria 3190, Australia

Tel. (03) 556 6222 Fax (03) 555 7616

Requested by: John Foster, GFE Resources Ltd.

Order Number: 3227

File Number: 94/0635

Subject: Analysis of Langley 1 Gas Sample

Sampled: 28th of May, 1994

Received: 30th of May, 1994

Author: Ivan Strudwick

Approved by: A. J. Stevenson

Date: 30th of May, 1994

Distribution: John Foster, Operations Co-ordinator
GFE Resources Ltd., 11th Floor, East Tower

A. J. Stevenson, Scientific Services

Gas Quality & Environment (2)

Master File

Keywords: Langley 1, Natural, Analysis

LAN Reference: U:\CHEMISTR\TYPING\ILS\LANG0635.94

Master Report Number: 94/0635/C

Job Order Number: 8780206

43:ILS:ils

GAS AND FUEL CORPORATION OF VICTORIA
SCIENTIFIC SERVICES - LABORATORY REPORT

LANGLEY 1 DST MAIN FLOW 9-18am SAMPLE

Date Sampled: 28th of May, 1994

Report Reference Number: 94/0635

Component	**Mole Percent Concentration**
Methane	30.6
Ethane	0.907
Propane	0.313
Iso-Butane	0.061
Normal-Butane	0.073
Neo-Pentane	0.001
Iso-Pentane	0.027
Normal-Pentane	0.022
Hexanes	0.056
Heptanes+	0.116
Carbon Dioxide	66.7
Oxygen+Argon	0.010
Nitrogen	1.08
Helium	0.023

Calculated Properties for the dry gas at M.S.C.

Gross Heating Value	13.0 MJ/m^3
Wobbe Index	11.8 MJ/m^3
Relative Density	1.22

Procedure References: SSS-11-006
ISO 6976

Analyst: I. Strudwick

Checked:

Date: 30/05/1994

amdel

Amdel Limited
A.C.N. 008 127 802

Petroleum Services
PO Box 338
Torrensville SA 5031

Telephone: (08) 416 5240
Facsimile: (08) 234 0355

RECEIVED

E4204

15 June 1994

GFE Resources Ltd
PO Box 629
Market Street Post Office
MELBOURNE VIC 3000

Attention: John Foster

REPORT LQ3051

CLIENT REFERENCE: Verbal Request

WELL NAME/RE: Langley-1

MATERIAL: HP Gas

WORK REQUIRED: Gas Composition

Please direct technical enquiries regarding this work to the signatory below under whose supervision the work was carried out.

Brian Watson.

Brian L. Watson
Manager
Petroleum Services

amdel

National Association of Testing Authorities, Australia

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PETROLEUM SERVICES GAS ANALYSIS

Method GL-01-01
ASTM D 1945-81 (modified)

Client: GFE RESOURCES Ltd.

Report # LQ3051

Sample: LANGLEY-1
DST-1, Main Flow
Pressure: 1140 psi
Date: 28/04/94, Time: 0910 h

GAS	MOL %
Nitrogen	1.05
Carbon Dioxide	66.05
Methane	31.26
Ethane	0.98
Propane	0.35
I-Butane	0.06
N-Butane	0.08
I-Pentane	0.03
N-Pentane	0.02
Hexanes	0.04
Heptanes	0.06
Octanes and higher h'c	0.02
Total	100.00

(0.00 = less than 0.01%)

Calculated Gas Density
(Air = 1) : 1.211

Calorific Value (15.0 deg C, 101.325 kPa)

Gross:	356 BTU/CU Ft	13.25 MJ/CU.M
Nett:	321 BTU/CU Ft	11.95 MJ/CU.M
Gross calorific value of water-saturated gas		12.99 MJ/CU.M

Average Molecular Weight = 35.061

All results are calculated on the basis that only the measured constituents are present.
This report relates specifically to the sample submitted for analysis.

Approved Signatory for
Robyn L Tamke

Registration No: 2013

Date 02-Jun-94

911.7.1

AMDEL LIMITED - METHOD GL-01-01

(ASTM D1945-81, MODIFIED)

This method conforms to ASTM D1945-81, *Analysis of Natural Gas by Gas Chromatography*; however, this standard is quite general and permits considerable scope in the configuration of equipment and processing of results.

Tests carried out by Amdel Limited in May and June 1987 indicate that the repeatability of our analyses conforms to that specified in the standard. This being the case, we maintain that our analyses will reach the reproducibility requirement also. These precision estimates are:

Component Level (mol %)	**Repeatability**	**Reproducibility**
0.01 to 1	0.03	0.06
1 to 5	0.05	0.10
5 to 25	0.15	0.20
Over 25	0.30	0.60
C_6 and heavier fractions*	5% of amount	10% of amount

* The standard assumes calculation of results into C_6 and $C_{7(+)}$ fractions.

The repeatability is the value below which, in 95% of cases, the difference between two single values obtained under the same conditions may be expected to lie. Reproducibility is defined similarly but refers to analyses carried out by, for example, different operators, different days or different laboratories.

For the sake of uniformity and client's convenience, we retain two decimal place reporting.

APPENDIX 7B

DST-2

LANGLEY-1

GFE Resources Ltd

DST REPORT

Well: **LANGLEY-1**
Permit: **PPL1**
DST No.: **TWO**
Date: **1/6/94**
Formation: **Eumeralla**
Total Depth: **1910 mKB**
Interval: **1875 - 1910 mKB**
TEST Co.: **Australian DST**
Test Type: **Conventional Bottom Hole**

FLUID PROPERTIES	
SOURCE	RESISTIVITY
MAKE-UP WATER	
MUD	
RECOVERY	

TIMES	
FIRST FLOW	7:52:50
FIRST SHUT-IN	7:59:30
SECOND FLOW	9:02:30
SECOND SHUT-IN	9:17:00
TOTAL FLOW	21 mins.
FORM. TEMP.	71 °C
FORM. DEPTH	1910 mKB

NUMBER OF SAMPLES TAKEN	
GAS	
OIL	
WATER	
MUD	3
GAS SPECIFIC GRAVITY	
OIL GRAVITY (°API)	
MUD WEIGHT	9.3 ppg
MUD VISCOSITY (Sec./qt.)	

DOWNHOLE PRESSURE DATA (psig)		
GAUGE POSITION	Inside	
TYPE & SERIAL No.	EMP 080-148	
DEPTH (mKB)	1869.62	
INITIAL HYDROSTATIC	2942.8	
START FIRST FLOW	613.1	
END FIRST FLOW		
FIRST SHUT-IN		
START SECOND FLOW	261.0	
END SECOND FLOW		
SECOND SHUT-IN		
FINAL HYDROSTATIC	2946.7	

FIRST OPENING BLOW DESCRIPTION: **Closed chamber DST. Minimal pressure increase over flow period (0.15psi).**

SECOND OPENING BLOW DESCRIPTION: **Packer seat failed, lost 12bbls of mud until test was aborted.**

SURFACE FLOW DATA
FINAL FLOW:

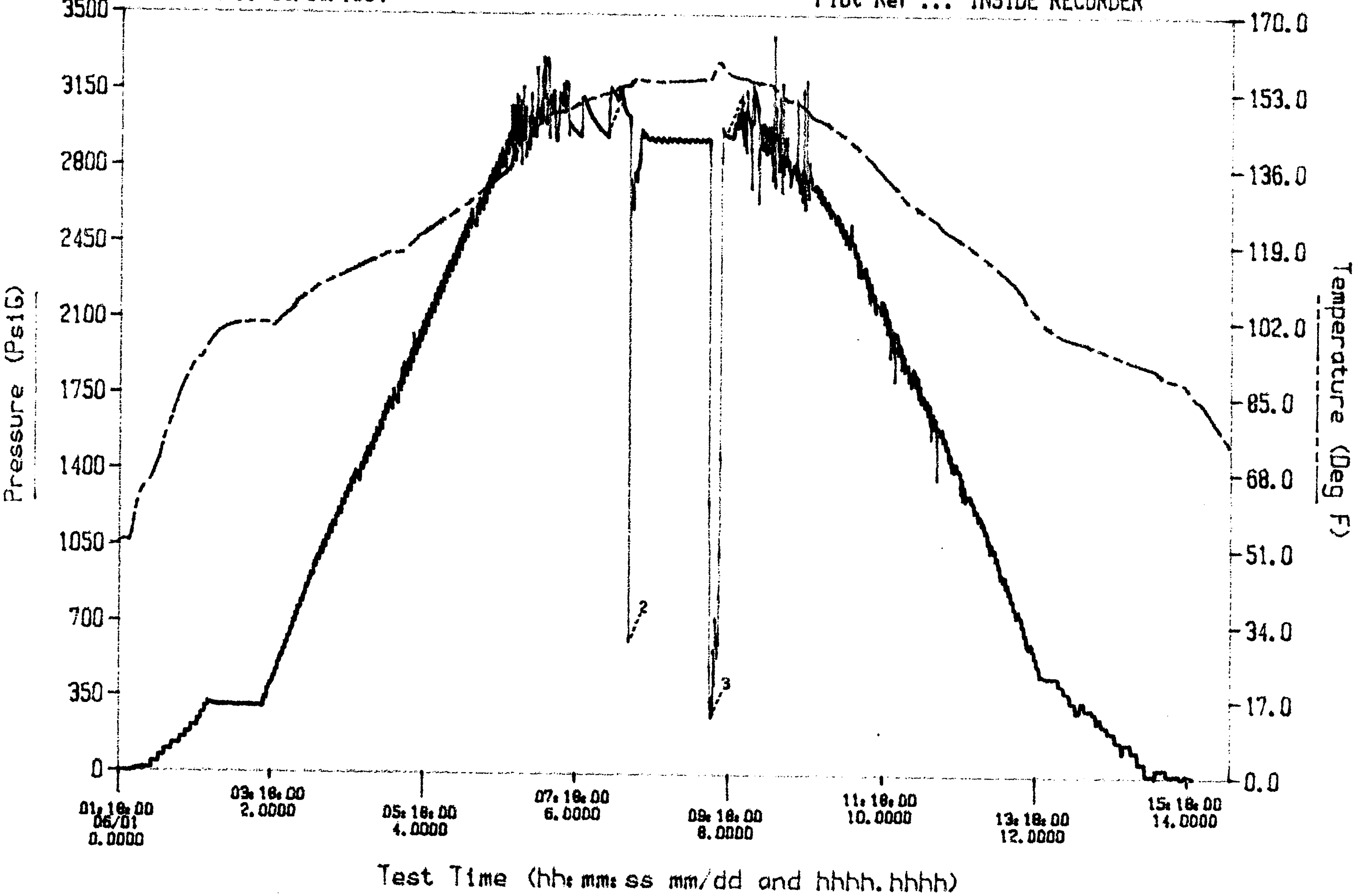
BOTTOM CHOKE SIZE (inches): ¾	MANIFOLD CHOKE SIZE & PRESSURE	ORIFICE PLATE SIZE & PRESSURE	FLOWING TIME (minutes)	FINAL FLOW PERIOD DATA	
				TIME (mins.)	PRESSURE(psig)
END FIRST FLOW	Closed chamber	n/a	6	5	misrun
FINAL FLOW-START	Closed chamber	n/a	10	10	
				20	
FINAL FLOW-MIDDLE	Closed chamber	n/a		30	
FINAL FLOW-END	Closed chamber	n/a		40	
RECOVERY:	10bbls of mud; consisting of 5bbls gas cut mud and 5bbls of slightly gas cut mud.			50	
				60	
REMARKS:	Test was misrun. On Initial Flow tool was open for less than 20 seconds and packer seat failed on second flow.				

AJ:F60

94/06/01
16:18:48

Company .... GFE RESOURCES LTD
Well .... LANGLEY # 1 PPL 1
Test Date .. 01/06/1994

EMP S/N 080-148
File Ref ... LGY1DST2
Plot Ref ... INSIDE RECORDER

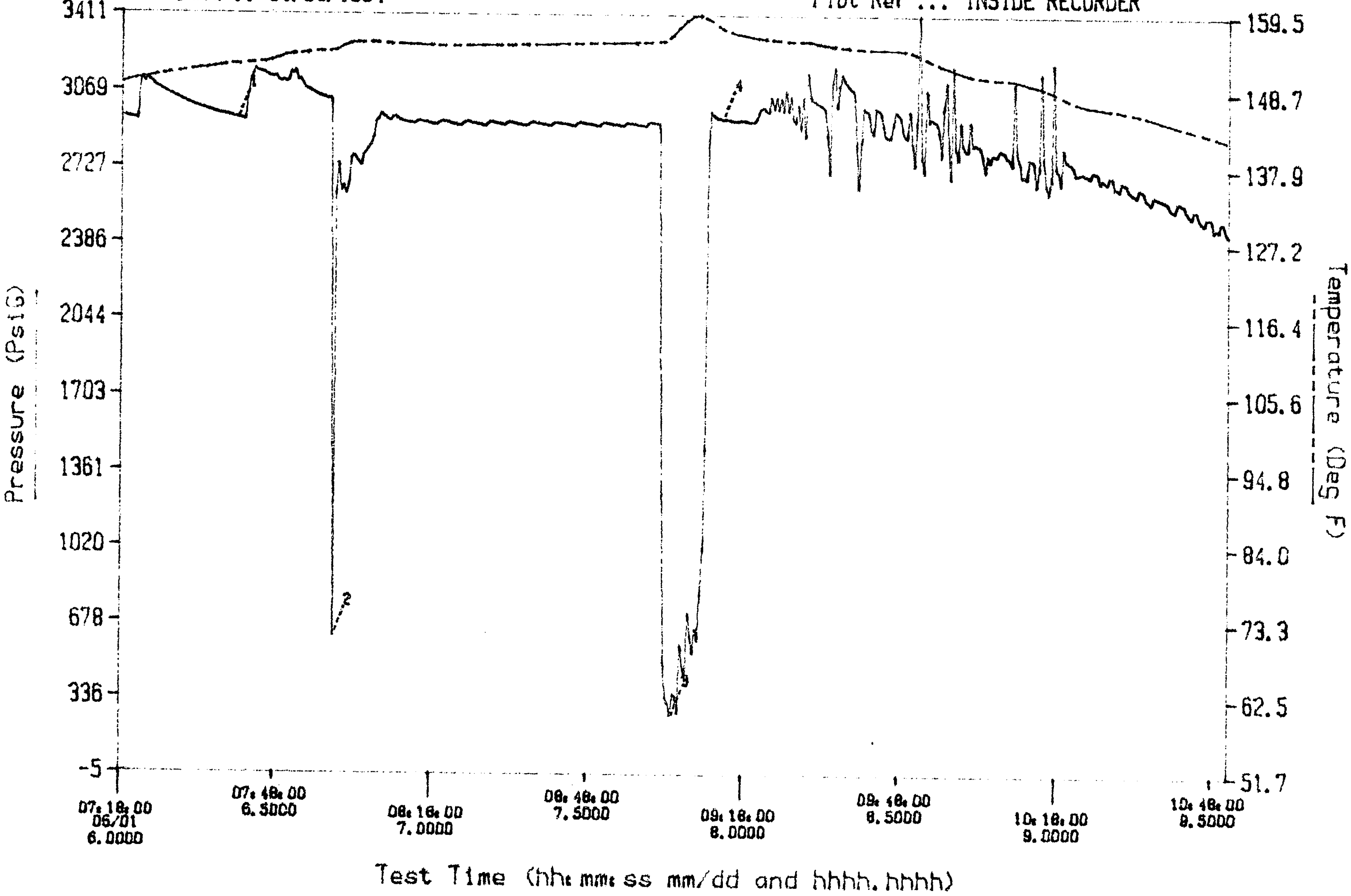


1 - INITIAL HYD; t=6.3788; P=2942.8
2 - PREFLOW; t=6.6900; P=613.1
3 - FINAL FLOW; t=7.7711; P=261.0
4 - FINAL HYD; t=7.9344; P=2946.7

06/01
16:27:42

Company .... GFE RESOURCES LTD
Well .... LANGLEY # 1 PPL 1
Test Date .. 01/06/1994

EMP S/N 080-148
File Ref ... LGY1DST2
Plot Ref ... INSIDE RECORDER



1 - INITIAL HYD; t=6.3789; P=2942.8
2 - PREFLOW; t=6.6900; P=613.1
3 - FINAL FLOW; t=7.7711; P=261.0
4 - FINAL HYD; t=7.9344; P=2946.7

PE906694

This is an enclosure indicator page.
The enclosure PE906694 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906694 has the following characteristics:

ITEM_BARCODE = PE906694
CONTAINER_BARCODE = PE900950
NAME = DST 2 Data
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DST
DESCRIPTION = DST 2 Data, Langley-1
REMARKS =
DATE_CREATED = 1/06/94
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

AUSTRALIAN

Telephone
(076) 222 655
(076) 221 150 FAX

AUSTRALIAN D.S.T. CO. PTY. LTD.

DST

COMPANY NAME	GFE Resources Ltd.
WELL NAME	Langley #1
LOCATION	Otway Basin PPL-1
TICKET #	2392
DST #	Two

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

FINAL REPORT

CONVENTIONAL BOTTOM HOLE

COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley #1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1847.97 to 1910.00 m (62.03 m)

TICKET # 2392
D.S.T.# Two
FORMATION --
DATE 94/06/01

TEST PERIOD MINUTES:

PRE-FLOW :	05	FIRST SHUT-IN :	63
SECONFLOW:	11	SECOND SHUT-IN :	
THIRDFLOW :		THIRD SHUT-IN :	

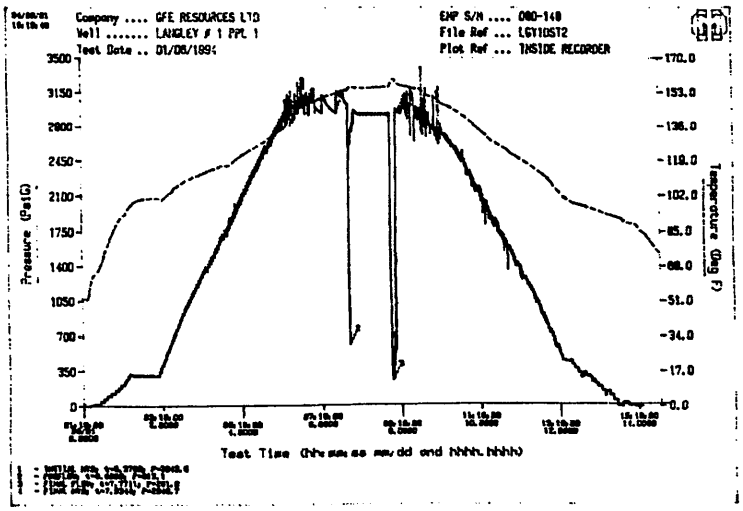
RECOVERY DURING FLOW PERIODS

FLUID RECOVERY TOTAL 268.00 ft.

268.00 ft of Mud.
ft of
ft of
ft of

GAS RECOVERY
TIME psig mcf/Day

Closed Chamber Test.



DOWNHOLE PRESSURE DATA (PSIG) **ALL MEASSUREMENTS ARE "IMPERIAL"**

RECORDER NUMBER		13782		13784	080-148	338	
CLOCK HOUR - EMP		24 Hr.		24 Hr.	EMP	24 Hr.	
DEPTH FEET		1861.19		1868.39	1869.62	1879.50	
PRESSURE PORT		FLUID	INSIDE	INSIDE	OUTSIDE	OUTSIDE	OUTSIDE
INITIAL HYDROSTATIC	(A)			2961.0	2942.8	2960.4	
START FIRST FLOW	(B)	0.00		22.5	613.1	729.6	
END FIRST FLOW	(B1)						
FIRST SHUT-IN	(C)	49.8		2940.9		2926.1	
START SECONDFLOW	(D)	161.4		294.9	261.0	890.8	
END SECONDFLOW	(E)						
SECOND SHUT-IN	(F)						
FINAL HYDROSTATIC	(G)			2962.0	2946.7	2961.5	
START THIRD FLOW	(H)						
END THIRD FLOW	(I)						
THIRD SHUTIN	(J)						

SEMI-LOG EXTRAPOLATION
RECORDER #

FIRST SHUT-IN : PSIG SLOPE $kPa^2/10^6$ / Log Cycle
SECOND SHUT-IN : PSIG SLOPE $kPa^2/10^6$ / Log Cycle
THIRD SHUT-IN : PSIG SLOPE $kPa^2/10^6$ / Log Cycle

Permeability MD
Draw Down
Skin Factor
Damage Ratio

FIRST FLOW : Had at least 40 000 lbs on tool, did not move when rotated to shut-in. Dropped free, chased tool to bottom. Set weight and rotated tool to open and again tool dropped. Chased tool to bottom and mud started to drop. Pulled out of hole.

SECONDFLOW :

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

FINAL REPORT

GAS - FLOW RATES and GENERAL DATA

COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley #1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1847.97 to 1910.00 m (62.03 m)

TICKET # 2392
D.S.T.# Two
FORMATION --
DATE 94/06/01

TIME	ORIFICE SIZE	SURFACE TEMP F	SURFACE PRESSURES PSI	RATE MCF/DAY	LIQUID	REMARKS

ADDITIONAL WELL and TEST INFORMATION:

Time started in	01:46	Hours
Time on bottom	07:00	Hours
Time tool opened	07:51	Hours
Time tool pulled	09:10	Hours
Time out of hole	14:00	Hours
Tool weight	-	lb
Weight set on packer	-	lb
Initial String Weight	-	lb
Weight pulled	-	lb
Unseated string weight	-	lb

Mud Type	KCL	
Mud Weight	1114	kg/m^3
Mud Viscosity	43	cp
Water Loss	8.1	
Filter Cake	1.59	mm.
Mud Drop	Yes	m
Tool Skid	Yes	m
Bottom Choke	19.05	m
Hole Size	216.00	mm
Reverse Circulated	-	
BH. TEMP	(154°F) 68°C	F
FILL	2	m

ELEVATIONS:		
K.B.	69.7	m
Ground	64.0	m
Total Depth	1910.00	m
PIPE ABOVE TOOLS		
Drill Collar I.D.	-	mm
Drill Pipe I.D.	-	mm
Drill Collar	133.00	m
Drill Pipe	1667.48	m
HWD. Pipe	55.28	m
Packer Size	191.00	mm
No. of Packers	2	

SAMPLES TAKEN:
Bottom Hole sampler
Fluid
Gas
Sent to

Hole Condition	Good
Tester	V. Sale
Representative	Ken Smith
Contractor	Century Drilling
Rig Number	11

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

FINAL REPORT

TEST TOOL - CONVENTIONAL

COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley #1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1847.97 to 1910.00 m (62.03 m)

TICKET # 2392
D.S.T.# Two
FORMATION _
DATE 94/06/01

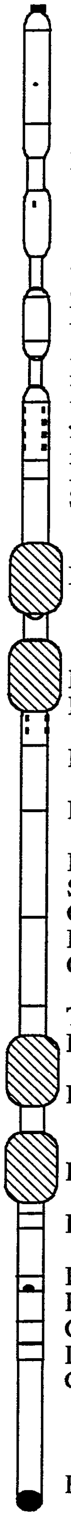
TOTAL TOOL TO BOTTOM OF TOP PACKER
TOOL IN INTERVAL
BOTTOM PACKER AND ANCHOR
TOTAL TOOL

DRILL COLLAR IN INTERVAL
D.C. ANCHOR STANDS SINGLES
D.P. ANCHOR STANDS SINGLES
TOTAL ASSEMBLY
D.C. ABOVE TOOLS STANDS SINGLES
H.W.D.P. STANDS SINGLES
D.P. ABOVE TOOLS STANDS SINGLES

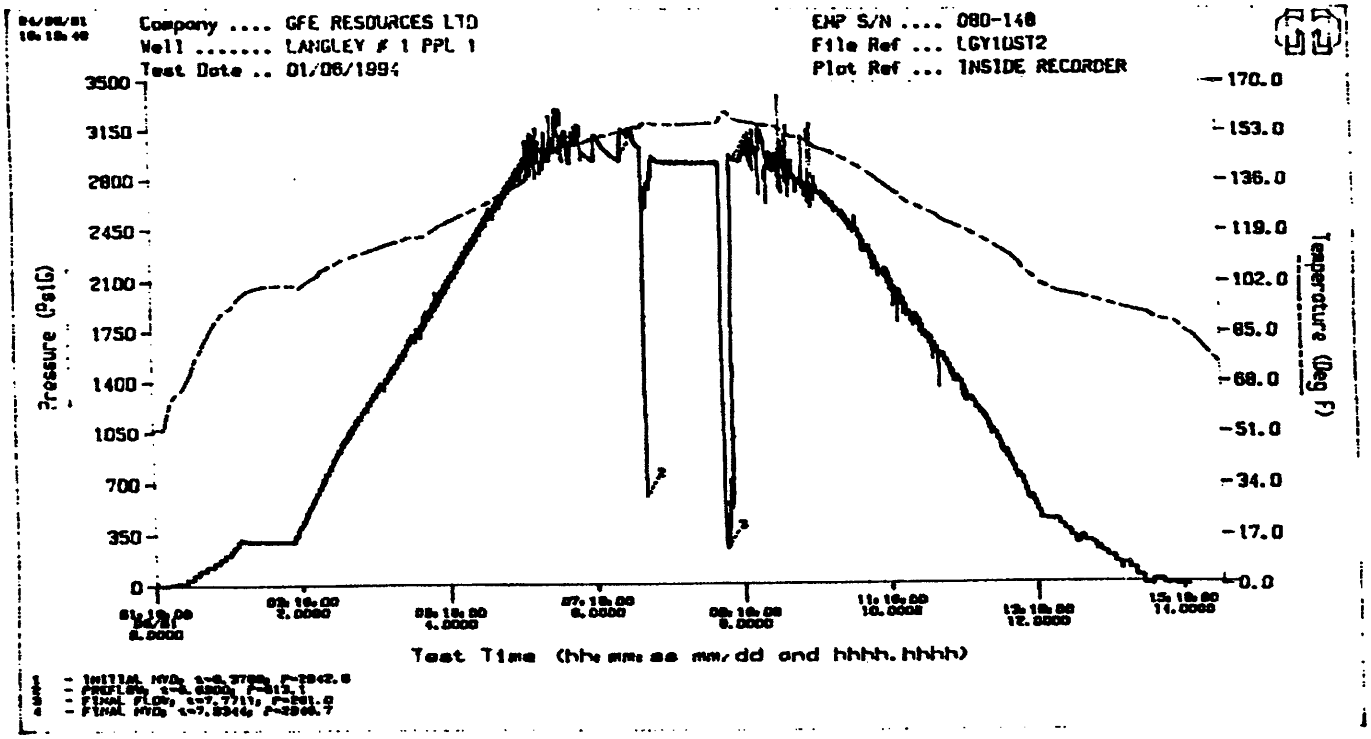
TOTAL DRILL COLLARS, DRILL PIPE & TOOLS
TOTAL DEPTH
TOTAL STICK-UP ABOVE K.B.

PIPE TALLY

DRILL COLLAR JOINT LENGTH	DRILL PIPE JOINT LENGTH		
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Total 1	Total 2	Total 3	Total 4
	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Total 5	Total 6	Total 7	Total 8
1	1	1	DC 1
2	2	2	DP 2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
	10	10	10
			11
Total 9	Total 10	Total 11	TOTAL



BO SUB	.30
PO SUB	.30
CO SUB	.30
Fluid Rec.13782	1.52
SHUT-IN TOOL	1.98
SAMPLER	
SAMPLER	
HMV	1.72
REC #13784	
REC #080-148	
JARS	1.98
REC #	1.52
REC #	1.83
SAFETY JOINT	.67
PACKER	2.03
PACKER	1.12
DEPTH 1874.97 m	
PERS.	.91
REC.#	
RECEIVER SUB	
SPACING	
C.O. SUB	
DRILL COLLAR	
C.O. SUB	
T.COLLAR	
DEPTH ______ ft	
PACKER	
PACKER	
PERFS	3.04
REC #338	1.52
PERFS	2.13
C.O. SUB	.30
DRILL PIPE	26.34
C.O. SUB	.30
BULL NOSE	.49
T.D. 1910.00 m	


Company .... GFE RESOURCES LTD
Well .... LANGLEY # 1 PPL 1
Test Date .. 01/06/1994
EMP S/N 080-148
File Ref ... LGY1DST2
Plot Ref ... INSIDE RECORDER
Pressure (PsiG)
3500
3150
2800
2450
2100
1750
1400
1050
700
350
0
Temperature (Deg F)
170.0
153.0
136.0
119.0
102.0
85.0
68.0
51.0
34.0
17.0
0.0
2
3
01:18:00
06/01
0.0000
03:18:00
2.0000
05:18:00
4.0000
07:18:00
6.0000
09:18:00
8.0000
11:18:00
10.0000
13:18:00
12.0000
15:18:00
14.0000
Test Time (hh:mm:ss mm/dd and hhhh.hhhh)
1 - INITIAL HYD,
2 - PREFLOW,
3 - FINAL FLOW, t=7.7711,
4 - FINAL HYD,

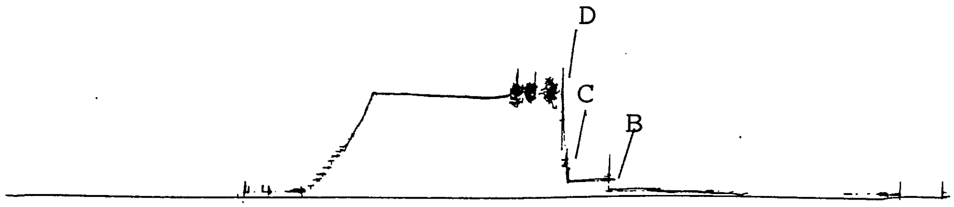
AUSTRALIAN D.S.T. CO. PTY. LTD.

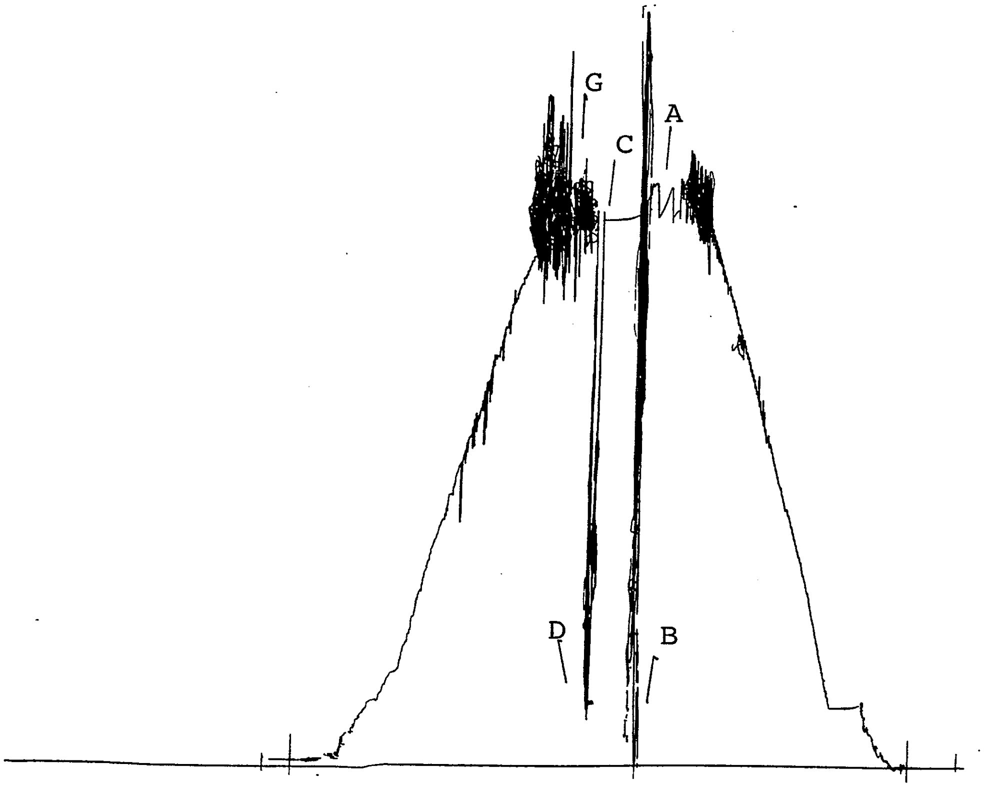
BOX 619, ROMA, QUEENSLAND 4455

Well Name :Langley #1
Location :Otway Basin PPL-1

Ticket #:2392
DST # :Two

Recorder :13782
Depth :1861.19
Port :Fluid
A IN Hydrostatic : 0.0
B Preflow : 0.0
B1 End Preflow : 0.0
C First Shutin : 49.8
D Second flow : 161.4
E End 2nd flow : 0.0
F Second Shutin : 0.0
G FL Hydrostatic : 0.0
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0





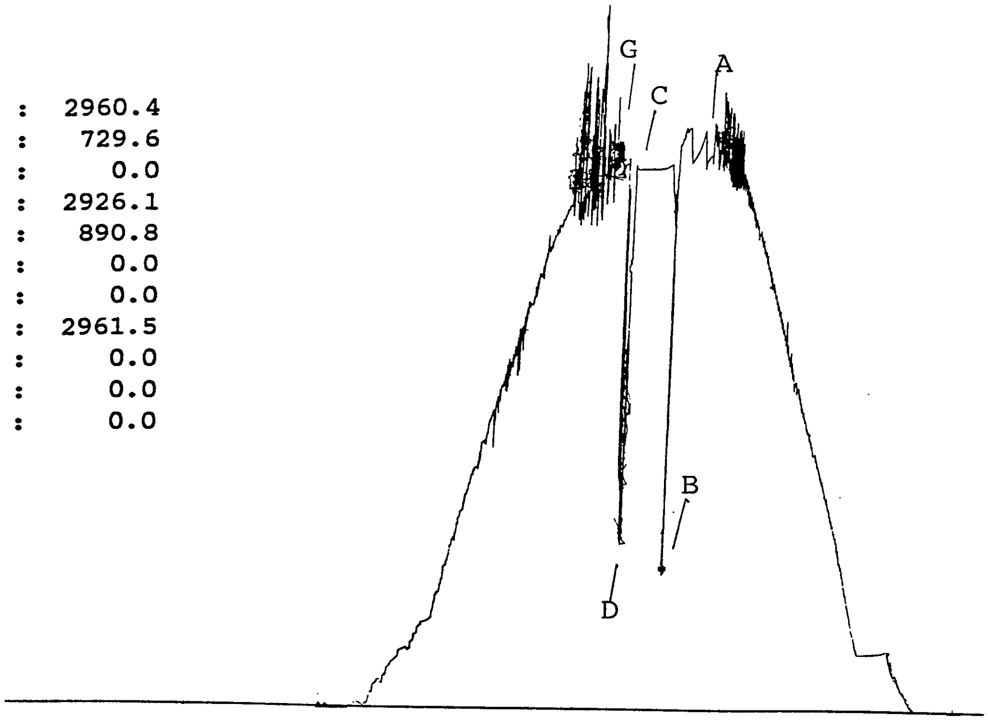
Recorder :13784
Depth :1868.39
Port :Inside
A IN Hydrostatic : 2961.0
B Preflow : 22.5
End Preflow : 0.0
C First Shutin : 2940.9
D Second flow : 294.9
E End 2nd flow : 0.0
F Second Shutin : 0.0
G FL Hydrostatic : 2962.0
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0

AUSTRALIAN D.S.T. CO. PTY. LTD.
BOX 619, ROMA, QUEENSLAND 4455

Well Name :Langley #1
Location :Otway Basin PPL-1

Ticket #:2392
DST # :Two

Recorder :338
Depth :1879.50
Port :Outside
A IN Hydrostatic : 2960.4
B Preflow : 729.6
B1 End Preflow : 0.0
C First Shutin : 2926.1
D Second flow : 890.8
E End 2nd flow : 0.0
F Second Shutin : 0.0
G FL Hydrostatic : 2961.5
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0



APPENDIX 7C

DST-3

LANGLEY-1

GFE Resources Ltd

DST REPORT

Well:	LANGLEY-1	Permit:	PPL1	DST No.:	THREE	Date:	7/6/94
Formation:	Eumeralla	Total Depth:	2006mKB	Interval:	1883.07-1909.13 mKB		
TEST Co.:	Australian D.S.T.	Test Type:	Closed Chamber Inflate Straddle				

FLUID PROPERTIES		TIMES		NUMBER OF SAMPLES TAKEN	
SOURCE	RESISTIVITY	FIRST FLOW	8:51:00	GAS	4
MAKE-UP WATER		FIRST SHUT-IN	8:58:00	OIL	
MUD		SECOND FLOW	10:10:40	WATER	
RECOVERY		SECOND SHUT-IN	11:30:30	MUD	
		TOTAL FLOW	87 mins.	GAS SPECIFIC GRAVITY	
				OIL GRAVITY (°API)	
		FORM. TEMP.	69.4 °C	MUD WEIGHT	9.3 ppg
		FORM. DEPTH	1885 mKB	MUD VISCOSITY (Sec./qt.)	

Durations:

Pre-Flow 7 mins.
Initial Shut-In 72:40 mins.
Main Flow 80 mins.
Final Shut-In 157 mins.

DOWNHOLE PRESSURE DATA (psig)

GAUGE POSITION	Inside	Inside	Outside	Fluid
TYPE & SERIAL No.	EMP 080-148	Mech. 338	Mech. 13784	Mech. 13782
DEPTH (mKB)	1874.9	1873.07	1884.8	1866.53
INITIAL HYDROSTATIC	3049.9	2999.0	3042.6	
START FIRST FLOW	102.2	90.4	170.4	1.9
END FIRST FLOW	139.6	102.7	243.9	120.8
FIRST SHUT-IN	988.1	950.0	977.6	125.5
START SECOND FLOW	106.4	99.6	139.8	146.7
END SECOND FLOW	206.0	177.9	207.1	186.4
SECOND SHUT-IN	926.0	894.9	912.2	186.4
FINAL HYDROSTATIC	2937.6	2943.7	2993.2	

FIRST OPENING BLOW DESCRIPTION: **Closed chamber surface pressure built from 0psig to 16.4psig during Pre-Flow.**

SECOND OPENING BLOW DESCRIPTION: **Closed Chamber surface pressure built from 0psig to 24.8psig in Main Flow.**

SURFACE FLOW DATA | FINAL FLOW: **Estimated 8-10 mcfd**

BOTTOM CHOKE SIZE (inches): 3/4	MANIFOLD CHOKE SIZE & PRESSURE	ORIFICE PLATE SIZE & PRESSURE	FLOWING TIME (minutes)	FINAL FLOW PERIOD DATA TIME (mins.)	PRESSURE(psig)
END FIRST FLOW	see P-T plot			5	see P-T plot
FINAL FLOW-START				10	
				20	
FINAL FLOW-MIDDLE				30	
FINAL FLOW-END				40	
				50	
				60	

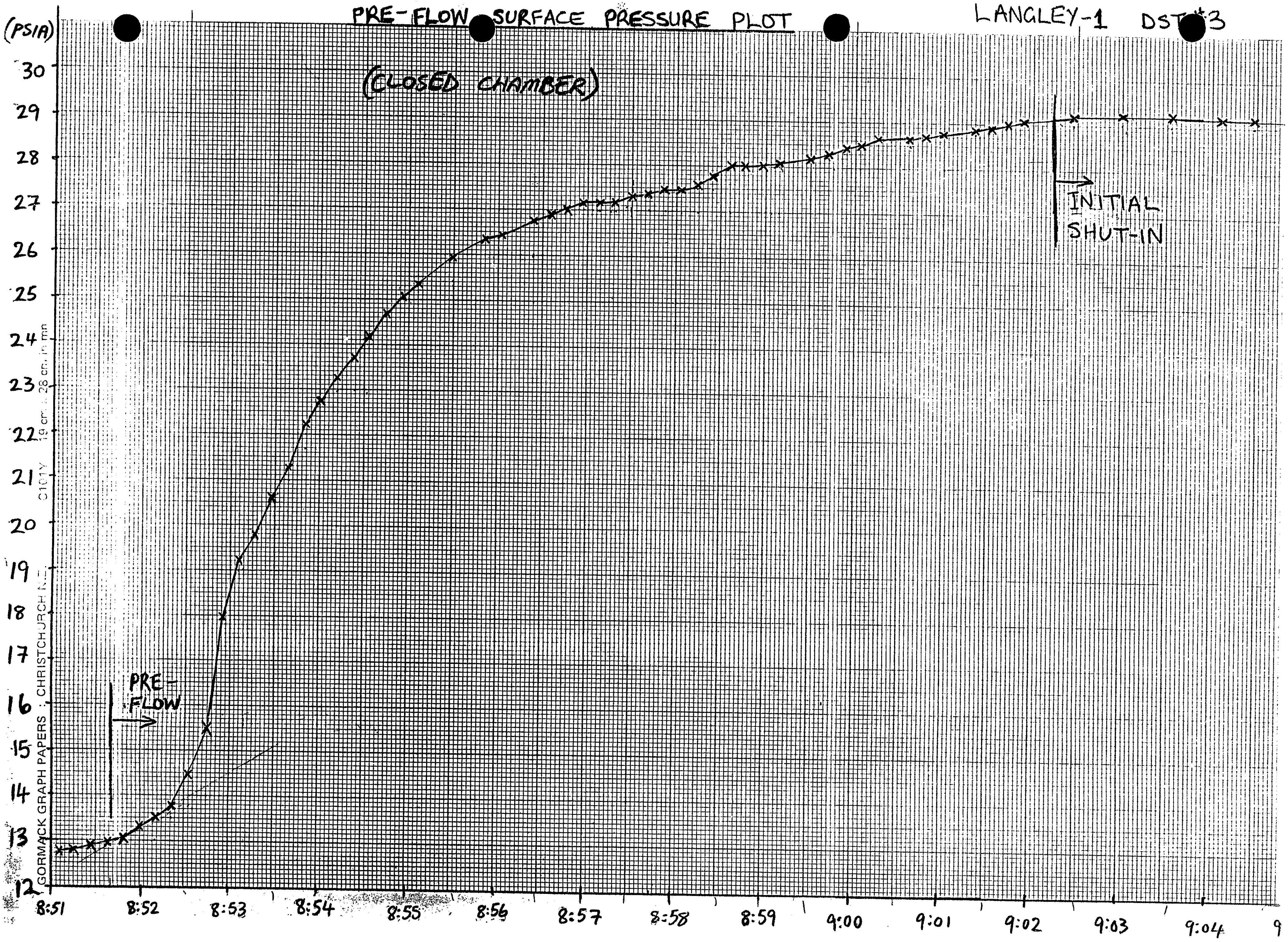
RECOVERY: **Estimated 8-10 mcfd flammable gas; 2.2bbls rat hole mud.**

REMARKS: **Final Shut-In terminated prematurely due to concern about tool becoming stuck if left in place for too long.**

LANGLEY-1 DST#3

PRE-FLOW SURFACE PRESSURE PLOT

(CLOSED CHAMBER)

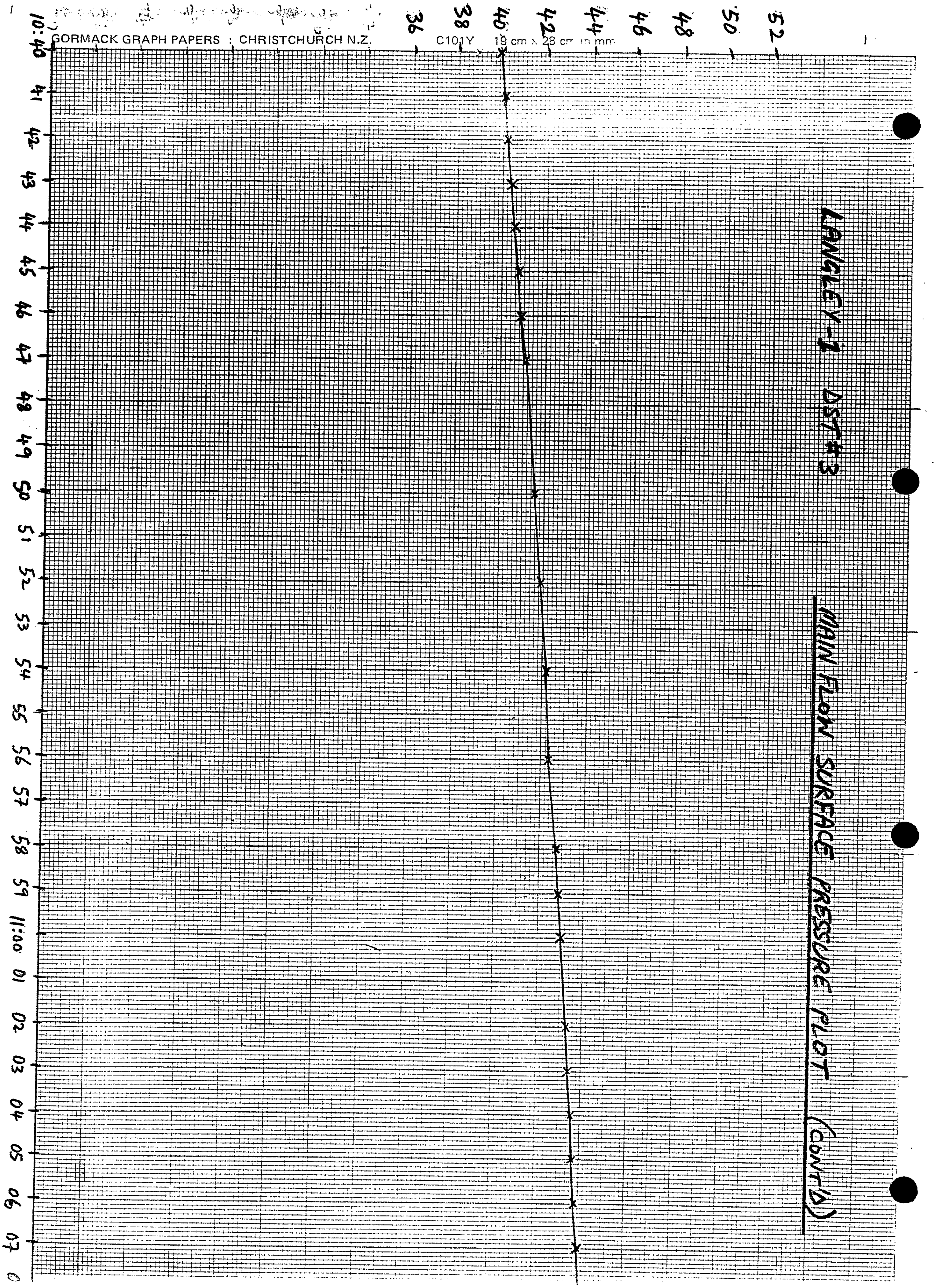


PE906695

This is an enclosure indicator page.
The enclosure PE906695 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906695 has the following characteristics:
ITEM_BARCODE = PE906695
CONTAINER_BARCODE = PE900950
NAME = DST 3 Data
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DST
DESCRIPTION = DST 3 Data, Langley-1
REMARKS =
DATE_CREATED = 7/06/94
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR =
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)



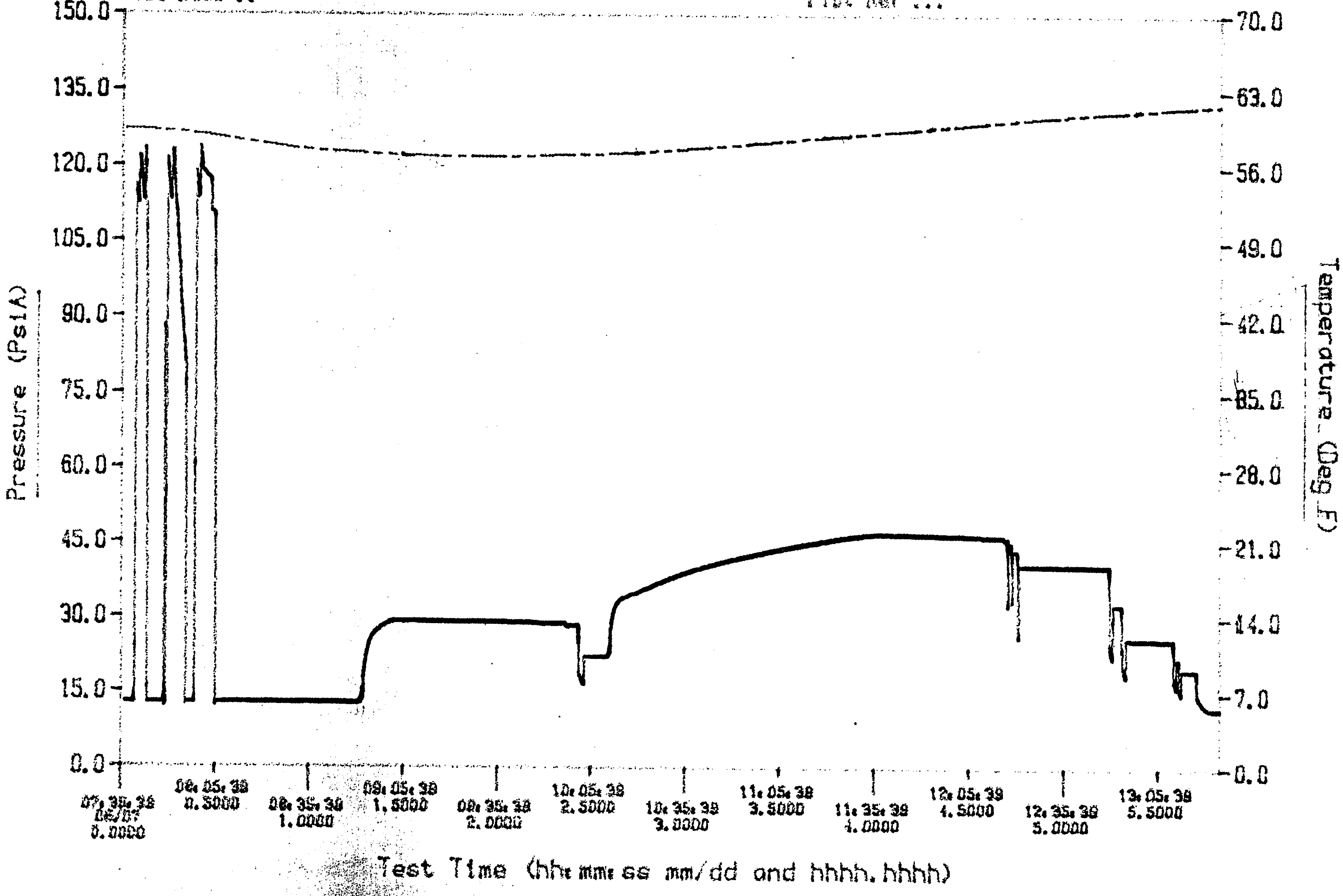
LANGLEY-1 DST#3

MAIN FLOW SURFACE PRESSURE PLOT (CONT'D)

08/01/91
08:07:57

Company ....
Well ....
Test Date ..

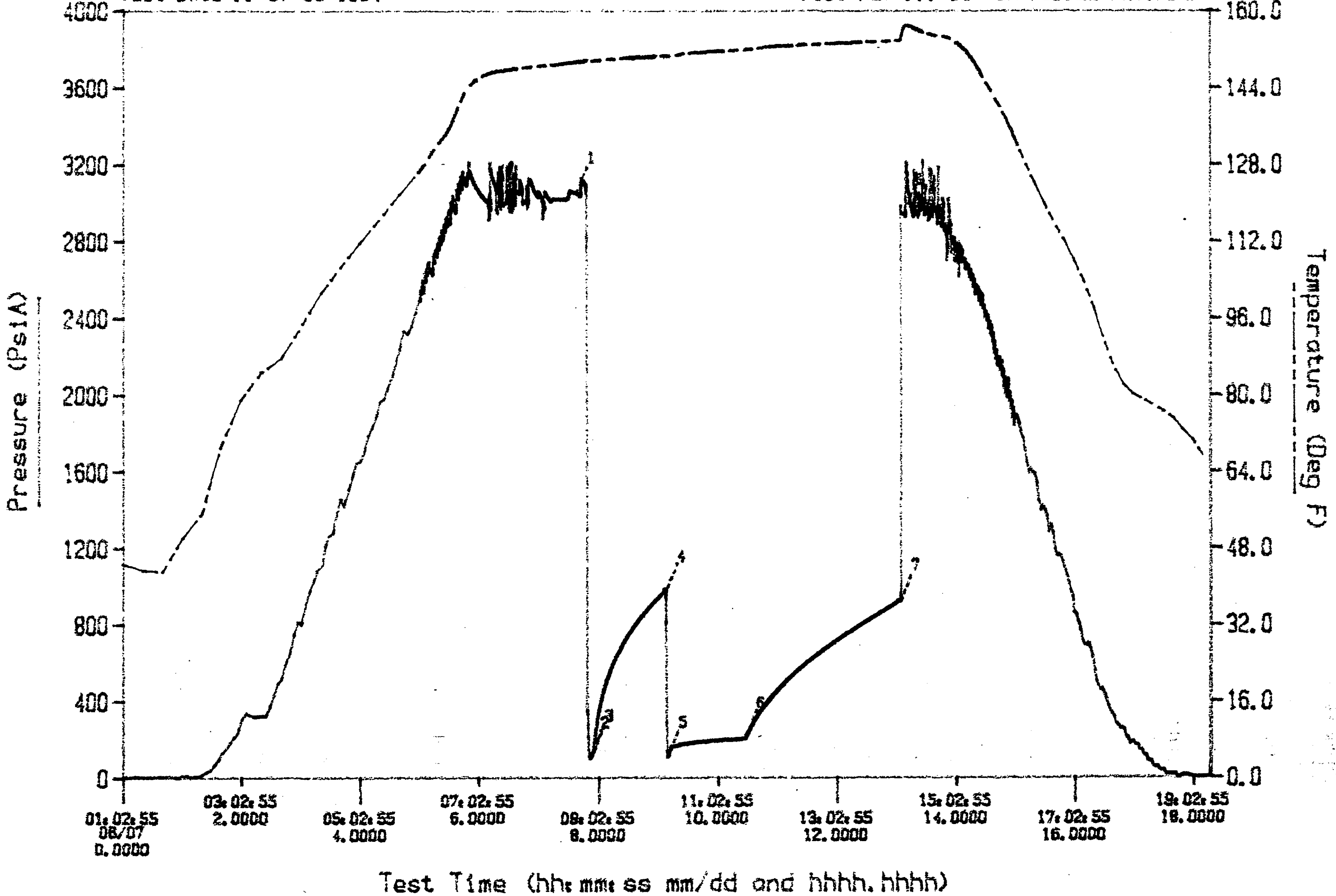
EMP S/N 380-485
File Ref ... L6Y1-SRG SURFACE GAUGE
Plot Ref ...



06/07
11:13:50

Company .... GFE RESOURCES LTD
Well .... LANGLEY #1 OTWAY BASIN PERMIT PPL-1
Test Date .. 07-06-1994

EMP S/N 080-148
File Ref ... LGY1DST3
Plot Ref ... BOTTOM MIDDLE RECORDER

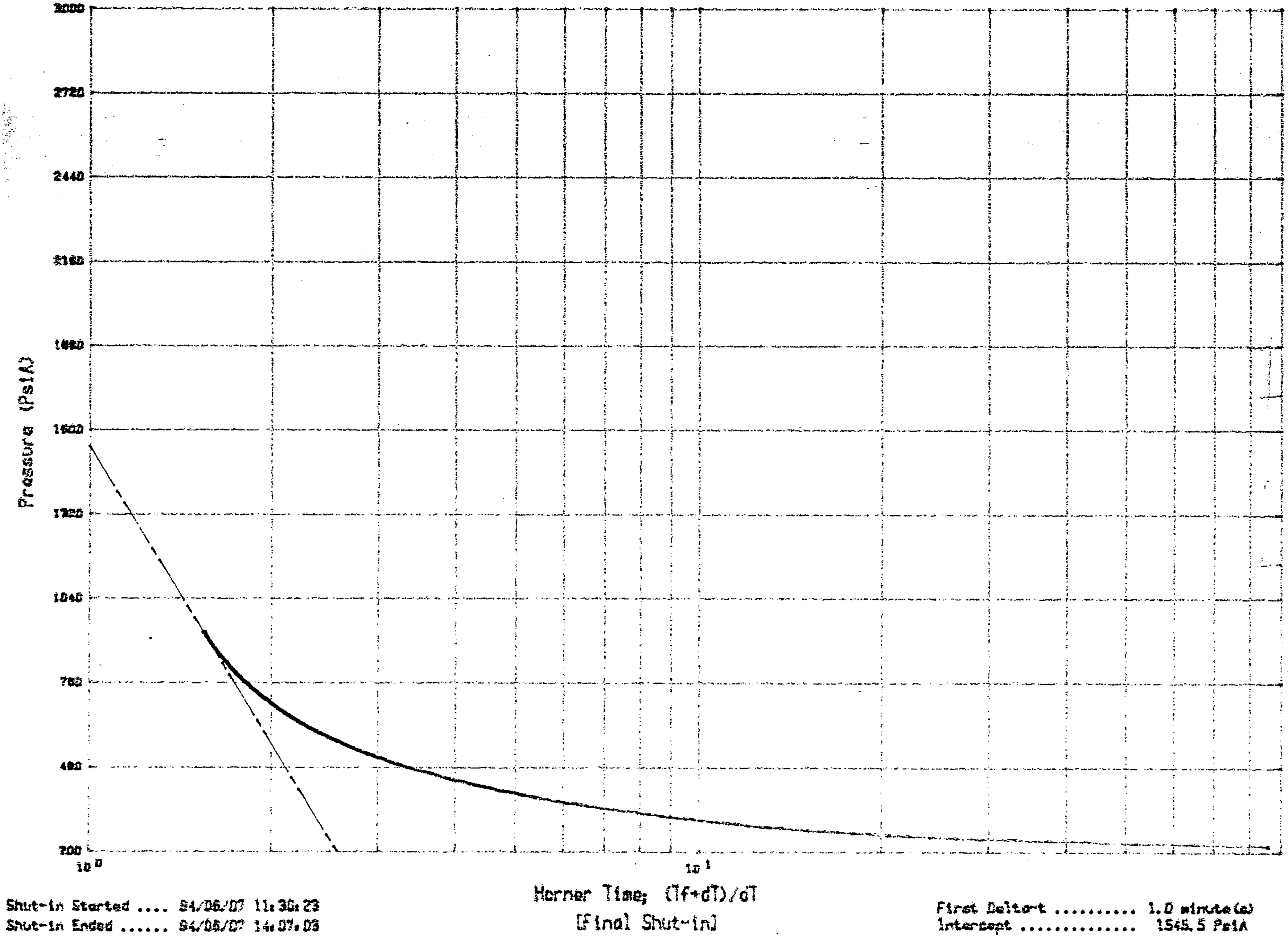


1 - INITIAL HYD; t=7.6356; P=3049.9
2 - PRE-FLOW; t=7.8522; P=102.2
3 - FINAL PRE-FLOW; t=7.9189; P=139.6
4 - INITIAL SHUT-IN; t=9.1300; ~~P=974.7~~ 988.07
5 - INITIAL FLOW; t=9.1578; P=106.4
6 - FINAL FLOW; t=10.4578; P=206.0
7 - FINAL SHUT-IN; t=13.0889; P=926.0
8 - FINAL HYD; t=13.1356; P=2937.6

/06/07
11:28:56

Company .... GFE RESOURCES LTD
Well .... LANGLEY #1 OTWAY BASIN PERMIT PPL-1
Test Date .. 07-06-1994

EMP S/N 080-148
File Ref ... LGY1DST3
Plot Ref ... BOTTOM MIDDLE RECORDER



Shut-in Started 94/06/07 11:30:23
Shut-in Ended 94/06/07 14:07:03
Total Flow Time .... 85.0 minute(s)

First Deltat .... 1.0 minute(s)
Intercept .... 1545.5 PsiA
Slope .... 3266.2 PsiA/Cycle

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

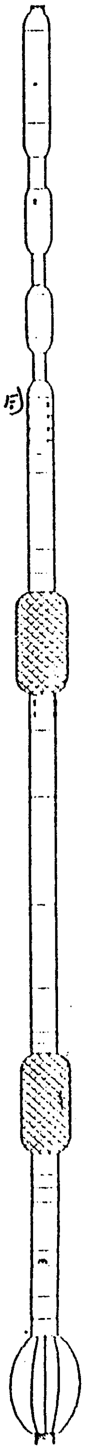
FIELD REPORT

TEST TOOL - INFLATE

COMPANY NAME : GEE RESOURCES LTD.
WELL NAME : LANGLEY #1
LOCATION : OTWAY BASIN PPL-1
TESTED INTERVAL : 1883.07 TO 1909.13

TICKET # 2459
D.S.T.# THREE
FORMATION EUMERALLA
DATE 7-6-1994

TOTAL TOOL TO BOTTOM OF TOP PACKER	18.975
TOOL IN INTERVAL	26.06
BOTTOM PACKER AND ANCHOR	4.208
TOTAL TOOL	49.243
DRILL COLLAR IN INTERVAL	17.230
TOTAL ASSEMBLY TO BOTTOM OF TOP PACKERS	18.975
D.C. ABOVE TOOLS 8 STANDS ___ SINGLES	142.48
D.P. ABOVE TOOLS 87 STANDS + PUP JOINT SINGLES	1670.41
HWDP	55.28
TOTAL DRILL COLLARS, DRILL PIPE & TOOLS	1887.145
TOTAL DEPTH TO BOTTOM OF TOP PACKER	1883.07
TAL STICK-UP ABOVE K.B.	4.075 4.500 (ADF)



P.O.SUB.	.3657
PO SUB	.3048
CO SUB	.2438
Fluid Rec.	1.524
HYDRAULIC TOOL	1.630
SAMPLER	
SQUEEZEE VALVE	1.158
~~REC.~~ JARS	2.231
REC	1.524
~~JARS~~ EMP REC	1.828
SAFETY JOINT	2.740
INFLATE PUMP	1.258
SCREEN	1.319
BYPASS PORT	
DEFLATE	1.021
INFLATE PACKER	1.828
DEPTH ft 1883.07	
FLOW PORTS	.597
REC.#	2.438
SPACING	16.472
X/O	.3048
D/C	17.23
X/O	.3048
T. COLLAR	.6096
DEPTH ft 1909.13	
INFLATE PACKER	1.670
REC #	
	2.538
DRAGSPRING	

PIPE TALLY

DRILL COLLAR JOINT	LENGTH	H/W DRILL PIPE JOINT	LENGTH	DRILL PIPE			
1		1		1	19.24	1	19.13
2		2		2	19.02	2	19.27
3		3		3	19.28	3	19.31
4		4		4	19.32	4	19.16
5		5		5	19.30	5	19.19
6		6		6	19.19	6	19.25
7		7		7	19.31	7	19.35
8		8		8	19.11	8	19.19
9		9		9	19.23	9	19.17
10		10		10	18.80	10	19.16
Total 1	142.48	Total 2	55.28	Total 3	191.80	Total 4	192.18
1	19.28	1	19.19	1	19.19	1	19.12
2	19.03	2	19.05	2	19.24	2	19.20
3	19.19	3	19.27	3	19.20	3	19.06
	18.57	4	18.65	4	19.33	4	19.29
5	19.21	5	19.16	5	19.29	5	19.26
6	19.15	6	19.29	6	19.29	6	18.76
7	19.30	7	19.09	7	19.26	7	19.10
8	19.35	8	19.27	8	19.31	8	19.34
9	19.28	9	19.22	9	19.25	9	19.10
10	19.30	10	19.16	10	19.19.	10	19.31
Total 5	191.66	Total 6	191.35	Total 7	192.55.	Total 8	191.54
1	19.12	1	19-22	1	18.96	DC 1	
2	19.20	2	19.17	2	18.94	DP 2	
3	19.09	3	19.16	3	19.19	3	
4	19.14	4	18.94	4	19.21	4	
5	19.03	5	19.26	5	19.05	5	
6	19.16	6	19.19	6	19.11	6	
7	19.09	7	19.16	7	19.18	7	
8	19.18	8	19.10	8		8	
9	19.10	9	19.10	9		9	
10	19.16.	10	18.90.	10		10	
						11	
Total 9	191-27	Total 10	191-20.	Total11	133.64	TOTAL	

7/6/94.

Kevin / Ken,

These are the results of samples from DST # 3. LANGLEY # 1.

Top and Bottom samples were the same,(Mud).

WT.	9.3+ ppg
CL+	14,900 mg/lt
CA	50 mg/lt
KCL	2.6 %
PH	8.5

These samples are drilling mud and no formation fluids present.

Regards,
Clive.

AUSTRALIAN

Telephone
(076) 222 655
(076) 221 150 FAX

AUSTRALIAN D.S.T. CO. PTY. LTD.

DST

COMPANY NAME	GFE Resources Ltd.
WELL NAME	Langley # 1
LOCATION	Otway Basin PPL-1
TICKET #	2459
DST #	Three

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

FINAL REPORT

INFLATE STRADDLE

COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley # 1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1883.07 to 1909.13 m (26.06 m)

TICKET # 2459
D.S.T.# Three
FORMATION Eumeralla
DATE 07-06-94

TEST PERIOD MINUTES:

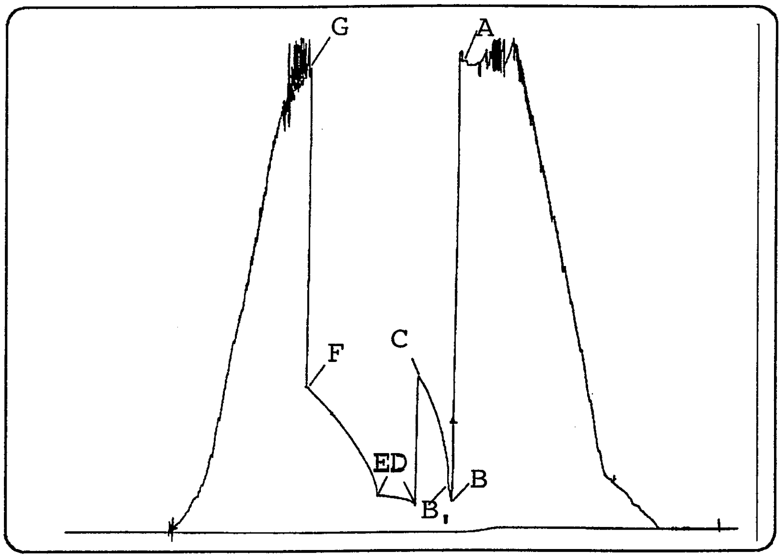
PRE-FLOW :	11	FIRST SHUT-IN :	69
SECONFLOW:	82	SECOND SHUT-IN :	214
THIRDFLOW :		THIRD SHUT-IN :	

RECOVERY DURING FLOW PERIODS

FLUID RECOVERY TOTAL 91.00 m

91.00 m of Rat hole mud (2.2 Bbl.)
m of
m of
m of

GAS RECOVERY
TIME kPa M^3/DAY
Closed chamber



DOWNHOLE PRESSURE DATA (PSIG)

ALL MEASSUREMENTS ARE "SI"

RECORDER NUMBER		13782	338	080-148	13784		
CLOCK HOUR - EMP		24 Hr.	24 hr.	EMP	24 Hr.		
DEPTH METRES		1866.53	1873.07	1874.90	1884.80		
PRESSURE PORT		FLUID	INSIDE	INSIDE	OUTSIDE	OUTSIDE	OUTSIDE
INITIAL HYDROSTATIC	(A)		2999.0	3049.9	3042.6		
START FIRST FLOW	(B)	1.9	90.4	102.2	170.4		
END FIRST FLOW	(B1)	120.8	102.7	139.6	243.9		
FIRST SHUT-IN	(C)	125.5	950.0	974.7	977.6		
START SECONDFLOW	(D)	146.7	99.6	106.4	139.8		
END SECONDFLOW	(E)	186.4	177.9	206.0	207.1		
SECOND SHUT-IN	(F)	186.4	894.9	926.0	912.2		
FINAL HYDROSTATIC	(G)		2943.7	2937.6	2993.2		
START THIRD FLOW	(H)						
END THIRD FLOW	(I)						
THIRD SHUTIN	(J)						

SEMI-LOG EXTRAPOLATION
RECORDER #

FIRST SHUT-IN : kPa SLOPE $kPa^2/10^6$ / Log Cycle
SECOND SHUT-IN : kPa SLOPE $kPa^2/10^6$ / Log Cycle
THIRD SHUT-IN : kPa SLOPE $kPa^2/10^6$ / Log Cycle

Permeability MD
Draw Down
Skin Factor :
Damage Ratio

FIRST FLOW : Closed chamber. Surface pressure building from 0 to 16.4 PSIG in 10 minutes.

SECONDFLOW : Closed chamber. Surface pressure building from 0 to 24 PSIG.

TEST SUCCESSFUL

The charts indicate low permeability and no damage within the interval tested.

Australian DST Co. Pty. Ltd.

Box 619, Roma, Queensland 4455

FINAL REPORT

GAS - FLOW RATES and GENERAL DATA

COMPANY NAME :	GFE Resources Ltd.	TICKET #	2459
WELL NAME :	Langley # 1	D.S.T.#	Three
LOCATION :	Otway Basin PPL-1	FORMATION	Eumeralla
TESTED INTERVAL :	1883.07 to 1909.13 m (26.06 m)	DATE	07-06-94

TIME	ORIFICE SIZE	SURFACE TEMP F	SURFACE PRESSURES PSI	RATE MCF/DAY	LIQUID	REMARKS

Closed chamber test.

ADDITIONAL WELL and TEST INFORMATION:

Time started in	02:00	Hours	Mud Type	KCL		**ELEVATIONS:**		
Time on bottom	08:00	Hours	Mud Weight	Polymer	ft/lb.	K.B.	69.7	m
Time tool opened	08:51	Hours	Mud Viscosity	1114	cp	Ground	64.0	m
Time tool pulled	14:07	Hours	Water Loss	48	mm	Total Depth	2006.00	m
Time out of hole	19:00	Hours	Filter Cake	.159	m	**PIPE ABOVE TOOLS**		
Tool weight	10 500	lbs	Mud Drop	No		Drill Collar I.D.	71.4	mm
Weight set on packer	15 000	lbs	BTM H. Temp	(157 F) 64	C	Drill Pipe I.D.	97.2	mm
Initial String Weight	115 000	lbs	Bottom Choke	19.05	mm	Drill Collar	142.48	m
Weight pulled	135 000	lbs	Hole Size	216	mm	Drill Pipe	1670.41	m
Unseated string weight	105 000	lbs	Reverse	No		HWD. Pipe	55.28	m
Cushion	None	m	Circulated			Packer Size	178	mm
						No. of Packers	Two	

SAMPLES TAKEN:	By customer	Hole Condition	Good
Bottom Hole sampler		Tester	K. Perrin
Fluid		Representative	K. Smith
Gas		Contractor	Century Drilling
Sent to		Rig Number	11

Australian DST Co. Pty. Ltd.
Box 619, Roma, Queensland 4455

FINAL REPORT

TEST TOOL - INFLATE

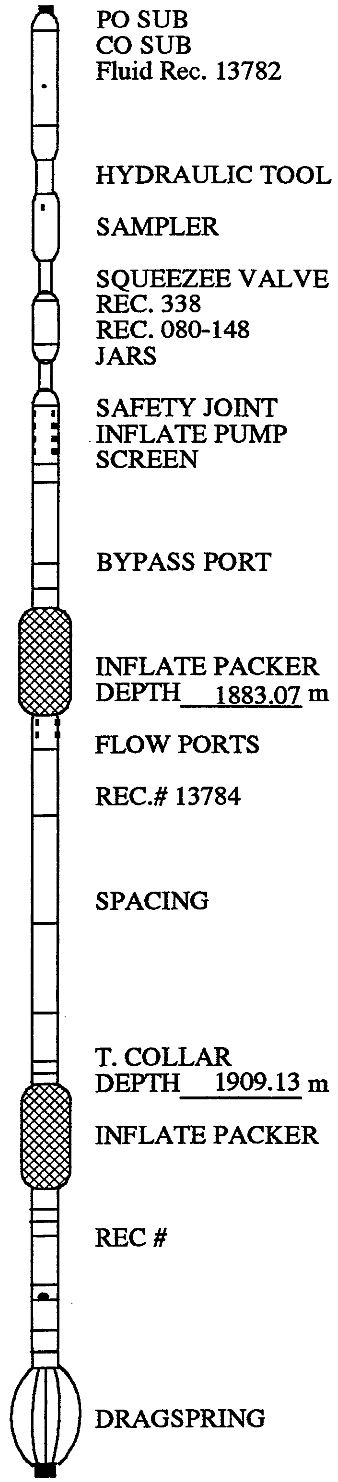
COMPANY NAME : GFE Resources Ltd.
WELL NAME : Langley # 1
LOCATION : Otway Basin PPL-1
TESTED INTERVAL : 1883.07 to 1909.13 m (26.06 m)

TICKET # 2459
D.S.T.# Three
FORMATION Eumeralla
DATE 07-06-94

TOTAL TOOL TO BOTTOM OF TOP PACKER			18.98
TOOL IN INTERVAL			26.06
BOTTOM PACKER AND ANCHOR			
TOTAL TOOL			45.04
DRILL COLLAR IN INTERVAL			17.23
TOTAL ASSEMBLY TO BOTTOM OF TOP PACKERS			18.98
D.C. ABOVE TOOLS	8 STANDS	SINGLES	142.48
D.P. ABOVE TOOLS	57 STANDS	SINGLES	1670.41
HWDP	3 STANDS	SINGLES	55.28
TOTAL DRILL COLLARS, DRILL PIPE & TOOLS			1887.15
TOTAL DEPTH TO BOTTOM OF TOP PACKER			1883.07
TOTAL STICK-UP ABOVE K.B.			4.08

PIPE TALLY

DRILL COLLAR JOINT LENGTH	DRILL PIPE JOINT LENGTH		
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Total 1	Total 2	Total 3	Total 4
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
Total 5	Total 6	Total 7	Total 8
1	1	1	DC 1
2	2	2	DP 2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
			11
Total 9	Total 10	Total 11	TOTAL



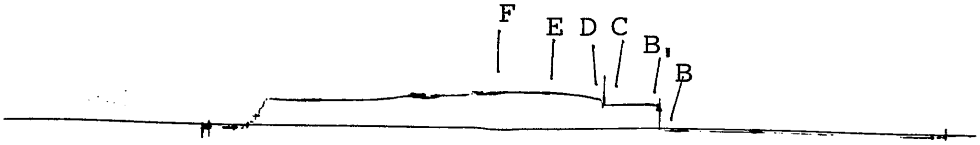
Fluid Rec. 13782
REC. 338
REC. 080-148
INFLATE PACKER DEPTH 1883.07 m
REC.# 13784
T. COLLAR DEPTH 1909.13 m

AUSTRALIAN D.S.T. CO. PTY. LTD.
BOX 619, ROMA, QUEENSLAND 4455

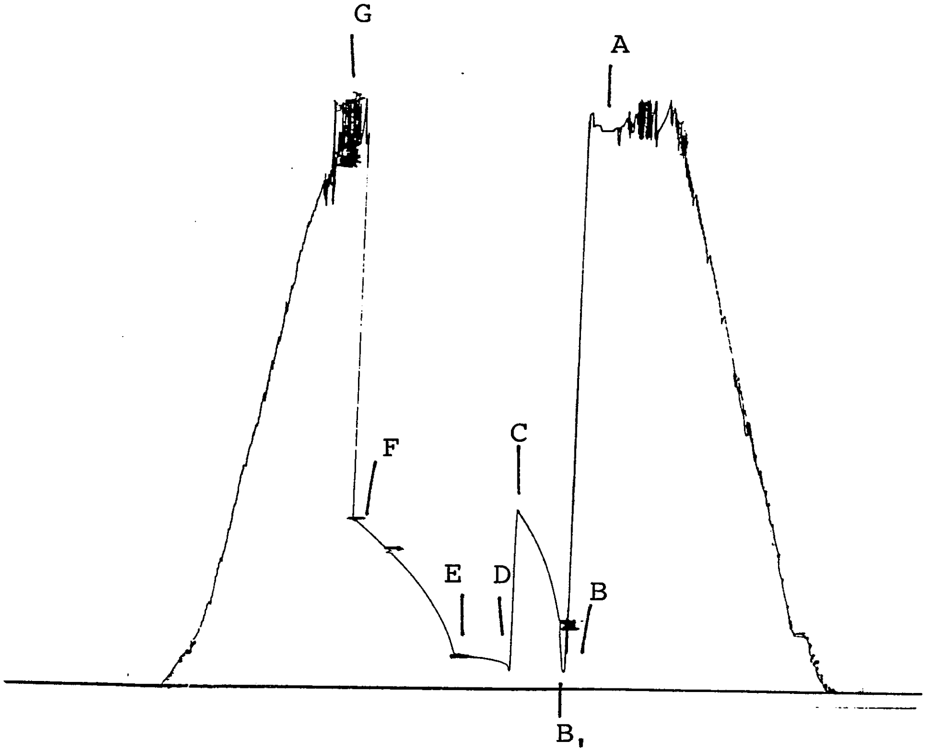
Well Name :Langley #1
Location :Otway Basin PPL-1

Ticket #:2459
DST # :Three

Recorder :13782
Depth :1866.53
Port :Fluid
A IN Hydrostatic : 0.0
B Preflow : 1.9
B1 End Preflow : 120.8
C First Shutin : 125.5
D Second flow : 146.7
E End 2nd flow : 186.4
F Second Shutin : 186.4
G FL Hydrostatic : 0.0
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0



Recorder :338
Depth :1873.07
Port :Inside
A IN Hydrostatic : 2999.0
B Preflow : 90.4
End Preflow : 102.7
C First Shutin : 950.0
D Second flow : 99.6
E End 2nd flow : 177.9
F Second Shutin : 894.9
G FL Hydrostatic : 2943.7
H Third flow : 0.0
I End third Flow : 0.0
J Third Shutin : 0.0



AUSTRALIAN D.S.T. CO. PTY. LTD.

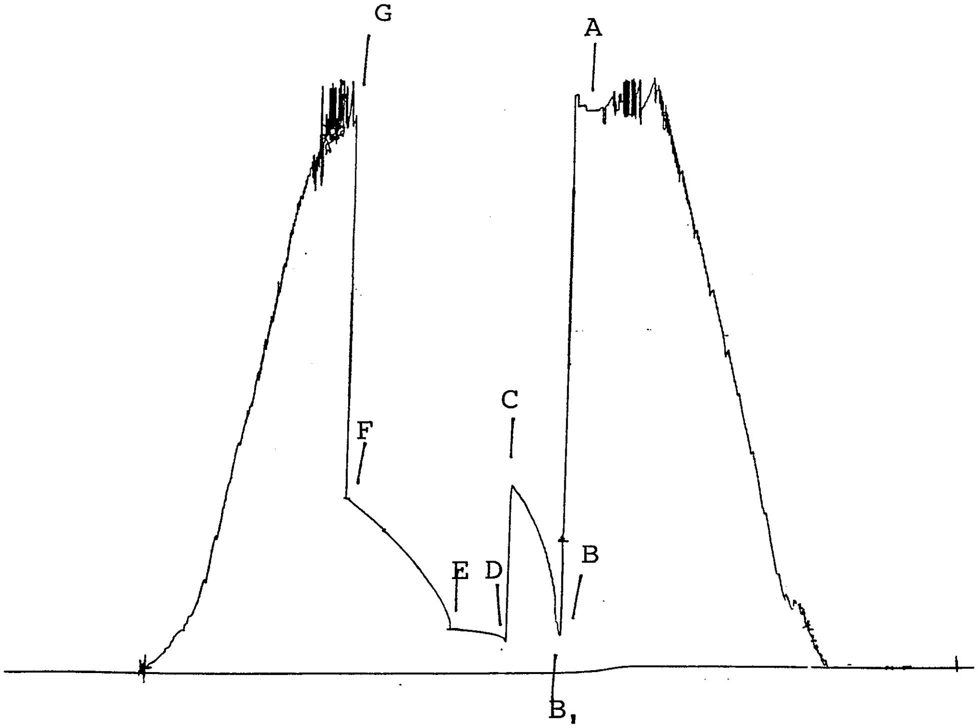
BOX 619, ROMA, QUEENSLAND 4455

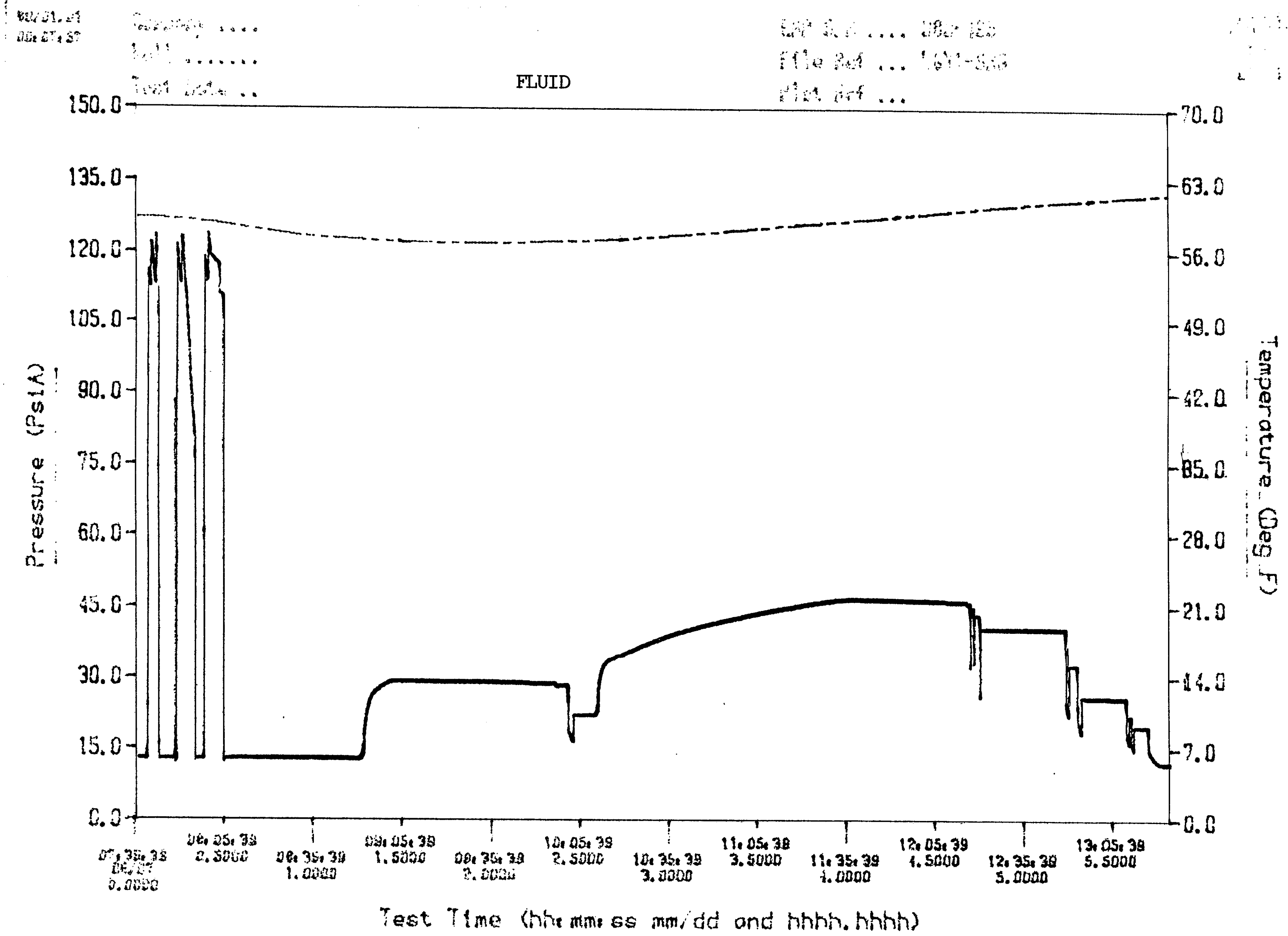
Well Name :Langley #1
Location :Otway Basin PPL-1

Ticket #:2459
DST # :Three

Recorder :13784
Depth :1884.80
Port :Outside

A	IN Hydrostatic :	3042.6
B	Preflow :	170.4
B1	End Preflow :	243.9
C	First Shutin :	977.6
D	Second flow :	139.8
E	End 2nd flow :	207.1
F	Second Shutin :	912.2
G	FL Hydrostatic :	2993.7
H	Third flow :	0.0
I	End third Flow :	0.0
J	Third Shutin :	0.0




Company ....
Well ....
Test Date ..
File Ref ...
Plot Ref ...
FLUID
Pressure (PsiA)
150.0
135.0
120.0
105.0
90.0
75.0
60.0
45.0
30.0
15.0
0.0
Temperature (Deg F)
70.0
63.0
56.0
49.0
42.0
85.0
28.0
21.0
14.0
7.0
0.0
07:35:38 06/27 0.0000
08:05:38 0.5000
08:35:39 1.0000
09:05:38 1.5000
09:35:38 2.0000
10:05:39 2.5000
10:35:39 3.0000
11:05:38 3.5000
11:35:39 4.0000
12:05:39 4.5000
12:35:38 5.0000
13:05:39 5.5000
Test Time (hh:mm:ss mm/dd and hhhh.hhhh)

GAS AND FUEL CORPORATION OF VICTORIA
SCIENTIFIC SERVICES - LABORATORY REPORT

1136 Nepean Highway, Highett, Victoria 3190, Australia

Tel. (03) 556 6222 Fax (03) 555 7616

Requested by: John Foster, GFE Resources Ltd.

File Number: 94/0701

Subject: Analysis of Langley 1 Gas Sample

Sampled: 7th of June, 1994

Received: 8th of June, 1994

Author: Ivan Strudwick

Approved by: A. J. Stevenson

Date: 9th of June, 1994

Distribution: John Foster, Operations Co-ordinator
GFE Resources Ltd., 11th Floor, East Tower

A. J. Stevenson, Scientific Services

Gas Quality & Environment (2)

Master File

Keywords: Langley 1, Natural, Analysis

LAN Reference: U:\CHEMISTR\TYPING\ILS\LANG0701.94

Master Report Number: 94/0701/C

Job Order Number: 8780206

43:ILS:ils

GAS AND FUEL CORPORATION OF VICTORIA
SCIENTIFIC SERVICES - LABORATORY REPORT

LANGLEY #1 DST 3 FSI 1-15pm SAMPLE

Date Sampled: 7th of June, 1994

Report Reference Number: 94/0701

Component	**Mole Percent Concentration**
Methane	87.1
Ethane	4.18
Propane	1.73
Iso-Butane	0.405
Normal-Butane	0.472
Neo-Pentane	0.009
Iso-Pentane	0.179
Normal-Pentane	0.147
Hexanes	0.215
Heptanes+	0.241
Carbon Dioxide	0.245
Oxygen+Argon+Nitrogen	5.1
Helium	0.017

Note: There was not sufficient sample to determine the separate oxygen+argon and nitrogen concentrations.

Calculated Properties for the dry gas at M.S.C.

Gross Heating Value	39.75 MJ/m^3
Wobbe Index	49.40 MJ/m^3
Relative Density	0.647

Procedure References: SSS-11-006
ISO 6976

Analyst: I. Strudwick

Checked: **Date:**09/06/1994

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CSIRO
AUSTRALIA

DIVISION OF
PETROLEUM RESOURCES

SYDNEY LABORATORY

TELEPHONE: +61 2 887 8666

22 August 1993

RECEIVED
8 SEP 1994
6127
[illegible]

Kevin Lanigan
GFE Resources Ltd
Box 629 Market Street Post Office
Melbourne Victoria 3000

Dear Kevin,

Please find attached the carbon isotope compositions on the light gas components from the Langley -1 gas sample.

The preparation for isotope analysis was carried out on our updated equipment which was checked for accuracy against the IAEA natural gas isotope standards NGS #1 and #2. The compositions are reported in parts per thousand relative to the carbon isotope reference material Pedee Belemnite (PDB).

Please call if you have further questions and I look forward to any future research co-operation.

Your sincerely,

Robert Dall[illegible]

Langley -1 Gas Sample

DST-3

Stable Carbon Isotope Analysis	$\delta^{13}C$ (PDB)
Methane	-31.2
Ethane	-23.4
Propane	-23.4
n-Butane	-22.8
n-Pentane	-22.9

APPENDIX 8

APPENDIX

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APPENDIX 8

TABULATED MUD GAS DATA

LANGLEY-1

LANGLEY-1

Total Gas and Chromatography

Depth (m)	TOTAL GAS (unit)	C1 (ppm)	C2 (ppm)	C3 (ppm)	C4 (ppm)
500	0.1	1			
505	0.1	2			
510	0.1	9			
515	0.1	18			
520	0.2	30			
525	0.2	24			
530	0.1	18			
535	0.1	18			
540	0.1	12			
545	0.1	12			
550	0.1	8			
555	0.1	8			
560	0.1	6			
565	0.1	6			
570	0.1	8			
575	0.1	3			
580	0.1	2			
585	0.1	1			
940	0.1	1			
945	0.1	2			
950	0.1	5			
960	0.2	24			
970	0.2	30			
980	0.1	18			
990	0.1	8			
1000	0.1	3			
1005	0.1	2			
1010	0.1	1			
1175	0.1	1			
1180	0.1	2			
1185	0.1	3			
1190	0.1	18			
1195	0.1	27			
1200	0.1	18			
1205	0.1	6			
1210	0.1	3			
1215	0.1	1			
1335	0.1	1			
1340	0.1	1			
1345	0.1	2			
1350	0.1	12			
1353	0.1	9			
1355	0.1	6			
1360	0.1	17			

Depth (m)	TOTAL GAS (unit)	C1 (ppm)	C2 (ppm)	C3 (ppm)	C4 (ppm)
1363	0.1	28			
1365	0.1	30			
1370	0.5	85			
1372	0.7	140			
1374	0.4	79			
1378	0.4	82			
1380	0.2	36			
1385	0.4	80			
1390	0.5	113			
1395	0.7	140			
1400	0.7	116			
1405	1.1	204			
1410	0.8	146			
1415	1.2	217			
1420	0.9	174			
1424	2.2	426			
1425	0.6	110			
1428	1	201			
1430	1	195			
1435	1.6	293			
1438	0.4	61			
1440	0.3	60			
1445	0.8	152			
1450	1	198			
1455	0.9	183			
1460	1	206			
1465	1.2	247	1		
1470	1.2	238	3		
1475	1.4	293	5		
1477.5	2.4	476	7		
1480	2.3	451	6		
1482	2.9	567	7		
1485	1.8	348	5		
1490	1.7	348	3		
1495	2	390	4		
1500	5.5	1037	9		
1505	2.8	530	5		
1515	3.2	610	7		
1520	3	600	5		
1525	1.3	237	4		
1530	2.5	475	5		
1535	2.3	439	5		
1540	2.1	402	4		
1545	1.7	317	3		
1550	2.4	451	8		
1555	3.2	604	10		
1560	3.3	622	14		
1565	3.6	695	15		
1567.5	3.7	705	18		

Depth (m)	TOTAL GAS (unit)	C1 (ppm)	C2 (ppm)	C3 (ppm)	C4 (ppm)
1570	3.1	585	13		
1575	3.9	741	19		
1578.5	2.7	512	14		
1580	2.7	524	14		
1585	2.5	476	14		
1590	2.3	421	19		
1595	2.5	466	16		
1600	3.2	587	22		
1605	3.3	622	22		
1610	3.2	595	22		
1615	3.3	604	24		
1620	3	549	20		
1625	2.2	397	16		
1628	2.4	439	12		
1630	1.1	189	7		
1635	1	183	6		
1640	1.7	298	12		
1645	1.7	305	12		
1650	1.8	341	8		
1655	1.3	232	8		
1660	1.5	268	11		
1665	1.6	292	11		
1670	1.7	284	17		
1675	1.8	338	19		
1680	1.8	302	20		
1685	1.6	265	19		
1690	1.4	229	20	1	
1695	2	329	19	3	
1700	2.3	384	22	4	
1705	2.2	372	22	6	
1710	1.9	330	14	3	
1715	1.5	265	11	1	
1718	1.6	262	12	2	
1720	1.6	301	12	1	
1725	1.6	302	12	1	
1728	1.3	231	8	1	1
1729.5	19	3233	86	13	21
1731.5	3	610	14	1	1
1733	3.5	690	18	2	1
1735	6	1068	29	3	1
1735.5	8.5	1495	35	3	1
1736	11.6	2196	53	4	2
1737	13.6	2538	62	7	8
1738	15.7	2867	72	10	22
1739	16.6	3019	77	12	25
1740	18.1	3254	96	14	35
1741	17	3050	77	12	30
1742	16.2	2964	77	11	24
1743	15.8	2913	76	10	24

Depth (m)	TOTAL GAS (unit)	C1 (ppm)	C2 (ppm)	C3 (ppm)	C4 (ppm)
1744	14.3	2586	72	8	24
1745	12	2196	64	8	18
1747	12.4	2196	48	32	4
1752	14.8	2562	83	41	14
1754	12	2257	38	21	6
1756	15.7	2684	119	44	20
1760	20.5	3477	72	38	33
1765	4.6	732	43	24	3
1770	3	519	17	11	1
1775	1.6	256	13	4	
1780	1	162	7	1	
1782.5	2.5	380	26	7	
1784	1.2	202	10	3	
1786	4	650	36	10	
1786.5	1.8	318	15	2	
1787	3.2	550	30	8	
1788	1.6	293	10	3	
1789	3.1	537	32	10	
1790	4.6	759	46	12	
1791	2.5	440	21	6	
1792	3.4	558	38	11	
1793	1.9	305	24	10	
1794.3	1.5	250	19	6	
1795	2.8	495	25	9	
1797	5.5	793	125	16	
1800	4.3	704	50	13	1
1801.5	21	3111	262	104	38
1802.5	2.8	421	38	15	1
1803	7.1	1265	46	9	
1805	2.8	476	21	9	
1809	5.3	900	47	17	
1810	4.3	750	38	15	
1815	8.3	1464	72	18	
1820	6	1067	49	12	
1823	4	670	27	8	
1824	10	1432	94	22	
1825	1.7	275	10	4	
1830	1.2	201	9	2	
1832.5	3.1	549	15	4	
1835	2.3	427	10	1	
1840	1.7	305	11		
1845	1.8	326	9		
1850	2.4	445	10	1	
1854.5	3	567	16	2	
1855.5	2.2	402	12	2	
1859	2.4	439	14	2	1
1860	14	2379	101	21	10
1861	2.2	403	15	3	1
1865	2.1	393	14	2	

Depth (m)	TOTAL GAS (unit)	C1 (ppm)	C2 (ppm)	C3 (ppm)	C4 (ppm)
1867.5	5	888	34	7	
1868	3.5	622	24	5	
1868.5	1.8	366	11	2	
1870	3	531	19	3	
1875	3.8	714	26	2	
1877	2	366	12	1	
1878.5	5.6	1037	34	6	
1879	5	961	25	1	
1883	2.3	421	9	2	
1885	5.2	976	24	3	1
1887	16.3	2928	100	18	20
1887.5	5.3	950	23	3	1
1888.5	13	2257	86	17	16
1890	11	1952	67	12	17
1891.5	78	13664	480	89	167
1892	11	2024	41	7	12
1893.5	66	11895	384	74	100
1894.5	12	2300	68	13	18
1895.5	34	5856	219	42	58
1896	12.5	2165	77	15	20
1897	7	1345	32	7	1
1898	13.5	2287	105	31	20
1899	10.2	1677	89	24	17
1900	15	2531	94	20	20
1901	76	13237	513	110	100
1902	87	14030	432	130	192
1903	15.5	2607	46	35	45
1904	16	2684	115	34	28
1904.5	42	7167	275	57	80
1905	54	9607	302	74	92
1906	38	6458	213	35	47
1907	14	2379	101	29	26
1908	9.2	1647	34	19	3
1909	11.5	1982	77	21	5
1910	9.5	1616	72	21	12
1912	11	2013	43	25	7
1915	10	1525	108	53	20
1916.5	11.2	1770	113	52	16
1918	9.3	1586	75	30	12
1920	5.5	808	56	38	16
1921.5	8.2	1281	75	47	17
1922	10.3	1677	89	44	16
1923	5	762	50	32	10
1925	3	430	29	21	4
1930	1.6	287	8	5	1
1932	1.3	238	6	2	
1934	1.4	250	9	3	
1935.5	5.5	1037	27	5	
1940	5.3	982	24	3	

Depth (m)	TOTAL GAS (unit)	C1 (ppm)	C2 (ppm)	C3 (ppm)	C4 (ppm)
1945	2.4	427	18	3	
1947.5	2.4	411	24	3	1
1948.5	12	2013	103	19	5
1949	4.8	854	42	7	1
1950	4.2	762	31	6	
1951	3.3	610	24	4	
1954	3.5	641	26	5	
1955	3.7	640	27	6	
1960	4.9	863	34	8	
1963	5.3	961	31	7	
1965	6	1067	38	7	
1968	5.8	1046	37	10	1
1970	14.5	2379	65	12	12
1975	7.1	1323	41	5	1
1976	30	5124	202	40	45
1976.7	48	6405	240	53	52
1980	9.6	1708	58	12	7
1985	4	671	34	12	1
1990	3	512	19	5	
1995	6	1067	34	8	
2000	6.1	1075	37	9	1
2002	15	2623	98	22	17
2006	2.2	366	15	4	1

APPENDIX 9

APPENDIX 9

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APPENDIX 9

PETROGRAPHY REPORT

LANGLEY-1

WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS

FOR
GFE RESOURCES Ltd.

LANGLEY-1

PETROGRAPHIC ANALYSIS

A. J. BUSWELL

Suite 17
The Russell Centre
159 Adelaide Terrace
East Perth 6004
Western Australia

INTRODUCTION

Methods

A total of eleven samples, six side wall cores and five core plug ends, have been analysed within this report. All samples have been petrographically examined and detailed descriptions carried out on three side wall core samples, while basic descriptions were carried out on the remaining eight samples.

All samples were impregnated with blue coloured resin and then ground to a thickness of 35 microns. After sectioning the samples were stained with Alizarin Red S and Potassium ferricyanide according to the Dickson (1966) method. This stain is used to distinguish between calcite (red), ferroan calcite (blue), dolomite (no stain), and ferroan dolomite (turquoise). Mineral percentages where obtained through visual estimate in the basic descriptions and through point counting four hundred points on the detailed descriptions (Table 1). Two photomicrographs per sample have been taken so as to highlight the main petrographic features within the thin sections.

DEPTH	Mineral Percentage Analysis Type	Sample Condition
1522.0m	Point Count - 400 points	Poor
1745.4m	Visual Estimate	Good
1746.3m	Visual Estimate	Good
1748.6m	Visual Estimate	Good
1749.6m	Visual Estimate	Good
1754.15m	Visual Estimate	Good
1784.0m	Visual Estimate	Good
1808.0m	Visual Estimate	Poor
1818.5m	Visual Estimate	Poor
1836.5m	Point Count - 400 points	Good
1884.0m	Point Count - 400 points	Moderate

Table 1. Sample condition and type of grain size analysis carried out

RESULTS AND INTERPRETATIONS

Rock Types

The samples can be divided into six groups according to lithological variations (Table 2).

Zone	Depth	Rock Type	Formation
6	1522.0m	Sideritic sandstone, fine grained	Nullawarre
5	1745.4m	Medium grained, weakly lineated quartz sandstone.	Waarre (Unit C)
4	1746.3m	Massive quartz sandstone, coarse grained.	Waarre (Unit C)
	1748.6m	Massive quartz sandstone, coarse grained	
	1749.6m	Massive quartz sandstone, coarse grained	
	1754.15m	Massive quartz sandstone, coarse grained	
3	1784.0m	Sideritic sandstone, medium grained.	Waarre (Unit B)
2	1808.5m	Micaceous quartz sandstone, medium/fine grained	Waarre (Unit A)
	1818.0m	Micaceous quartz sandstone. fine grained	
1	1836.5m	Lithic rock (predominantly volcanic)	Eumeralla
	1884.0m	Lithic rock (predominantly volcanic)	

Table 2. Lithological summary

ZONE 1 (Eumeralla Formation)
The samples are predominantly composed of lithic fragments. These fragments appear to be mainly of volcanic origin. The lithic fragments are the dominant framework grains within the zone. The framework grain size varies up to coarse sand with an average of fine/medium sand. Sorting is moderate to good and the grains are generally sub-rounded. Cementation appears to be minor, with the only recognisable cement being a massive pore filling authigenic chert. A great deal of alteration of the detrital grains to chlorite has occurred, giving a green hue to the rock in its "fresh" state.

ZONE 2 (Waarre Unit A)
The samples within this zone are in very poor condition having been heavily deformed during the side wall coring process. This makes accurate identification of the texture, grain size, porosity, grain shape and sorting impossible. An interpretation has been made but it is tentative.

The samples appear to represent micaceous quartz sandstones. They are probably grain supported as some concave/convex grain contacts are evident. Cementation is difficult to determine, however it appears to be moderate, with authigenic silica providing the primary cement. Quartz is the dominant framework grain. The grain size varies up to medium sand, with an average of approximately fine/medium sand.

Muscovite is the dominant mica present with lesser biotite. The muscovite occurs as bent and broken laths and as granular aggregates. The aggregates are interpreted to have formed from the in situ breakage of detrital grains. Kaolinisation of the muscovite is commonly identifiable. The biotite occurs as elongate laths with minor chlorite alteration associated.

ZONE 3 (Waarre Unit B)
Zone Three is comprised of one sample of a massive sideritic sandstone. It is predominantly grain supported with authigenic siderite forming the matrix material. Authigenic silica provides the dominant cement. Quartz is the dominant framework grain. It has a size range up to very coarse sand, with an average of approximately medium sand. It is possible that this sample represents a siderite nodule, however no conclusive evidence is present.

The authigenic siderite is present in the form of a fine granular aggregates. The siderite appears to be a replacement of detrital clays. Minor detrital clays are still associated with the siderite.

ZONE 4 (Waarre Unit C)
Zone four is composed of massive quartz arenites. They are grain supported and generally display concave/convex to curved contacts. Authigenic silica provides the dominant cement.

Quartz is the dominant framework grain, with lesser feldspar. The size range varies up to pebbles and has an average of approximately coarse sand. Sorting is moderate to poor. The grain shape varies from very angular to well rounded, with an average of sub-rounded.

Minor authigenic clays and pyrite are present.

ZONE 5 (Waarre Unit C)
Zone five is represented by a single sample. It is composed of a micaceous quartz sandstone. A weak alignment of the elongate axis of the detrital quartz is evident within the sandstone. The sample is grain supported, with concave/convex grain contacts. Cementation is moderate, with authigenic silica providing the primary cement.

Quartz is the dominant framework grain. It has a size range up to coarse sand and an average of approximately medium sand. Sorting is moderate to good. Minor feldspar is also present as a framework grain

Muscovite is the dominant mica present with lesser biotite. The muscovite occurs as bent and broken laths and as granular aggregates. The aggregates are interpreted to have formed from the in situ breakage of detrital grains. Kaolinisation of the muscovite is commonly identifiable. The biotite occurs as elongate laths with minor chlorite alteration associated.

ZONE 6 (Nullawarrre Formation)
Zone six is composed of an apparently massive sideritic quartz sandstone. It is predominantly matrix supported, with authigenic siderite providing the matrix material. The quartz has a size range up to medium sand and an average of approximately fine

sand. A great deal of dissolution of the detrital grains has occurred through contact with the siderite.

Porosity and Permeability

ZONE 1 (Eumeralla Formation)
The porosity and permeability within Zone 1 is negligible. A great deal of authigenic clays have formed through the breakdown of the relatively unstable lithic fragments. These clays have resulted in a reduction in primary porosity. Disaggregation of the lithic fragments prior to complete lithification has also resulted in the compaction of detrital material to infill much of the early depositional porosity. The porosity has then been further reduced by the infilling of all remaining primary intergranular porosity by authigenic chert.

ZONE 2 (Waarre Unit A)
Within Zone Two, two side wall core samples have been examined. Both of these samples are of a low quality due to deformation caused by the side wall coring process. This makes accurate identification of the porosity and permeability within this zone impossible.

ZONE 3 (Waarre Unit B)
Zone 3 has been covered by one side wall core sample. This sample displayed a high primary intergranular porosity, approximately 12%. A reduction in the porosity and permeability has been caused by the emplacement of authigenic siderite and to a lesser extent ferroan calcite. A trace of secondary porosity has also formed through the dissolution of detrital feldspars. The dissolution has been so intense that a minor increase in the permeability may also have occurred.

ZONE 4 (Waarre Unit C)
The fourth zone (covering part of Waarre Unit C) displays very good primary intergranular porosity and permeability. Visual estimates of the primary porosity range from 14% to 19%. Minor occlusion of the porosity may have occurred with the emplacement of a late stage detrital clay. This clay tends to coat the pore boundaries. This may have resulted in a reduction in the permeability as pore space between grains is infilled, possible indicating a blocking of the pore throats. It is impossible to determine whether the pore throats are blocked given the one dimensional view of a thin section. Further analysis with a scanning electron microscope (SEM) would be required to clarify this. It is also not possible to determine the origin of these clays from thin section analysis. It is possible that the clays are a result of deposition of drill mud rather than during the diagenetic history. Approximately 1% of secondary porosity has also been produced through the intense leaching of detrital feldspars. This secondary porosity also appears to have increased the permeability due to the intensity of the leaching. It is possible that some of the apparently primary porosity is, in fact secondary due to the complete leaching of detrital grains, however no conclusive evidence is identifiable.

Measured porosity data indicates a similar porosity range as that measured by visual estimate from the thin section (18.3% to 22.4%). Minor variations of porosities obtained from the thin sections are probably a result of minor error in visual estimates and local variations within samples. All samples within this zone display high permeabilities, particularly sample 1748.60m. No petrographic features are identifiable to indicate why this sample has a substantially higher permeability.

ZONE 5 (Waarre Unit C)
The fifth zone is covered by one side wall core sample. This sample appears to display a very good primary intergranular porosity, approximately 20%. A minor reduction in the porosity and permeability has resulted from the expansion of micas, due to kaolinisation. A trace of secondary porosity produced from the dissolution of the detrital feldspars is also present.

Measured porosity of the sample from Zone 5 is very close to that obtained by visual estimate from thin section analysis. A permeability of 277 md has been obtained from this sample. This value is substantially lower than that of the samples within Zone 4, although the porosity is similar. This is attributed to the finer grain size of the sample and the possible blocking of pore throats by the expanding micas.

ZONE 6 (Nullawarre Formation)
The upper most zone (Nullawarre Formation) is covered by one side wall core sample. This sample is in generally poor condition as a result of the side wall coring process and therefore an accurate interpretation of the porosity and permeability is not possible. However the intact parts of the sample tend to indicate a very low porosity due to the authigenic siderite infilling all primary porosity. This may, however be misleading as the more lithified, less porous portions of the sample will be preferentially preserved.

Diagenesis

ZONE 1 (Eumeralla Formation)
The diagenesis within Zone 1 (Eumeralla) appears to be restricted to two major events. The initial phase probably began soon after deposition and involved the alteration of detrital material to authigenic clays. The dominant recognisable clay appears to be chlorite. This phase of chloritisation probably continued throughout the majority of the sample's diagenetic history. The only other recognisable phase of diagenesis is the emplacement of authigenic chert within the intergranular pore space. It is not clear whether this has infilled either primary or secondary pore space. This phase appears to be better developed within the sample SWC #13 1836.5m, although this is interpreted to be due to the lower degree of chloritisation of the sample which may be making optical identification of the chert difficult. There may also have been less primary porosity within the deeper sample (SWC #6 1884.0m).

ZONE 2 (Waarre Unit A)
The initial phase of diagenesis within Zone Two (Waarre Unit A) appears to have been the formation of a thin authigenic silica cement. During this phase of cementation the alteration of detrital micas to form kaolinite and lesser chlorite began. This would have resulted in a reduction of the primary intergranular porosity as the micas expanded with the kaolinite alteration along the cleavage planes. The broken up

aggregates of muscovite would also have been preferentially kaolinised resulting in completely infilled pore spaces.

The second diagenetic phase was the emplacement of the carbonates; ferroan calcite and dolomite. No direct evidence for the relative timing of the two carbonate phases is apparent. The ferroan calcite occurs as a pore filling material. It appears that it generally infills secondary pore space within partially leached feldspars and, possibly other detrital and authigenic grains. The dolomite is commonly associated with the ferroan calcite, sometimes forming a granular rim around the ferroan calcite. This also appears to be the replacement of some pre-existing mineral. Associated with the carbonate emplacement phase is minor dissolution of other detrital and authigenic minerals through contact with the carbonate. This is particularly evident on the feldspars and authigenic clays, with lesser dissolution of quartz also occurring.

ZONE 3 (Waarre Unit B)

Within Zone 3 (Waarre Unit B) the initial phase of diagenesis was the formation of a thin authigenic silica cement. During this phase the alteration of muscovite to kaolinite also began. This would have resulted in a reduction of the primary intergranular pore space as the micas expanded from the alteration infilling the pore space. The leaching of the detrital feldspars also occurred in the late stages of the authigenic silica cementation phases. This would have occurred after the rock was fully lithified.

The second major phase was siderite emplacement. This appears to have commenced during the late stage of silica cementation, indicated by the presence of minor siderite rhombs within the authigenic silica overgrowths. The siderite emplacement continued after silica cementation. Much of the siderite appears to be related to the in situ replacement of detrital clays. Associated with the siderite emplacement is the dissolution of the detrital and authigenic grains.

ZONE 4 (Waarre Unit C)

The initial diagenetic phase within Zone 4 (Waarre Unit C) is the formation of a thin authigenic silica cement. Either during the late stages of this cementation or after it the leaching of the detrital feldspars occurred. The formation of authigenic pyrite also occurred early in the diagenetic sequence. This may have been related to the alteration of detrital clays.

The final stage of "diagenesis" was the emplacement of detrital clays. This is not strictly a diagenetic phase but has been included in the diagenetic history as it is a post depositional change. The clays post date the silica cements as indicated by their position on the outside of the authigenic silica. The clays are interpreted as having formed as a result of the migrating clays carried by formation fluids, or downward permeating meteoric water. An alternative explanation for the emplacement of the clays is through injection of drill mud during the drilling process. It is not possible to give a conclusive interpretation for the origin of the mud from thin section analysis. Further analysis by SEM may give a more conclusive answer.

ZONE 5 (Waarre Unit C)

The diagenetic history of Zone Five (Waarre Unit C) is very similar to that of zone 4 with the exception of the late stage detrital clays, which are absent. The degree of kaolinisation is also much greater within this zone due to the higher percentage of detrital micas present to source the kaolinite.

ZONE 6 (Nullawarre Formation)
Within Zone Six (Nullawarre Formation) the dominant phase of diagenesis was the emplacement of the siderite. It is however, likely that a phase of authigenic silica cementation pre-dated this phase. The siderite emplacement has resulted in the dissolution of much of the detrital grains present and has infilled all pore space. In some cases pseudomorphs of detrital grains are identifiable indicating the complete, in situ replacement of a pre-existing grain.

Environmental Indicators

The only sample with any environmental indicators is 1745.4m which contained a trace of glauconite. This would tend to indicate a marine origin for this sample.

LANGLEY-1	1522.0m	1745.4m	1746.3m	1748.6m	1749.6m	1754.15m	1784.0m	1808.0m	1818.5m	1836.5m	1884.0m
DETRITAL											
Quartz	39.75%	59%	73%	77%	74%	78%	53%	83%	93%	4.00%	10.50%
Feldspar	0.50%	2%	3%	1%	1%	1%	1%	1%		2.00%	7.50%
Muscovite	0.25%	6%					1%	6%	4%	0.75%	0.25%
Biotite		Trace						1%	Trace	0.25%	0.75%
Glauconite		Trace									
Clay		1%	2%	2%	1%	1%	2%	2%		3.50%	
Spinel		Trace ?									
Rock Fragments			5%	1%	1%	Trace	Trace	Trace	1%	79.00%	47.50%
Zircon							Trace	Trace			
Tourmaline								Trace	Trace		
AUTHIGENIC											
Siderite	59.25%						28%				
Ferroan Calcite	0.25%				Trace		3%	4%	Trace		
Calcite										1.25%	Trace
Dolomite								2%	1%		
Chert										4.25%	0.50%
Chlorite								1%	Trace	5.00%	33.00%
Pyrite		10%	1%	Trace	8%	1%					
Kaolinite		2%	Trace	Trace	Trace		Trace	Trace	1%		
Silica		Trace					Trace		Trace		
Opaque										Trace	Trace
POROSITY											
Primary		20%	15%	19%	14%	18%	12%				
Secondary		Trace	1%	Trace	1%	1%	Trace				

Analysis Type	Point Count	Visual	Visual	Visual	Visual	Visual	Visual	Visual	Visual	Point Count	Point Count

Table 3. Mineral percentages.

SAMPLE: Langley-1 1522.0m

Mineralogy:

Detrital	Quartz	39.75%
	Feldspar	0.50%
	Muscovite	0.25%
Authigenic	Siderite	59.25%
	Ferroan Calcite	0.25%

NB: The sample is in poor condition, with only minor regions of intact sample. These portions of the sample may not be representative of the sample as a whole. No indication of the porosity could be determined from the sample due to its generally disaggregated nature.

Description:

The sample is composed of an apparently massive sideritic sandstone. Regions of both grain support and matrix support are evident, with matrix support being dominant. The matrix is provided by authigenic siderite. Cementation appears to be good.

The quartz has a size range of medium silt (0.02mm) to medium sand (0.28mm), with an average of approximately fine sand (0.18mm). Sorting is moderate. The grain shape varies from very angular to well rounded, with an average of sub-rounded. No authigenic silica overgrowths are evident. If any overgrowths had been formed it is likely that they have been removed through contact with the corrosive siderite. The grains predominantly display an undulose extinction.

The feldspar displays a similar grain size and shape as that of the detrital quartz. Albite and polysynthetic twinned grains are evident. The grains are generally heavily corroded by the siderite.

Siderite is present in the form of a fine granular aggregate throughout the sample. Variations in the relative siderite content are evident, with the more sideritic portions being better preserved. The relationship between the relative proportions of siderite is not possible to determine due to sample condition. The siderite displays highly corrosive contacts with all other grains. Pseudomorphs are evident within the siderite, indicating the complete in situ alteration of detrital grains has occurred.

It is not possible to give an accurate determination of the porosity due to the sample condition. However within the preserved portions of the sample no porosity is evident due to the infilling by siderite.

Diagenesis

The dominant phase of diagenesis is the formation of siderite. No evidence exists to indicate whether the siderite has relaced detrital clays, or whether a pre-existing phase of cementation had occurred.

PE906697

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W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
CLIENT_OP_CO = GFE RESOURCES LTD

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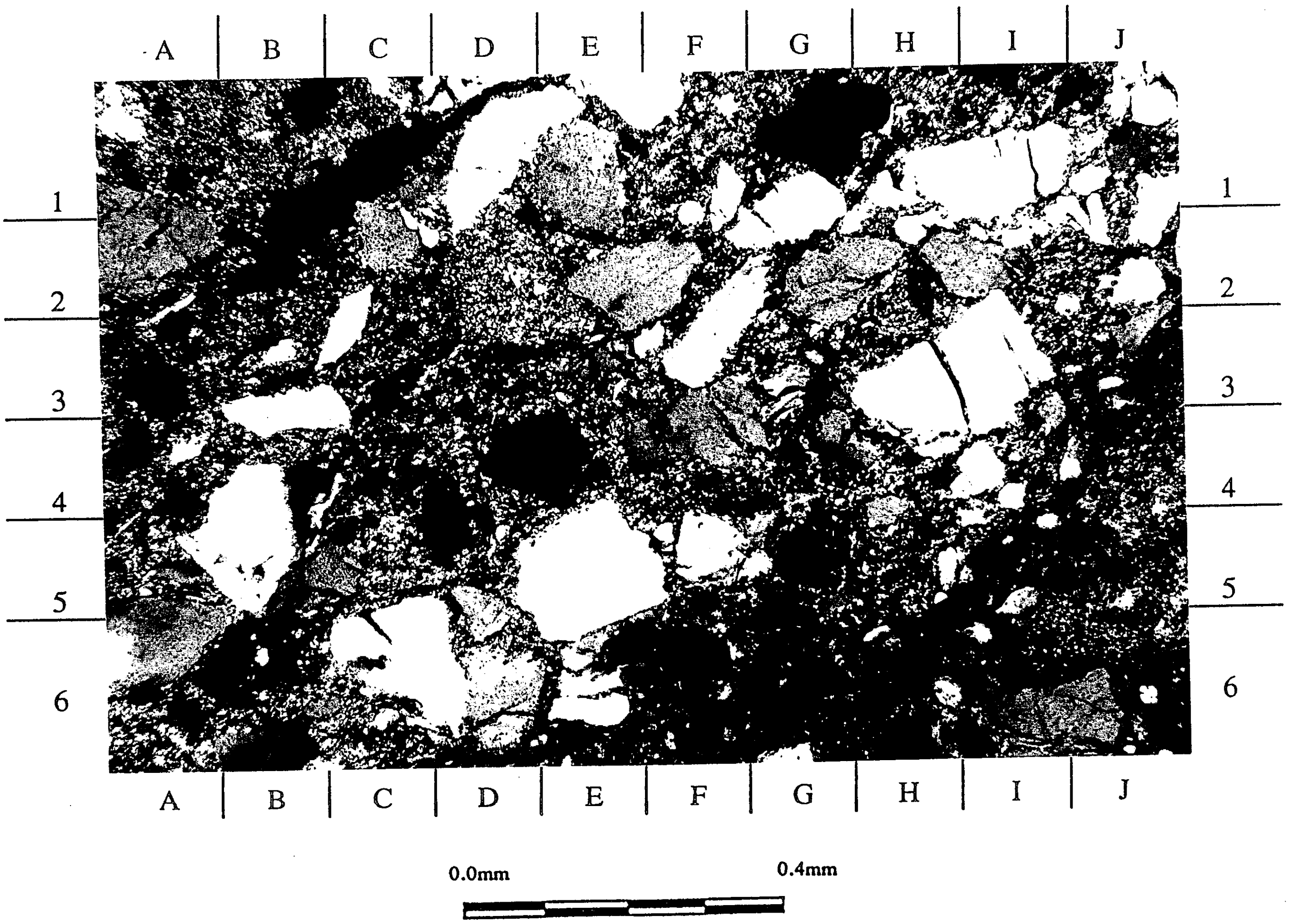

Figure 1. 1522.0m x75.6 XPL
Massive sideritic quartz sandstone. Authigenic siderite can be seen acting as the matrix material between detrital quartz grains.

PE906698

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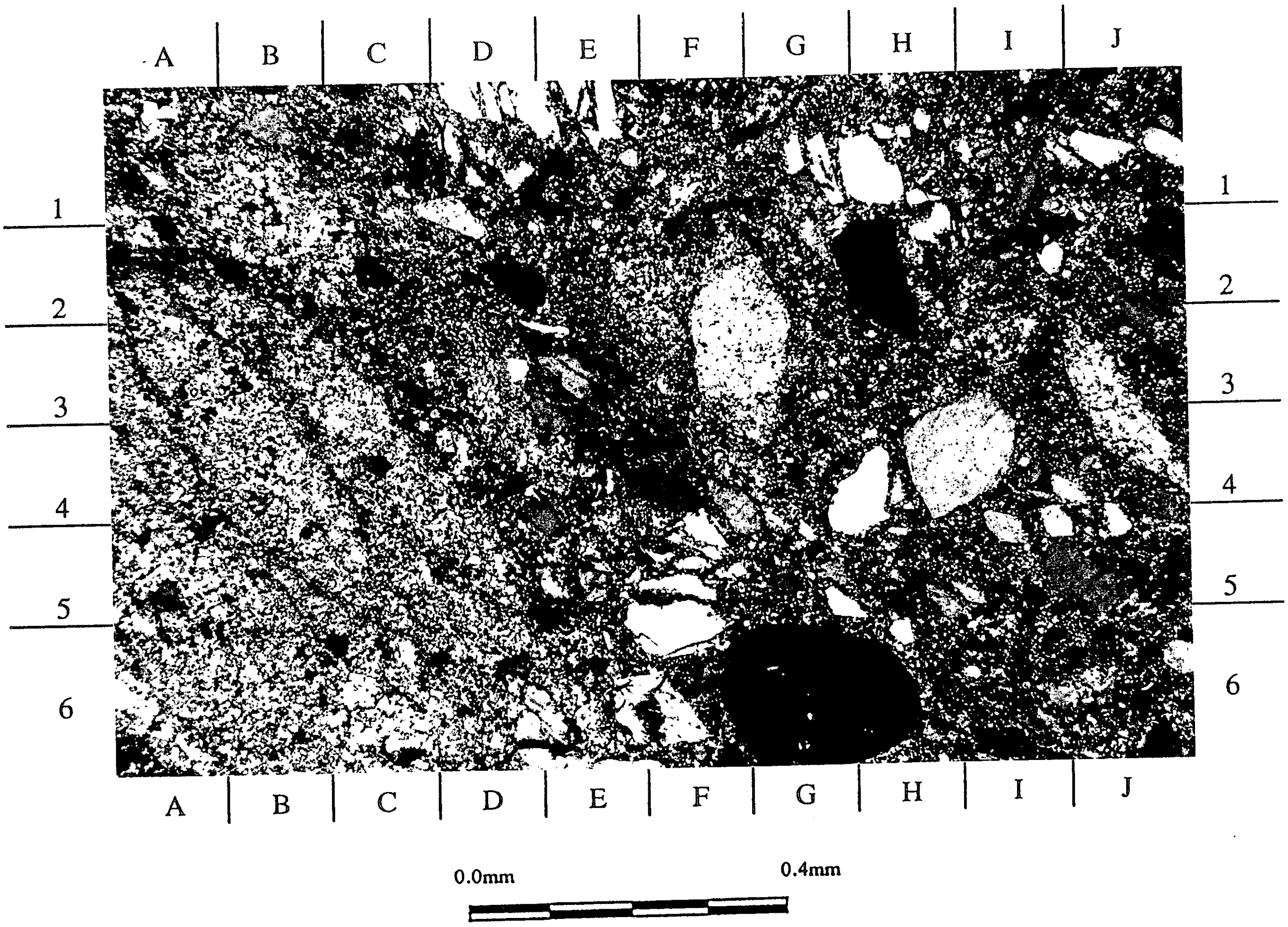

Figure 2. 1522.0m x75.6 XPL
Authigenic siderite with fractured grains of detrital quartz. A siderite pseudomorph is evident at F2. Traces of detrital clays and organic matter are also evident at B5.

SAMPLE: Langley-1 1745.4m

Mineralogy:

Detrital	Quartz	59%
	Feldspar	2%
	Muscovite	6%
	Glauconite	Trace
	Detrital Clays	1%
	Biotite	Trace
	Spinel ?	Trace
Authigenic	Pyrite	10%
	Kaolinite	2%
	Silica	Trace
Porosity	Primary	20%
	Secondary	Trace

Description:

The sample is a quartz sandstone. It displays a strong lineation, defined by elongate accumulations of pyrite. A weak preferred orientation of the elongate axis of detrital quartz is also present. The rock is grain supported with grain boundaries displaying curved to concave/convex contacts. Cementation appears to be moderate, with authigenic silica providing the primary cement.

Quartz is the dominant framework grain. Visual grain size estimates range from very fine sand (0.08mm) to coarse sand (0.59mm), with an average of approximately medium sand (0.22mm). Sorting is moderate to good. The grain shape varies from sub-angular to well rounded, with an average of sub-rounded. Authigenic silica overgrowths are present. These are commonly very poorly defined, due to the lack of a detrital "dust" inclusion rim on the outside of the detrital grain. The overgrowths that are identifiable are generally thin and discontinuous. The grains display predominantly undulose extinction (60%) with lesser straight and approximately 5% composite. The composite grains appear to be composed of quartzite rock fragments.

Feldspar is also present as a framework grain and has a similar grain size as the detrital quartz. Albite and polysynthetic twinned and untwinned grains are present. A great deal of leaching of the detrital grains is evident, particularly within the albite and untwinned grains. In some cases this has led to the almost complete disaggregation of the detrital grain.

Muscovite is present as elongate laths and as granular aggregates. The laths are generally expanded with kaolinisation along the cleavage planes. The granular aggregates have also commonly undergone kaolinisation.

Pyrite is present in the form of elongate granular aggregates and appears to have replaced detrital grains and detrital clays. Traces of organic rich clays are commonly present along the margins of the authigenic pyrite accumulations. The pyrite also rarely displays an elongate lath morphology, possibly indicating a replacement of a detrital mica grain. This replacement can be seen to have begun before the expansion of the micas, as indicated by the morphology of the accumulations. However the pyritisation can be seen to continue into the period of exfoliation of the micas, as partially pyritised exfoliated micas are also evident. The pyrite displays highly corrosive contacts with detrital quartz grains.

Good primary intergranular porosity and permeability appears to be present. A minor reduction in the porosity and permeability has resulted from the swelling of the micas as kaolinisation occurs. Secondary intra-granular porosity is also present, formed from the leaching of detrital feldspars. The leaching has been so intense that this may have also improved the permeability.

Diagenesis:

The initial stage of diagenesis is the formation of authigenic silica cement. During this phase the pyritisation of detrital clays and micas also began. The alteration of the muscovite to form kaolinite then probably commenced while the silica cementation and the pyritisation continued. The final stage of diagenesis was the leaching of the detrital feldspars.

PE906699

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CLIENT_OP_CO = GFE RESOURCES LTD

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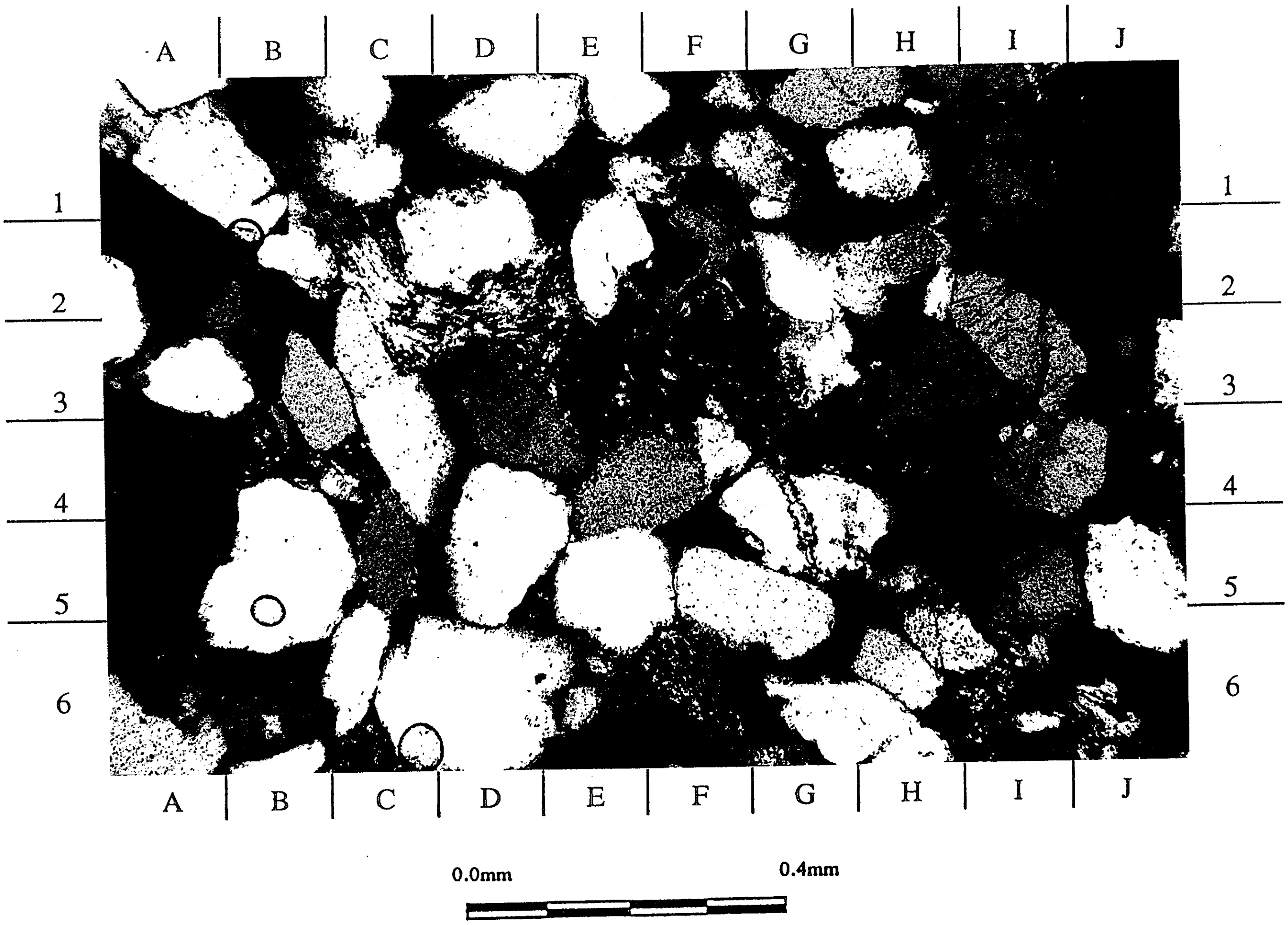

Figure 3. 1745.4m x75.6 XPL
Quartz sandstone. A weak preferred alignment of the elongate axis of the detrital quartz is evident running from A1 to J1. A partially kaolinised muscovite grain can be seen at C2, with increasing kaolinisation to G3.

PE906700

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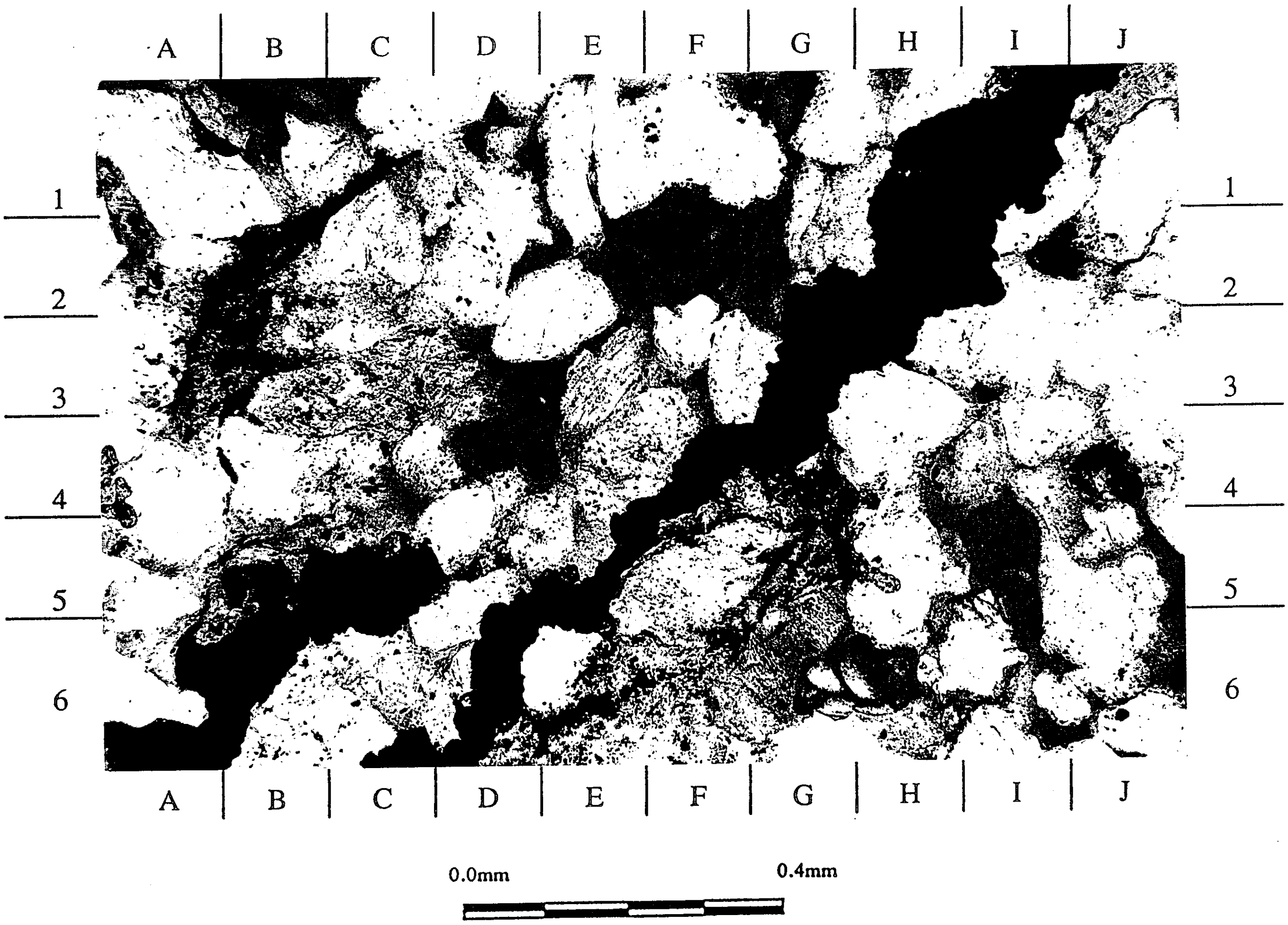

Figure 4. 1745.4m x75.6 PPL
Good intergranular porosity (stained blue) is clearly evident. A pyrite lamination is visible running from J1 to D6, this can be seen to be associated with the brown detrital clays located at G4.

SAMPLE: Langley-1 1746.3m

Mineralogy:

Detrital	Quartz	73%
	Feldspar	3%
	Rock Fragments	5%
	Clays	2%
Authigenic	Pyrite	1%
	Kaolinite	Trace
Porosity	Primary	15%
	Secondary	1%

Description:

The sample is a massive quartz arenite. It is grain supported, with grain boundaries displaying concave/convex to curved contacts. Cementation is moderate, with authigenic silica providing the dominant cement.

Quartz is the dominant framework grain. Visual grain size estimates range from very fine sand (0.09mm) to pebbles (6.00mm), with an average of approximately coarse sand (1.00mm). Sorting is moderate to poor. The grain shape varies from angular to well rounded, with an average of rounded. Authigenic silica overgrowths are present. These are commonly very poorly defined due to the lack of a detrital "dust" inclusion rim on the outside of detrital grains. The overgrowths that are identifiable are generally thin and discontinuous. The grains predominantly display an undulose extinction (60%) with lesser straight and approximately 5% composite. The composite grains appear to be composed of quartzite rock fragments.

Feldspar is also present as a framework grain and has an average grain size of approximately coarse sand (1.0mm). Albite twinned grains are dominant although minor untwinned grains are also identifiable. A great deal of leaching of detrital grains is evident. In some cases this has led to the almost complete disaggregation of the detrital grain.

Brown amorphous clays are present along the margins of the framework grains. These clays can be seen to post date the authigenic silica and are therefore interpreted as having been emplaced when formation or meteoric waters passed through the sample. These clays commonly completely coat the inside of pore spaces.

Fine granular and granular aggregates of authigenic pyrite are present. This may be related to the alteration of a pre-existing mineral, although no trace of the original mineral remains. The pyrite displays highly corrosive contacts with the detrital and authigenic quartz.

A trace of kaolinite is present, compacted into the primary intergranular pore space. This is interpreted as having formed as a result of the total in situ alteration of detrital minerals, probably muscovite.

SAMPLE: Langley-1 1746.3m cont.

Good primary intergranular porosity and permeability appear to be present. A reduction in the permeability may have resulted from the emplacement of the detrital clays, which have commonly lined the pores and possible led to the blocking of pore throats. Secondary porosity has been produced from the in situ leaching of the detrital feldspars. The leaching is so intense that the permeability has been enhanced.

Diagenesis:

The initial phase of diagenesis was the silica cementation. During this phase, or immediately after, the authigenic kaolinite was formed and the leaching of the feldspars began. This was followed by the formation of authigenic pyrite and minor dissolution of silica.

The final stage of "diagenesis" appears to be the emplacement of detrital clays. This is indicated by the clay coatings being on the out-side of the authigenic silica overgrowths and kaolinite accumulations. The clays are interpreted as having been emplaced by the movement of formation or meteoric water through the sample.

PE906701

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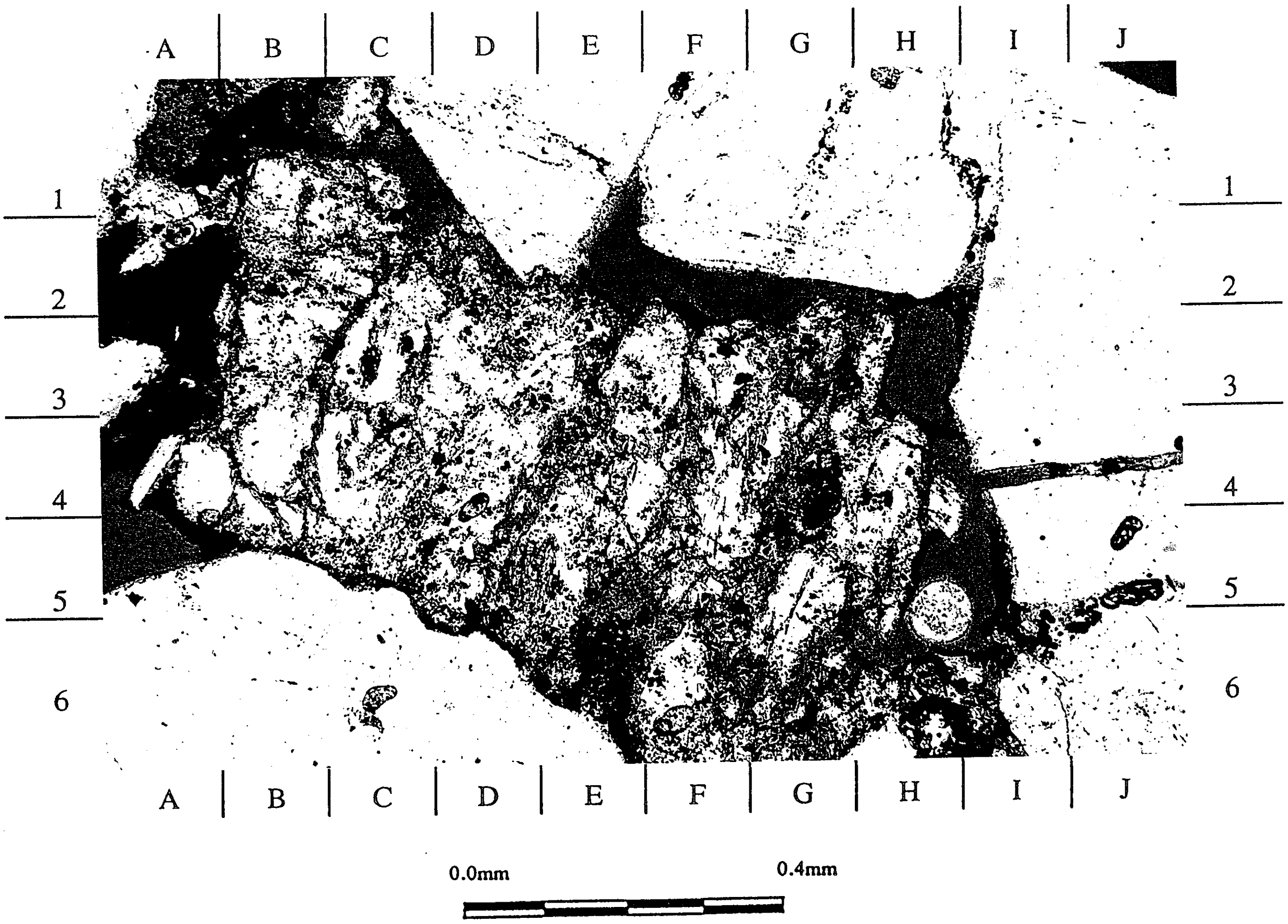

Figure 5. 1746.3m x75.6 PPL
Quartz sandstone with good intergranular porosity (stained blue). Secondary porosity is also evident within the heavily leached feldspar at F4. Thin detrital clays are also visible coating the primary pore space at H3.

PE906702

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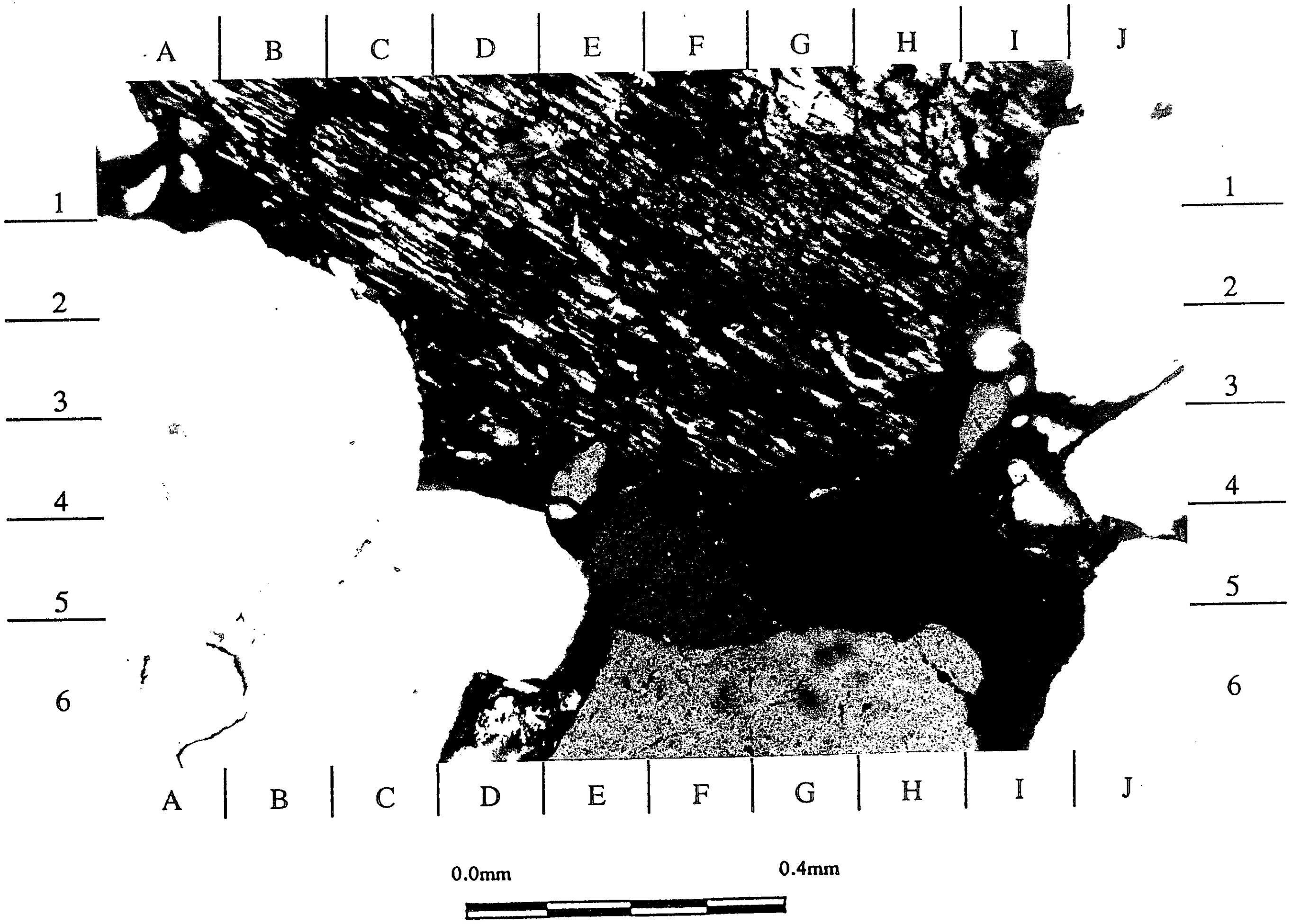

Figure 6. 1746.3m x75.6 XPL
Quartz sandstone with heavily leached feldspar at E2. A detrital clay coating on primary pore space is also evident at J4.

SAMPLE: Langley-1 1748.6m

Mineralogy:

Detrital	Quartz	77%
	Feldspar	1%
	Rock Fragments	1%
	Clays	2%
Authigenic	Pyrite	Trace
	Kaolinite	Trace
Porosity	Primary	19%
	Secondary	Trace

Description:

The sample is a massive quartz arenite. It is grain supported, with the grain boundaries displaying concave/convex to curved contacts. Cementation is moderate, with authigenic silica providing the dominant cement.

Quartz is the dominant framework grain. Visual grain size estimates range from fine sand (0.15mm) to granules (3.00mm), with an average of approximately very coarse sand (1.10mm). Sorting is poor. The grain shape varies from very angular to well rounded, with an average of sub-rounded. Authigenic silica overgrowths are present. These are commonly very poorly defined, due to the lack of a detrital "dust" inclusion rim on the outside of the detrital grain. The overgrowths that are identifiable are generally thin and discontinuous. The grains predominantly display an undulose extinction (60%), with lesser straight and approximately 5% composite. The composite grains appear to be composed of quartzite rock fragments.

Feldspar is also present as a framework grain, and has an average grain size of approximately coarse sand (0.90mm). Albite twinned grains are dominant although minor untwinned grains are also identifiable. A great deal of leaching of the detrital grains is evident. In some cases this has led to the almost complete disaggregation of the detrital grain. A trace of ferroan calcite is associated with the feldspar.

Brown amorphous clays are present along the margins of the framework grains. These clays can be seen to post date the authigenic silica and are therefore interpreted as having been emplaced when formation or meteoric waters passed through the sample. These clays commonly completely coat the inside of pore spaces.

Good primary intergranular porosity and permeability appears to be present. A reduction in the permeability may have resulted from the emplacement of the detrital clays, which have commonly lined the pores and possible led to the blocking of pore throats. Secondary porosity has been produced from the in situ leaching of the detrital feldspars. The leaching is so intense that the permeability has been enhanced.

SAMPLE: Langley-1 1746.3m cont.

Diagenesis:

The initial phase of diagenesis was silica cementation. During this phase, or immediately after, leaching of the feldspars began. This was followed by the formation of authigenic pyrite and minor dissolution of silica.

The final stage of diagenesis appears to be the emplacement of the detrital clays. This is indicated by the clay coatings being on the out-side of the authigenic silica overgrowths and kaolinite accumulations. The clays are interpreted as having been emplaced by the movement of formation water through the sample. An alternative interpretation is that the clays are a result of injection of drill mud into the highly porous lithology.

PE906703

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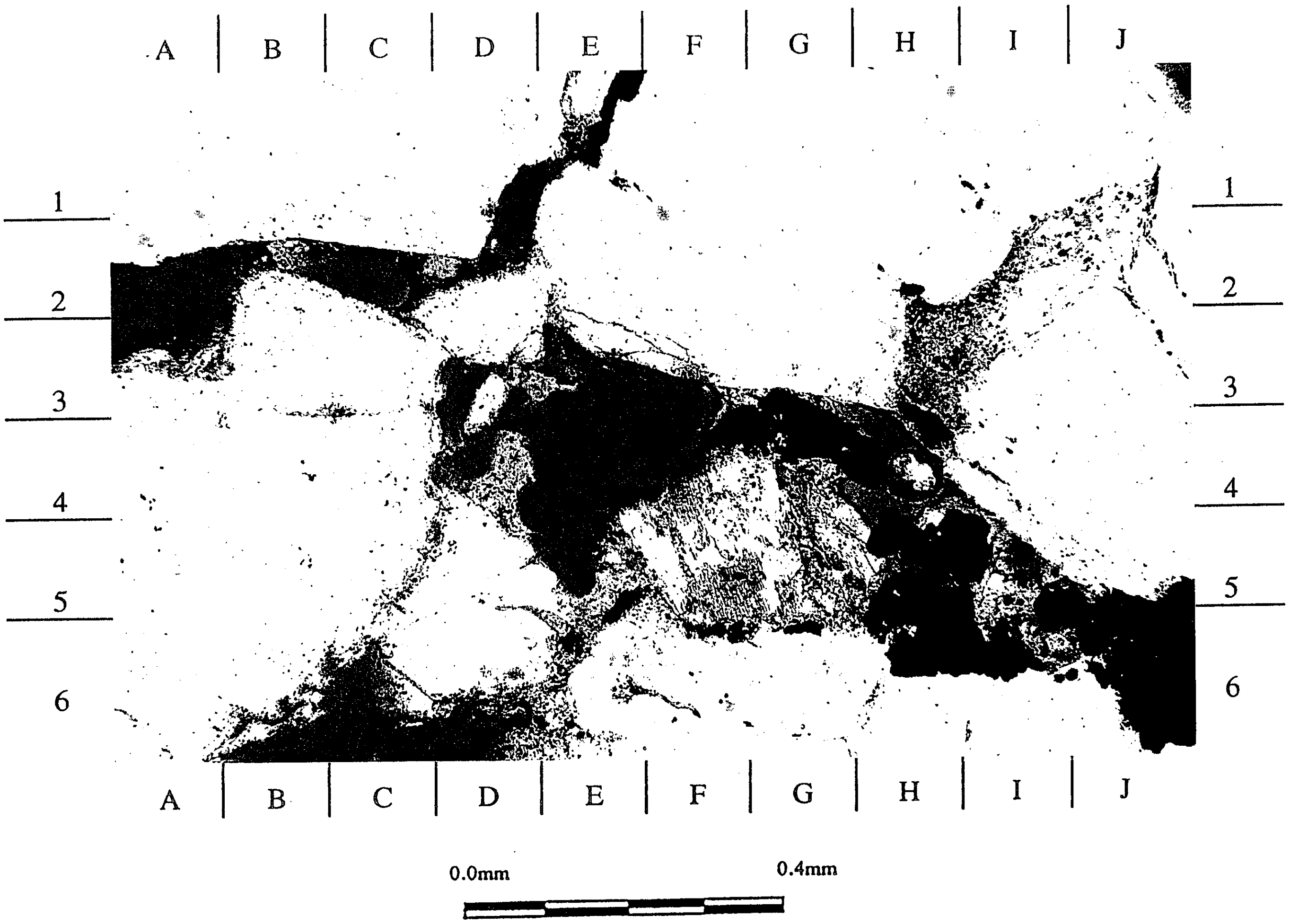

Figure 7. 1748.6m x75.6 PPL
Massive quartz sandstone. Good primary intergranular porosity is evident (stained blue). A partially leached feldspar can be seen at G5. Authigenic pyrite is also evident at H5.

PE906704

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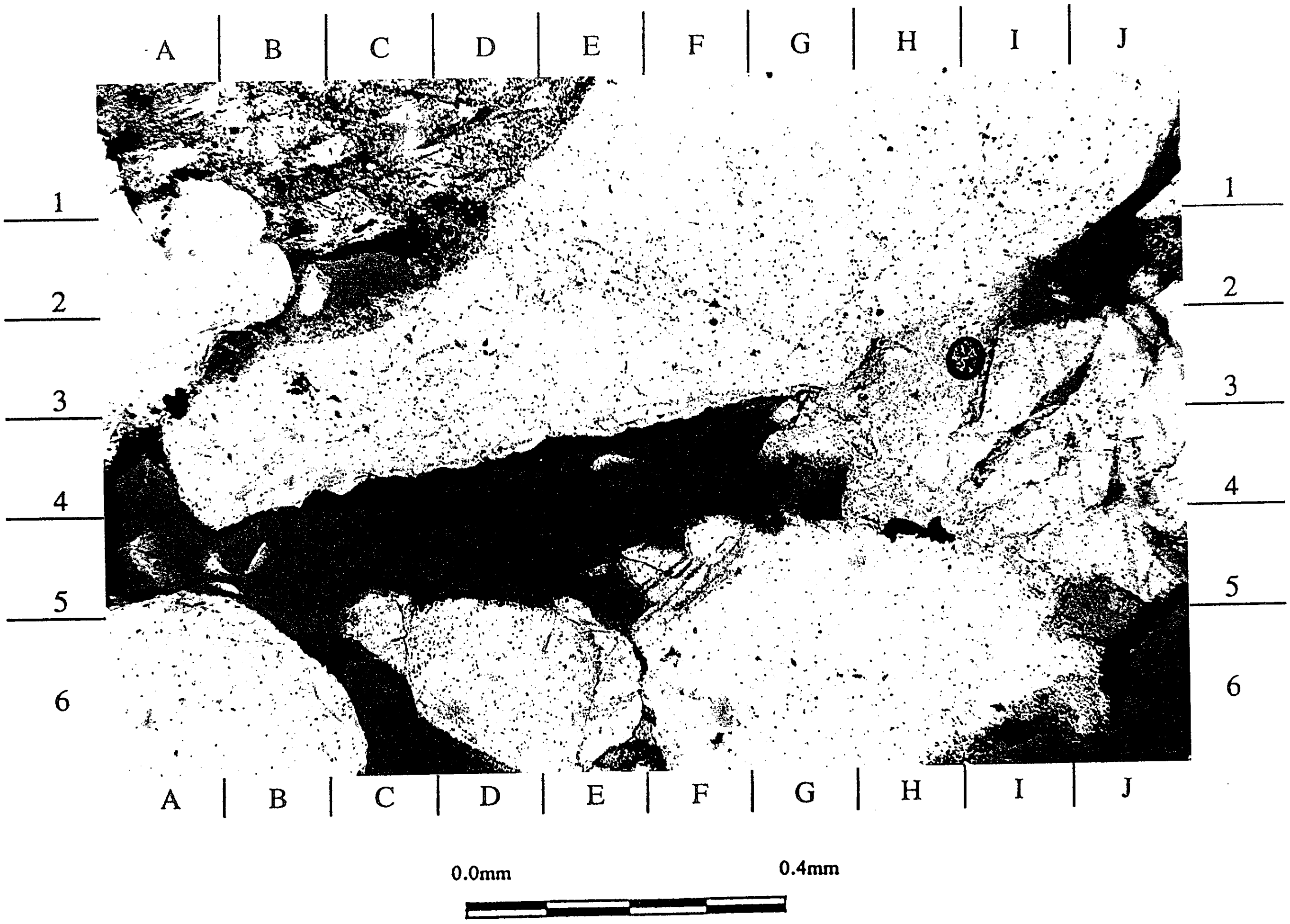

Figure 8. 1748.6m x75.6 PPL
Massive quartz sandstone. Good primary intergranular porosity (stained blue). Detrital clays are evident coating authigenic quartz at D4. The detrital clays can also be seen to bridge two framework grains and possible be infilling a pore throat at C6.

SAMPLE: Langley-1 1749.6m

Mineralogy:

Detrital	Quartz	74%
	Feldspar	1%
	Rock Fragments	1%
	Clays	1%
Authigenic	Pyrite	8%
	Kaolinite	Trace
	Ferroan Calcite	Trace
Porosity	Primary	14%
	Secondary	1%

Description:

The sample is a massive quartz arenite. It is grain supported, with the grain boundaries displaying concave/convex to curved contacts. Cementation is moderate, with authigenic silica and pyrite providing the cements.

Quartz is the dominant framework grain. Visual grain size estimates range from very fine sand (0.11mm) to granules (3.00mm), with an average of approximately coarse sand (0.95mm). Sorting is moderate to poor. The grain shape varies from very angular to well rounded, with an average of sub-rounded. Authigenic silica overgrowths are present. These are commonly very poorly defined, due to the lack of a detrital "dust" inclusion rim on the outside of the detrital grain. The overgrowths that are identifiable are generally thin and discontinuous. The grains predominantly display an undulose extinction (60%), with lesser straight and approximately 1% composite. The composite grains appear to be composed of quartzite rock fragments. Minor detrital chert is also present

Feldspar is also present as a framework grain and has an average grain size of approximately coarse sand (0.95mm). Albite twinned grains are dominant, although minor untwinned grains are also identifiable. A great deal of leaching of the detrital grains is evident. In some cases this has led to the almost complete disaggregation of the detrital grain. Minor ferroan calcite is associated with the feldspars.

Brown amorphous clays are present along the margins of the framework grains. These clays can be seen to post-date the authigenic silica and are therefore interpreted as having been emplaced when formation or meteoric waters passed through the sample. These clays commonly completely coat the inside of pore spaces.

Coarse cubes (average size approximately 0.02mm) and granular aggregates of authigenic pyrite are present. These are both highly corrosive towards the framework grains. The pyrite is preferentially associated with the feldspars, micas and detrital chert, however it is also commonly present along the margins of the quartz grains.

A trace of kaolinite is present, compacted into the primary intergranular pore space. This is interpreted as having formed as a result of the total in situ alteration of detrital minerals, probably muscovite. Traces of partially altered muscovite are identifiable.

SAMPLE: Langley-1 1749.6m cont.

Good primary intergranular porosity and permeability appear to be present. A reduction in the permeability may have resulted from the emplacement of the detrital clays, which have commonly lined the pores and possible led to the blocking of pore throats. Authigenic pyrite has also reduced the primary porosity. Secondary porosity has been produced from the in situ leaching of the detrital feldspars. The leaching is so intense that the permeability has been enhanced.

Diagenesis:

The initial phase of diagenesis was silica cementation. During this phase, or immediately after, the authigenic kaolinite was formed and the leaching of the feldspars began. It is most likely that the formation of the kaolinite began before the rock was fully lithified as indicated by the compacted nature of the kaolinite. This was followed by the formation of the authigenic pyrite and minor dissolution of the silica.

The final stage of "diagenesis" appears to be the emplacement of the detrital clays. This is indicated by the clay coatings being on the out-side of the authigenic silica overgrowths and kaolinite accumulations. The clays are interpreted as having been emplaced by the movement of formation water through the sample. An alternative interpretation is that the clays are a result of injection of drill mud into the highly porous lithology.

PE906705

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W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
CLIENT_OP_CO = GFE RESOURCES LTD

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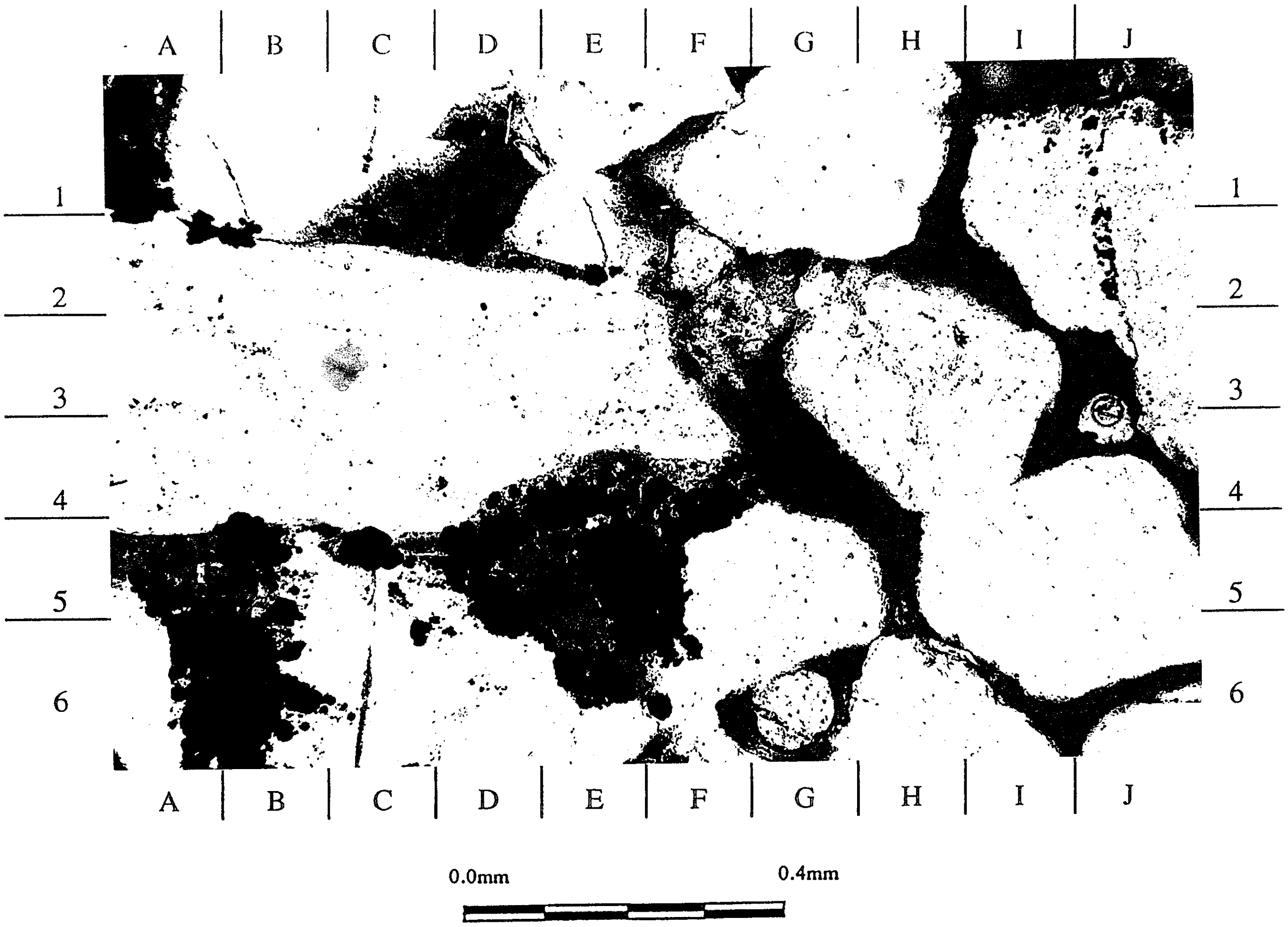

Figure 9. 1749.6m x75.6 PPL
Massive quartz sandstone. Good primary porosity is visible (stained blue). Authigenic pyrite can be seen within the pore space at E5. This can be seen to display highly corrosive contacts with the quartz grains. Detrital clays are evident coating the pore space (eg. H2).

PE906706

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The enclosure PE906706 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906706 has the following characteristics:

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CLIENT_OP_CO = GFE RESOURCES LTD

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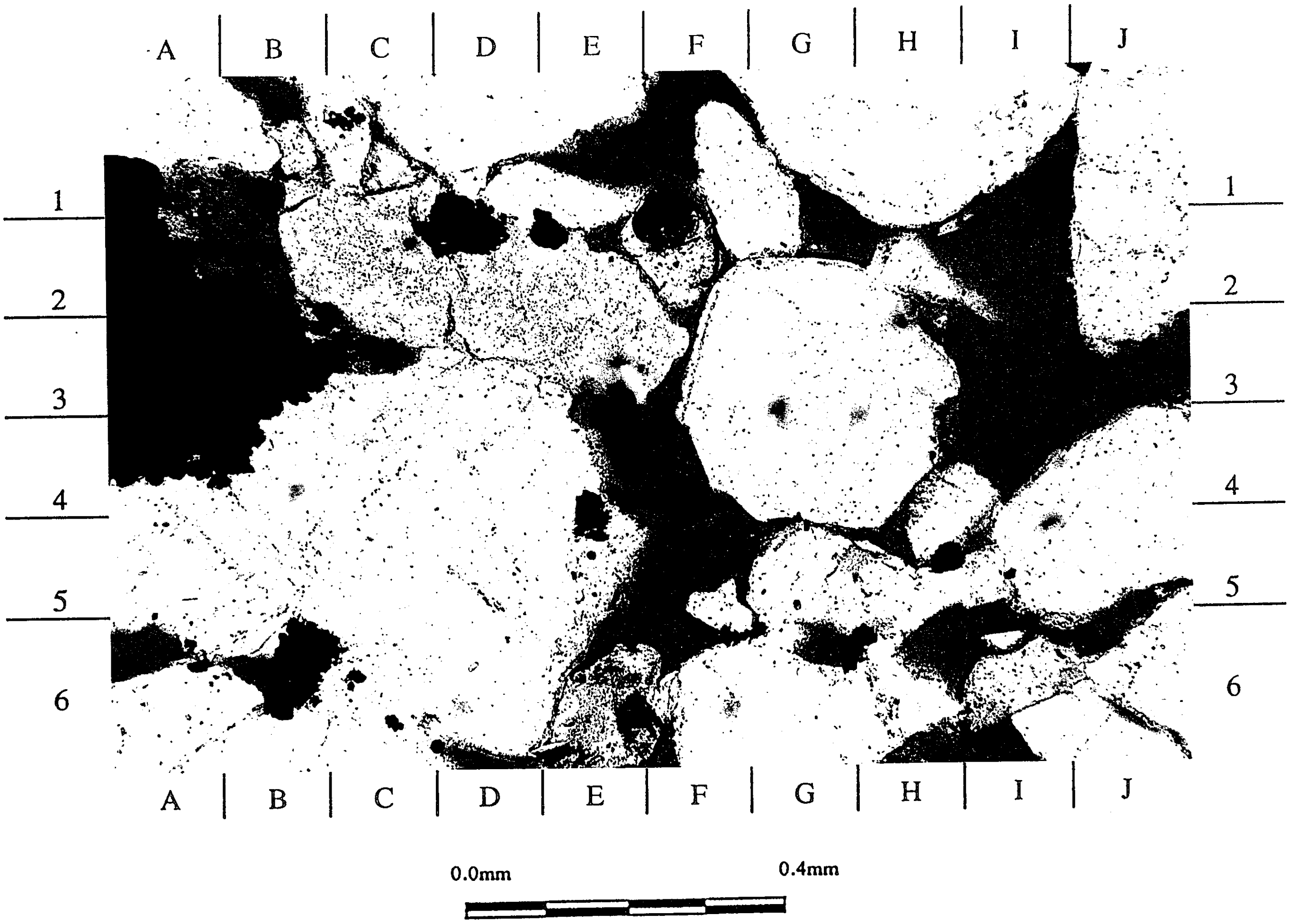

Figure 10. 1749.6m x75.6 PPL
Massive quartz sandstone. Good primary porosity is evident (stained blue). Thin authigenic silica overgrowths can be seen at F2. The overgrowth can be seen to be coated with detrital clay.

SAMPLE: Langley-1 1754.15m

Mineralogy:

Detrital	Quartz	78%
	Feldspar	1%
	Rock Fragments	Trace
	Clays	1%
Authigenic	Pyrite	1%
Porosity	Primary	18%
	Secondary	1%

Description:

The sample is a massive quartz arenite. It is grain supported, with the grain boundaries displaying concave/convex to curved contacts. Cementation is moderate to good, with authigenic silica providing the dominant cement.

Quartz is the dominant framework grain. Visual grain size estimates range from very fine sand (0.11mm) to granules (4.00mm), with an average of approximately coarse sand (0.85mm). Sorting is moderate. The grain shape varies from angular to well rounded, with an average of rounded. Authigenic silica overgrowths are present. These are generally thin (0.01mm) and discontinuous. The overgrowths are also poorly defined, with fluid inclusions generally marking the detrital grain boundary. The grains predominantly display an undulose extinction (60%) with lesser straight and approximately 1% composite. The composite grains appear to be composed of quartzite rock fragments.

The feldspar grains display a similar average size distribution as that of the detrital quartz. Albite twinned grains are dominant, although minor untwinned grains are also identifiable. A great deal of leaching of the detrital grains is evident, in some cases, leading to the almost complete disaggregation of the detrital grain.

Brown amorphous clays are present along the margins of the framework grains. These clays can be seen to post date the authigenic silica and are therefore interpreted as having been emplaced when formation or meteoric waters passed through the sample. These clays commonly completely coat the inside of pore spaces.

Fine granular crystals and granular aggregates of authigenic pyrite are present. The pyrite appears to be replacing a fossil fragment in one case, however in the majority of the occurrences no pre-existing material is evident. The pyrite displays highly corrosive contacts with the detrital and authigenic quartz.

Good primary intergranular porosity and permeability appear to be present. A reduction in the permeability may have resulted from the emplacement of the detrital clays, which have commonly lined the pores and possibly led to the blocking of pore throats. Secondary porosity has been produced from the in situ leaching of the detrital feldspars. The leaching is so intense that the permeability has been enhanced.

SAMPLE: Langley-1 1754.15m cont.

Diagenesis:

The initial phase of diagenesis was the formation of authigenic silica cement, followed by the leaching of feldspars and emplacement of pyrite.

The final stage of "diagenesis" appears to be the emplacement of detrital clays. This is indicated by the clay coatings being on the out-side of the authigenic silica overgrowths and kaolinite accumulations. The clays are interpreted as having been emplaced by the movement of formation water through the sample. An alternative interpretation is that the clays are a result of injection of drill mud into the highly porous lithology.

PE906707

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CLIENT_OP_CO = GFE RESOURCES LTD

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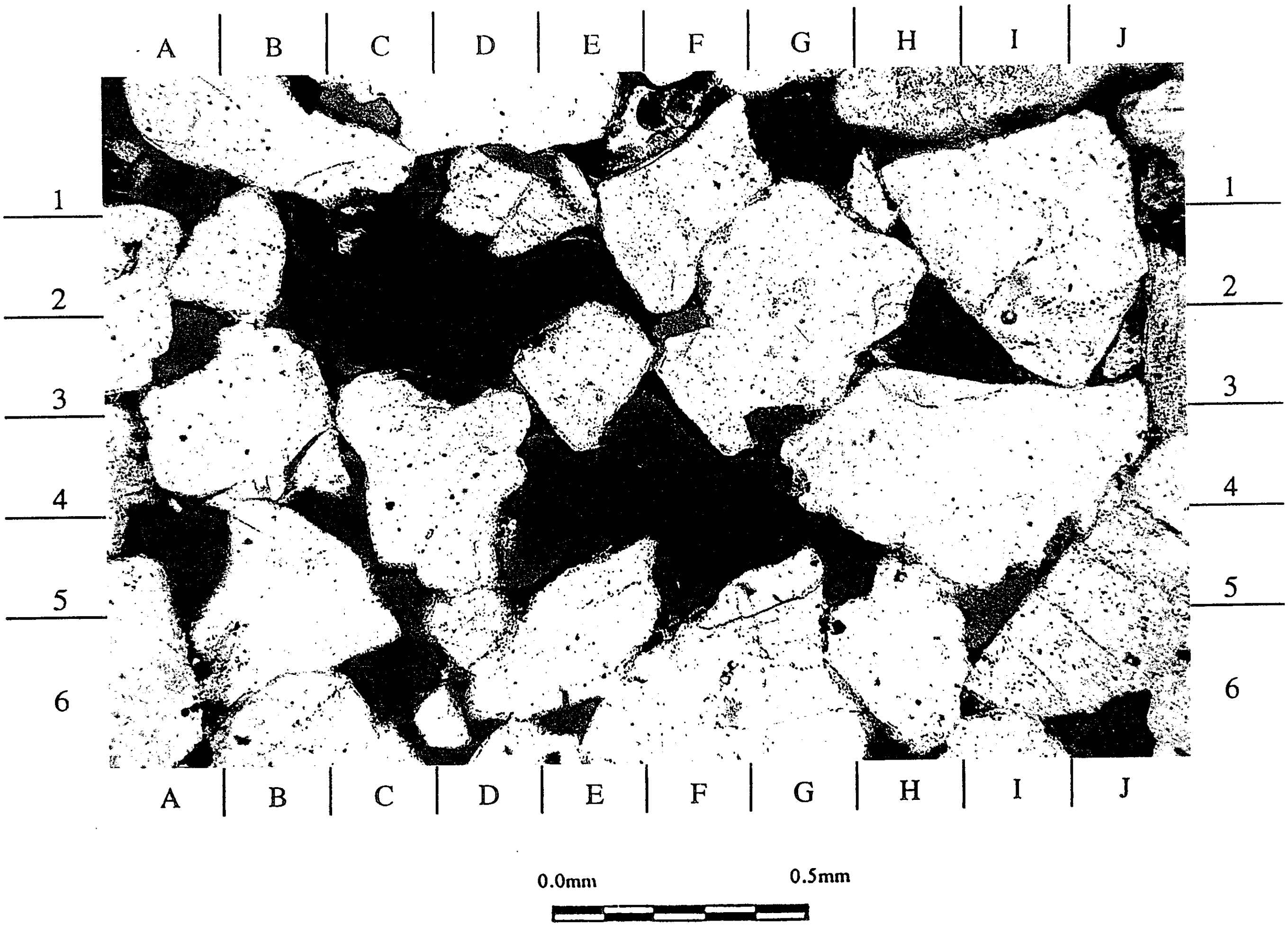

Figure 11. 1754.15m x48 PPL
Massive quartz sandstone. Good primary porosity is evident (stained blue). Detrital clays can be clearly seen coating the quartz grains and partly blocking pore throats.

PE906708

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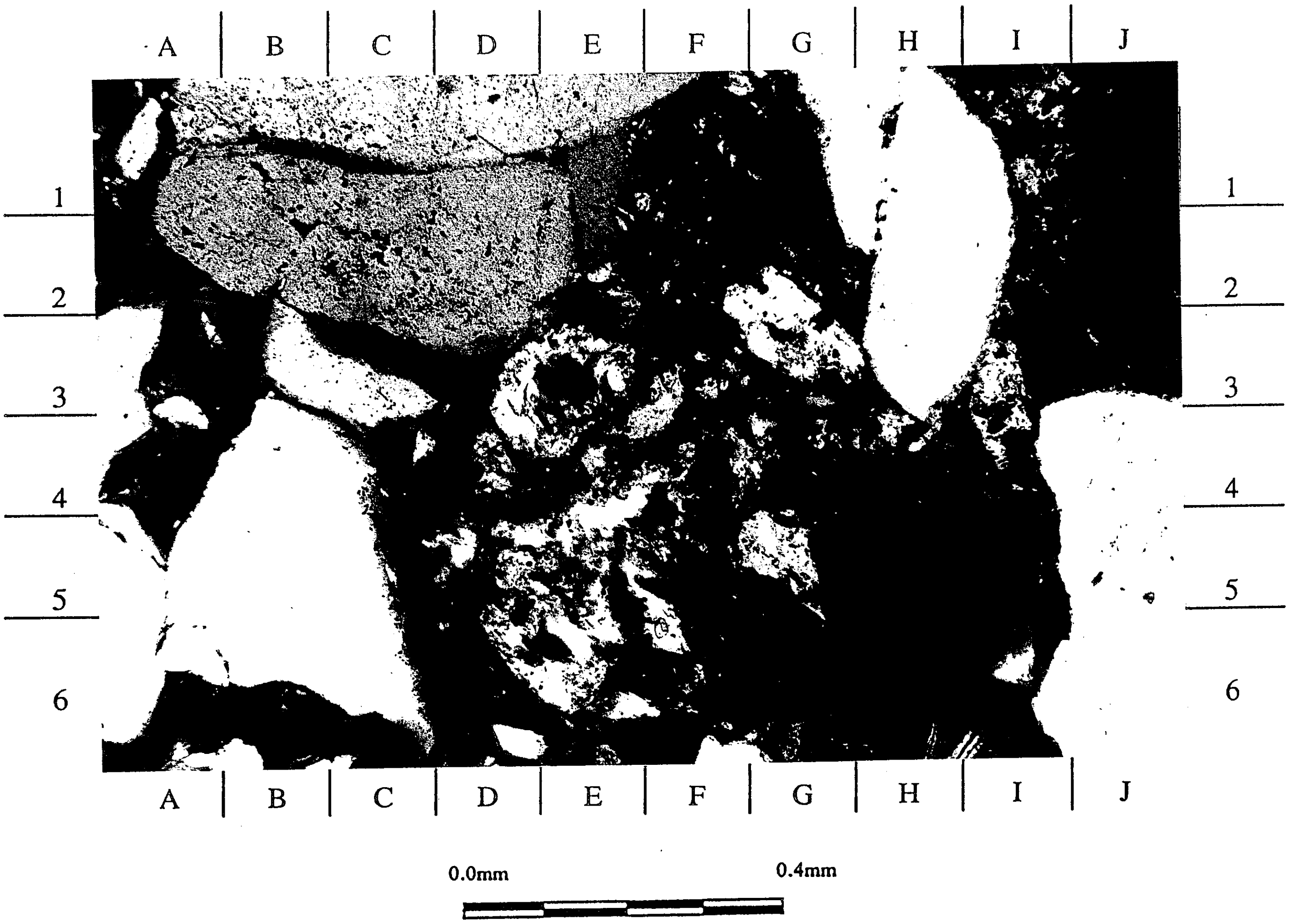

Figure 12. 1754.15m x75.6 XPL
Massive quartz sandstone with a heavily leached feldspar at E4.

SAMPLE: Langley-1 1784.0m

Mineralogy:

Detrital	Quartz	53%
	Feldspar	1%
	Muscovite	1%
	Detrital Clay	2%
	Volcanic Rock Fragments	Trace
	Zircon	Trace
Authigenic	Siderite	28%
	Ferroan Calcite	3%
	Kaolinite	Trace
	Silica	Trace
Porosity	Primary	12%
	Secondary	Trace

Description:

The sample is a massive sideritic quartz sandstone. It is predominantly grain supported, with grain boundaries displaying point to curved contacts. The grain contacts have been commonly removed by corrosive contacts with authigenic siderite. Authigenic siderite forms the main matrix material. Cementation appears to be moderate with authigenic siderite providing the dominant visible cement.

Quartz is the dominant framework grain. Visual grains size estimates range from coarse silt (0.06mm) to very coarse sand (1.10mm), with an average of approximately medium sand (0.50mm). Sorting is moderate. The grain shape varies from sub-angular to well rounded, with an average of sub-rounded. Traces of authigenic silica overgrowths are present. These appear to have acted as the initial cement pre-dating the authigenic siderite. It is probable that the a high proportion of the authigenic silica has been removed by contact with the siderite. The grain extinction is predominantly undulose (approximately 80%), with lesser straight and traces of composite.

Polysynthetic, albite and untwinned grains are present. The albite and untwinned grains are commonly heavily leached.

Authigenic siderite is present as a fine granular aggregate throughout the sample. Two poorly defined sideritic laminations are evident. Associated with these laminations is a great deal of brown organic matter. These siderite laminations are interpreted as having replaced organic rich detrital clay laminations. The siderite is also present along the margins of quartz grains and infilling the intergranular porosity. It generally displays highly corrosive contacts, with both the detrital and authigenic silica.

SAMPLE: Langley-1 1784.0m cont.

Ferroan calcite is present in a massive sparry form, infilling the intergranular pore space. Traces of feldspar are commonly associated with the ferroan calcite accumulations. The ferroan calcite also appears to have preferentially infilled the secondary pore space within the partially leached detrital feldspars. The ferroan calcite also displays highly corrosive contacts with the detrital feldspar and quartz.

Detrital muscovite is present in the form of elongate laths. Minor kaolinisation of the micas is evident.

Minor detrital clays are located within the intergranular pore space. These are dark brown in colour and predominantly amorphous.

Good primary intergranular porosity is present. Minor reductions in the porosity and permeability have occurred with the emplacement of the authigenic siderite and ferroan calcite. Minor secondary intragranular porosity has been produced due to the dissolution of detrital feldspars.

Diagenesis:

The initial phase of digenesis was the formation of authigenic silica, which resulted in the formation of the primary cement. During this phase the alteration of detrital micas to form kaolinite probably began and during its late stages the leaching of the detrital feldspars began.

The second major phase was the siderite emplacement. This appears to have occurred during the final stages of the authigenic silica formation. Minor siderite rhombs are evident along the detrital margins of quartz grains on the inside of authigenic silica overgrowths. The siderite emplacement also continued post authigenic silica as indicated by siderite coatings on the authigenic silica. Much of the siderite appears to have replaced detrital clays.

The final phase of digenesis was the emplacement of ferroan calcite, followed by the dissolution of detrital quartz and feldspar.

PE906709

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WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
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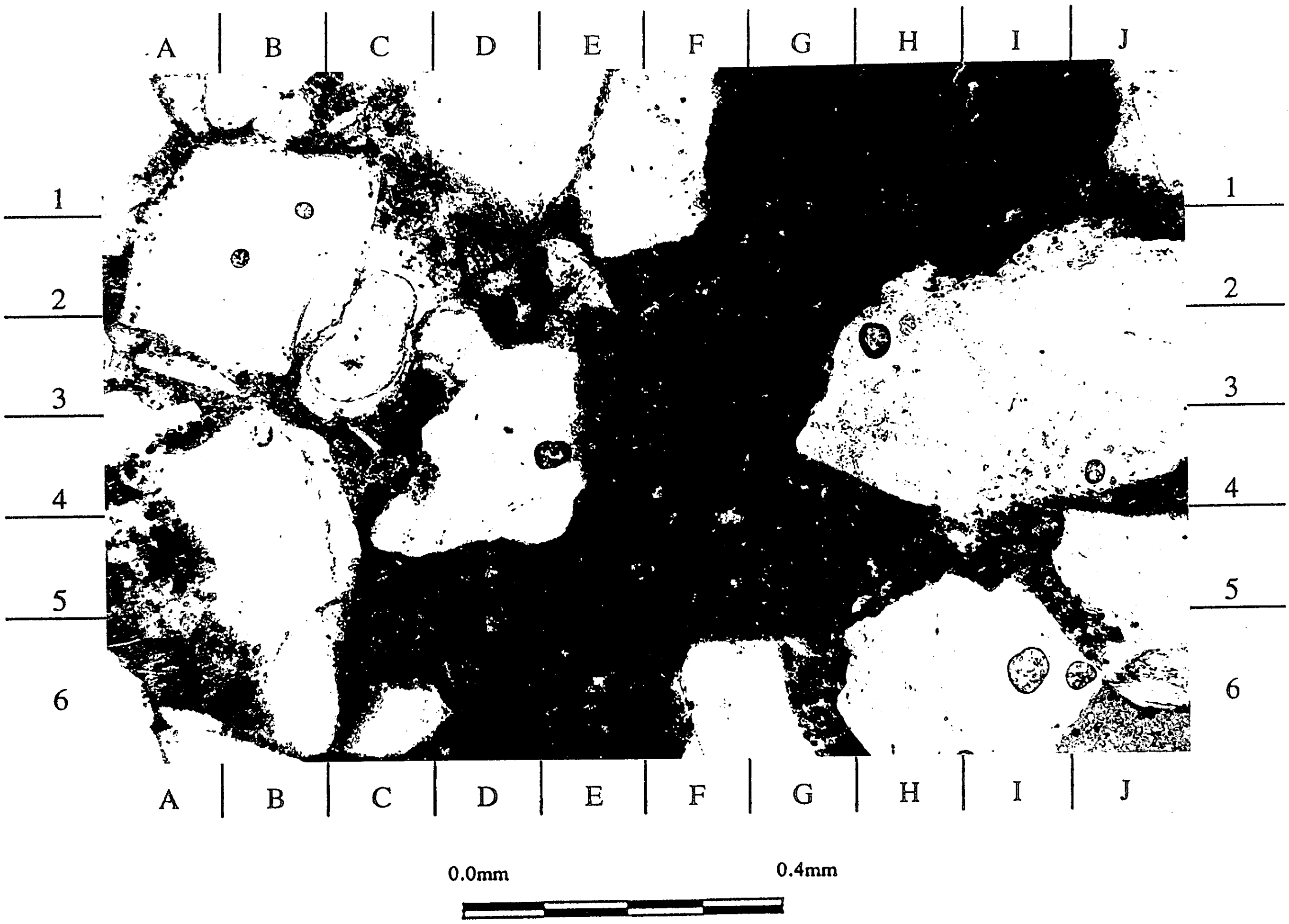

Figure 13. 1784.0m x75.6 PPL
Siderite lamination within sandstone. The siderite appears to be replacing detrital clays. It can also be seen to pre and post date the authigenic silica formation. Post dating siderite is evident at B5 while pre-dating siderite can be seen on the edge of the detrital grain at B2.

PE906710

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The enclosure PE906710 has the following characteristics:

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CLIENT_OP_CO = GFE RESOURCES LTD

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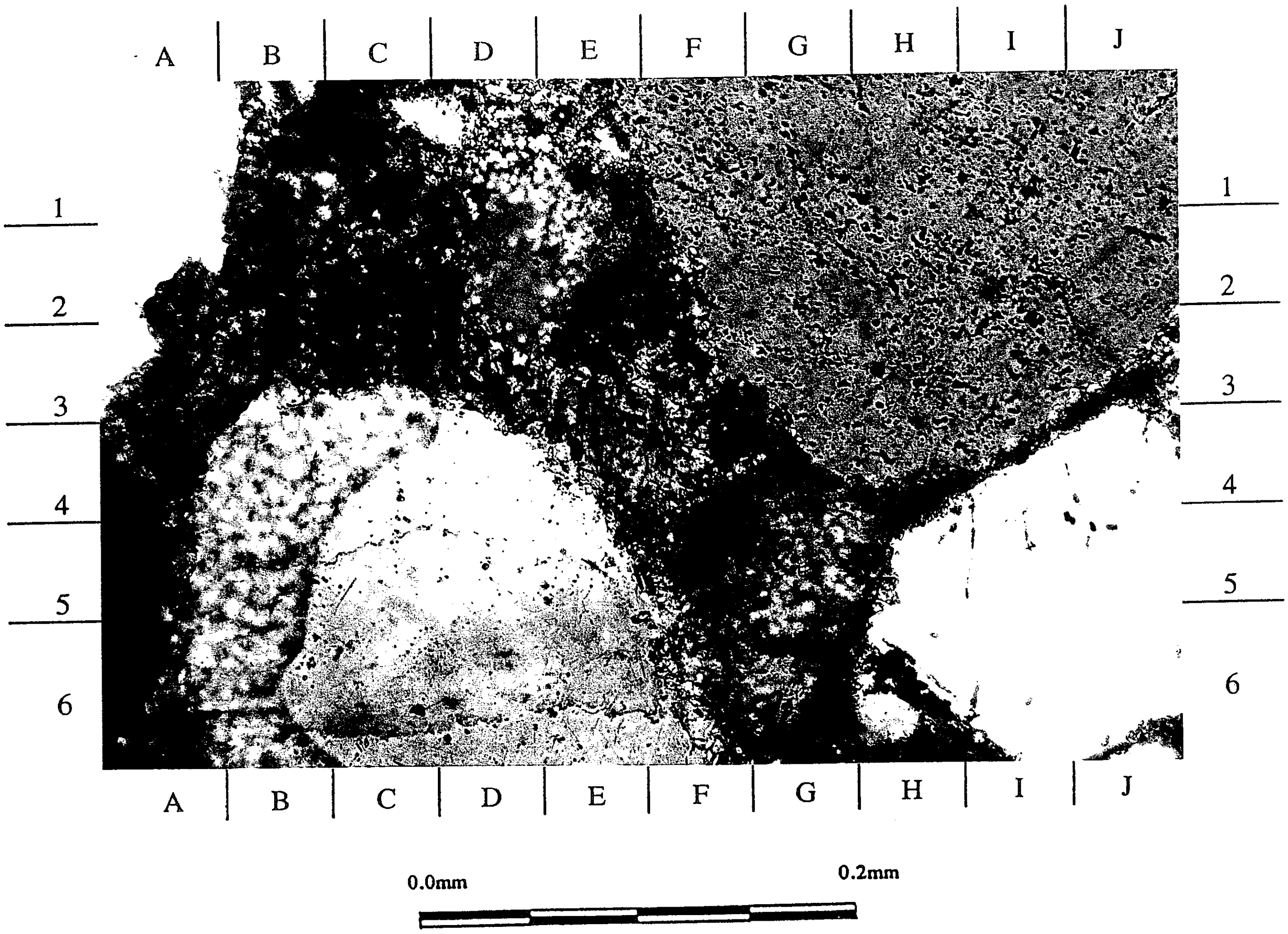

Figure 14. 1784.0m x192 XPL
Authigenic ferroan calcite E3 (stained blue) surrounded by authigenic siderite. The corrosive nature of the siderite towards the quartz is clearly visible at F2.

SAMPLE: Langley-1 1808.0m

Mineralogy:

Detrital	Quartz	83%
	Muscovite	6%
	Feldspar	1%
	Detrital Clay	2%
	Biotite	1%
	Kaolinite	Trace
	Tourmaline	Trace
	Zircon	Trace
	Rock Fragments	Trace
Authigenic	Ferroan Calcite	4%
	Dolomite	2%
	Chlorite	1%

NB: The sample has been deformed by the side wall coring process. The cements have been broken and a large proportion of the sample is disaggregated. The detrital grains are also commonly shattered. These factors make identification of porosity, permeability and structure very difficult and possibly, misleading. The grain size and shape measurements may also be of low confidence.

Description:

The sample is an apparently massive quartz sandstone. It appears to be predominantly grain supported, although this may be misleading due to the sample condition. The unbroken grain boundaries display concave/convex to curved contacts. The degree of cementation is impossible to determine from this sample.

Quartz is the dominant framework grain. Visual grain size estimates range from approximately coarse silt (0.06mm) to medium sand (0.35mm), with an average of approximately fine/medium sand (0.25mm). Sorting is difficult to accurately assess but appears to be moderate to good. The grain shape varies from angular to well rounded, with an average of sub-rounded. Thin, discontinuous authigenic silica overgrowths are commonly present. These appear to have acted as the primary cement.

Muscovite is present in two forms; granular aggregates and elongate tabular laths. The granular aggregates appear to have formed as a result of the in situ breakdown of the laths. The laths are commonly bent and broken, with kaolinite alteration common. The kaolinite alteration is most heavily developed within the granular aggregates of muscovite. In some cases only traces of the detrital muscovite remain.

Detrital biotite is also present in the form of elongate laths. Chlorite alteration of the biotite is evident. Minor completely chloritised biotite grains are also present.

Brown amorphous clays are present throughout the sample. It is impossible to interpret whether the clays are of detrital or authigenic origin, due to the sample condition.

SAMPLE: Langley-1 1808.0m

Both ferroan calcite and dolomite are present. The ferroan calcite is present in a massive sparry form. It occurs as pore filling material and as replacement of other grains. The dolomite is present as granular aggregates, which are commonly associated with the ferroan calcite. The dolomite is also generally present as a rim around the ferroan calcite. This is interpreted as the ferroan calcite infilling secondary intra granular pore space, with the later stage dolomite replacing the rest of the detrital grain.

The sample condition makes identification of the porosity and permeability impossible.

Diagenesis:

The initial phase of diagenesis was the formation of authigenic silica cement. During this period the disaggregation of the muscovite began, followed by the kaolinite and chlorite replacement of micas.

The second major phase of diagenesis was the emplacement of the carbonates. No direct evidence for the relative timing of the carbonates is present, however the ferroan calcite is interpreted as pre-dating the dolomite. The final phase is the dissolution of detrital material through contact with the corrosive carbonates.

PE906711

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CLIENT_OP_CO = GFE RESOURCES LTD

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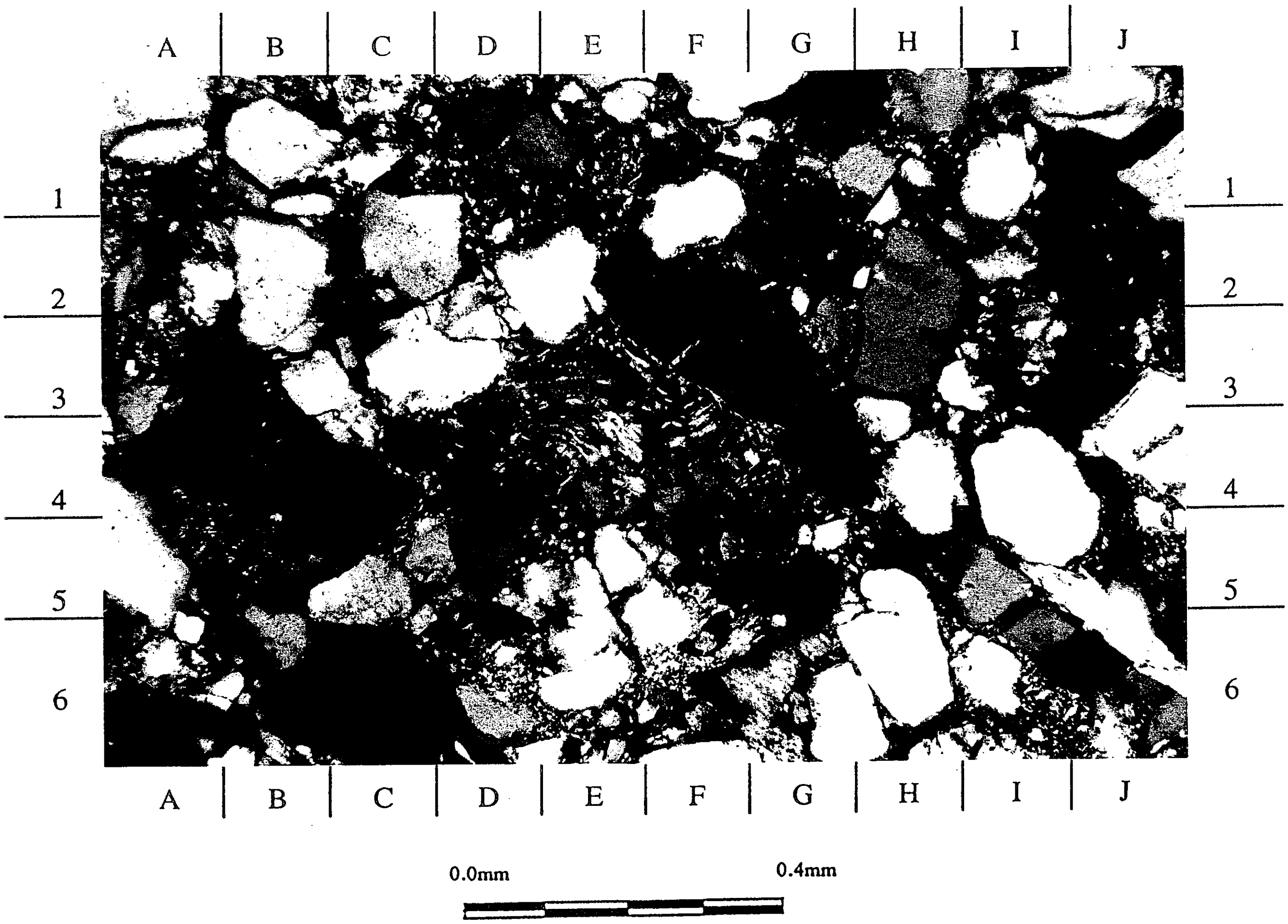

Figure 15. 1808.0m x75.6 XPL
Massive micaceous sandstone. The sample can be seen to be predominantly disaggregated. A partially kaolinised mica is evident at F3. An exfoliated biotite is also visible at E3.

PE906712

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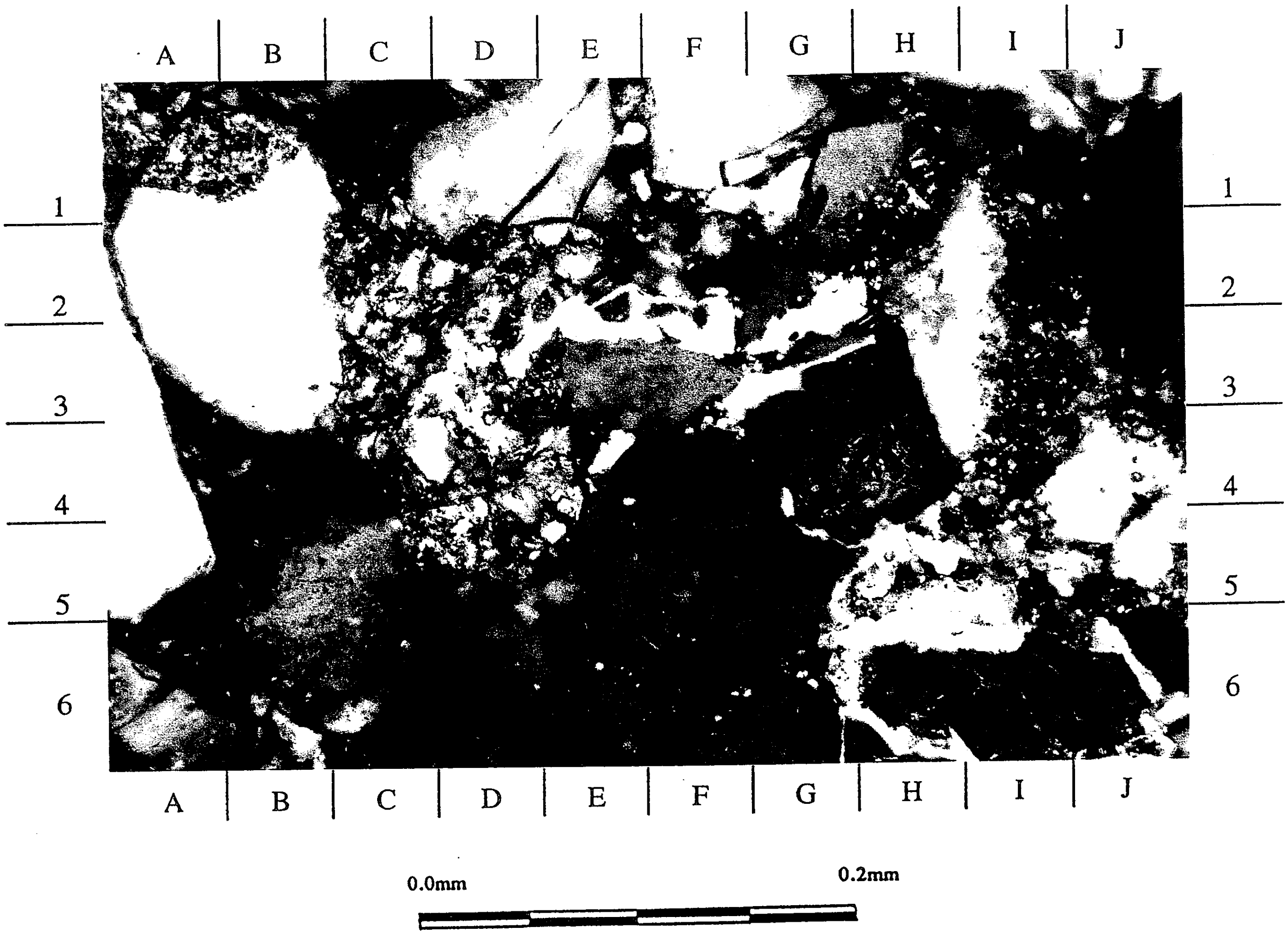

Figure 16. 1808.0m x192 XPL
Massive sparry ferroan calcite is evident at H3. This can be seen to display highly corrosive contacts with the detrital quartz grains. Shattered grains and drill mud are visible at D2.

SAMPLE: Langley-1 1818.5m

Mineralogy:

Detrital	Quartz	93%
	Muscovite	4%
	Rock Fragments	1%
	Biotite	Trace
	Tourmaline	Trace
Authigenic	Dolomite	1%
	Kaolinite	1%
	Ferroan Calcite	Trace
	Chlorite	Trace
	Silica	Trace

NB: The sample has been heavily deformed by the side wall coring process. The cements have been broken and the sample almost completely disaggregated. The detrital grains are also commonly shattered. These factors make identification of porosity, permeability and structure impossible. The grain size and shape measurements may also be of low confidence.

Description:

Quartz is the dominant framework grain. Visual grain size estimates range from coarse silt (0.05mm) to medium sand (0.42mm), with an average of approximately fine sand (0.24mm). It is not possible to give a reliable estimate of the degree of sorting. The grain shape appears to vary from very angular to well rounded, with an average of sub-rounded. Thin (generally 0.01mm), discontinuous silica overgrowths are evident. These probably formed the dominant primary cement prior to breakage during side wall coring. Minor regions of the sample display intact silica cementation. The grains predominantly display an undulose extinction.

Both biotite and muscovite micas are present. The biotite occurs as elongate, bent and broken laths. These laths are generally partially altered to authigenic chlorite. The muscovite occurs as both elongate laths and as granular accumulations. Kaolinite replacement of the muscovite is commonly evident. Authigenic pyrite is commonly associated with the partially altered micas.

Two phases of carbonate are recognisable; ferroan calcite and dolomite, with the dolomite being dominant. The dolomite is present as fine granular aggregates. These aggregates are preferentially associated with kaolinised micas and partially leached feldspars. The ferroan calcite is also associated with the authigenic clays. Both phases of carbonate display highly corrosive contacts with the detrital and authigenic quartz.

SAMPLE: Langley-1 1818.5m

Diagenesis:

The initial phase of diagenesis was the formation of an authigenic silica cement. During this phase the alteration of the micas to form authigenic clays occurred. These clays probably began formation prior to the complete lithification of the sample. Authigenic pyrite would also have begun to form during this phase, probably as a result of the alteration of detrital grains.

The second phase of diagenesis was the emplacement of the carbonates. These may have begun formation within secondary porosity produced through the leaching of feldspar and authigenic clays. No direct evidence for the relative timing of the two phases of carbonate is present. The final phases of diagenesis was the dissolution of quartz, feldspar and clays by contact with the carbonates.

PE906713

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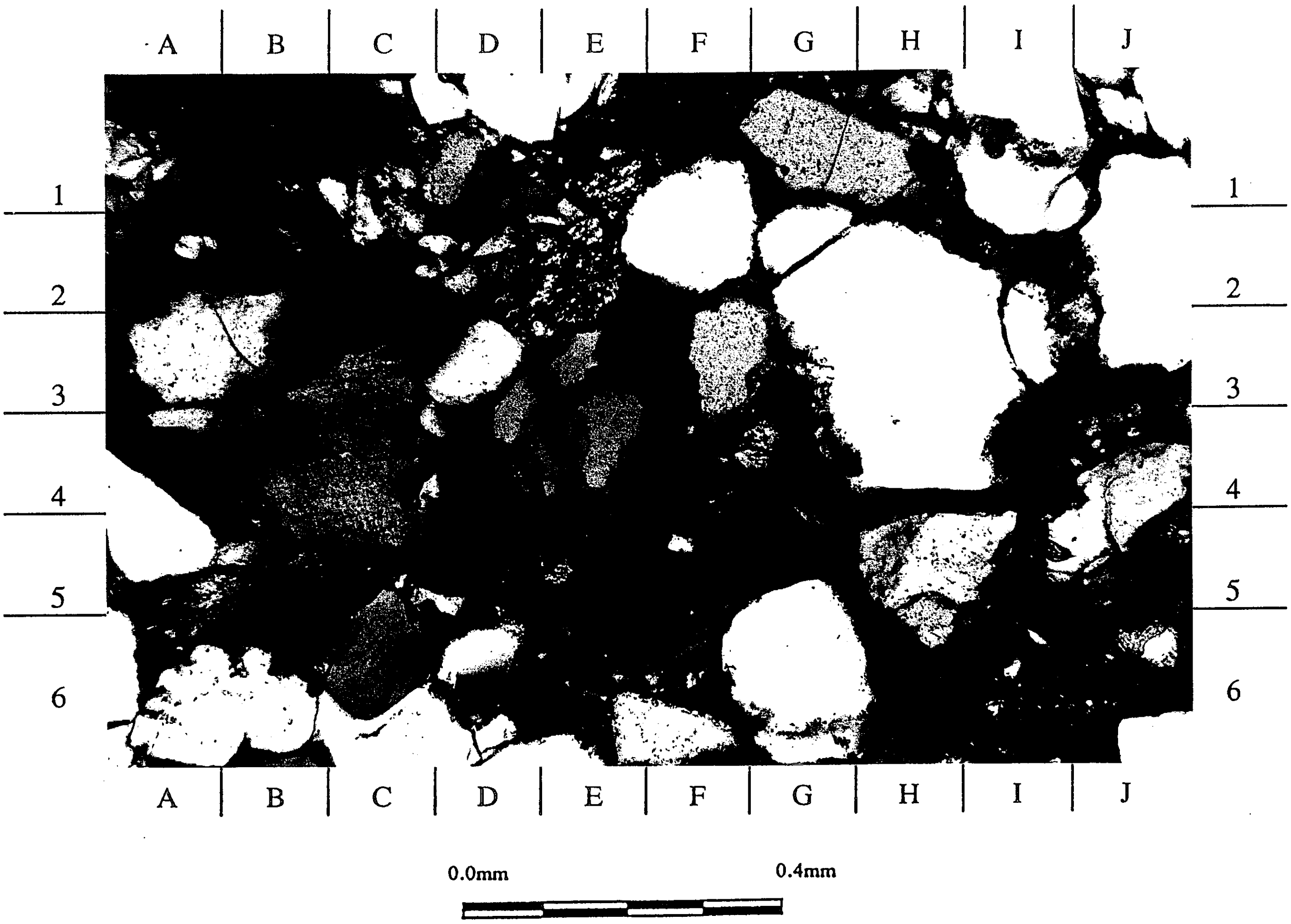

Figure 17. 1818.5m x75.6 XPL
Predominantly disaggregated quartz sandstone. Chloritised biotite is evident at G4 and I4.

PE906714

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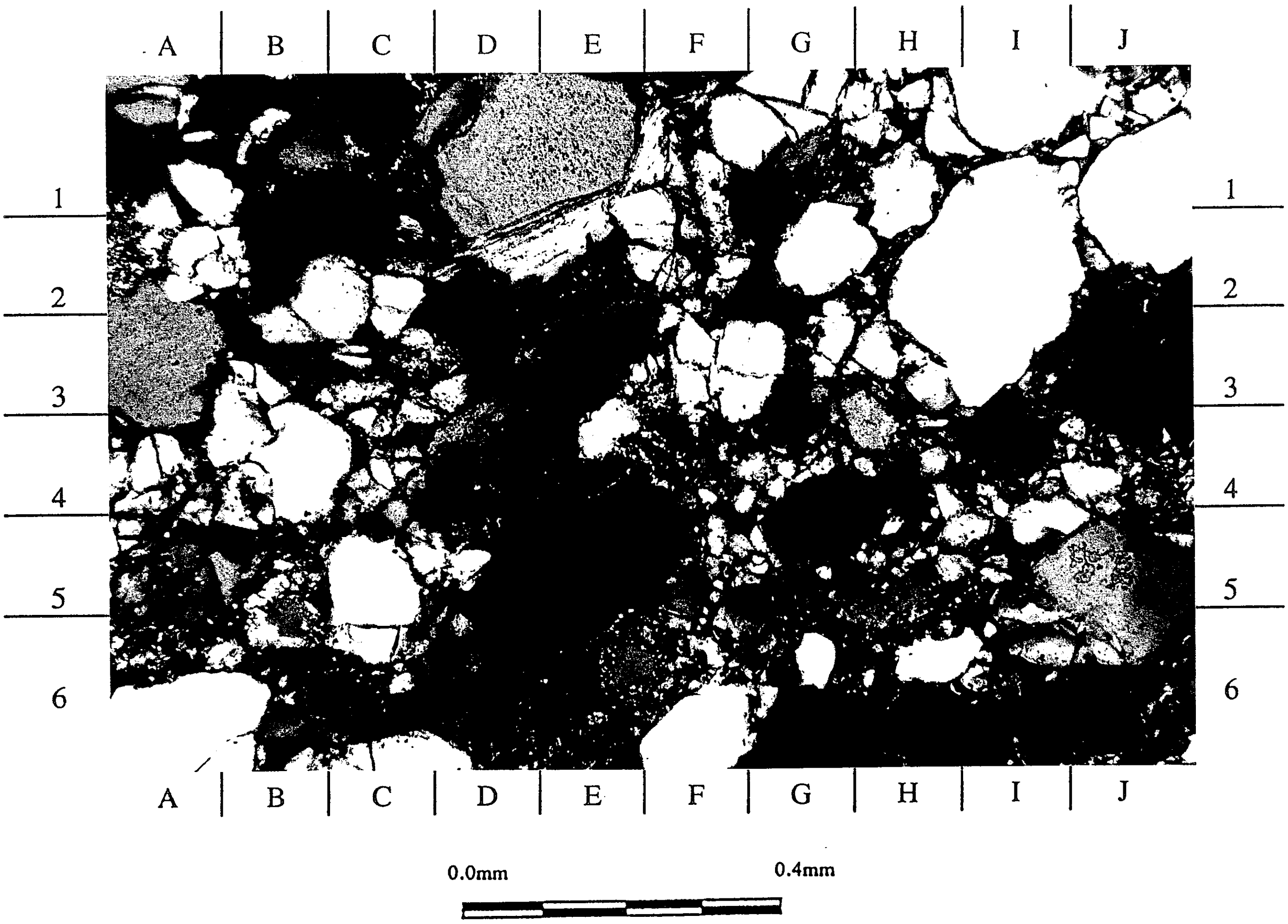


Figure 18. 1818.5m x75.6 XPL
The shattered and disaggregated nature of the sample is clearly evident. A muscovite lath at E2 can be seen to be expanding to fill pore space due to kaolinisation along its cleavage planes.

SAMPLE: Langley-1 1836.5m

Mineralogy:

Detrital	Rock Fragments	79.0%
	Quartz	4.0%
	Feldspar	2.0%
	Biotite	0.25%
	Muscovite	0.75%
	Clays	3.5%
Authigenic	Chlorite	5.0%
	Calcite	1.25%
	Chert	4.25%
	Opaque	Trace

Description:

The sample is a lithic rock. The lithic fragments predominantly appear to be of volcanic origin. A weak preferred orientation of the elongate axis of the detrital grains is present. The sample is predominantly grain supported, with minor zones of matrix support. The grain boundaries display point to weakly curved contacts. The matrix material is provided by authigenic chlorite and detrital clays. Cementation appears to be poor with the authigenic chert providing the only visible cement.

The dominant framework grains are volcanic rock fragments, with lesser quartz and feldspar. The grain size ranges from fine sand (0.14mm) to coarse sand (0.76mm), with an average of approximately medium sand (0.35mm). Sorting is moderate to good. The grain shape varies from very angular to well rounded, with an average of sub-rounded.

Brown detrital clays are present as coatings on the framework grains (generally 0.01mm to 0.03mm thick) and infilling intergranular porosity.

Chlorite is present in several forms depending on what detrital grain it has replaced. Amorphous chlorite is present within the intergranular pore space, this may be the alteration of detrital clays. The chlorite also occurs with a strong micaceous structure, this is interpreted as being derived from detrital micas, probably biotite. The chlorite also occurs as an in situ alteration of the volcanic fragments, as numerous partly altered grains are evident.

Authigenic chert is present in the form of a pore filling cement. The infilled pores can be seen to have detrital clay coatings. It is not evident whether these pores where primary or secondary in nature, however the general shape of the pores would tend to indicate that they are primary.

Calcite is present replacing detrital rock fragments. It displays highly corrosive contacts with all other mineralogies.

SAMPLE: Langley-1 1836.5m cont.

Porosity is evident within the thin section. However, this has been interpreted as forming as a result of partial disaggregation of the sample during the side wall coring process. Authigenic chert is believed to have completely obliterated any porosity present.

Diagenesis:

Two phases of diagenesis are evident; chloritisation and chert emplacement. No direct evidence for the relative timing of these events is apparent. However the lack of any chlorite surrounded by chert has been interpreted to indicate the chert pre-dates the chlorite.

PE906715

This is an enclosure indicator page.
The enclosure PE906715 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906715 has the following characteristics:
ITEM_BARCODE = PE906715
CONTAINER_BARCODE = PE900950
NAME = Photomicrograph, Appendix 9, Figure 19
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Photomicrograph, Appendix 9, Figure 19, Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

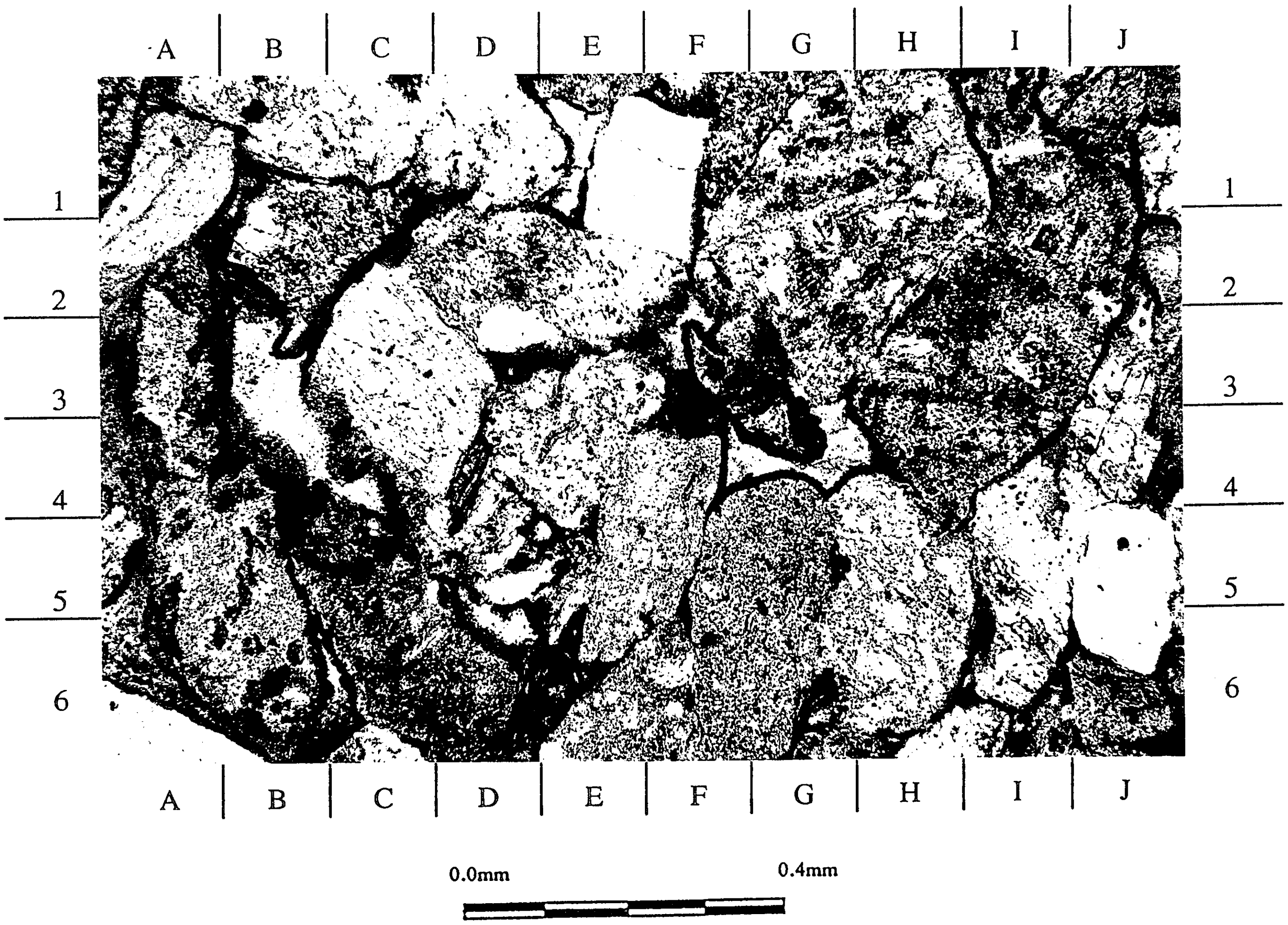


Figure 19. 1836.5m x75.6 PPL
Lithic rock. The main framework grain is composed of lithic fragments with authigenic chert infilling the pore space (eg. B3).

PE906716

This is an enclosure indicator page.
The enclosure PE906716 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906716 has the following characteristics:

ITEM_BARCODE = PE906716
CONTAINER_BARCODE = PE900950
NAME = Photomicrograph, Appendix 9, Figure 20
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Photomicrograph, Appendix 9, Figure 20, Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

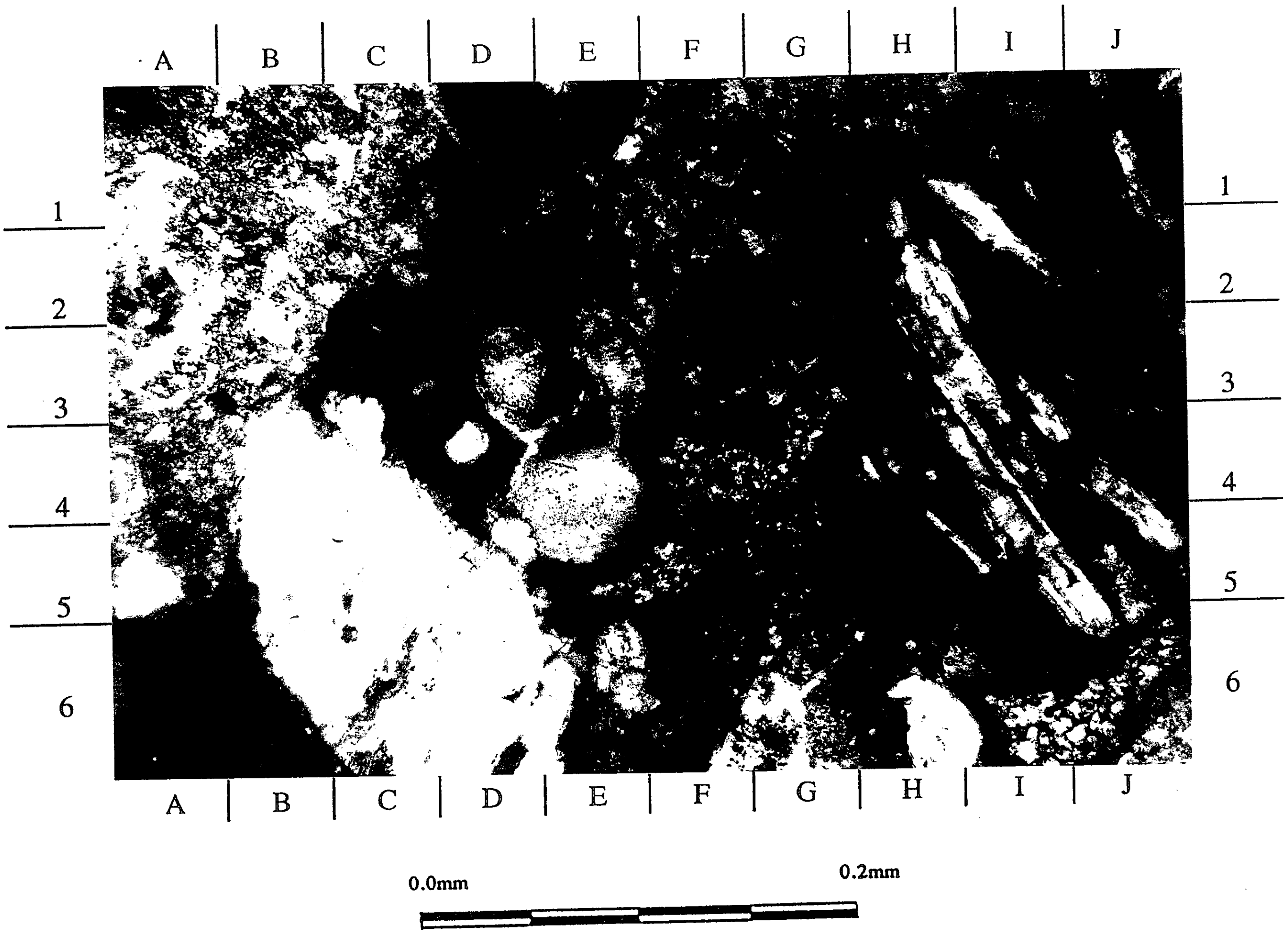


Figure 20. 1836.5m x192 XPL
Lithic fragments with authigenic chert infilling the primary pore space (eg. J6).

SAMPLE: Langley-1 1884.0m

Mineralogy:

Detrital	Volcanic Rock Fragments	47.5%
	Quartz	10.5%
	Feldspar	7.5%
	Biotite	0.75%
	Muscovite	0.25%
Authigenic	Chlorite	33.0%
	Chert	0.50%
	Calcite	Trace
	Opaque	Trace

Description:

The sample is a lithic rock. The majority of the lithic fragments appear to be of volcanic origin. A weak, preferred orientation of the elongate axis of the detrital grains is present. The sample is predominantly grain supported, with minor zones of matrix support. The grain boundaries display point to weakly curved contacts. The matrix material is provided by authigenic chlorite. Cementation appears to be poor with the authigenic chlorite providing the only visible cement.

The dominant framework grains are volcanic rock fragments with lesser quartz and feldspar. The grain size ranges from coarse silt (<0.05mm) to coarse sand (0.60mm), with an average of approximately fine/medium sand (0.25mm). Sorting is moderate to good. The grain shape varies from very angular to well rounded, with an average of sub-rounded.

The feldspars present display polysynthetic and albite twinning, untwinned grains are also present. A twin extinction angle of 5° to 8° has been measured on the albite twinned grains, indicating an albite composition. Sericitic alteration of the feldspars appear to have occurred. Leaching of the feldspars within the volcanic fragments is also evident.

Chlorite is present in several forms, depending on what detrital grain it has replaced. Amorphous chlorite is present within the intergranular pore space, which may be the alteration of detrital clays. Commonly associated with the amorphous clays are thin radial coatings on the surrounding detrital grains. This would tend to support an in situ alteration origin for the chlorite. The chlorite also occurs with a strong micaceous structure, interpreted as being derived from detrital micas, probably biotite. The chlorite also occurs as an in situ alteration of the volcanic fragments, numerous partly altered grains are evident.

Porosity is evident within the thin section, however, this has been interpreted as having formed as a result of partial disaggregation of the sample during the side wall coring process. Some of the porosity may be real, however it is impossible to determine how much, if any. Authigenic chert can be seen to have infilled some of the detrital pore space.

SAMPLE: Langley-1 1884.0m cont.

Diagenesis:

Two phases of diagenesis are evident; chloritisation and chert emplacement. No direct evidence for the relative timing of these events is apparent. However the lack of any chlorite surrounded by chert has been interpreted to indicate the chert pre-dates the chlorite.

PE906717

This is an enclosure indicator page.
The enclosure PE906717 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906717 has the following characteristics:

ITEM_BARCODE = PE906717
CONTAINER_BARCODE = PE900950
NAME = Photomicrograph, Appendix 9, Figure 21
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Photomicrograph, Appendix 9, Figure 21, Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

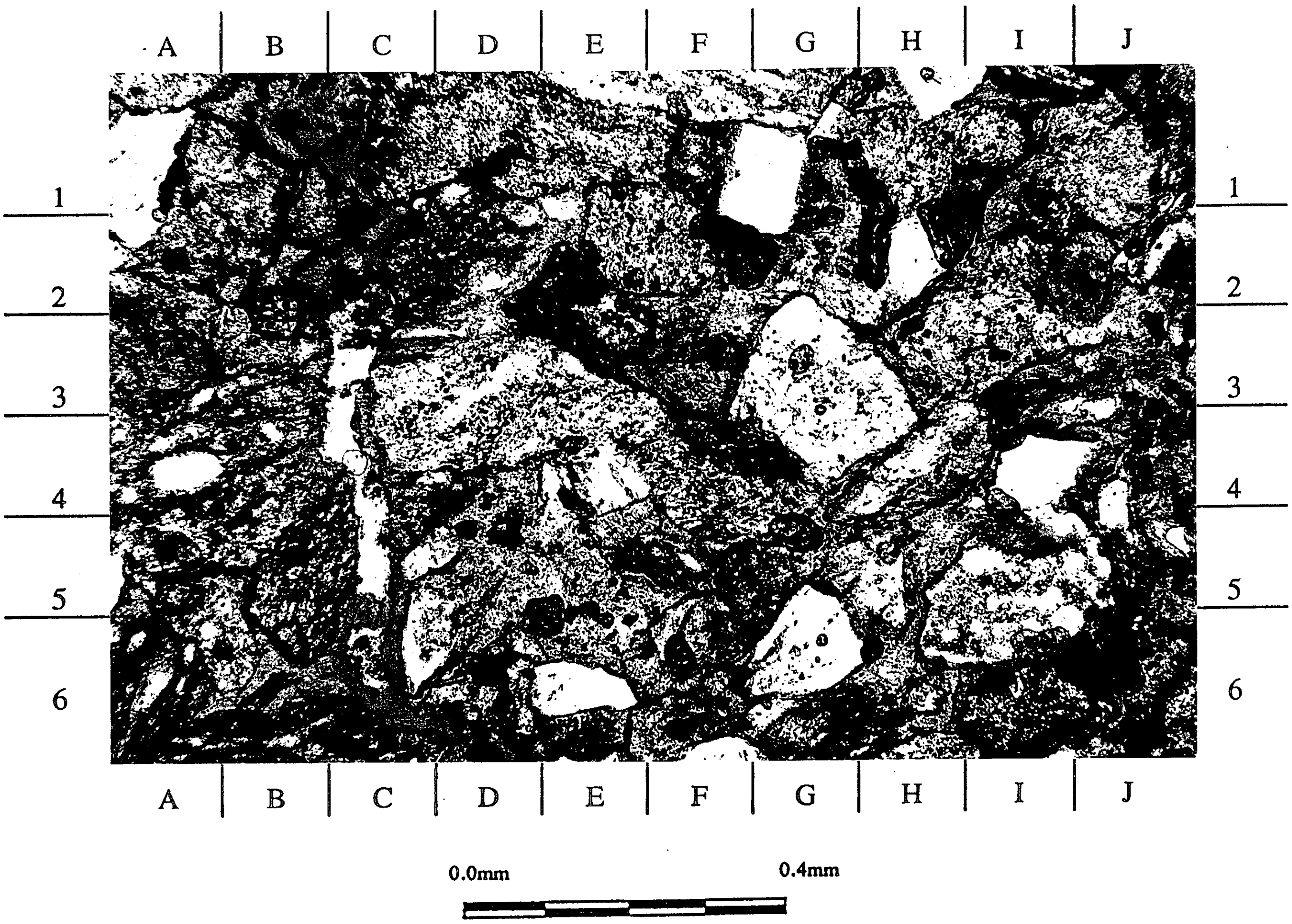


Figure 21. 1884.0m x75.6 PPL
Lithic rock with a great deal of chlorite alteration (eg. F3). Chert infilling the pore space (eg. B2 has been either replaced or obscured by the authigenic chlorite (turning it green).

PE906718

This is an enclosure indicator page.
The enclosure PE906718 is enclosed within the container PE900950 at this location in this document.

The enclosure PE906718 has the following characteristics:

ITEM_BARCODE = PE906718
CONTAINER_BARCODE = PE900950
NAME = Photomicrograph, Appendix 9, Figure 22
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = PHOTOMICROGRAPH
DESCRIPTION = Photomicrograph, Appendix 9, Figure 22, Langley-1
REMARKS =
DATE_CREATED =
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = WESTERN AUSTRALIAN SEDIMENTARY CONSULTANTS
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

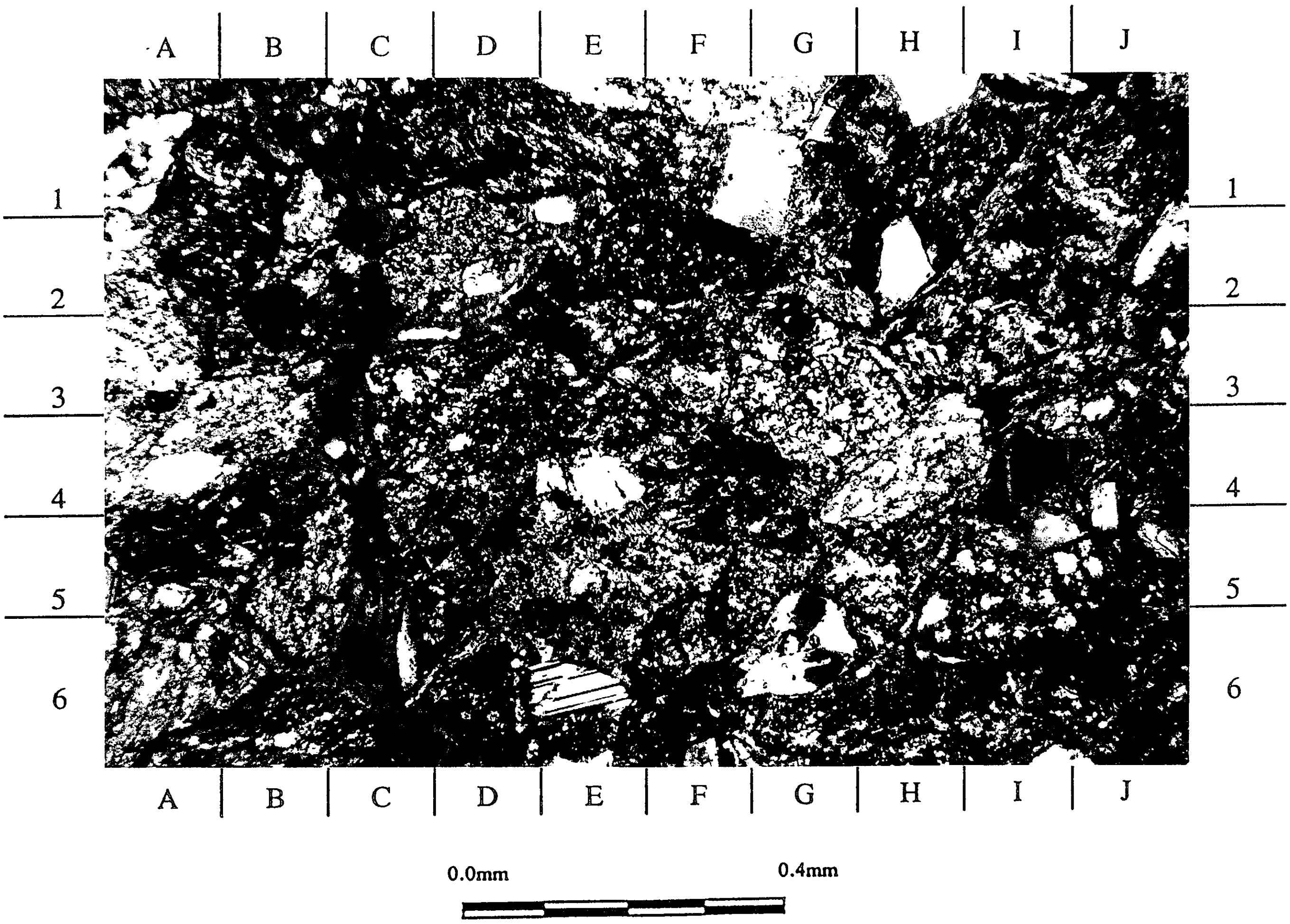


Figure 22. 1884.0m x75.6 XPL
Lithic fragments with detrital and authigenic clays infilling the pore space. In situ alteration of the lithic fragments is also evident.

APPENDIX 10

APPENDIX 10

GFE RESOURCES LTD

APPENDIX 10

GEOCHEMISTRY REPORTS

LANGLEY-1

GEOTECH GEOTECHNICAL SERVICES PTY LTD
125 Burswood Road, Victoria Park, Western Australia 6100

Telephone (09) 362 5222
Facsimile (09) 362 5908

RECEIVED
20 JUN 1994
E4202
GFE RESOURCES LTD

7 June, 1994

Mr. N. Newell/Mr. K. Lanigan
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Noel/Kevin,

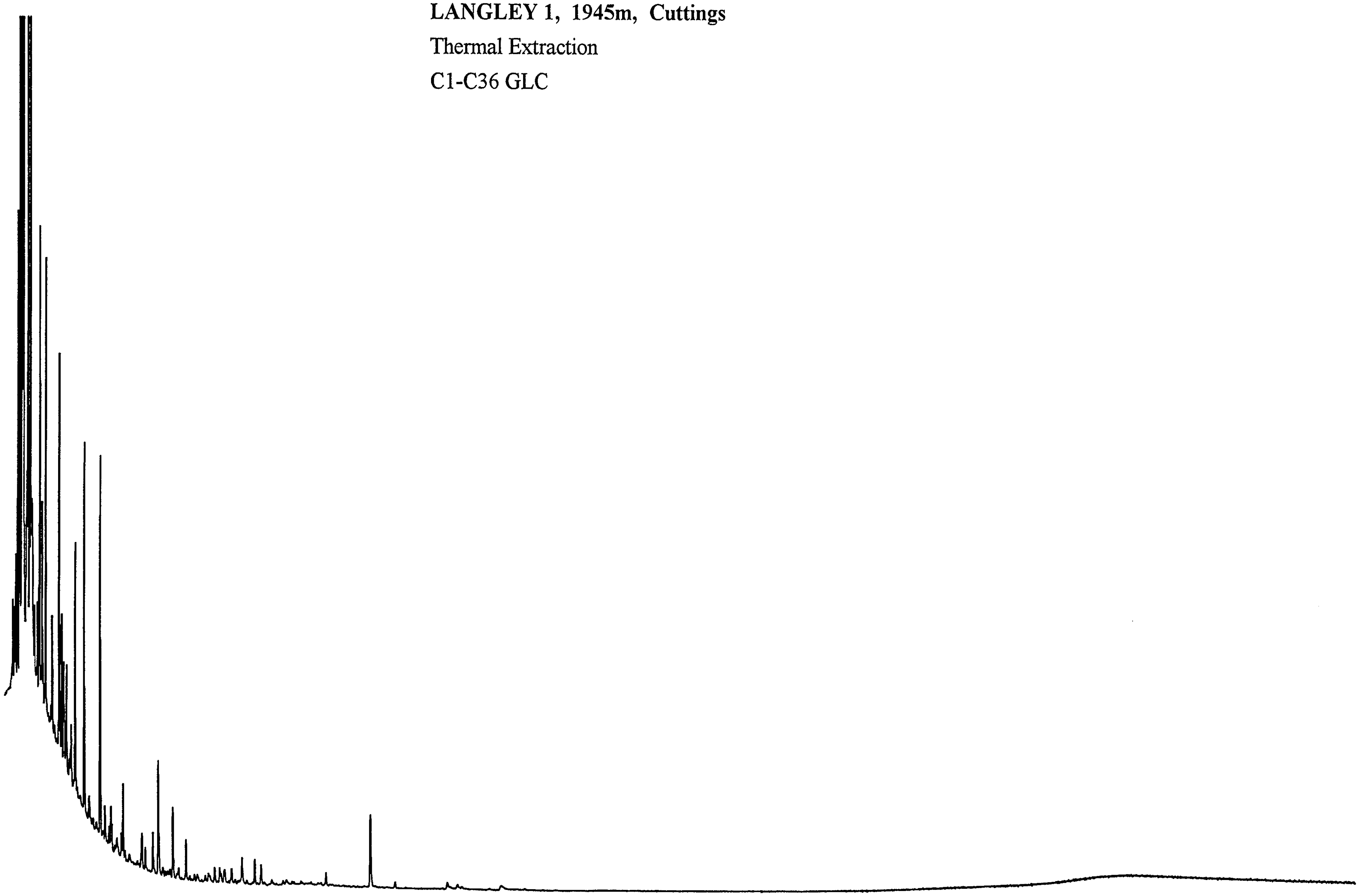
Please find enclosed thermal extract GC data for Langley-1, 1936m and 1945m, as well as an invoice for this work.

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

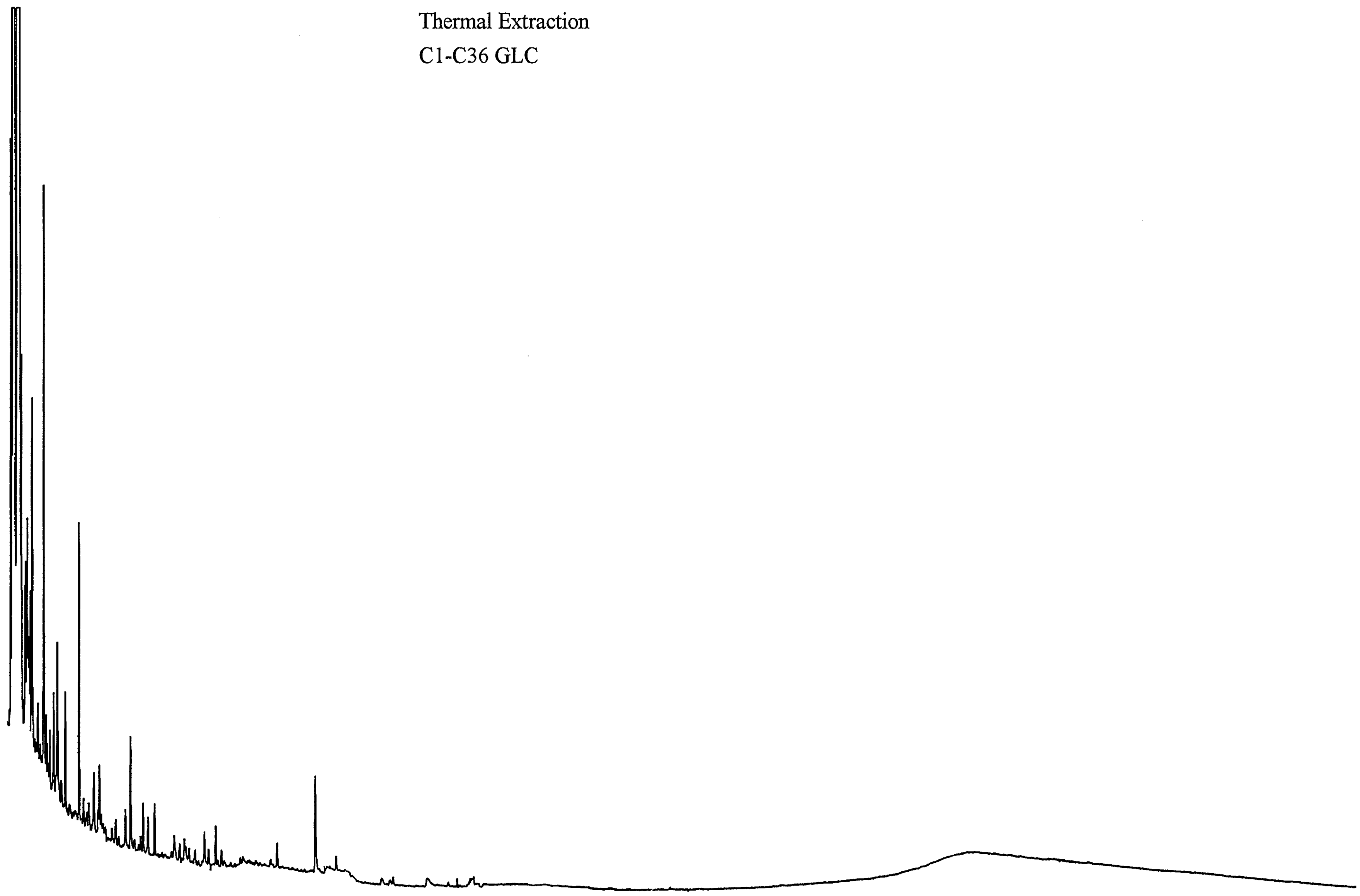
Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

LANGLEY 1, 1945m, Cuttings
Thermal Extraction
C1-C36 GLC



LANGLEY 1, 1936m, Cuttings
Thermal Extraction
C1-C36 GLC



GEOTECH GEOTECHNICAL SERVICES PTY LTD
125 Burswood Road, Victoria Park, Western Australia 6100
Telephone (09) 362 5222
Facsimile (09) 362 5908

RECEIVED
28 JUN 1994
E4420
GFE RESOURCES LTD

24 June, 1994

Mr. K. Lanigan
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Kevin,

Please find enclosed TOC, Rock-Eval and Whole Extract GC results for Langley-1, as well as an invoice for this work.

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

ACN 050 543 194

TABLE 1

ROCK-EVAL PYROLYSIS DATA (one run)

LANGLEY 1

Jun-94

DEPTH (m)	TMAX	S1	S2	S3	S1+S2	S2/S3	PI	PC	TOC	HI	OI
1825.5	420	0.43	6.71	0.45	7.14	14.91	0.06	0.59	3.46	194	13
1855.5	nd	nd	nd	nd	nd	nd	nd	nd	0.17	nd	nd
19~~42~~.5 24	nd	nd	nd	nd	nd	nd	nd	nd	0.28	nd	nd

TMAX = Max. temperature S2
S1+S2 = Potential yield
PC = Pyrolysable carbon
OI = Oxygen Index

S1 = Volatile hydrocarbons (HC)
S3 = Organic carbon dioxide
TOC = Total organic carbon
nd = no data

S2 = HC generating potential
PI = Production index
HI = Hydrogen index

GEOTECHNICAL SERVICES PTY LTD

TABLE 3

LANGLEY 1

Summary of Gas Chromatography Data

A. Alkane Compositional Data

WHOLE EXTRACT

DEPTH(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
1291.0	6.02	0.76	0.13	nd	nd	nd

TABLE 3

LANGLEY 1

Summary of Gas Chromatography Data

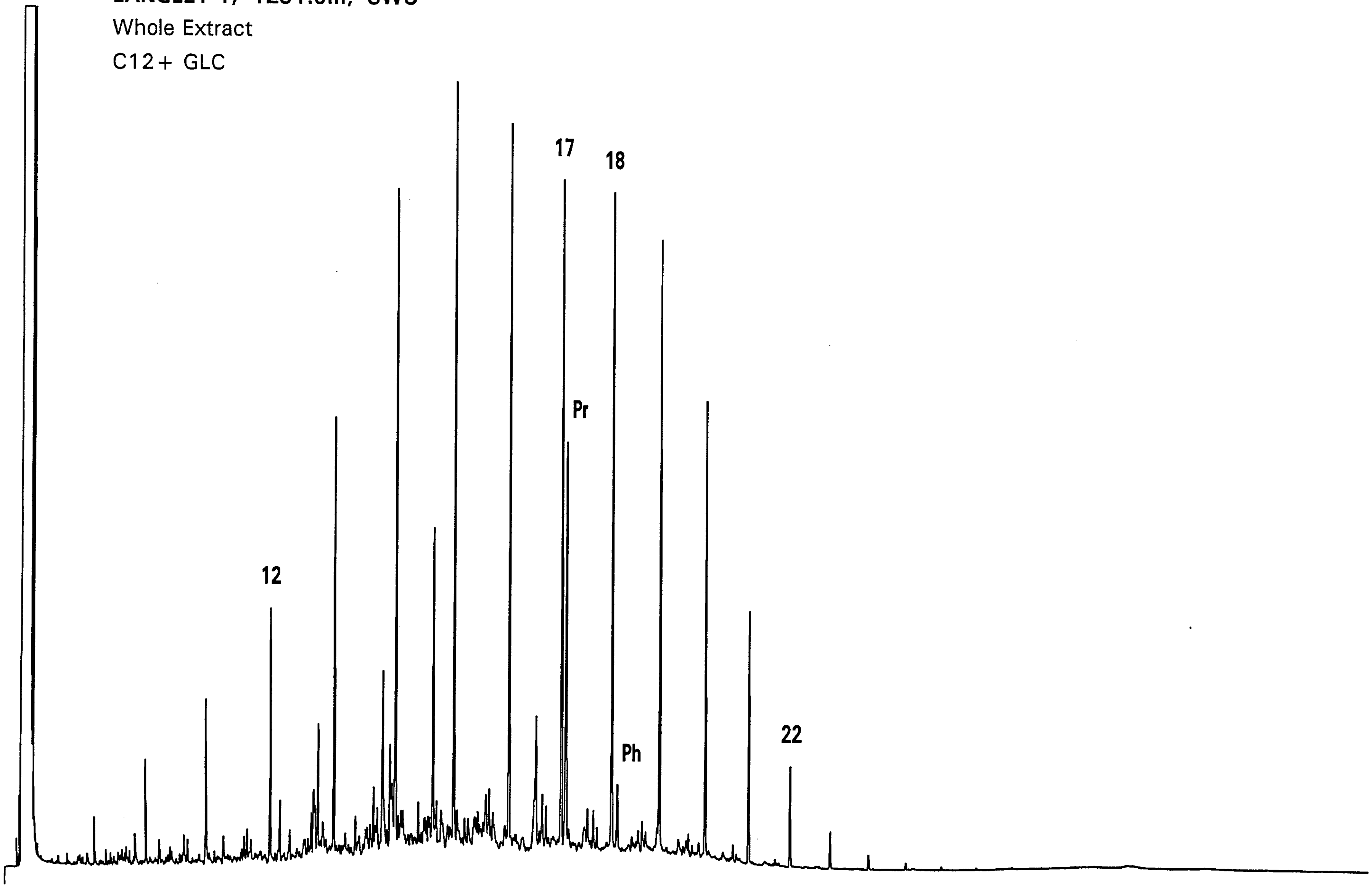
B. n-Alkane Distributions

WHOLE EXTRACT

DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
1291.0	3.7	6.3	10.4	12.5	11.8	11.3	8.6	10.9	1.4	9.6	7.3	3.8	1.5	0.6	0.2	0.1	0.0	0.0	-	-	-	-

nd = no data

LANGLEY 1, 1291.0m, SWC
Whole Extract
C12+ GLC



GEOTECHNICAL SERVICES PTY LTD

2076ED1

GEOTECH GEOTECHNICAL SERVICES PTY LTD
125 Burswood Road, Victoria Park, Western Australia 6100
Telephone (09) 362 5222
Facsimile (09) 362 5908

28 June, 1994

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1 JUL 1994
E1516
GFE RESOURCES LTD

Mr. K. Lanigan
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Kevin,

Please find enclosed Saturate GC results for 3 samples from Langley-1.

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

TABLE 2

Summary of Extraction and Liquid Chromatography

LANGLEY 1

Jun-94

A. Concentrations of Extracted Material

				-------Hydrocarbons-------			----Nonhydrocarbons----		
DEPTH(m)	Weight of Rock Extd (grams)	Total Extract (ppm)	Loss on Column (ppm)	Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphalt (ppm)	NonHC Total (ppm)
1291.0	13.0	15861.5	nd	nd	nd	nd	nd	nd	nd
1518.5	7.3	731.0	nd	nd	nd	nd	nd	nd	nd
1732.0	9.1	1127.1	33.1	640.9	254.1	895.0	198.9	nd	198.9
1770.0	9.3	2358.0	246.5	375.1	739.5	1114.7	996.8	nd	996.8
1803.5	20.0	25.0	nd	nd	nd	nd	nd	nd	nd
1884.0	22.4	44.6	nd	nd	nd	nd	nd	nd	nd

TABLE 2

Summary of Extraction and Liquid Chromatography

L GLEY 1

Jun-94

B. Compositional Data

	---Hydrocarbons----			---Nonhydrocarbons-----			EOM(mg)	SAT(mg)	SAT	ASPH	HC
DEPTH(m)	%SAT	%AROM	%HC's	%NSO	%ASPH	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
1291.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1518.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1732.0	58.6	23.2	81.8	18.2	nd	18.2	nd	nd	2.5	nd	4.5
1770.0	17.8	35.0	52.8	47.2	nd	47.2	nd	nd	0.5	nd	1.1
1803.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1884.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

nd = no data

TABLE 4

LANGLEY 1 Summary of Gas Chromatography Data

A. Alkane Compositional Data SATURATE FRACTION

DEPTH(m)	Prist./Phyt.	Prist./n-C17	Phyt./n-C18	CPI(1)	CPI(2)	(C21+C22)/(C28+C29)
1291.0	nd	nd	nd	nd	nd	nd
1518.5	6.55	0.73	0.12	nd	1.36	127
1732.0	6.29	0.71	0.12	1.13	1.12	11.1
1770.0	3.75	0.60	0.10	1.09	1.10	1.10
1803.5	nd	nd	nd	nd	nd	nd
1884.0	nd	nd	nd	nd	nd	nd

TABLE 4

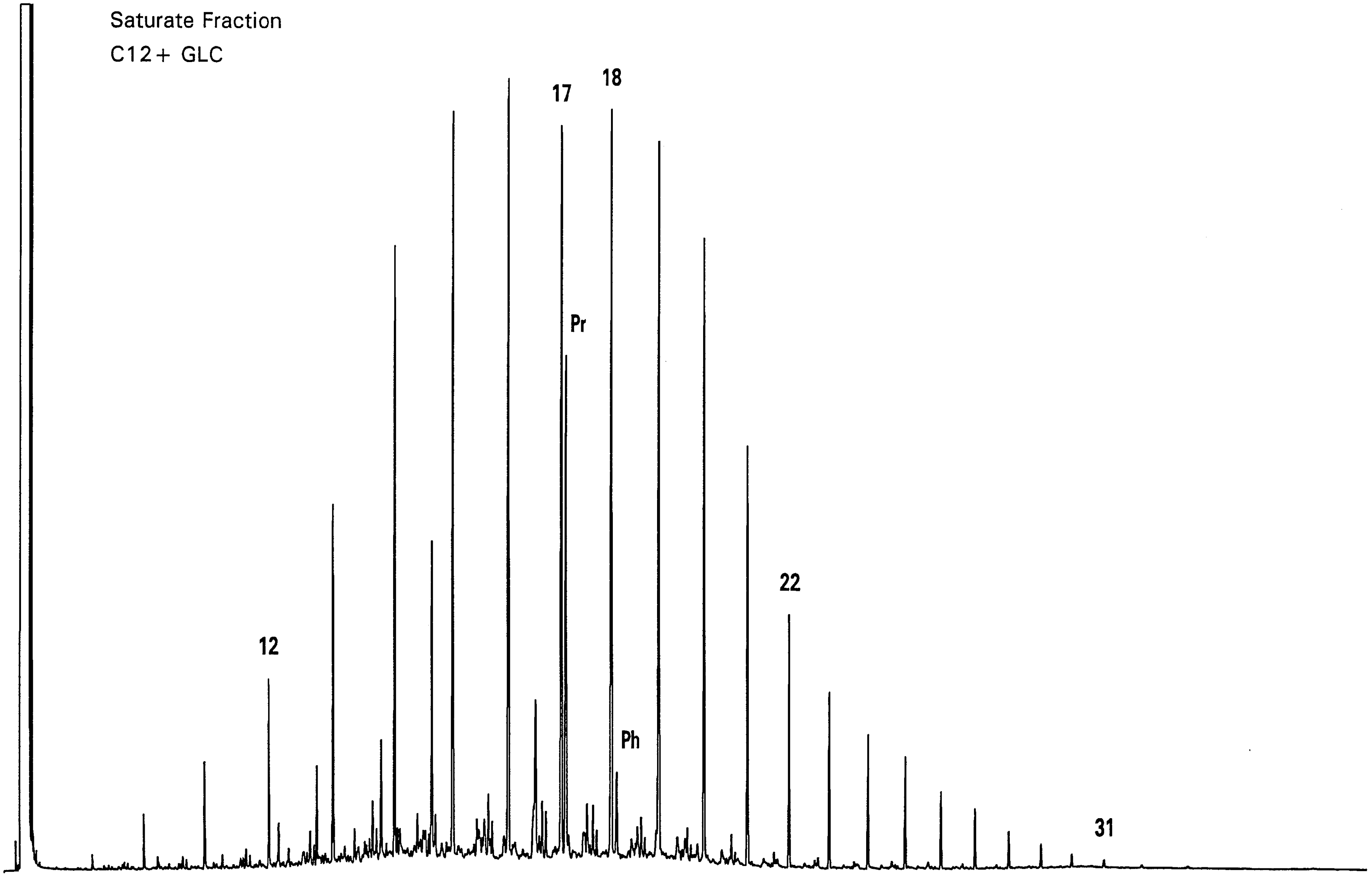
LANGLEY 1 Summary of Gas Chromatography Data

B. n-Alkane Distributions SATURATE FRACTION

DEPTH(m)	nC12	nC13	nC14	nC15	nC16	nC17	iC19	nC18	iC20	nC19	nC20	nC21	nC22	nC23	nC24	nC25	nC26	nC27	nC28	nC29	nC30	nC31
1291.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1518.5	3.1	5.7	9.5	11.8	12.0	11.9	8.7	11.1	1.3	10.1	7.6	4.1	1.7	0.7	0.3	0.2	0.1	0.0	0.0	0.0	-	-
1732.0	2.1	4.1	7.5	10.1	10.9	11.1	7.9	10.7	1.2	10.7	8.2	5.1	3.0	2.1	1.6	1.3	0.9	0.7	0.4	0.3	0.2	0.1
1770.0	1.3	1.9	2.3	2.1	1.9	2.5	1.5	3.9	0.4	5.5	6.3	6.6	6.8	7.2	6.7	7.2	6.3	6.8	5.9	6.3	5.4	5.1
1803.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1884.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

nd = no data

LANGLEY 1, 1732m, SWC
Saturate Fraction
C12+ GLC



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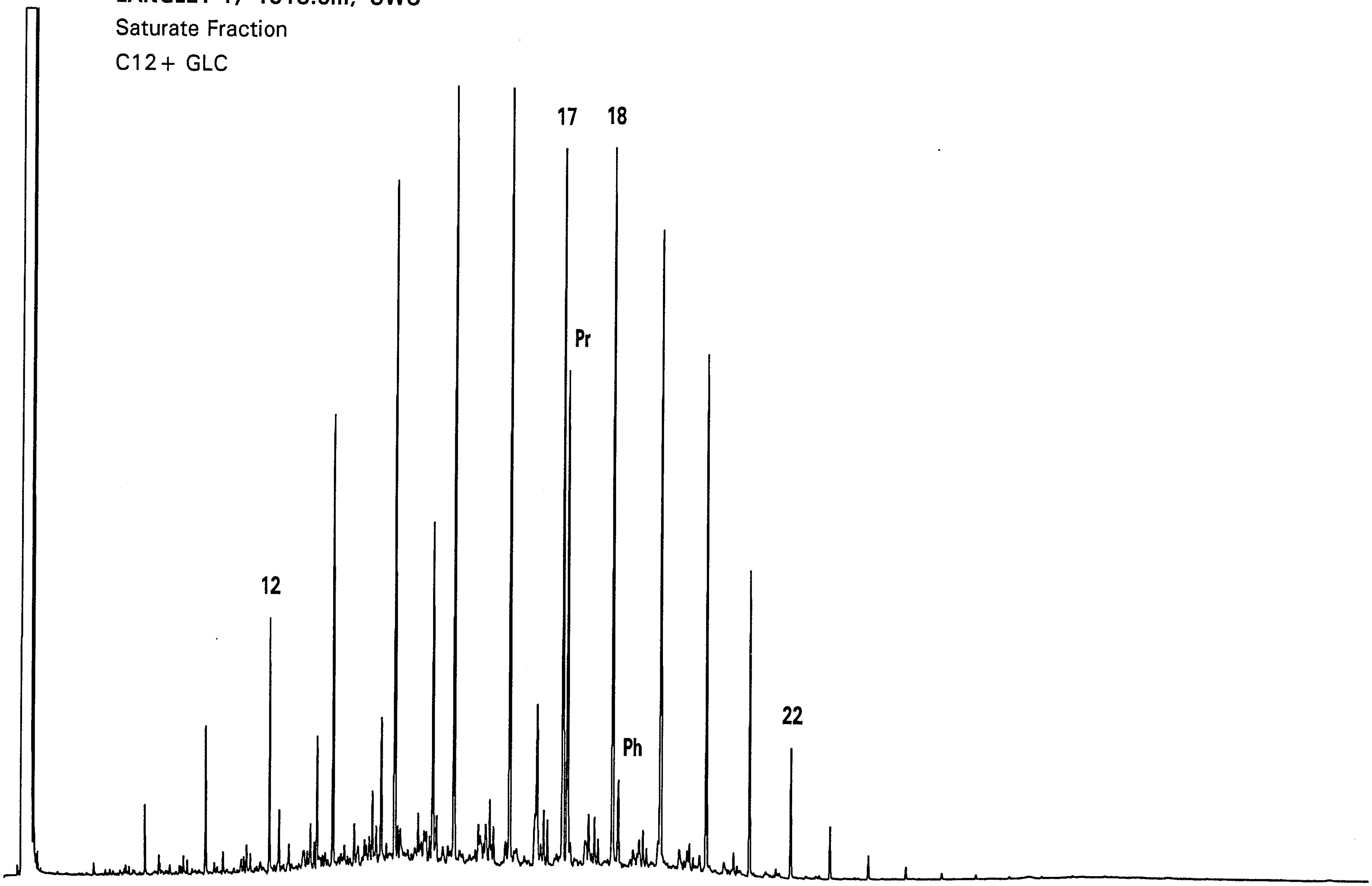
LANGLEY 1, 1518.5m, SWC

Saturate Fraction

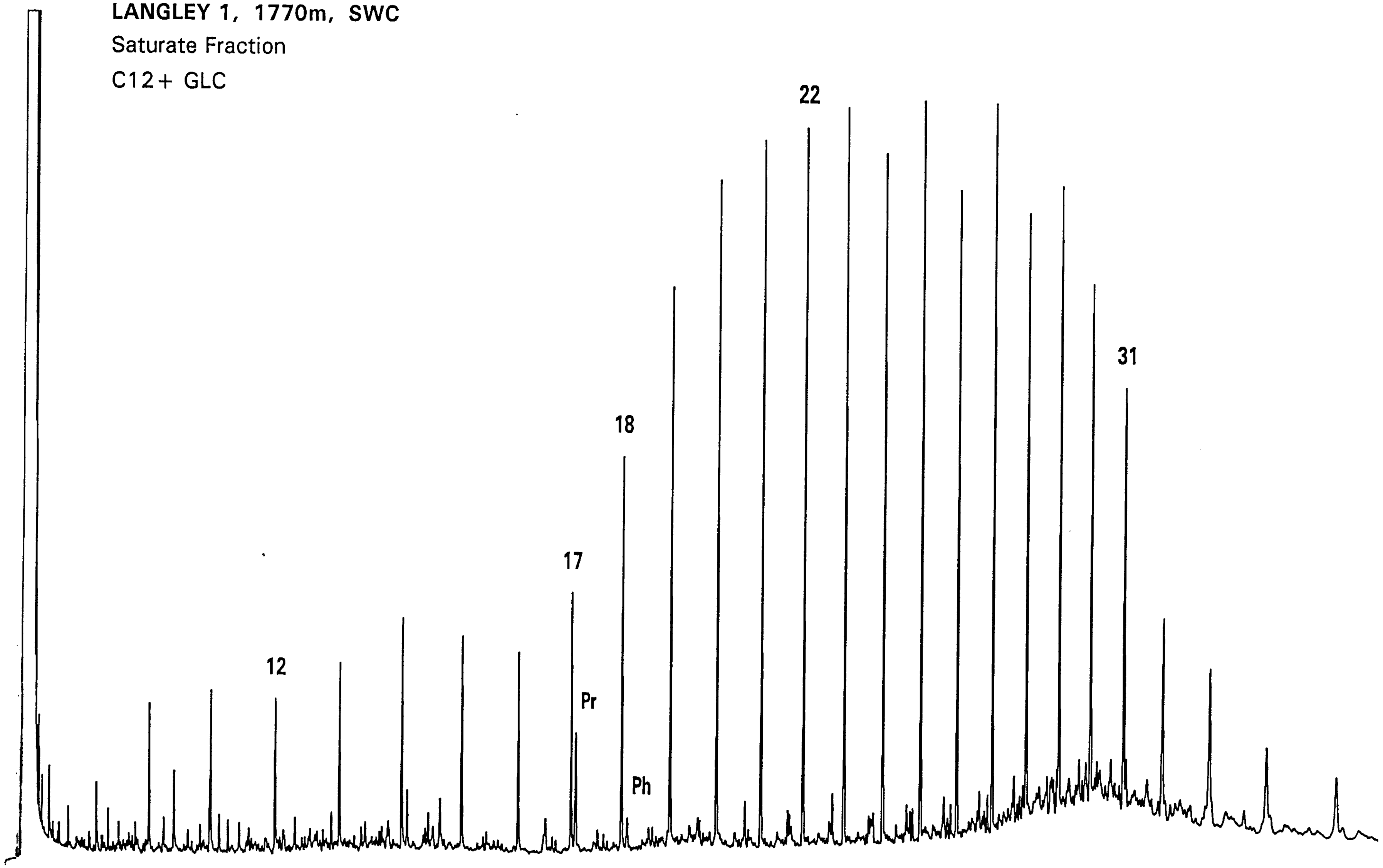
C12+ GLC



GEOTECHNICAL SERVICES PTY LTD

2076ED2

LANGLEY 1, 1770m, SWC
Saturate Fraction
C12+ GLC



GEOTECHNICAL SERVICES PTY LTD

GEOTECH GEOTECHNICAL SERVICES PTY LTD
105 Burswood Road, Victoria Park, Western Australia 6100

Telephone (09) 362 5222
Facsimile (09) 362 5908

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1 JUL 1994
E1518
GFE RESOURCES LTD

29 June, 1994

Mr. K. Lanigan
GFE Resources Ltd
Level 6
6 Riverside Quay
South Melbourne VIC 3205

Dear Kevin,

Please find enclosed Solvent extraction and Pyrolysis GC results for Langley-1, 1825.5m SWC.

The source potential for oil is very poor, as reflected in the virtual lack of C_{15} to C_{31} alkene + alkane pairs, and downgrades the hydrogen index of 194.

However, compared with adjacent samples, this sediment yielded a good amount of extractable organic matter (Tab.5, 730.7 ppm) which is in agreement with the promising S_1 value from Rock-Eval pyrolysis.

I would recommend to perform GC sat on this extract to characterise the nature of the free hydrocarbons (which may have contributed to the Rock-Eval S_2 peak and therefore have caused the relatively high S_2 value of 6.71 mg/g).

If you have further queries or if we can be of any assistance to you, please do not hesitate to contact us.

Yours sincerely,

Dr. Birgitta Hartung-Kagi
Managing Director

TABLE 5

Summary of Extraction and Liquid Chromatography

LANGLEY 1 Jun-94

A. Concentrations of Extracted Material

				-------Hydrocarbons-------			----Nonhydrocarbons----		
PTH(m)	Weight of Rock Extd (grams)	Total Extract (ppm)	Loss on Column (ppm)	Saturates (ppm)	Aromatics (ppm)	HC Total (ppm)	NSO's (ppm)	Asphalt (ppm)	NonHC Total (ppm)
1291.0	13.0	15861.5	nd	nd	nd	nd	nd	nd	nd
1518.5	7.3	731.0	nd	nd	nd	nd	nd	nd	nd
1732.0	9.1	1127.1	33.1	640.9	254.1	895.0	198.9	nd	198.9
1770.0	9.3	2358.0	246.5	375.1	739.5	1114.7	996.8	nd	996.8
1803.5	20.0	25.0	nd	nd	nd	nd	nd	nd	nd
1825.5	10.0	730.7	nd	nd	nd	nd	nd	nd	nd
1884.0	22.4	44.6	nd	nd	nd	nd	nd	nd	nd

TABLE 5

Summary of Extraction and Liquid Chromatography

L GLEY 1 Jun-94

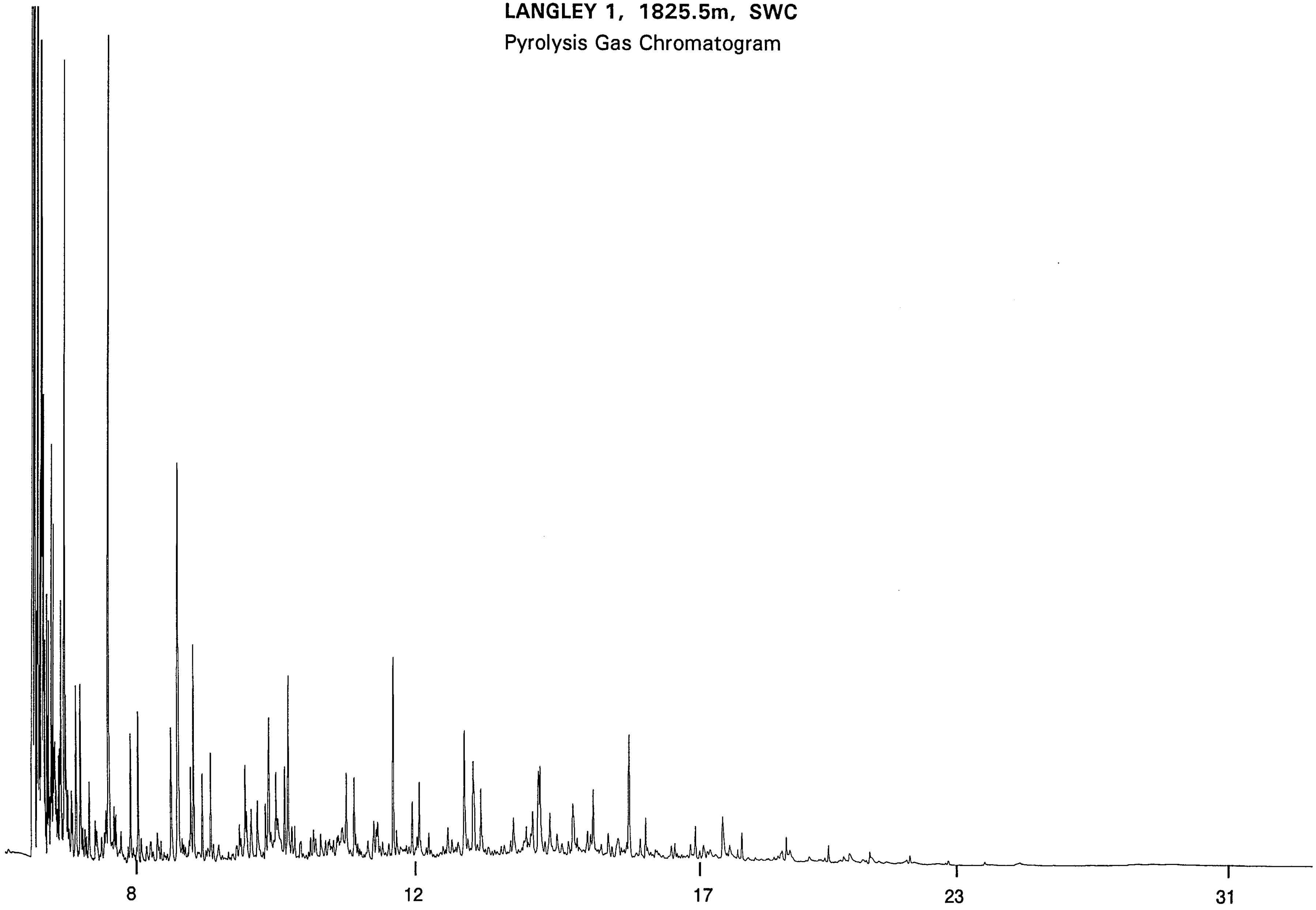
B. Compositional Data

	---Hydrocarbons----			---Nonhydrocarbons-----			EOM(mg)	SAT(mg)	SAT	ASPH	HC
							-------	-------	-------	-------	-------
DEPTH(m)	%SAT	%AROM	%HC's	%NSO	%ASPH	%Non HC's	TOC(g)	TOC(g)	AROM	NSO	Non HC
1291.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1518.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1732.0	58.6	23.2	81.8	18.2	nd	18.2	nd	nd	2.5	nd	4.5
1770.0	17.8	35.0	52.8	47.2	nd	47.2	nd	nd	0.5	nd	1.1
1803.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1825.5	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1884.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

nd = no data

LANGLEY 1, 1825.5m, SWC

Pyrolysis Gas Chromatogram



GEOTECHNICAL SERVICES PTY LTD

TABLE 2-1

ALKENE AND ALKANE COMPONENT ANALYSIS FROM PYROLYSIS-GC

LANGLEY 1, 1825.5m, SWC Jun-94

Carbon No.	----Alkane + Alkene----			-------Alkane-------			-------Alkene-------			Alkane/Alkene
	A	B	C	A	B	C	A	B	C	
1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	2.711	nd	nd	1.777	nd	nd	0.934	nd	nd	1.90
6	1.211	nd	nd	0.553	nd	nd	0.658	nd	nd	0.84
7	1.062	nd	nd	0.529	nd	nd	0.533	nd	nd	0.99
8	0.840	nd	nd	0.441	nd	nd	0.399	nd	nd	1.11
9	0.611	nd	nd	0.336	nd	nd	0.275	nd	nd	1.22
10	0.654	nd	nd	0.305	nd	nd	0.349	nd	nd	0.87
11	0.688	nd	nd	0.268	nd	nd	0.420	nd	nd	0.64
12	0.485	nd	nd	0.258	nd	nd	0.227	nd	nd	1.14
13	0.300	nd	nd	0.154	nd	nd	0.146	nd	nd	1.05
14	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
15	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
16	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
17	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
18	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
19	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
20	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
21	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
22	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
23	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
24	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
25	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
26	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
27	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
28	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
29	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
30	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd
31	0.000	nd	nd	0.000	nd	nd	0.000	nd	nd	nd

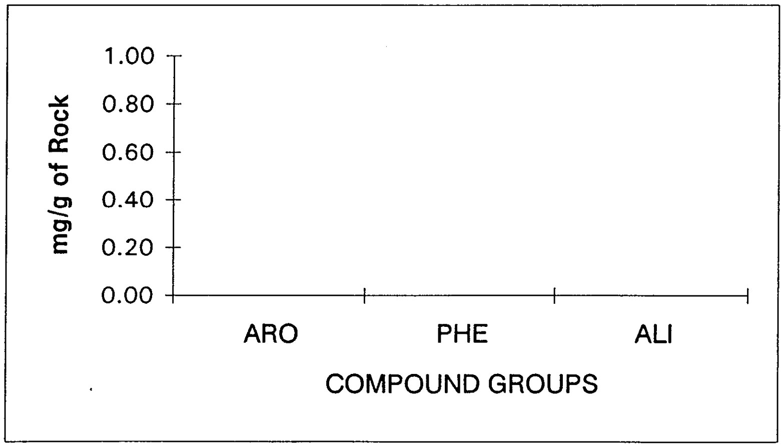
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC

TABLE 3-1

AROMATIC AND PHENOLIC COMPONENT ANALYSIS FROM PYROLYSIS-GC

LANGLEY 1, 1825.5m, SWC Jun-94

		--------------------Value--------------------		
Key	Compound Name	A	B	C
A.	Benzene	1.808	nd	nd
B.	Toluene	2.884	nd	nd
C.	Ethylbenzene	0.552	nd	nd
D.	m- + p-xylene	1.872	nd	nd
E.	Styrene	0.332	nd	nd
F.	o-xylene	0.699	nd	nd
G.	Phenol	0.671	nd	nd
H.	o-cresol	0.000	nd	nd
I.	m- + p-cresol	0.000	nd	nd
J.	C2 phenol	0.000	nd	nd
K.	C2 phenol	0.000	nd	nd



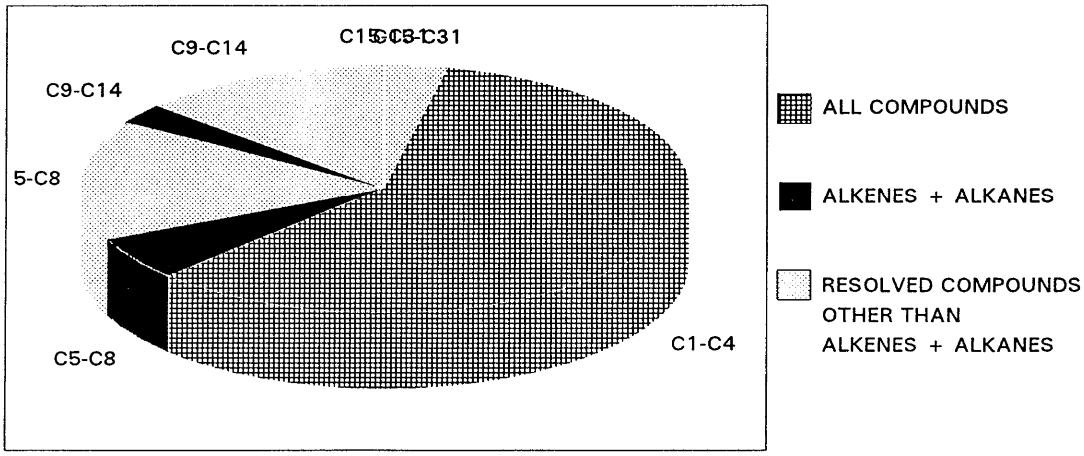
nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
ARO = aromatic compounds (A to F)
PHE = phenolic compounds (G to K)
ALI = aliphatic compounds (C9 to C31 alkenes + alkanes)

TABLE 4-1

PARAMETER SUMMARY FOR PYROLYSIS GAS CHROMATOGRAPHY

LANGLEY 1, 1825.5m, SWC Jun-94

		Value		
Parameter	A	B	C	D
C1-C4 abundance (all compounds)	59.08	nd	nd	
C5-C8 abundance (all resolved compounds)	21.49	nd	nd	
C5-C8 abundance (alkanes + alkenes)	5.82	nd	nd	
C9-C14 abundance (all resolved compounds)	16.10	nd	nd	
C9-C14 abundance (alkanes + alkenes)	2.74	nd	nd	
C15-C31 abundance (all resolved compounds)	3.33	nd	nd	
C15-C31 abundance (alkanes + alkenes)	0.00	nd	nd	
C9-C31 abundance (all resolved compounds)	19.44	nd	nd	
C9-C31 abundance (alkanes + alkenes)	2.74	nd	nd	
C5-C31 abundance (all resolved compounds)	40.92	nd	nd	
C5-C31 abundance (alkanes + alkenes)	8.56	nd	nd	
C5-C31 alkane abundance	4.62	nd	nd	
C5-C31 alkene abundance	3.94	nd	nd	
C5-C8 alkane/alkene				1.31
C9-C14 alkane/alkene				0.93
C15-C31 alkane/alkene				nd
C5-C31 alkane/alkene				1.17
(C1-C5)/C6+				1.83
R				4.69



nd = no data
A = % of resolved compounds in S2
B = mg/g Rock (Rock-Eval)
C = (mg/g Rock)/TOC
D = no units
R = m + p-xylene/n-octene

APPENDIX 11

GFE RESOURCES LTD

APPENDIX 11

PALYNOLOGY REPORT

LANGLEY-1

Palynological analysis of Langley-1, Port Campbell Embayment, Otway Basin.

by

Alan D. Partridge

Biostrata Pty Ltd

A.C.N. 053 800 945

Biostrata Report 1994/11

12 September 1994

INTERPRETATIVE DATA

Introduction

Thirty-three sidewall cores and two core samples between 895-1989m were analysed in Langley-1. The author cleaned and split the samples then forwarded them to Laola Pty Ltd in Perth for processing to prepare the palynological slides.

Between 3.2 to 14.4 grams (average 9.8 g) of the sidewall cores and 13 grams of the conventional core samples were processed for palynological analysis. High residue yields were extracted from most samples, and kerogen slides were prepared with filtered and unfiltered fractions, and separate oxidised slides were prepared from fractions concentrated from the residues using 8 and 15 micron filters. Notwithstanding the use of the coarser filter palynomorphs concentrations on nearly all palynological slides was generally low to very low. Further, most palynomorphs in all but the shallowest four samples are poorly preserved. Because of the interaction of these two problems the palynological slides were particularly difficult and slow to examine. The assemblage abundance data presented in Table-2 were obtained from counts made on slides prepared using the 8 microns filter.

Spore-pollen diversity is moderate to occasionally high averaging 25+ species in the productive samples. Spore-pollen recorded as contaminants or as reworked are excluded from calculation of species diversity for individual samples and overall average. Microplankton diversity is low to moderate 3 to 27 species in the Sherbrook and Wangerrip Groups with an average of 10+ species, and very low in the Eumeralla Formation with only one or two non-marine microplankton recorded per sample.

Geological ages, formations and palynological zones for the interval sampled in Langley-1 are given in Table-1. Additional interpretative data with zone identification and Confidence Ratings are recorded in Table-3, whilst basic data on residue yields, preservation and diversity are recorded on Tables-4 and 5. All species which have been identified with binomial names are tabulated on the palynomorph range charts which present the recorded assemblages in order of lowest appearances.

Table-1: Palynological Summary Langley-1

AGE	UNIT	SPORE-POLLEN ZONES	MICROPLANKTON ZONES (SUBZONES)
PALEOCENE	K/T BOUNDARY SHALE 892-917m	*L. balmei* 895m	*P. pyrophorum* 895m
MAASTRICHTIAN		Upper *T. longus* 91~~8~~6m	(*A. acutulum*) 91~~8~~6m
CAMPANIAN TO SANTONIAN	PAARATTE FORMATION 917-1348m	*N. senectus* 1291-1325m	Indeterminate
	SKULL CREEK MUDSTONE 1348-1517m	*T. apoxyexinus* 1516-1692m	*I. cretaceum* 1516-1677m
	NULLAWARRE GREENSAND 1517-1555m		
	BELFAST MUDSTONE 1555-1716m		*O. porifera* 1712.5m 1692
CONIACIAN		*P. mawsonii* 1701-1825.5m	*C. striatoconus* 1701m
TURONIAN	WAARRE D 1716-1731m		*P. infusorioides* (*I. glabrum*) 1712.5-1728m
	WAARRE C 1731-1768m		*P. infusorioides* (*A. parvum*) 1733.5m
	WAARRE B 1768-1803m		*P. infusorioides* (*C. edwardsii*) 1768.2-1825.5m
	WAARRE A 1803-1826m		
LATE ALBIAN	EUMERALLA FORMATION 1826-T.D.	*P. pannosus* 1855-1989m	

Geological Comments

1. The sequence sampled in Langley-1, with minor modifications, can be readily assigned to the Mesozoic spore-pollen and microplankton zones defined by Helby, Morgan & Partridge (1987). The time interval sampled is from the Late Albian to basal Paleocene.

2. A number of the spore-pollen zones used or discussed herein represent modifications or name changes by Helby *et al.* (1987) of zones originally erected by Dettmann & Playford (1969) in wells from the Port Campbell Embayment. As these latter zones are is still widely used in reports and publications on the Otway Basin it is appropriate to provide a summary of the equivalence between the two zonation schemes. Explanations of the reasons for the zone name changes can be found in Helby *et al.* (1987). The zones referred to in this report are:

Dettmann & Playford (1969)	**Helby *et al.* (1987)**
Nothofagidites Microflora (in part only)	*N. senectus* Zone
T. pachyexinus Zone	*T. apoxyexinus* Zone
C. triplex Zone	*P. mawsonii* Zone
A. distocarinatus Zone	*A. distocarinatus* Zone
P. pannosus Zone	*P. pannosus* Zone

3. The spore-pollen zones identified conform to the normal succession in the Otway Basin except that the *P. mawsonii* Zone was found to extend to the base of the Waarre Formation (as well as base of the Sherbrook Group) and the *A. distocarinatus* Zone as redefined by Helby *et al.* (1987) is considered to be absent at the unconformity between the Waarre and Eumeralla Formations.

   Above 1516m the samples analysed are too widely spaced to distinguish all spore-pollen known to occur in this part of the sequence.

4. Marine microplankton first appear in Langley-1 in the basal sample analysed from the Waarre Formation and thereafter are found in all samples analysed from the Sherbrook Group. The microplankton zones conform to the normal sequence between the basal Turonian to Santonian, but above 1516m the decreased sampling density and low microplankton diversity means not all zones known to occur in the succession could be identified. In contrast, the close sampling of the

Waarre Formation (21 samples at 5 metres spacing) has enabled the recognition of additional subzones within the *P. infusorioides* Zone.

5. Commencing from total depth the oldest unit penetrated in Langley-1 is the Eumeralla Formation, which based on the sidewall cores recovered is a characteristically blue-grey claystone to siltstone (Table-4). The Late Albian *P. pannosus* Zone identified from this section conforms to the youngest age known from this formation.

6. The base of the overlying Waarre Formation and hence base of Sherbrook Group is readily recognised on the palynology by the influx of marine microplankton representing the base of a marine transgression. This occurs in the shaly unit between 1820-1826m at the base of Unit A of the Waarre Formation (see Buffin 1989). The microplankton are of low abundance (<5% of assemblage) but have moderate diversity. The assemblage is considered no older than the *P. infusorioides* Zone and hence is of Turonian to very latest Cenomanian in age (Helby *et al.* 1987, fig.45). No samples were analysed from the sandy part of Unit A between 1803 and1820m.

7. It is noted that Evans (1966, p.33) has recorded marine dinoflagellates from the top of his Unit M (= Eumeralla) in Port Campbell-2 and other wells, and Dettmann & Playford (1969, p.193) consider that the uppermost horizons of their *C. paradoxa* Zone and hence Eumeralla Formation occasionally yield marine microplankton including *Odontochitina operculata* and *Cribroperidinium* (al. *Gonyaulacysta*) *edwardsii*. The detailed sampling and analysis in Langley-1 suggests these occurrences of marine dinoflagellates in the Eumeralla Formation are unlikely. Instead it is suggested that the assemblages recorded by both Evans (1966) and Dettmann & Playford (1989) are from equivalents of the Waarre Formation and the misassignment of both age and formation is a result of relying on the spore-pollen for age identification without recognising that there is reworking of palynomorphs from the underlying Eumeralla Formation.

8. In Unit B of the Waarre Formation between 1768-1803m all samples analysed contain marine microplankton and there is a overall increase in their abundance and diversity going up section. Other marine indicators include the identification of a scolecodont at 1789m and microforaminiferal inner liners at 1776.5m. The latter represent the chitinous inner layers of the earliest chambers of foraminifera. In this case they are very rare and it is unlikely that any foraminifera could be extracted from the small amount of sample remaining from the sidewall

core using the conventional techniques for extraction of calcareous microfossils.

9. From Unit C of the Waarre Formation between 1731-1768m only three samples have been analysed. Although the two samples from the conventional core contained both marine microplankton and foraminiferal inner liners these marine indicators were swamped by abundant terrestrially derived kerogen including spores and pollen and thus appear less marine than assemblages from the underlying Unit B. The shallowest of the three samples, the sidewall core at 1733.5m, represents a significant change in the microplankton assemblage with the first appearance of index or eponymous species of the *Ascodinium parvum* Zone recognised by Evans (1966). This zone is recognised as a separate subzone within the *P. infusorioides* Zone in Langley-1. In the adjacent Port Campbell-2 well the *A. parvum* Zone was recognised by Evans (1966) between 7906-8100ft (2410-2469m) in contrast to its occurrence in only the thin shale bed between 1733-1734m in Langley-1. Assuming the early palynological work in Port Campbell-2 can still be trusted it is suggested that a significant part of this zone could be missing in Langley-1 at a sequence boundary or minor unconformity at approximately 1731m. Support for this interpretation is provided by the sidewall core at 1732m which is a coarse sandstone of a brown colour and weathered character.

10. Above 1731m, the Unit D of the Waarre Formation and the overlying Belfast Mudstone are open marine shales based on the abundance and diversity of microplankton and consistent presence of foraminiferal inner liners. With the exception of low gamma spikes at 1702m and 1716.5m there is little change in the gamma log between these two units. There is however more character and potential lithological resolution on the combined bulk density/neutron porosity logs where there are distinct log breaks at 1696.5m (or 1698m) and 1716m. It is unclear, however, at which break to place the major formation boundary. Correlating from Iona-1 and Iona-2 on the position of the *C. striatoconus* and *O. porifera* Zones in the three wells the boundary between the Waarre Unit D and the Belfast Mudstone would be best placed at 1696.5m (see Partridge 1994). Correlating from Port Campbell-2 where *Conosphaeridium striatoconus* has been recorded by Cookson (1965) between 7403-7450ft (2256-2271m), from the basal part of the Belfast Mudstone, the base of this last unit would be best placed in Langley-1 at 1716m. To agree with geological analysis in the well completion report the deeper pick at 1716m is accepted as base of Belfast Mudstone.

Since the type section for the Flaxmans Formation is given by Glenie (1971) as the interval 7676-8184ft (2334-2494m) in Port Campbell-2 it seems likely that Unit D of the Waarre Formation in Langley-1 actually represents the Flaxmans Formation.

11. The Belfast Mudstone to basal Skull Creek Mudstone in Langley-1 contains the *O. porifera* and *I. cretaceum* microplankton Zone as was also found in Iona-2. The top of the *I. cretaceum* Zone in both wells is characterised by the species *Isabelidinium rotundatum* ms Marshall 1984 (recorded as *Isabelidinium* sp. cf *I. cretaceum* on the Iona-2 range charts). This species has considerable potential for defining a new zone or subzone which can be used to correlate the base of the Skull Creek Mudstone.

12. The distinctive shale unit between 892-917.5m in Langley-1 is remarkably similar to the Cretaceous/Tertiary (K/T) boundary shale which is widely found in the eastern part of the offshore Gippsland Basin. This correlation is supported by a basal Paleocene age at 895m based on identification of the *L. balmei/P. pyrophorum* Zones and a Maastrichtian Upper *T. longus* Zone age below the shale at 918m. In Iona-1, where the shale between 637-660m shows remarkably similar gamma log character, data in Morgan (1988) indicates the Maastrichtian Upper *T. longus* Zone extends as shallow as 652m and confirms that the K/T boundary actually lies within this shale package. The recent mapping and palynological study by Keating (1993) shows clearly that neither this shale nor these ages can be found in the type outcrop section of the Pebble Point Formation.

13. As discussed in more detail in the following zone descriptions the spore-pollen succession in Langley-1 lacks clear evidence for the presence of the *A. distocarinatus* Zone as redefined by Helby *et al.* (1987). Thus an obvious question is what was the zone concept that Dettmann & Playford (1969) were applying when they designated the type section for the *A. distocarinatus* Zone in the adjacent Port Campbell-2 well**?** From the detailed sampling and palynological analysis in Langley-1 it is suggested that their zone represented the consistent occurrence or partial acme zone for the zone species *A. distocarinatus*. In Langley-1 this approximates Unit B of the Waarre Formation because the spore *A. distocarinatus* was recorded in 7 of the 10 samples from this unit and although specimens are rare in individual samples they are still much more abundant than either *Phyllocladidites mawsonii* or *Clavifera triplex* which define the base of the *P. mawsonii* Zone. It is suspected that the identification of the *A. distocarinatus* Zone will need to be revised throughout the Otway Basin.

This conclusion has been derived from a more rigorous and detailed analysis of individual samples rather than more detailed sampling. For example in a preliminary review of the Port Campbell-2 well *Clavifera triplex* has been recorded from as deep as core-15 at 8409-8418ft (2563-2566m) which is given as the base of the type section for the *A. distocarinatus* Zone!

Table-2: Microplankton Abundance for Selected Samples.

Sample Type	Depth (m)	Microplankton Zone or Subzone	Microplankton Abundance as % Relative to total Spore-pollen and Microplankton	Most abundant microplankton species as % of total microplankton
SWC-46	1677	*I. cretaceum*	14%	*Isabelidinium cretaceum* ≥25%. *Amosopollis cruciformis* <10%.
SWC-45	1692	*O. porifera*	21%	*Heterosphaeridium* spp. >35%. *Amosopollis cruciformis* >15%.
SWC-44	1701	*C. striatoconus*	13%	*Heterosphaeridium* spp. >40% *Amosopollis cruciformis* >20%.
SWC-43	1712.5	*I. glabrum*	26%	*Amosopollis cruciformis* >70%.
SWC-42	1718	*I. glabrum*	36%	*Heterosphaeridium* spp. >25% *Amosopollis cruciformis* >25%.
SWC-40	1729.5	*P. infusorioides*	>75%	*Heterosphaeridium* spp. >20%. *Amosopollis cruciformis* >15%.
SWC-38	1733.5	*A. parvum*	>40%	*Amosopollis cruciformis* >35% *Ascodinium parvum* >10%.
SWC-37	1768.2	*C. edwardsii*	13%	Mixed *Cyclonephelium* & *Heterosphaeridium* spp. >50%.
SWC-34	1776.5	*C. edwardsii*	12%	*Oligosphaeridium* spp. >40%.
SWC-33	1778.5	*C. edwardsii*	25%	*Cribroperidinium edwardsii* >25%.
SWC-32	1781	*C. edwardsii*	13%	No species dominant in low count.
SWC-28	1795	*C. edwardsii*	3%	Microplankton count too low.
SWC-27	1798	*C. edwardsii*	6%	*Odontochitina operculata/costata.*
SWC-16	1824	*C. edwardsii*	4%	Microplankton count too low.
SWC-11	1855		5%	*Micrhystridium* sp. 100%.
SWC-2	1989		3%	*Sigmopollis carbonis* 75%.

14. All samples analysed from the Sherbrook Group are considered to be marine based on the abundance and diversity of their contained microplankton (Tables 2 & 5). Abundance of microplankton expressed as a percentage increases gradually through the Waarre Units A and B where it varies from 3% to 25% but averages <12%. Average diversity in these units is 8 species per sample and overall diversity in excess of 15 species. Data from Unit C is limited but in the interval from the shallowest sample at 1733.5m to the shallowest sample counted in the Belfast Mudstone at 1677m average microplankton abundance increases dramatically to >30%. The highest abundance occurs at the base of Unit D (at 1729.5m) and suggests that this is a significant marine flooding surface.

15. The few organic walled microplankton recorded from the Eumeralla Formation would generally be classed as acritarchs and are here all considered to be derived from non-marine lacustrine environments. The deposition of the Otway Group at high latitudes in the Early Cretaceous can be compared to modern deposition environments above the Arctic Circle where there are typically thousands of lakes of all sizes in the modern depositional basins as a consequence of low temperatures and low evaporation. It is easy to envisage algal cysts deposited in such lakes being reworked by fluvial processes throughout the depositional basin. These microplankton in the Otway Group have been recorded and discussed by other palynologists dating back to Evans (1966, p.31).

16. Reworked palynomorphs were recorded from virtually all samples analysed. Because of the considerable age difference the Permian and Triassic spores and pollen are the most obvious reworked palynomorphs. Reworked Early Cretaceous spores and pollen from the Otway Group are found throughout the Sherbrook Group but the full extent of this reworking is impossible to estimate as many Early Cretaceous species are considered to range into the Late Cretaceous. The detailed sampling of the Waarre Formation and detailed examination of samples where several slides were examined for each sample has enabled more confidence in identification of the portion of the assemblage reworked from the underlying Otway Group and these species are grouped together on the range chart. Of particular interest is the occurrence of *Coptospora paradoxa* only at 1781m where it is interpreted as reworked. As this species was relied on in many of the early palynological reports for picking the top of the Eumeralla Formation it suggests considerable caution should be applied when evaluating these early report.

Biostratigraphy

The zone and age determinations for the Cretaceous samples are based on the Australia wide Mesozoic spore-pollen and microplankton zonation schemes described by Helby, Morgan & Partridge (1987), with addition of a number of microplankton subzones which have the potential to provide a more detailed subdivision of the lower units in the Sherbrook Group. For the Tertiary, zone and age determinations are based on the spore-pollen zonation scheme of Stover & Partridge (1973) with subsequent unpublished modifications.

Author citations for most spore-pollen species can be sourced from Helby, Morgan & Partridge (1987), Dettmann (1963), Stover & Partridge (1973) or other references cited herein. Author citations for dinoflagellates can be found in the indexes of Lentin & Williams (1985, 1989) or other references cited herein. Species names followed by "ms" are unpublished manuscript names.

Spore-Pollen Zones

***Lygistepollenites balmei* Zone.**
Interval: 895.0 metres.
Age: Basal Paleocene.

This shallowest sample is assigned to this broad zone on the presence of the eponymous species *Lygistepollenites balmei* together with *Australopollis obscurus*, *Gambierina rudata* and *Tricolpites phillipsii*. No diagnostic species of either the Upper or Lower subzones of the *L. balmei* Zone were recorded but the associated microplankton would suggest assignment of the Lower subzone.

Upper *Tricolpites longus* Zone.
Interval: 918.0 metres.
Age: Maastrichtian.

The presence of rare *Stereisporites (Tripunctisporis)* sp. with common *Gambierina rudata* confirms the sample is no older than the Upper *Tricolpites longus* Zone, while the species *Proteacidites clinei* ms, *P. otwayensis* ms, *Tetradopollis securus* ms and *Battenipollis sectilis* (Stover) Jarzen & Dettmann 1992 confirm an age no younger than this zone. The index species *Forcipites* (al. *Tricolpites*) *longus* was not recorded.

***Nothofagidites senectus* Zone.**
Interval: 1291.0-1325.0 metres (34+ metres).
Age: Lower Campanian.

Two samples are assigned to this zone on the rare presence of the eponymous species *Nothofagidites senectus*. The shallower sample also contains frequent specimens of the accessory index species *Forcipites* (al. *Tricolpites*) *sabulosus* (Dettmann & Playford) Dettmann & Jarzen 1988. No other zone diagnostic species were recorded in these obviously high diversity samples which were difficult to work due to the low concentrations of the palynomorphs.

***Tricolporites apoxyexinus* Zone** (formerly the *Tricolpites pachyexinus* Zone).
Interval: 1541.0-1692.0 metres (151+ metres).
Age: Santonian.

Whilst moderate diversity assemblages of mainly long ranging species were recorded from the six samples over this interval, because of the overall poor preservation index species were extremely rare. In particular the eponymous species *T. apoxyexinus* was not recorded. Assignment to the zone is thus based on accessory species such as *Ornamentifera sentosa* (at 1516m & 1677m), *Forcipites stipulatus* Dettmann & Jarzen 1988 (at 1634m), *Latrobosporites amplus* (at 1516m & 1541m) and *L. ohaiensis* (at 1692m). Supporting the zone assignment are the more consistent presence, compared to their occurrences in the underlying zone, of the species *Australopollis obscurus, Clavifera triplex, Herkosporites elliottii* and *Phyllocladidites mawsonii.* This latter feature is similar to the observations made in Iona-2 (Partridge 1994).

Two specimens suggest the *T. apoxyexinus* Zone could extend lower. A single specimen of *Latrobosporites amplus* was recorded at 1701m and a poorly preserved specimen of *Tricolporites apoxyexinus* at 1712.5m. Both samples are also above the last rare occurrence of *Appendicisporties distocarinatus* (at 1718m) which is not considered to range above the underlying *P. mawsonii* Zone (Helby *et al.* 1987, fig.33; Partridge 1994). However, assigning the samples at 1701m and 1712.5m to the *T. apoxyexinus* Zone would break the preferred correlations between the spore-pollen and microplankton zones established by Helby *et al.* (1987) whereby the *T. apoxyexinus/P. mawsonii* Zone boundary is correlated to the *O. porifera/C. striatoconus* Zone boundary. Whilst the possible need for such a recalibration is here noted it is not considered that the spore-pollen succession in Langley-1 is either sufficiently well preserved or adequately documented to justify such a change in our standard correlations without further testing.

***Phyllocladidites mawsonii* Zone** (formerly the *Clavifera triplex* Zone).
Interval: 1701.0-1825.5 metres (124+ metres).
Age: Turonian-Coniacian.

All twenty-two samples over the interval of the *P. mawsonii* Zone are poor to very poorly preserved and this is compounded by the generally low to very low palynomorph concentrations. The eponymous species *Phyllocladidites mawsonii* was recorded in approximately one in four samples and has its FAD (First Appearance Datum) at 1802m. The former index species *Clavifera triplex* is recorded in just half the samples above its FAD at 1772m. Although neither of these species extend to the base of the Waarre Formation in Langley-1, in other aspects, both the spore-pollen and associated microplankton assemblages do not change markedly in character. Given the rarity of the key index species, a feature that has also been well documented in the Gippsland Basin, it is reasonable to say the base of the *P. mawsonii* Zone extends to the base of the Waarre Formation.

The lower part of the interval can be considered a separate subzone based on the occurrence of *Hoegisporis trinalis* ms which was recorded in all but one of the 14 samples between 1750.2-1824m. Other consistent species over this interval are *Rugulatisporites admirabilis* ms and *Appendicisporites distocarinatus*. The latter was recorded in all samples between 1772-1798m. Species recorded sporadically in the interval are *Interulobites intraverrucatus*, *Densoisporites muratus* ms, *Cicatricosisporites cuneiformis* and *C. pseudotripartitus*. Counts of selected samples show the assemblages can be characterised by common to abundant *Dilwynites* spp. (9%-25%; average 21%) and *Gleicheniidites* spp. (12%-24%; average 19%), with frequent to common *Podocarpidites* spp. (4%-13%; average 11%), *Microcachryidites antarticus* (<2%-8%; average <5%), and *Cupressacites* sp. (<1%-6%; average <4%). The abundances of these species or species groups clearly distinguish these samples from those assigned to the underlying *P. pannosus* Zone.

In the six samples between 1701-1733.5m the frequency of occurrence of the more diagnostic species markedly decreases. A possible exception is *Clavifera triplex* which both more consistent and more abundant (max. <2%). This difficulty in finding key species is partly a consequence of poor preservation of the palynomorphs in the more pyrite rich lithologies, but is also a consequence of the more distal marine character of the shaly lithologies between 1698-1731m. Nevertheless, key species found in this interval supporting the *P. mawsonii* Zone assignment include the LADs (Last Appearance Datums) for *Appendicisporites distocarinatus* at 1718m; *Cyatheacidites tectifera* at 1701m; and *Laevigatosporites musa* ms at 1733.4m. Counts of the assemblages were less reliable than the deeper interval because of poorer preservation and lower palynomorph concentrations. They show the same pattern of species abundances as given above except for the two shallowest samples at 1701m and 1712.5m. These display an increase in abundance of *Cupressacites* sp. to 14%-15% and compensating decrease in *Dilwynites* spp. to 8%-10%. The other categories are much the same. As discussed in the overlying zone there is other evidence to suggest these two shallowest samples may belong to the *T. apoxyexinus* Zone.

Of taxonomic interest is the identification of *Piriurella elongata* Cookson & Eisenack 1979 at 1798m. This species was considered by the original authors to be an algal species but has subsequently been shown to be a fungal spore by Smith & Chaloner (1979).

Appendicisporites distocarinatus Zone.

Interval: Not recorded in Langley-1.
Age: Cenomanian.

Langley-1 is close to Port Campbell-2 wherein the original type section for the *Appendicisporites distocarinatus* Zone was designated by Dettmann & Playford (1969) as between 8096ft-8418ft (2468-2566m). Based on the extremely good sampling and detailed analysis in Langley-1 it is believed that the type section of the *A. distocarinatus* Zone needs to be reassigned to the *P. mawsonii* Zone. The justification for this reassignment is that the top of the *A. distocarinatus* Zone has been redefined by Helby *et al.* (1987) to place more emphasis on the first appearance of *Phyllocladidities mawsonii* compared to the first appearance of *Clavifera triplex*. The latter was given more weight by Dettmann & Playford (1969). Since the results in Langley-1 show that *P. mawsonii* can be found as a very rare component of the assemblages to near the base of the Waarre Formation it is hypothesised that a similar range would be found Port Campbell-2 with more detailed analysis.

Considering the detailed occurrence data from Langley-1 it would seem the designated type section of the *A. distocarinatus* Zone in Port Campbell-2 would approximated the interval in Langley-1 between 1776.5-1779m where the zone index *A. distocarinatus* occurs in every sample prior to first appearance of *C. triplex* at 1772m. A difficulty with this interpretation is that this represents only an 12+ metres interval in Langley-1 whereas the type section in Port Campbell-2 is much thicker at 98 metres. To resolve this difficulty requires new palynological work on Port Campbell-2.

***Phimopollenites pannosus* Zone.**
Interval: 1855.0-1989.0 metres (144+ metres).
Age: Late Albian.

Two samples are assigned to the *P. pannosus* Zone. The deeper sample contains *Phimopollenites pannosus* and is dominated by the pollen types *Podocarpidites/Falcisporites* spp. (19%) and spores of *Cyathidites* spp. (20%). The shallower sample lacks the eponymous species but it too can be confidently assigned to the Eumeralla Formation based on an assemblage dominated by *Podocarpidites/Falcisporites* spp. (42%) and *Corollina* spp (25%) and lack of younger index spore-pollen or marine dinoflagellates characteristic of the Waarre Formation. This confidence is derived from the slightly better sampling in Iona-2 where it was clearly shown that the Eumeralla Formation can be distinguished from the Waarre Formation based on abundances of the commonest species (Partridge 1994).

Microplankton Zones

***Palaeoperidinium pyrophorum* Zone**
Interval: 895.0 metres
Age: Basal Paleocene.

The *Palaeoperidinium pyrophorum* Zone is a recently recognised zone in the Gippsland Basin and lies between the *Trithyrodinium evittii* and *Eisenackia crassitabulata* Zones of Partridge (1975, 1976). It defines the interval from the last appearance of *T. evittii* to the last appearance of *P. pyrophorum* and is recognised in Langley-1 by the presence of the eponymous species. Lithologically the sample shows some similarity to the Pebble Point Formation but the gamma log character suggests it is still within the sedimentary package informally termed the K/T Boundary Shale (Table-1). Recent work by Keating (1993) has shown that the type outcrop section of this formation extends no older than the *E. crassitabulata* Zone and is of Late Paleocene age. Away from the type section precise limits for the Pebble Point Formation still need to be revised.

***Alterbidinium acutulum* Zone**
Interval: 918.0 metres
Age: Maastrichtian.

The *A. acutulum* Zone was defined by Wilson (1984) as the interval between the last appearance of *Odontochitina porifera* (and the genus *Odontochitina*) to the first appearance of *Manumiella druggii*. Based on the absence of both these species and related morphotypes this limited diversity assemblage can be assigned to this zone on the presence of *Alterbidinium acutulum*.

Undifferentiated *Isabelidinium* Superzone.
Interval: 1291.0-1325.0 metres (34+ metres).
Age: Senonian.

The two samples contain only rare dinoflagellates (7+ species). Their stratigraphic position, plus presence of *Heterosphaeridium evansii* ms Marshall 1984 (= *H. laterobrachius* ms) in the shallower sample and *Odontochitina porifera* in the deeper sample, confirm assignment to the broad superzone and a Senonian age.

***Isabelidinium cretaceum* Zone.**
Interval: 1516.0-1677.0 metres (161+ metres).
Age: Santonian.

Of the five samples over this interval the three deeper samples are assigned to the *I. cretaceum* Zone on the rare to common occurrence of the eponymous species and lack of the succeeding zone indicators. The two shallowest samples are assigned to the zone on the presence of *Isabelidinium rotundatum* ms Marshall 1984. This species is the variety of *I. cretaceum* recorded by Cookson & Eisenack (1961, p.11, figs 1,2) from the Belfast No. 4 bore. It is characteristically circumcavate rather than simply cavate at the apices like the holotype and most of the paratypes of *I. cretaceum*.

Other zone diagnostic species are *Isabelidinium thomasii* at 1541m and 1677m, *Heterosphaeridium evansii* ms at 1516m and 1579m while *Trithyrodinium vermiculata* occurs in all samples between 1516-1579m. The assemblages are mostly dominated by *Heterosphaeridium* spp. while *Odontochitina porifera* is a conspicuous accessory.

***Odontochitina porifera* Zone.**
Interval: 1692.0 metres (<25 metres).
Age: Santonian.

This poorly preserved, moderate diversity assemblage is assigned to the zone on the presence of *Odontochitina porifera* and *O. cribropoda* and lack of the succeeding zone indicators. The assemblage is dominated by *Heterosphaeridium heteracanthum*. A single specimen of *Isabelidinium rotundatum* ms recorded is interpreted as caved.

***Conosphaeridium striatoconus* Zone.**
Interval: 1701.0 metres.
Age: Coniacian.

The sample is confidently assigned to the zone based on the occurrence of frequent specimens of *C. striatoconus*. The only supporting species for this assignment is the FAD for *Dinogymnium acuminatum* in an assemblage dominated by *Heterosphaeridium heteracanthum*. *Odontochitina cribropoda* was represented by a single specimen.

***Palaeohystrichophora infusorioides* Zone.**
Interval: 1712.5-1825.5 metres (113+ metres).
Age: Turonian.

All samples over this interval contain marine dinoflagellates with diversity in individual samples varying from 5 species in the poorly preserved and terrestrial kerogen dominated core samples to greater than 27 species at 1718m. Average diversity was 10+ species whilst total diversity over the interval was 42+ species. Except for the occurrence of *Isabelidinium glabrum* between 1712.5-1728m all species recorded are known to range beyond the *P. infusorioides* Zone. The zone is therefore recognised on negative evidence identical to the way it was originally defined (Helby *et al.* 1987, p.62). The interval is no older than the *P. infusorioides* Zone based on the absence of index species *Pseudoceratium ludbrookiae* and significant accessory species *Litosphaeridium siphoniphorum* and *Canninginopsis denticulata*. Although conforming to the strict definition, the assemblages are less diverse than assemblages from the Northwest Shelf. Conspicuously absent are the variety of *Diconodinium* species. In contrast to the base the top of the zone is clearly defined by the FAD for *Conosphaeridium striatoconus* the key index species of the overlying zone.

Three subzone recognised within the *P. infusorioides* Zone in Langley-1 are discussed below:

***Isabelidinium glabrum* Subzone.**
Interval: 1712.5-1728.0 metres (15+ metres).
Age: Turonian.

The three samples contain a small *Isabelidinium* species tentatively referred to *I. glabrum* known to occur in upper part *P. infusorioides* Zone (Helby *et al.* 1987, fig.37). The assemblages may be equivalent to those containing *Isabelidinium* (al. *Deflandrea*) *acuminatum* recorded from Port Campbell-1 between 5660-5700ft

(1725-1737m) by Evans (1966, p.25). The Langley-1 specimens however cannot be referred to *I. acuminatum* as they lack the characteristic apical horn on the endophragm (Cookson & Eisenack 1958; pl.4, figs. 5-7). The specimen illustrated by Evans (1966, pl.1, fig.6) does seem to have this apical horn but still needs to be checked.

Other features of this zone are the very rare occurrences of *Odontochitina cribropoda* at 1781m and 1728m and possible occurrence of *Valensiella griphus* originally described from Cenomanian on Bathurst Island (Norvick, 1976). *Heterosphaeridium* spp. and *Amosopollis cruciformis* dominate the microplankton assemblages (Table-2).

***Ascodinium parvum* Subzone.**

Interval: 1733.5.

Age: Turonian.

The sample contains a similar assemblage to the underlying *Cribroperidinium edwardsii* Zone but differs by presence of *Ascodinium parvum* (approx. 10%) and absence of *C. edwardsii* which may have been replaced by introduction of related species *Cribroperidinium cooksonae*. Overall the microplankton assemblage is dominated by algal cyst *Amosopollis cruciformis* with an abundance of approximately 35%.

The *A. parvum* Zone was originally proposed by Evans (1966) but has not subsequently been widely documented. Evans did not specify a type section but gave prominence to its occurrence in Port Campbell-2 between 7906-8102ft (2410-2469m).

Ascodinium parvum was identified on overall shape as preservation of specimens were too poor to confidently identify acheopyle type. *Isabelidinium acuminatum* in same sample was identified by distinct apical horn on endophragm and clear **"I"** acheopyle.

***Cribroperidinium edwardsii* Subzone.**

Interval: 1768.2-1825.5 metres (57+ metres).

Age: Turonian.

This zone was originally defined in Iona-2 as an acme zone covering all of the Waarre Formation (Partridge 1994). In Langley-1 because the index species *Cribroperidinium edwardsii* is consistently present in all samples over the zone interval but is prominent in only two samples it is felt the designation as an acme zone is inappropriate. Further, the subzone interval only corresponds to

Units A and B of the Waarre (*sensus* Buffin 1989) in Langley-1, but was found in all four samples in the Waarre in Iona-2 extending up into Units C and D. The younger occurrences in Iona-2 are now suspect and believed caused by either sample contamination, reworking, mis-identification, or simply very rare occurrences. The preferred zone charactristic is the consistent occurrence of *C. edwardsii.*

Aside from the eponymous species the samples contain fairly consistent *Odontochitina costata/operculata* and *Oligosphaeridium complex/pulcherrimum* and inconsistent *P. infusorioides.* A further subdivision of this zone may be practical locally based on the prominence of *Cyclonephelium compactum*, *C. distinctum* and *Palaeoperidinium cretaceum* in the lower part and the incoming and rise to prominence of *Heterosphaeridium heteracanthum* and *Kiokansium polypes* in the upper part. This will need further testing as these changes could equally be a reflection of facies or environments.

Because of low palynomorph concentration the counts on the microplankton through this zone (Table-2) are only reliable to within 5%. The abundance of the algal cyst *Amosopollis cruciformis* is consistently less than 1% of total spore-pollen and microplankton count and estimated to be generally less than 10% of microplankton count.

Non-marine microplankton in Eumeralla Formation.
Interval: 1855.0-1989.0 metres (144+ metres).
Age: Late Albian.

The two samples from the Eumeralla Formation are characterised by a limited suite of microplankton comprising *Sigmopollis carbonis*, *Micrhystridium* sp. A of Marshall (1989) and *Veryhachium* sp. These have been previously recorded from this unit (Evans 1966, p.31-34; Partridge 1994) and are interpreted to indicate deposition in freshwater, most likely lacustrine environments. The form *Sigmopollis carbonis* has been compared to Holocene microfossil algae occurring in eutrophic and mesotrophic freshwater environments by Pals *et al.* (1980, p.407) and Srivastava (1984, p.528).

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Table-3: Interpretative Palynological Data for Langley-1, Otway Basin

Sample Type	Depth (m)	Spore-pollen Zone	CR*	Microplankton Zones	CR*	Comments
SWC-59	895.0	*L. balmei*	B2	*P. pyrophorum*	B3	
SWC-58	916.0	Upper *T. longus*	B1	(*A. acutulum*)	B3	FAD *Stereisporites* (*Tripunctisporis*) sp. with common *Gambierina rudata*.
SWC-56	1291.0	*N. senectus*	B1	Indeterminate		FAD *Forcipites sabulosus*.
SWC-55	1325.0	*N. senectus*	B2	Indeterminate		FAD *Nothofagidites senectus*.
SWC-52	1516.0	*T. apoxyexinus*	B1	*I. cretaceum*	B2	*Isabelidinium rotundatum* ms present.
SWC-49	1541.0	*T. apoxyexinus*	B4	*I. cretaceum*	B3	*Isabelidinium rotundatum* ms present.
SWC-48	1579.0	*T. apoxyexinus*	B5	*I. cretaceum*	B3	*Trithyrodinium vermiculata* present.
SWC-47	1634.0	*T. apoxyexinus*	B1	*I. cretaceum*	B3	FAD *Forcipites stippulatus*.
SWC-46	1677.0	*T. apoxyexinus*	B2	*I. cretaceum*	B3	FAD *Isabelidinium cretaceum* with spore *Ornamentifera sentosa*.
SWC-45	1692.0	*T. apoxyexinus*	B4	*O. porifera*	B3	FAD *Odontochitina porifera*.
SWC-44	1701.0	*P. mawsonii*	B1	*C. striatoconus*	B2	*Cyatheacidites tectifera* and *Clavifera vultuosus* ms present.
SWC-43	1712.5	*P. mawsonii*	B5	*P. infusorioides* (*I. glabrum*)	B4	Poorly preserved specimen of *Tricolporites apoxyexinus* present with *Clavifera vultuosus* ms.
SWC-42	1718.0	*P. mawsonii*	B2	*P. infusorioides* (*I. glabrum*)	B4	LAD of good *Appendicisporites distocarinatus*.
SWC-41	1728.0	*P. mawsonii*	B4	*P. infusorioides* (*I. glabrum*)	B2	FAD *Odontochitina cribropoda*.
SWC-40	1729.5	Indeterminate		*P. infusorioides*	B2	Spore-pollen assemblage non-diagnostic.
SWC-38	1733.5	*P. mawsonii*	B2	*P. infusorioides* (*A. parvum*)	B4	*Amosopollis cruciformis* abundant, with frequent *Ascodinium parvum* and rare *Isabelidinium acuminata*.
Core-1	1750.2	*P. mawsonii*	B2	*P. infusorioides*	B5	LAD *Hoegisporis trinalis* ms and local LAD *Densoisporites muratus* ms.
Core-1	1758.8	*P. mawsonii*	B4	Indeterminate		Palynomorphs sparse.
SWC-37	1768.2	*P. mawsonii*	B2	*P. infusorioides* (*C. edwardsii*)	B3	Megaspore *Balmeisporites glenelgensis* present.
SWC-35	1772.0	*P. mawsonii*	B1	*P. infusorioides* (*C. edwardsii*)	B3	Local FAD of *Clavifera triplex*, and LAD of consistent *A. distrocarinatus*.
SWC-34	1776.5	*P. mawsonii*	B4	*P. infusorioides* (*C. edwardsii*)	B3	*Densoisporites muratus* ms present. FAD for Microforaminiferal inner tests.
SWC-33	1778.5	*P. mawsonii*	B2	*P. infusorioides* (*C. edwardsii*)	B3	Local FAD of *Kiokansium polypes*.
SWC-32	1781.0	*P. mawsonii*	B4	*P. infusorioides* (*C. edwardsii*)	B2	Reworked? *Coptospora paradoxa*.
SWC-29	1789.0	*P. mawsonii*	B4	*P. infusorioides* (*C. edwardsii*)	B3	Marine scolecodont and *Phyllocladidites mawsonii* present.

Table-3: Interpretative Palynological Data for Langley-1, cont...

Sample Type	Depth (m)	Spore-pollen Zone	CR*	Microplankton Zones	CR*	Comments
SWC-28	1795.0	*P. mawsonii*	B4	*P. infusorioides (C. edwardsii)*	B3	*Appendicisporites distocarinatus* and *Interulobites intraverrucatus* present.
SWC-27	1798.0	*P. mawsonii*	B4	*P. infusorioides (C. edwardsii)*	B3	FAD of consistent *A. distocarinatus*
SWC-26	1799.5	*P. mawsonii*	B3	*P. infusorioides (C. edwardsii)*	B3	*Microdinium ornatum* present.
SWC-25	1802.0	*P. mawsonii*	B3	*P. infusorioides (C. edwardsii)*	B3	FAD *Phyllocladidites mawsonii.*
SWC-18	1821.0	*P. mawsonii*	B4	*P. infusorioides (C. edwardsii)*	B3	Frequent *Hoegisporis trinalis.*
SWC-17	1822.5	*P. mawsonii*	B4	*P. infusorioides (C. edwardsii)*	B3	Frequent *Palaeoperidinium cretaceum.*
SWC-16	1824.0	*P. mawsonii*	B4	*P. infusorioides (C. edwardsii)*	B3	FAD *Palaeohystrichophora infusorioides.*
SWC-15	1825.5	*P. mawsonii*	B4	*P. infusorioides (C. edwardsii)*	B3	FAD *Appendicisponites distocarinatus* and *Cribroperidinium edwardsii.*
SWC-14	1827.0	Indeterminate				Barren sample.
SWC-11	1855.0	*P. pannosus*	B4			Dominated by *Podocarpidites* spp. 42% and *Corollina torosa* 26%.
SWC- 2	1989.0	*P. pannosus*	B1			Several specimens of *Phimopollenites pannosus.*

*CR = Confidence Ratings
LAD = Last Appearance Datum
FAD = First Appearance Datum

Confidence Ratings

The Confidence Ratings assigned to the zone identifications on Table-4 are quality codes used in the STRATDAT relational database being developed by the Australian Geological Survey Organisation (AGSO) as a National Database for interpretive biostratigraphic data. Their purpose is to provide a simple relative comparison of the quality of the zone assignments. The alpha and numeric components of the codes have been assigned the following meanings:

Alpha codes: Linked to sample type

A	Core
B	Sidewall core
C	Coal cuttings
D	Ditch cuttings
E	Junk basket
F	Miscellaneous/unknown
G	Outcrop

Numeric codes: Linked to fossil assemblage

1	**Excellent confidence:**	High diversity assemblage recorded with key zone species.
2	**Good confidence:**	Moderately diverse assemblage recorded with key zone species.
3	**Fair confidence:**	Low diversity assemblage recorded with key zone species.
4	**Poor confidence:**	Moderate to high diversity assemblage recorded without key zone species.
5	**Very low confidence:**	Low diversity assemblage recorded without key zone species.

BASIC DATA

Table 4: Basic Sample Data - Langley-1, Otway Basin

Table-5: Basic Palynomorph Data for Langley-1, Otway Basin

Palynomorph Range Charts for Langley-1, Otway Basin

Range Chart 1: Spore-pollen by Lowest Appearance

Range Chart 2: Microplankton by Lowest Appearance

Table-4: Basic Sample Data for Langley-1, Otway Basin.

SAMPLE TYPE	DEPTH (metres)	REC (cm)	LITHOLOGY	SAMPLE WT (g)	RESIDUE YIELD
SWC-59	895.0	4.0	Black micaceous, pyritic' argillaceous sandstone =Pebble Pt Fm (clean sample).	11.4	High
SWC-58	916.0	5.0	Dk gry med. grn. sandstone with mud filled burrows up to 5mm diameter. Accessory mica & pyrite (sample well cleaned).	14.4	Low
SWC-56	1291.0	1.5	Interlaminated black siltstone & grey fine grn sandstone (laminae <1mm). Poorly cleaned.	7.0	Low
SWC-55	1325.0	4.5	Med tan-gry mottled sandstone. Sample cross cut by veins of drilling mud up to 1mm thick.	13.5	Low
SWC-52	1516.0	3.5	Dk gry homogeneous claystone (clean sample).	11.3	Moderate
SWC-51	1518.5	<1.0	Lt gry argillaceous sandstone with coarse quartz pebbles (badly mud penetrated - not selected for palynology).		
SWC-50	1522.0	2.5	Soft med. gry sandstone (badly mud penetrated - not selected for palynology).		
SWC-49	1541.0	3.0	Dk gry-blk homogeneous siltstone with trace mica. (Clean sample).	10.8	High
SWC-48	1579.0	5.0	Dk. gry-blk siltstone, fractured with some mud contamination	10.9	High
SWC-47	1634.0	3.0	Dk gry-blk homogeneous siltstone, with very fine glauconite. (Clean sample).	10.4	High
SWC-46	1677.0	3.5	Dk gry-blk grn glauconitic siltstone, firm not bedded (minor mud contamination).	10.8	High
SWC-45	1692.0	5.0	Dark grey homogeneous siltstone (badly mud penetrated).	11.2	Moderate
SWC-44	1701.0	4.7	Dk gry-blk firm siltstone with v.fine glauconite (<20%), negligible mud contamination.	11.9	High
SWC-43	1712.5	4.3	Dk gry-blk firm silty glauconitic mudstone (sample well cleaned).	10.3	Moderate
SWC-42	1718.0	3.5	Med. gry mudstone with 6mm laminae of lt gry f. grn sandstone (clean sample).	10.2	Moderate
SWC-41	1728.0	4.0	med gry silty mudstone with floating quartz pebbles up to 5mm, & trace mica and glauconite (clean sample).	9.9	High
SWC-40	1729.5	5.0	Med. gry, med. gry argillaceous sandstone with white clay matrix and common pyrite, tr. glauconite (clean sample).	10.2	Low
SWC-39	1732.0	<2.0	Unconsolidated or fracture sample of brown to white sandstone with pebbles up to 10mm. Sample appears mud contaminated - not suitable for palynology.		
SWC-38	1733.5	4.0	Interlaminated dk gry-blk mudstone with lt gry f. grn sandstone; laminae 1-4mm (clean sample).	7.4	High
Core-1	1750.2		Med-dk grey claystone with trace mica and pyrite.	12.8	High
Core-1	1758.5		Med-dk grey claystone with laminae of carbonaceous matter and pyrite <1mm thick.	13.0	High

Table-4: Basic Sample Data for Langley-1, Otway Basin.

SAMPLE TYPE	DEPTH (metres)	REC (cm)	LITHOLOGY	SAMPLE WT (g)	RESIDUE YIELD
SWC-37	1768.2	3.5	Interlaminated med gry pyritic sandstone & dk gry mudstone; laminae 1-5mm thick (clean sample).	10.4	Moderate
SWC-35	1772.0	3.0	Interlaminated dk gry mudstone (up to 18mm thick) with white f. grn sandstone (up to 6mm). Clean sample, but sandstone not processed.	7.1	High
SWC-34	1776.5	3.5	Finely laminated med. gry siltstone and lt gry f. grn sandstone; no obvious glauconite (clean sample).	8.9	Low
SWC-33	1778.5	3.8	Med grey faintly laminated muddy siltstone; no obvious glauconite (clean sample).	10.3	Moderate
SWC-32	1781.0	4.0	Med. gry homogeneous glauconitic (<20%) sandstone (clean sample).	9.4	Moderate
SWC-31	1783.0	3.5	Brown (oxidised?) sandstone mixed with hard med. gry siltstone. No glauconite observed (sample broken and poorly cleaned).		
SWC-29	1789.0	3.0	Interlaminate med. gry claystone (8mm) with lt gry f. grn sandstone (6-12mm). Sandstone not processed but clean sample.	6.4	High
SWC-28	1795.0	3.5	Med. grey homogeneous claystone with carbonaceous fragments (clean sample).	8.6	High
SWC-27	1798.0	2.7	Med. gry claystone with a few siltstone laminae <1mm thick (clean sample).	11.1	High
SWC-26	1799.5	3.3	Med. gry claystone with siltstone laminae <1mm thick (clean sample).	11.0	High
SWC-25	1802.0	2.5	Dk grey claystone with occasional thin (<1mm) wh. siltstone laminae (clean sample).	10.2	High
SWC-18	1821.0	3.0	Dk grey homogeneous claystone with white med. sandstone layer 5mm thick (clean sample but sandstone not processed).	9.7	High
SWC-17	1822.5	<2.0	Interlaminated med. grey claystone and white f. grn sandstone (<2mm). Sample badly mud penetrated poorly cleaned.	5.6	High
SWC-16	1824.0	4.0	Dk grey claystone with occasional thin (<1mm) white siltstone laminae (clean sample).	10.1	High
SWC-15	1825.5	1.5	Med. gry f-crs grn poorly sorted sandstone with carbonaceous laminae (fairly well cleaned).	3.2	High
SWC-14	1827.0	3.7	Lt blue gry argillaceous siltstone/sandstone =Eumeralla (clean sample).	10.1	Very low
SWC-11	1855.5	3.0	Lt blue gry homogeneous claystone (clean sample).	9.8	Low
SWC-10	1870.0	3.0	Med. blue grey claystone with micro laminae of carbonaceous material (clean sample).		
SWC- 8	1878.5	4.0	Med. blue grey homogeneous claystone. Sample hard with micro fractures which may be mud penetrated, otherwise well cleaned.		
SWC- 5	1924.5	4.0	Med. blue grey siltstone to silty mudstone (clean sample).		
SWC- 4	1957.0	3.0	Interlaminated med. grey siltstone and f. grn sandstone with laminae 0.1-2mm (clean sample).		
SWC- 2	1989.0	2.5	Med grey homogeneous brittle claystone (moderately clean sample).	9.0	Low

Table-5: Basic Palynomorph Data for Langley-1, Otway Basin.

Sample Type	Depth (m)	Palynomorph Concentration	Palynomorph Preservation	No. S-P spp*	Microplankton Abundance	No MP Species*
SWC-59	895.0	Moderate	Good	21+	Rare	5+
SWC-58	91~~8~~6.0	Low	Good	33+	Rare	6+
SWC-56	1291.0	Low	Fair-good	28+	Rare	3+
SWC-55	1325.0	Low	Fair	18+	Rare	4+
SWC-52	1516.0	Low	Fair	29+	Common	14+
SWC-49	1541.0	Low	Poor	18+	Common	9+
SWC-48	1579.0	Low	Very poor-poor	18+	Common	10+
SWC-47	1634.0	Moderate	Poor	23+	Common	10+
SWC-46	1677.0	Low	Poor	21+	Common	7+
SWC-45	1692.0	Low	Poor-fair	25+	Common	11+
SWC-44	1701.0	Low	Poor	39+	Common	22+
SWC-43	1712.5	Moderate	Poor	33+	Abundant	17+
SWC-42	1718.0	Moderate	Poor	27+	Abundant	27+
SWC-41	1728.0	Moderate	Poor	27+	Abundant	23+
SWC-40	1729.5	Very low	Poor	11+	Abundant	15+
SWC-38	1733.5	Very low	Very poor	25+	Abundant	12+
Core-1	1750.2	Low	Very poor	35+	Very rare	11+
Core-1	1758.8	Very low	Very poor	25+	Very rare	5+
SWC-37	1768.2	Low	Poor	26+	Common	9+
SWC-35	1772.0	Low	Poor	30+	Rare	7+
SWC-34	1776.5	Very low	Poor	25+	Frequent	7+
SWC-33	1778.5	Low	Poor	25+	Common	11+
SWC-32	1781.0	Low	Poor-fair	31+	Common	10+
SWC-29	1789.0	Low	Poor	24+	Rare	6+
SWC-28	1795.0	Very low	Very poor-poor	26+	Rare	4+
SWC-27	1798.0	Very low	very poor	21+	Rare	6+
SWC-26	1799.5	Low	Very poor	26+	Rare	11+
SWC-25	1802.0	Low	Poor	12+	Frequent	5+
SWC-18	1821.0	Very low	Poor	23+	Frequent	11+
SWC-17	1822.5	Low	Poor	31+	Rare	7+
SWC-16	1824.0	Low	Poor-fair	34+	Frequent	14+
SWC-15	1825.5	Low	Poor	24+	Rare	4+
SWC-14	1827.0	Barren				
SWC-11	1855.0	Moderate	Poor	18+	Very rare	1
SWC- 2	1989.0	Moderate	Poor	31+	Very rare	2

Diversity:
Very low = 1-5 species
Low = 6-10 species
Moderate = 11-25 species
High = 26-74 species
Very high = 75+ species

PE900755

This is an enclosure indicator page.
The enclosure PE900755 is enclosed within the container PE900950 at this location in this document.

The enclosure PE900755 has the following characteristics:

ITEM_BARCODE = PE900755
CONTAINER_BARCODE = PE900950
NAME = Microplankton Range Chart
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Microplankton Range Chart, Langley-1
REMARKS =
DATE_CREATED = 9/09/94
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = BIOSTRATA PTY LTD
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

PE900756

This is an enclosure indicator page.
The enclosure PE900756 is enclosed within the container PE900950 at this location in this document.

The enclosure PE900756 has the following characteristics:
ITEM_BARCODE = PE900756
CONTAINER_BARCODE = PE900950
NAME = Spore-Pollen Range Chart
BASIN = OTWAY
PERMIT = PPL1
TYPE = WELL
SUBTYPE = DIAGRAM
DESCRIPTION = Spore-Pollen Range Chart, Langley-1
REMARKS =
DATE_CREATED = 9/09/94
DATE_RECEIVED = 31/01/96
W_NO = W1099
WELL_NAME = LANGLEY-1
CONTRACTOR = BIOSTRATA PTY LTD
CLIENT_OP_CO = GFE RESOURCES LTD

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 12

APPENDIX 12

GFE RESOURCES LTD

APPENDIX 12

LOG ANALYSIS DATA

LANGLEY-1

15-01-96 ENVIRONMENTAL CORRECTIONS

Langley-1
GFE Resources Ltd.

Logs used

Log Mnemonic	Column Number	Corrected (* = YES)
DEPT	1	
LLD	4	*
LLS	5	*
SP	27	
GR	2	*
DT	7	
NPHI	14	*
CALI	10	
DRHO	12	
MSFL	6	*
RHOB	11	*
PEF	13	

DLL Correction

0 = NONE
1 = TYPE C
2 = D ECCENTRED
3 = D CENTRED

Logging Company

0 = SCHLUMBERGER
1 = HLS
2 = DRESSER ATLAS
3 = BPB
4 = SPERRY MWD
5 = BAKER MWD
6 = ANADRIL MWD
7 = NO CORRECTION

GR Correction

0 = NONE
1 = CENTRED
2 = ECCENTRED

Zone properties

Zone no.	1	2	3	4	5	6
Formation Name						
Depth high	1716.02	1730.04	1752.90	1771.95	1798.93	1826.51
Depth low	1730.04	1752.90	1771.95	1798.93	1826.51	1985.01
RMC	.33	.33	.33	.33	.33	.32
RM	.21	.22	.22	.21	.21	.21
ZONE Temperature	63.73	64.14	64.62	65.13	65.75	67.84
FILT SAL (KPPM)	22.82	22.82	22.82	22.82	22.82	22.82
FORM WATER(KPPM)	14.00	14.00	14.00	14.00	14.00	6.50
PRESSURE (PSI)	2742.53	2771.89	2805.24	2841.87	2885.29	3033.38
MUD WEIGHT	9.35	9.35	9.35	9.35	9.35	9.35
Logging Company	0	0	0	0	0	0
DLL Correction	3	3	3	3	3	3
GR Correction	1	1	1	1	1	1
GR SONDE DIAM	STD	STD	STD	STD	STD	STD
Neutron Temp Cor	YES	YES	YES	YES	YES	YES
Inductn Standoff	1.50	1.50	1.50	1.50	1.50	1.50

Zone no. 1 Langley-1 **Environmental Corrections**
GFE Resources Ltd. 15-01-96

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1716.024	13.240	12.250	82.310	.350	1.850	2.590
8.660	13.393	12.568	81.246	.377	1.434	2.590
1725.168	6.470	6.340	90.750	.280	8.860	2.770
8.780	6.621	6.593	89.967	.302	7.472	2.770

Zone no. 2

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1730.045	3.120	3.430	75.560	.260	5.040	2.670
8.470	3.188	3.571	74.064	.280	4.123	2.670
1739.189	34.890	29.920	26.080	.080	4.490	2.250
8.160	34.306	29.789	25.267	.088	3.651	2.250
1748.333	96.640	102.140	25.390	.010	8.280	2.230
8.160	92.304	99.557	24.599	.013	6.953	2.230

Zone no. 3

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1752.905	15.270	12.930	101.560	.250	13.710	2.490
8.470	15.357	13.181	99.549	.269	11.816	2.490
1762.049	3.320	2.540	24.170	.190	2.750	2.290
8.050	3.362	2.628	23.318	.205	2.178	2.290
1771.193	7.710	7.630	103.060	.300	3.050	2.520
8.810	7.880	7.921	102.282	.323	2.430	2.520

Zone no. 4

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1771.955	13.070	13.180	108.940	.280	8.870	2.400
8.920	13.289	13.614	108.544	.302	7.479	2.400
1781.099	9.260	9.300	87.940	.280	8.460	2.500
8.580	9.401	9.560	86.549	.301	7.116	2.500
1790.243	11.500	11.800	79.690	.220	11.840	2.470
8.820	11.694	12.172	79.116	.237	10.132	2.470

Zone no. 5

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1798.930	7.830	8.130	117.190	.290	10.470	2.530
8.630	7.973	8.386	115.548	.312	8.907	2.530
1808.074	3.470	2.510	43.440	.230	2.690	2.300
8.050	3.513	2.597	41.909	.248	2.130	2.300
1817.218	3.730	2.740	45.630	.220	3.640	2.330
8.160	3.784	2.839	44.208	.237	2.930	2.330
1826.362	3.880	4.210	98.440	.300	.870	2.350
9.990	4.074	4.550	101.713	.324	.646	2.355

Zone no. 6

DEPT & CALI	LLD	LLS	GR	NPHI	MSFL	RHOB
1826.514	3.380	3.710	101.500	.300	2.590	2.370
8.910	3.482	3.902	101.095	.325	2.049	2.370
1835.658	5.570	5.730	88.380	.220	4.490	2.420
8.770	5.705	5.964	87.586	.239	3.659	2.420
1844.802	4.970	4.500	99.560	.280	2.780	2.480
8.730	5.091	4.696	98.523	.303	2.208	2.480
1853.946	6.540	6.420	70.310	.250	5.350	2.400
9.160	6.738	6.745	70.649	.271	4.401	2.403
1863.090	4.420	4.020	119.060	.250	1.330	2.380
9.090	4.563	4.243	119.342	.271	1.014	2.383
1872.234	5.410	5.070	121.750	.260	2.970	2.190
10.310	5.696	5.513	127.090	.283	2.367	2.195
1881.378	6.130	5.710	78.810	.270	3.760	2.380
10.490	6.464	6.230	82.730	.294	3.035	2.387
1890.522	5.520	5.270	72.130	.250	3.350	2.290
10.700	5.846	5.787	76.207	.272	2.688	2.297
1899.666	7.830	7.370	68.190	.220	2.890	2.310
10.860	8.280	8.100	72.394	.240	2.300	2.317
1908.810	5.960	5.500	71.880	.250	2.660	2.370
10.840	6.321	6.060	76.265	.272	2.107	2.378
1917.954	9.140	9.100	77.880	.230	4.970	2.450
8.570	9.276	9.351	76.620	.249	4.072	2.450
1927.098	8.770	8.740	75.940	.230	10.250	2.420
8.940	8.968	9.084	75.718	.250	8.721	2.420

1936.242	8.020	7.760	75.810	.260	7.970	2.380
8.510	8.142	7.980	74.419	.282	6.694	2.380
1945.386	8.310	8.010	89.000	.230	7.140	2.480
8.470	8.426	8.223	87.237	.249	5.963	2.480
1954.530	5.870	5.460	101.940	.260	5.750	2.510
8.470	5.974	5.639	99.921	.282	4.748	2.510
1963.674	5.040	4.650	102.940	.220	1.810	2.420
8.470	5.135	4.815	100.901	.239	1.404	2.420
1972.818	6.400	6.370	73.310	.270	6.050	2.350
8.470	6.508	6.563	71.858	.292	5.009	2.350
1981.962	7.820	7.450	78.060	.230	5.360	2.420
8.470	7.935	7.657	76.514	.249	4.409	2.420

Langley-1 Complex Lithology Results
GFE Resources Ltd. 15-01-96

CPX flag values

1. VCL greater than 0.95
2. VN greater than 0.75
3. VS greater than 0.75
4. Bad hole condition
5. Matrix density greater than Lithological model
6. Matrix density less than Lithological model
7. Porosity derived from Sonic Log
8. Porosity derived from or limited by PHIMAX
9. Porosity derived from Density Log

$. Pay zone

Water saturation equations

1. Indonesia
2. Simandoux
3. Fertl & Hammock
4. Laminar
5. Bussian
6. User defined

VGRTYPE :Vclay from GR Equations used

```
0.  Not Used
                        IGR=(GR-GRmin)/(GRmax-GRmin)
1.  Linear              VGR=IGR
2.  Asymmetric (S shaped)
        Defined by 2 sets of intermediate points
        through which the S bend passes through.
        GR1, VGR1 and GR2, VGR2.
    Steiber equation:   VGR= IGR/(A + (A-1.0)*IGR)
3.  Steiber 1  A = 2.0
4.  Steiber 2  A = 3.0
5.  Steiber 3  A = 4.0
6.  Steiber 50%
     A is computed to give VGR= 0.5 when GR = GR50%)
7.  Larinov Old Rocks: VGR= (2**(2*IGR)-1.0)/3.0
8.  Larinov Tertiary : VGR= 0.083*(2.0*(3.7058*IGR)-1.0)
9.  Clavier          : VGR= 1.7-SQRT(3.38-(IGR+0.7)**2.0)
```

Langley-1
GFE Resources Ltd.

Complex Lithology Results
15-01-96

Logging Company

0. Schlumberger
1. HLS
2. Dresser
3. BPB
4. Sperry MWD
5. Baker MWD
6. Anadril MWD

Mud type

0. NaCl
1. KCl %
2. Oil-base
3. Barite

Neutron log type

0. CNL
1. TNPH
2. SNP
3. N
4. DSN2

RT Determination Flags by priority

1. Dual Laterolog - RXO
20. PHASOR-SFL
21. PHASOR-RXO
2. Dual Induction - LL8
3. ILD-SFL-RXO
10. DIL-SFL
11. DIL-LL3
8. ILD and 16 inch Normal
17. LLD-LLS
18. ID PHASOR
4. ILD
5. LLD
6. LL3 or LL7
7. Dual Laterolog
13. LLS
19. IM PHASOR
14. ILM
15. LL8
9. 64 inch Normal Log
12. SFL
16. RXO
0. No RT logs

Formation Water

0=NaCl
1=NaHCO3

CNL Chart

0=1988
1=1987

Zone no.	2	3	4	5	6
Formation Name					
Top depth	1730.045	1752.905	1771.955	1798.930	1826.514
Bottom depth	1752.905	1771.955	1798.930	1826.514	1985.010
Logging Company	0	0	0	0	0
Mud type	1	1	1	1	1
Formation Water Type	0	0	0	0	0
Neutron Log Type	0	0	0	0	0
Density-CNL Chart	0	0	0	0	0

Appendix 12

Langley-1
GFE Resources Ltd.

Complex Lithology Results
15-01-96

INPUT PARAMETERS

Zone no.	1	2	3	4	5	6
1. Top depth	1716.024	1730.045	1752.905	1771.955	1798.930	1826.514
2. Bottom depth	1730.045	1752.905	1771.955	1798.930	1826.514	1985.010
3. No logs						
4. RM	.426	.426	.426	.426	.426	.426
5. Temp. RM	22.000	22.000	22.000	22.000	22.000	22.000
6. RMF	.347	.347	.347	.347	.347	.347
7. Temp. RMF	14.000	14.000	14.000	14.000	14.000	14.000
8. RMC	.758	.758	.758	.758	.758	.758
9. Temp. RMC	16.000	16.000	16.000	16.000	16.000	16.000
10. Bit size	8.500	8.500	8.500	8.500	8.500	8.500
11. Mud wt	9.350	9.350	9.350	9.350	9.350	9.350
12. SSP	20.000	20.000	20.000	20.000	20.000	20.000
13. RW (SP)	.213	.176	.175	.174	.173	.169
14. FT=Form temp	63.729	64.144	64.615	65.132	65.745	67.837
15. RW @ FT	.226	.225	.224	.223	.221	.442
16. RW@75F(23.9C)	.425	.425	.425	.425	.425	.870
17. KPPM (RW)	14.000	14.000	14.000	14.000	14.000	6.500
18. RMF @ FT	.145	.144	.143	.142	.141	.138
19. KPPM (RMF)	22.823	22.823	22.823	22.823	22.823	22.823
20. RM @ FT	.218	.216	.215	.214	.212	.208
21. RHO H	.200	.200	.200	.200	.200	.200
22. RHO F	1.010	1.010	1.010	1.010	1.010	1.010
23. t F	188.994	188.994	188.994	188.994	188.994	188.994
24. RHOMA	2.650	2.650	2.650	2.650	2.650	2.670
25. PHIN min	-.035	-.035	-.035	-.035	-.035	-.035
26. t MA	55.500	55.500	55.500	55.500	55.500	55.500
27. t MA min	48.000	48.000	48.000	48.000	48.000	48.000
28. Sonic option	.000	.000	.000	.000	.000	.000
29. Compact/Over	1.000	1.000	1.000	1.000	1.000	1.000
30. CAL cut off	10.000	10.000	10.000	10.000	10.000	10.000
31. RUGO.cut off	1.000	1.000	1.000	1.000	1.000	1.000
32. DRHO cut off	.150	.150	.150	.150	.150	.150
33. No clay	RT	RT DN	RT DN	DN	DN	
34. Vclay Flag	.000	.000	.000	.000	.000	.000
35. Vclay type	.000	.000	.000	.000	.000	.000
36. Vclay inp1	.200	.200	.200	.200	.200	.200
37. Vclay out1	.150	.150	.150	.150	.150	.150
38. Vclay inp2	.800	.800	.800	.800	.800	.800
39. Vclay out2	.800	.800	.800	.800	.800	.800
40. Vclay 50%	.500	.500	.500	.500	.500	.500
41. VclayGR type	1.000	1.000	1.000	1.000	1.000	1.000
42. GR clean	20.000	20.000	20.000	25.000	35.000	40.000
43. GR clay	100.000	115.000	115.000	115.000	115.000	126.019
44. GR1	41.000	41.000	41.000	41.000	41.000	57.204
45. VGR1	.100	.100	.100	.100	.100	.100
46. GR2	60.000	60.000	60.000	60.000	60.000	108.815
47. VGR2	.300	.300	.300	.300	.300	.300
48. GR50%	70.000	70.000	70.000	70.000	70.000	70.000
49. R clay	7.495	8.000	8.000	9.000	9.000	14.889

	Zone no.	1	2	3	4	5	6
	Top depth	1716.024	1730.045	1752.905	1771.955	1798.930	1826.514
	Bottom depth	1730.045	1752.905	1771.955	1798.930	1826.514	1985.010
50.	R limit	1000.000	1000.000	1000.000	1000.000	1000.000	1000.000
51.	Rclay1 flag	.000	.000	.000	.000	.000	.000
52.	Rclay1	1.000	1.000	1.000	1.000	1.000	1.000
53.	Vcl @ Rclay1	.150	.150	.150	.150	.150	.150
54.	RHOB clay	2.599	2.536	2.558	2.539	2.514	2.511
55.	PHIN clay	.335	.337	.322	.336	.333	.276
56.	t clay	83.390	87.022	82.826	87.522	89.401	85.644
57.	M clay	.657	.668	.683	.666	.662	.688
58.	N clay	.413	.435	.435	.438	.443	.483
59.	PHIN 2.2	.234	.0076923	.217	.170	.222	.206
60.	t 2.2	90.000	90.000	90.000	90.000	90.000	90.000
61.	COER (a)	1.000	1.000	1.000	1.000	1.000	.620
62.	MXP (m)	1.700	1.700	1.700	1.700	1.700	2.150
63.	SXP (n)	2.000	2.000	2.000	2.000	2.000	2.000
64.	Lithomod	1.000	1.000	1.000	1.000	1.000	1.000
65.	SXO limit	.200	.200	.200	.200	.200	.200
66.	PHI max	.400	.283	.287	.299	.314	.336
67.	PHI min c.o.	.0010000	.0010000	.0010000	.0010000	.0010000	.0010000
68.	EXPX	1.500	1.500	1.500	1.500	1.500	1.500
69.	Clay cut off	.300	.300	.300	.300	.300	.300
70.	Por. cut off	.050	.050	.050	.050	.050	.050
71.	SW cut off	.500	.500	.500	.500	.500	.500
72.	Sat Equation	1.000	1.000	1.000	1.000	1.000	1.000
73.	SWirr.cutoff	.300	.300	.300	.300	.300	.300
74.	Perm Expon.	6.000	6.000	6.000	6.000	6.000	6.000
75.	PERM K coef	62500.000	62500.000	62500.000	62500.000	62500.000	62500.000
76.	RHOMA 1	2.806	2.509	2.616	2.616	2.616	2.574
77.	RHOMA 2	3.094	2.768	2.768	2.768	2.768	2.732
78.	RHOMA 3	3.307	3.000	3.000	3.000	3.000	3.000
79.	UMA 1	6.744	4.877	4.501	4.501	4.501	4.125
80.	UMA 2	18.708	12.791	12.791	12.791	12.791	12.290
81.	UMA 3	9.973	8.658	8.658	8.658	8.658	8.658
82.	UF	.400	.400	.400	.400	.400	.400
93.	PHINmat1	.288	.317	.317	.317	.317	.317
94.	PHIDmat1	.264	.400	.400	.400	.400	.400
95.	PHINmat2	.501	.527	.527	.527	.527	.527
96.	PHIDmat2	.206	.356	.356	.356	.356	.356
97.	PHINmat3	.118	.222	.077	.077	.077	.077
98.	PHIDmat3	-.012	.101	.246	.246	.246	.246
99.	PHINmat4	.387	.426	.426	.426	.426	.426
100.	PHIDmat4	-.092	-.055	-.055	-.055	-.055	-.055

Zone No. 2

Langley-1
GFE Resources Ltd.

Complex Lithology Results
15-01-96

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1730.0	74	2.9	4.1	28.0	2.670	.0	.0	143.5	112.0	15.6	56.9	GR	3.045	100.0	100.0	3.6	3.052	.00	.00	5
1733.9	90	11.4	9.7	29.0	2.540	.2	.0	69.8	70.1	24.0	73.2	GR	2.650	70.1	69.8	3.9	2.966	.32	.22	8
1737.7	37	43.4	2.8	14.1	2.270	-.3	.0	27.2	87.2	29.7	17.7	GR	2.607	77.1	27.2	17.8	2.674	.81	.54	6 $
1741.5	29	58.6	3.5	10.9	2.270	-.3	.0	24.6	81.3	33.6	9.7	GR	2.617	75.5	24.6	18.1	2.655	1.50	1.06	$
1745.3	35	23.1	4.2	20.5	2.170	-.3	.0	30.2	57.8	39.2	15.5	GR	2.707	57.8	30.2	23.9	2.788	2.32	1.69	8 $
1749.1	30	55.3	6.4	5.6	2.220	-.3	.0	26.1	62.4	30.4	10.4	GR	2.560	62.4	26.1	17.3	2.632	3.07	2.23	6 $
1752.9	100	17.9	11.8	26.9	2.490	.0	.0	52.9	59.2	19.9	69.7	SN	2.695	59.2	52.9	5.3	2.948	3.50	2.55	

Zone No. 3

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1752.9	100	17.9	11.8	26.9	2.490	.0	.0	52.9	59.2	19.9	69.7	SN	2.695	59.2	52.9	5.3	2.948	3.50	2.55	
1756.7	27	6.4	2.0	18.4	2.320	-.5	.0	69.8	99.1	24.1	.0	SN	2.695	93.1	69.8	21.3	2.695	.00	.00	
1760.5	52	5.3	2.5	25.8	2.480	-.4	.0	80.7	98.7	24.1	33.4	GR	2.826	95.8	80.7	13.9	2.898	.07	.04	
1764.3	26	5.2	1.7	24.7	2.280	-.5	.0	64.0	88.4	33.3	.0	SN	2.779	88.4	64.0	26.6	2.777	.07	.04	8
1768.1	75	8.6	3.0	22.6	2.500	-.3	.0	75.2	111.4	19.8	43.5	SN	2.728	94.5	75.2	8.8	2.874	.07	.04	
1772.0	109	13.1	7.5	30.2	2.400	.4	.0	45.3	51.5	22.0	46.5	SD	2.848	51.5	45.3	13.9	2.980	.10	.06	8

Zone No. 4

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1772.0	109	13.1	7.5	30.2	2.400	.4	.0	45.3	51.5	22.0	46.5	SD	2.848	51.5	45.3	13.9	2.980	.10	.06	8
1775.8	95	10.3	9.4	30.1	2.520	.3	.0	65.7	61.6	19.1	67.5	MN	2.903	65.7	65.7	6.9	3.000	.07	.04	5
1779.6	87	7.3	11.9	26.9	2.570	.4	.0	98.1	71.1	22.2	69.0	GR	2.833	98.1	98.1	3.3	2.969	.07	.04	
1783.4	77	11.7	7.7	28.0	2.483	.6	.0	57.9	62.7	19.6	57.6	GR	2.837	62.7	57.9	9.2	2.975	.07	.04	
1787.2	38	5.1	2.1	21.6	2.310	-.3	.0	74.6	94.5	27.4	14.5	GR	2.677	94.3	74.6	20.1	2.710	.07	.04	
1791.0	69	6.6	11.0	25.9	2.460	.0	.0	77.9	52.4	20.3	49.4	GR	2.755	77.9	77.9	10.2	2.915	.07	.04	
1794.8	106	8.1	9.1	35.5	2.510	.1	.0	98.8	90.8	25.0	90.0	GR	2.650	98.8	98.8	1.0	2.995	.15	.09	8
1798.6	108	8.0	9.1	33.3	2.550	.1	.0	100.0	100.0	24.7	92.6	GR	2.650	100.0	100.0	.6	3.008	.15	.09	8

Langley-1
GFE Resources Ltd.

Complex Lithology Results (cont'd)

15-01-96

Zone No. 5

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1798.9	116	7.7	8.9	31.2	2.530	.1	.0	91.3	79.3	25.9	94.3	N	2.650	91.3	91.3	3.0	2.977	.15	.09	8
1802.7	41	5.1	2.9	26.9	2.300	-.3	.0	61.0	65.6	31.2	7.8	GR	2.913	65.6	61.0	26.9	2.929	.00	.00	5
1806.5	48	5.7	2.2	26.9	2.340	-.4	.0	63.5	82.9	27.3	16.7	GR	2.824	82.9	63.5	22.4	2.865	.00	.00	
1810.4	54	6.4	2.6	26.9	2.320	-.3	.0	59.1	76.9	25.3	23.3	GR	2.805	76.9	59.1	21.4	2.871	.00	.00	
1814.2	51	6.1	2.5	28.0	2.340	-.2	.0	59.8	75.9	26.3	19.7	GR	2.862	75.9	59.8	22.6	2.905	.00	.00	
1818.0	43	5.5	2.3	23.7	2.300	-.3	.0	64.4	80.1	25.4	9.9	GR	2.786	80.1	64.4	23.7	2.817	.00	.00	
1821.8	69	5.3	4.2	29.1	2.380	-.1	.0	69.8	66.4	26.2	42.0	GR	2.833	69.8	69.8	16.2	2.933	.00	.00	
1825.6	47	12.0	6.7	20.5	2.430	-.1	.0	49.8	54.4	18.5	15.3	GR	2.928	54.4	49.8	19.1	2.961	.03	.01	5 $

Zone No. 6

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1826.5	101	3.2	2.0	32.5	2.370	.4		146.0	172.5	25.9	71.0	GR	2.650	100.0	100.0	2.3	2.925	.03	.01	4 78
1830.3	85	9.8	12.7	21.8	2.564	.8	.0	98.7	78.1	14.5	52.7	GR	2.768	98.7	98.7	3.0	2.903	.00	.00	
1834.1	88	6.0	6.5	25.0	2.440	.3	.0	102.0	77.2	20.2	55.5	GR	2.683	100.0	100.0	8.7	2.841	.00	.00	
1837.9	73	10.9	9.1	18.5	2.530	.1	.0	109.5	76.0	8.8	17.7	MN	2.797	100.0	100.0	12.4	2.830	.00	.00	
1841.8	85	8.2	7.0	21.8	2.383	.7	3.1	97.8	59.4	12.4	.0	MN	2.748	97.8	97.8	21.0	2.748	.00	.00	
1845.6	107	4.8	4.6	22.8	2.360	.5	.0	109.2	78.2	22.9	44.4	SD	2.641	100.0	100.0	13.7	2.743	.00	.00	
1849.4	85	4.8	3.2	30.3	2.430	.2	.0	99.9	94.9	23.1	52.5	GR	2.773	99.9	99.9	10.5	2.893	.00	.00	
1853.2	70	6.4	4.9	22.8	2.520	.4	.0	115.5	98.4	18.4	34.9	GR	2.802	100.0	100.0	9.2	2.881	.00	.00	
1857.0	105	5.5	1.0	26.1	2.266	1.9				23.3	75.4	GR	2.670	100.0	100.0	.0	2.914	.00	.00	2 4
1860.8	116	4.0	.6	35.8	1.983	1.1	.3	84.7	122.3	32.4	.0	MN	2.664	96.7	84.7	33.6	2.664	.00	.00	8
1864.6	110	4.8	2.6	29.3	2.383	.7	.0	97.6	99.8	24.0	59.3	SD	2.699	99.5	97.6	12.5	2.846	.00	.00	
1868.4	123	6.0	2.1	26.1	2.406	1.8				22.6	95.3	N	2.670	100.0	100.0	.0	2.914	.00	.00	2 4
1872.2	127	5.9	2.4	28.3	2.195	1.8				22.2	98.8	S	2.670	100.0	100.0	.0	2.932	.00	.00	2 4
1876.0	106	4.9	1.6	31.5	2.227	2.3		109.4	184.7	24.3	76.7	GR	2.670	100.0	100.0	1.8	2.926	.00	.00	4 78
1879.9	94	5.9	2.8	27.3	2.288	2.8		98.4	122.8	24.1	63.0	GR	2.670	99.7	98.4	5.4	2.880	.00	.00	4 78
1883.7	76	7.3	1.6	24.0	2.367	2.1		88.8	140.8	21.0	41.7	GR	2.670	97.7	88.8	11.2	2.809	.00	.00	4 7
1887.5	78	6.7	2.9	24.0	2.378	2.5		90.8	104.1	21.7	44.0	GR	2.670	98.1	90.8	11.1	2.817	.00	.00	4 7

Zone No. 6 (cont'd)

DEPTH M	GR	RT	RXO	PHIN	RHOB	DD	SPI	SWU	SXOU	PHIS	VCL	FVCL	RHOMAU	SXO	SW	PHIE	RHOMA	POR-M	HC-M	FLAGS
1891.3	81	7.7	1.4	25.1	2.319	2.9		83.3	147.5	22.4	47.5	GR	2.670	96.4	83.3	10.5	2.828	.00	.00	4 7
1895.1	75	7.5	2.7	22.9	2.306	1.9		81.0	96.9	32.5	40.5	GR	2.670	95.9	81.0	13.6	2.805	.00	.00	4 78
1898.9	74	8.5	2.1	26.3	2.280	3.9		84.0	126.1	20.5	40.1	GR	2.670	96.6	84.0	11.3	2.804	.00	.00	4 7
1902.7	76	6.5	1.6	28.2	2.323	.8	.0	79.6	115.4	37.5	41.3	GR	2.659	95.5	79.6	15.6	2.801	.00	.00	
1906.5	84	6.5	2.7	26.1	2.296	2.0		90.7	110.3	32.8	51.7	GR	2.670	98.1	90.7	9.2	2.843	.00	.00	4 78
1910.3	79	6.4	2.5	26.1	2.356	1.6		89.5	107.5	28.5	45.8	GR	2.670	97.8	89.5	11.5	2.823	.00	.00	4 78
1914.1	72	7.0	2.3	23.9	2.410	.2	.0	94.7	121.8	23.4	37.3	GR	2.680	98.9	94.7	11.6	2.801	.00	.00	
1918.0	77	9.2	4.1	24.9	2.450	.1	.0	85.8	88.2	16.5	36.6	MN	2.781	88.2	85.8	13.7	2.849	.00	.00	
1921.8	77	8.3	4.0	24.9	2.380	.0	.0	80.8	83.4	22.2	43.2	GR	2.697	83.4	80.8	13.1	2.839	.00	.00	
1925.6	87	8.7	4.0	27.1	2.413	.6	.0	77.6	84.0	21.0	53.5	SD	2.761	84.0	77.6	12.3	2.886	.00	.00	
1929.4	74	7.5	2.7	26.0	2.450	.3	.0	91.0	111.9	20.8	39.5	GR	2.756	98.1	91.0	11.1	2.862	.00	.00	
1933.2	70	9.9	9.8	27.1	2.433	.6	.0	72.4	50.8	23.7	34.8	GR	2.872	72.4	72.4	14.7	2.941	.00	.00	
1937.0	74	8.3	8.1	27.1	2.410	.0	.0	78.1	57.0	21.7	40.1	GR	2.791	78.1	78.1	13.3	2.903	.00	.00	
1940.8	76	9.2	6.6	26.0	2.470	.0	.0	80.6	71.6	20.6	42.0	GR	2.830	80.6	80.6	10.7	2.923	.00	.00	
1944.6	80	8.4	7.9	27.1	2.450	.0	.0	81.0	64.0	20.3	46.8	GR	2.796	81.0	81.0	10.2	2.915	.00	.00	
1948.4	107	6.5	4.4	27.1	2.520	.0	.0	98.8	115.8	21.5	78.1	GR	2.670	99.8	98.8	1.6	2.931	.00	.00	
1952.2	98	4.4	2.8	26.0	2.420	.0	.0	112.2	112.7	23.5	67.9	GR	2.643	100.0	100.0	8.2	2.837	.00	.00	
1956.1	101	6.3	4.6	27.1	2.490	.0	.0	97.3	102.1	21.6	71.0	GR	2.670	99.5	97.3	4.0	2.907	.00	.00	
1959.9	97	5.8	2.9	27.1	2.440	.0	.0	98.6	113.5	21.9	65.8	GR	2.686	99.7	98.6	7.9	2.866	.00	.00	
1963.7	101	5.5	1.4	23.9	2.420	.0	.0	106.4	162.0	21.1	57.0	SD	2.657	100.0	100.0	9.4	2.810	.00	.00	
1967.5	90	5.3	4.6	29.2	2.430	.0	.0	97.9	84.0	22.8	58.0	GR	2.713	97.9	97.9	8.9	2.882	.00	.00	
1971.3	76	6.4	5.8	26.0	2.390	.0	.0	91.3	70.6	23.0	42.0	GR	2.675	91.3	91.3	12.1	2.812	.00	.00	
1975.1	75	7.3	6.8	27.1	2.430	.0	.0	88.0	67.1	21.0	41.1	GR	2.743	88.0	88.0	11.7	2.858	.00	.00	
1978.9	77	8.5	6.4	24.9	2.380	-.1	.0	80.2	65.4	21.7	42.9	GR	2.716	80.2	80.2	13.8	2.852	.00	.00	
1982.7	76	7.7	3.8	27.1	2.400	.0	.0	81.3	82.4	21.2	41.5	GR	2.766	82.4	81.3	13.5	2.884	.00	.00	

Langley-1 GFE Resources Ltd. Complex Lithology Results 15-01-96

Hydrocarbon Volume Report

MEASURED DEPTH RESULTS:

ZONE #	1	2	3	4	5	6
FROM M	1716.024	1730.045	1752.905	1771.955	1798.930	1826.514
TO M	1730.045	1752.905	1771.955	1798.930	1826.514	1985.010
INTERVAL M	14.021	22.860	19.050	26.975	27.584	158.496
PHIE Cut off	.050	.050	.050	.050	.050	.050
SW Cut Off	**.500**	**.500**	**.500**	**.500**	**.500**	**.500**
Vclay Cut Off	.400	.400	.400	.400	.400	.400
Net Pay M	.076	18.745	.610	1.067	.152	.000
Average PHIE %	14.401	18.674	17.094	19.307	19.132	.000
Average SW %	45.808	27.477	45.505	39.044	49.771	.000
Average Vclay %	38.835	10.193	23.575	15.998	15.258	.000
Integrated PHI M	.011	3.501	.104	.206	.029	.000
Sum PHI*(1-SW) M	.008	2.552	.057	.125	.015	.000

Hydrocarbon Volume Report

MEASURED DEPTH RESULTS:

ZONE #	1	2	3	4	5	6
FROM M	1716.024	1730.045	1752.905	1771.955	1798.930	1826.514
TO M	1730.045	1752.905	1771.955	1798.930	1826.514	1985.010
INTERVAL M	14.021	22.860	19.050	26.975	27.584	158.496
PHIE Cut off	.050	.050	.050	.050	.050	.050
SW Cut Off	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
Vclay Cut Off	.400	.400	.400	.400	.400	.400
Net Pay M	.229	20.117	16.154	6.706	21.336	38.100
Average PHIE %	12.223	18.192	21.950	18.313	23.209	16.110
Average SW %	77.129	29.816	71.294	65.122	63.337	86.774
Average Vclay %	38.489	10.826	5.666	14.525	14.124	27.547
Integrated PHI M	.028	3.660	3.546	1.228	4.952	6.138
Sum PHI*(1-SW) M	.010	2.611	1.033	.439	1.835	.887