



Geological Survey of Canada
Open File 5059

Vitrinite reflectance data
for
Petro Canada *et al* Pothurst P-19

M. P. Avery

2005



Natural Resources
Canada

Ressources naturelles
Canada

Canada

GEOLOGICAL SURVEY OF CANADA

OPEN FILE 5059

Vitrinite reflectance data
for
Petro Canada *et al* Pothurst P-19

M. P. Avery
Marine Resources Geoscience Subdivision
Geological Survey of Canada (Atlantic), Dartmouth

2005

© Her Majesty the Queen in Right of Canada 2005
Available from
Geological Survey of Canada, Atlantic
Bedford Institute of Oceanography
1 Challenger Drive
Dartmouth, Nova Scotia B2Y 4A2

Open files are products that have not gone through the GSC formal publication process.
This report was released with the permission from the Director Geological Survey of Canada - Atlantic

Avery, M.P.
2005: Vitrinite reflectance data for Petro Canada *et al* Pothurst P-19; Geological Survey of Canada, Open File 5059, 13p.

Table of Contents

Well information	1
Introduction	1
Remarks	1
Method	2
Discussion	2
References	2
Table I - Inferred Hydrocarbon Thermal Maturity Levels	1
Table II - Summary of kerogen - based vitrinite reflectance	3
Table III - Formation Tops	3

(List of remaining figures and appendices in order of appearance)

Figure 1 - VR/depth plot for Pothurst P-19

Figure 2 - VR Histograms/depth plot for Pothurst P-19

Appendix I - Sample Preparation Method

Appendix II - Zones of petroleum generation and destruction

Appendix III - Data listings and basic statistics

Well information

G.S.C. Locality No.: D212 **Unique Well ID:** 300 P19 58500 60300 **Location:** 58.81483° N, 60.52567° W

R.T. Elevation: 12 **Water Depth:** 193 **Total Depth:** 3992

Sampled Interval: 555 - 3985 **Interval Studied:** 1675-3835

Depth Units: Metres referenced to R.T. **Rig Release Date:** October 22, 1982

Introduction

Vitrinite reflectance has been determined on 14 rotary cutting samples from Petro Canada *et al* Pothurst P-19, which was classified as an exploratory well located in the Saglek Basin on the northern Labrador Shelf. The well status is Plugged and Abandoned.

Sample preparation followed the procedures listed in Appendix I. Data acquisition and manipulation was done on a Zeiss Photometer III system with a custom interface to a computer for data storage and statistical summaries.

Analysis of the well reveals thermal maturity levels given in Table I. Specific maturity levels, as set out in this report, are based on those of Powell and Snowdon(1983) with modified terminology (Appendix II).

Table I
Inferred Hydrocarbon Thermal Maturity Levels

Depth in metres	Vitrinite Reflectance* %Ro	Hydrocarbon generation levels** for type II or III kerogen
193 [sea floor]	(0.20)	immature
1510	0.3	immature
2470	0.4	immature approaching maturity
3210	0.5	marginally mature
3820	0.6	onset of significant oil generation
3992 [T.D.]	(0.63)	approaching peak maturity

*()'s indicate Ro's extrapolated from linear regression slope: 0.130 log Ro/km

** Actual hydrocarbon products depend on type of organic matter present (Powell and Snowdon, 1983).

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was reasonably complete over the section penetrated between 1675 and 3835 m at Pothurst P-19. The data were plotted on a log Ro vs. linear depth scale. A regression line fitted through the data yielded a maturity slope of 0.130 log Ro/km. Because there is a significant variation in the number of readings from one sample point to another (Table II) the regression line was weighted based on the 'n' value for each point . The relative size of the point symbols provide an indication of the number of readings. The 'error bars' displayed on the maturity profile indicate one standard deviation on either side of the mean and may be deceptively small for samples with very few readings.

The histogram display (Figure 2) shows the variability in the reflectance populations, which represent the maturity of the sediments with depth. Plotting reflectance histograms on a log scale may help reveal any trends present in the Ro data. It also can help to demonstrate the effects of cavings, geology, casing points and other influences on the vitrinite reflectance populations.

These vitrinite reflectance data show that the thermal maturity of the lower section of Pothurst P-19 is suitable to generate and preserve hydrocarbons within the drilled section, between 3210 and 3992 m (T.D.), provided potential source rocks of the proper organic matter type and traps are present.

Method

Data obtained for this report were measured on polished whole rock mounts. Whole rock preparations present the operator with a view of the organic matter in its rock matrix as it naturally occurs.

Discussion

Although only one calculated regression line was fitted through the data points there may be a subtle anomaly in the data between samples at 2215 m and 2795 m. A vertical trend in vitrinite reflectance data is often seen just as the section enters the oil window (Carr, 2000). The reflectance is believed to be suppressed by the initial generation of hydrocarbons. On the other hand, the lithology of the Mokami formation is sandstone dominated which can produce higher reflectance values due to oxidation and/or thermal flux due to fluid migration through the sands.

References

- Carr, A. D.
2000: Suppression and retardation of vitrinite reflectance, Part 1. Formation and significance for hydrocarbon generation. *Journal of Petroleum Geology*, vol. 23(3), pp 313-343.
- Powell, T. G. and Snowdon, L. R.
1983: A composite hydrocarbon generation model. *Erdöl und Kohle, Erdgas, Petrochemie*, v. 36, p. 163-170.

c.c. P. Dennis, Director's Office, GSC (Atlantic)

H. Wielens, GSC (Atlantic)

P. Lake, GSC (Atlantic)

MResG Files, GSC (Atlantic)

L. Stasiuk,, GSC (Calgary)

C. Beaumont, Dalhousie Univ., Halifax

D. Hawkins, C-NLOPB, St. John's (3 copies)

Table II
Summary of kerogen - based vitrinite reflectance

Sample* Labels	Depth in metres	Mean Ro (SD) non-rotated	Number of Readings	
			Total	Edited
C402-05	1675	0.26 (± 0.05)	13	7
C403-05	1755	0.24 (± 0.00)	3	1
C404-05	1905	0.35 (± 0.04)	13	11
C405-05	2005	0.36 (± 0.04)	11	8
C406-05	2215	0.41 (± 0.04)	4	4
C407-05	2385	0.46 (± 0.01)	2	2
C408-05	2615	0.49 (± 0.03)	10	8
C409-05	2795	0.47 (± 0.02)	11	6
C410-05	3005	0.46 (± 0.04)	16	8
C411-05	3195	0.49 (± 0.04)	13	13
C412-05	3305	0.47 (± 0.01)	7	6
C413-05	3505	0.53 (± 0.04)	13	13
C414-05	3685	0.55 (± 0.05)	9	9
C415-05	3835	0.62 (± 0.06)	12	12

*Sample labels prefixes: 'C' indicates kerogen stubs prepared at GSC - Calgary

Table III
Formation Tops (Moir, pers. comm.)

Formation	Depth in metres
Saglek	249
Mokami	1322
Kenamu	2331
Leif Mb	2440-2544
Cartwright	3125
Markland	3620
paleocene Diabase Intrusive	4451

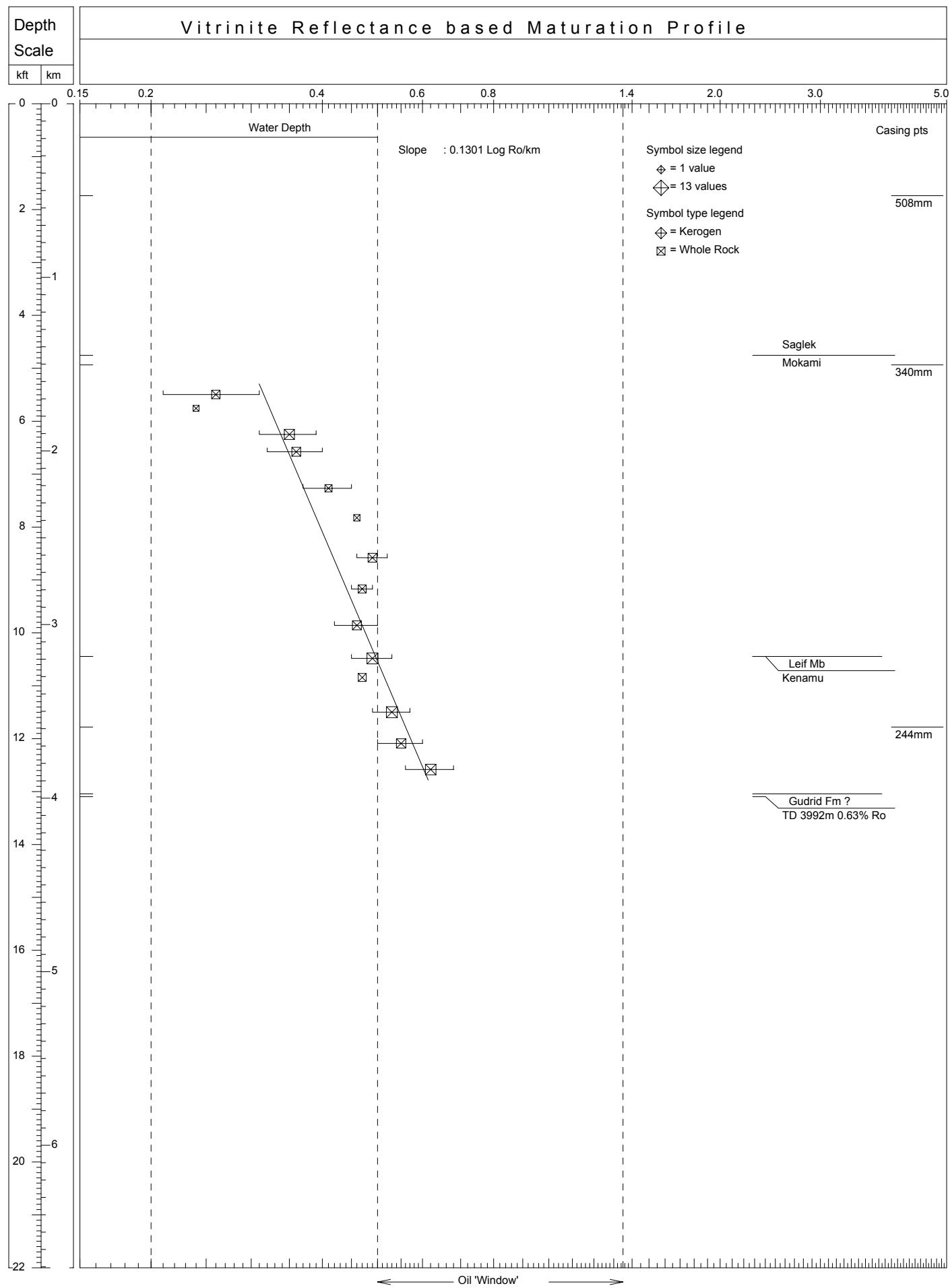


Figure 1. VR/depth plot for Pothurst P-19

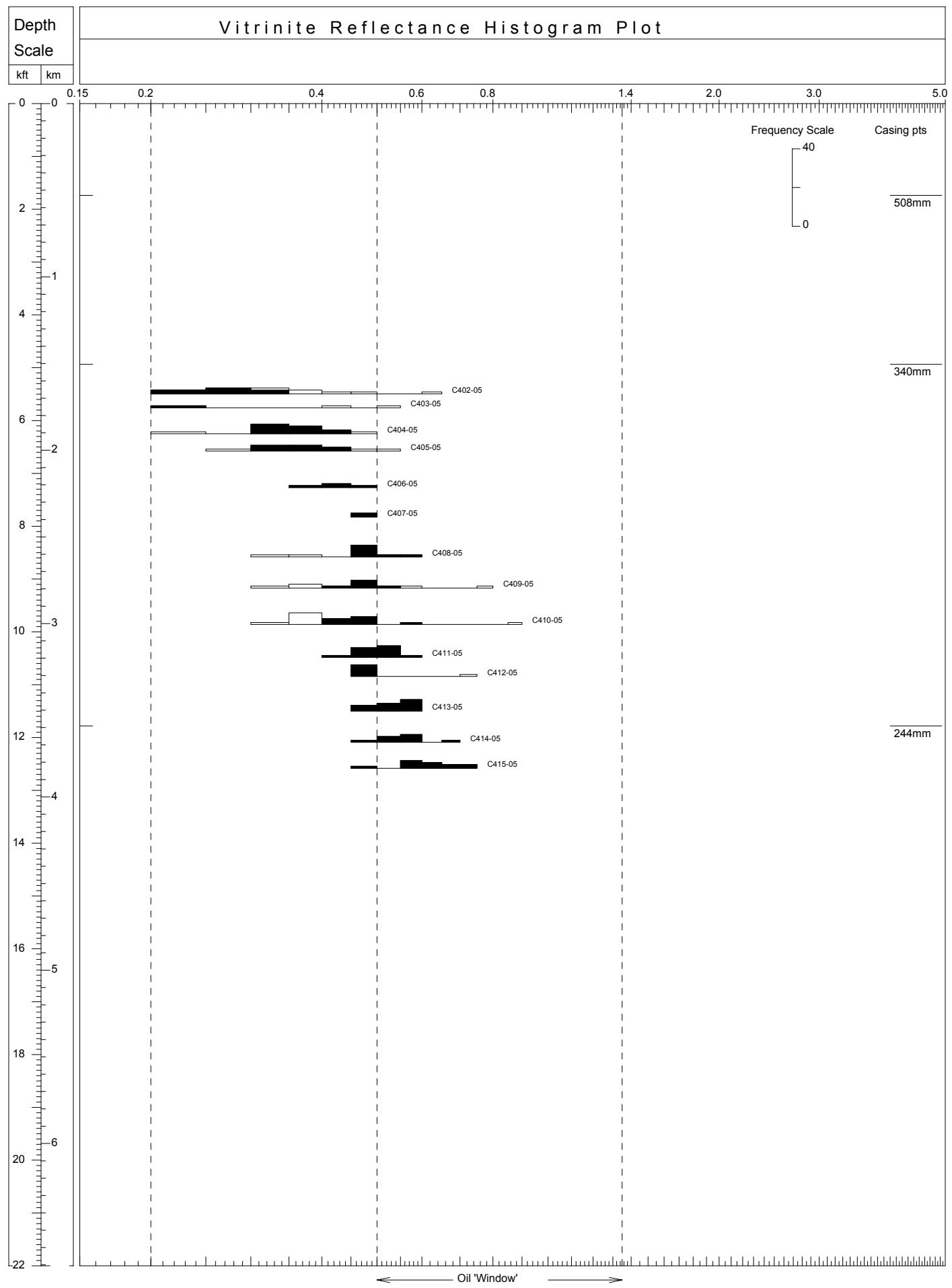


Figure 2. VR Histograms/depth plot for Pothurst P-19

Appendix I

Sample Preparation Method

Kerogen concentrate sample preparation

Preliminary wash (preparation for drill cuttings)

Dry samples in oven (25°C)

PALYNOLOGY Lab preparation

Place 20-30 grams in 250 ml plastic beaker.

Add 10% HCl till reaction ceases (removes carbonates).

Rinse 3 times.

Immerse in hot concentrated HF overnight (removes silicates).

Rinse 3 times.

Heat (60-65°C) in concentrated HCl (removes fluorides caused by HF).

Rinse 3 times.

Transfer to 15 ml test tube with 4-5 ml 4% Alconox.

Centrifuge at 1500 rpm for 90 sec.

Decant.

Rinse and centrifuge 3 times.

Float off organic fraction using 2.0 S.G. ZnBr solution.

Centrifuge at 1000 rpm for 8 min.

Float fraction into second test tube.

Wash and centrifuge 3 times.

Make kerogen smear slide.

Remaining kerogen material is made available to Organic Petrology Lab.

VITRINITE REFLECTANCE Lab preparation

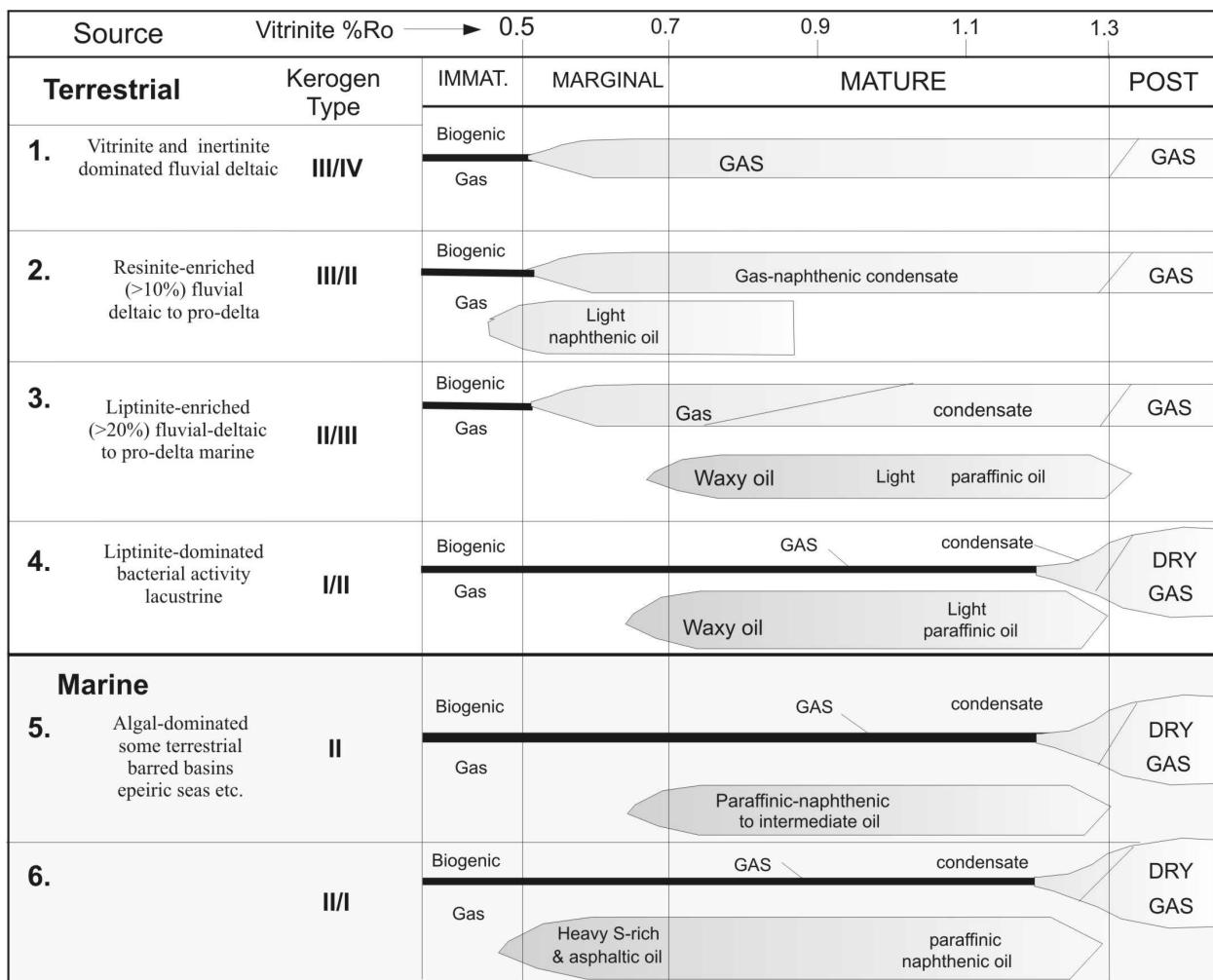
Pipette off excess water and prepare as 2.5 cm (1") diameter plastic stubs to fit polisher.

Freeze dry and fix material for polishing with epoxy resin.

Polish with diamond-based suspension to obtain low relief, scratch-free surface.

Examine under oil lens, incident light at approximately 1000x magnification.

Appendix II (Powell and Snowdon 1983)



Hydrocarbon generation model compiled from Powell and Snowdon (1983) illustrating the different thresholds of hydrocarbon generation and products as related to thermal maturity, kerogen type and paleodepositional environment.

Appendix III

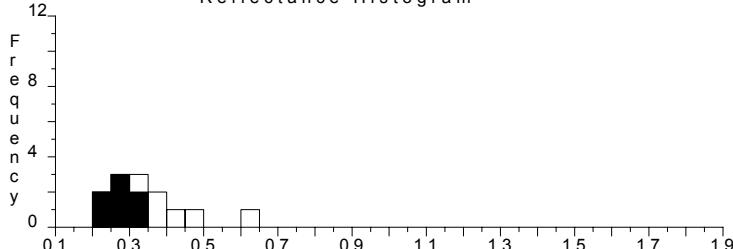
Data listings and basic statistics

Data listings and basic statistics for: Pothurst P-19

C402-05, 1675m

Col >	1	2	3	4	5	6	7	8	9	0
Row	0.41 (0.32)	0.37 (0.30)	0.49 (0.20)	(0.26)	(0.28)	(0.25)	0.34	0.39	(0.20)	0.64
Total	0.34 (Edit)	0.12 0.26	Stand Dev 0.05	Pts 7	Min 0.20	Max 0.64	Sum 4.45			
(Edit)	0.26	0.05								

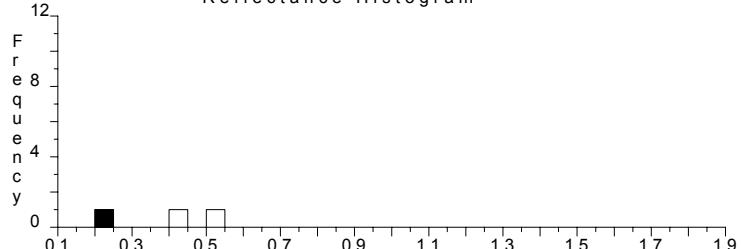
Reflectance Histogram



C403-05, 1755m

Col >	1	2	3			
Row	(0.24)	0.43	0.54			
Total	0.40 (Edit)	0.15 0.00	Pts 3	Min 0.24	Max 0.54	Sum 1.21
(Edit)	0.24	0.00				

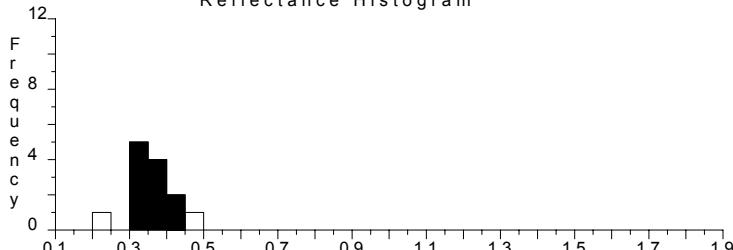
Reflectance Histogram



C404-05, 1905m

Col >	1	2	3	4	5	6	7	8	9	0
Row	0.24 (0.30)	(0.32) (0.34)	(0.35) (0.30)	0.47 (0.40)	(0.40) (0.37)	(0.38) (0.38)	(0.38) (0.38)	(0.38) (0.38)	(0.33) (0.33)	(0.40) (0.40)
Total	0.35 (Edit)	0.06 0.04	Stand Dev 0.04	Pts 11	Min 0.24	Max 0.47	Sum 4.58			
(Edit)	0.35	0.04								

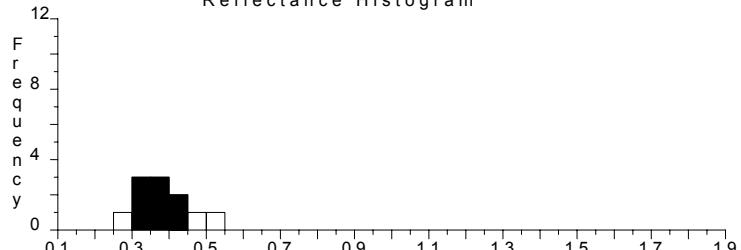
Reflectance Histogram



C405-05, 2005m

Col >	1	2	3	4	5	6	7	8	9	0
Row	0.28 (0.42)	0.45 (0.42)	(0.31) (0.31)	(0.35) (0.40)	(0.40) (0.38)	(0.38) (0.38)	(0.38) (0.38)	(0.36) (0.36)	(0.34) (0.34)	0.50 (0.50)
Total	0.37 (Edit)	0.07 0.04	Stand Dev 0.04	Pts 8	Min 0.28	Max 0.50	Sum 4.09			
(Edit)	0.36	0.04								

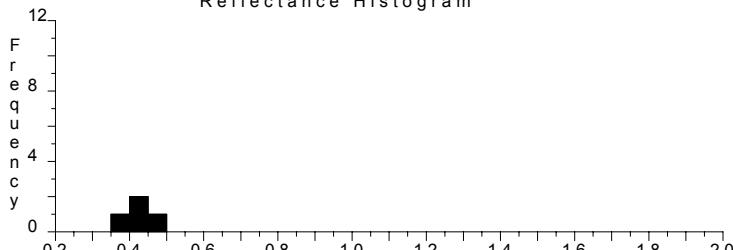
Reflectance Histogram



C406-05, 2215m

Col >	1	2	3	4			
Row	0.45 (0.45)	(0.35) (0.43)	(0.43) (0.41)	(0.41) (0.41)			
Total	0.41 (Edit)	0.04 0.04	Stand Dev 0.04	Pts 4	Min 0.35	Max 0.45	Sum 1.64
(Edit)	0.41	0.04					

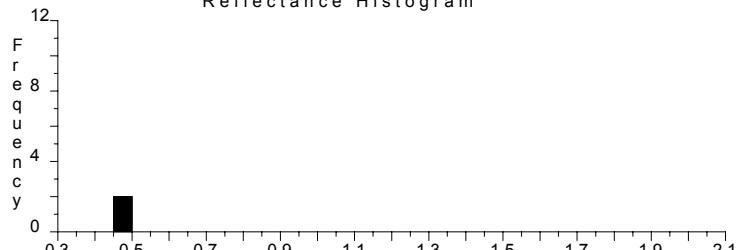
Reflectance Histogram



C407-05, 2385m

Col >	1	2					
Row	(0.45) (0.45)	(0.47) (0.47)					
Total	0.46 (Edit)	0.01 0.01	Stand Dev 0.01	Pts 2	Min 0.45	Max 0.47	Sum 0.92
(Edit)	0.46	0.01					

Reflectance Histogram



Data listings and basic statistics for: Pothurst P-19

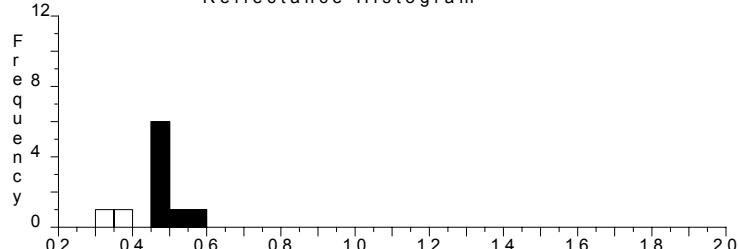
C408-05, 2615m

Col >	1 (0.52)	2 (0.48)	3 (0.48)	4 (0.56)	5 0.37	6 (0.48)	7 (0.49)	8 (0.46)	9 0.33	0 (0.47)
Row	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.46	0.07	10	0.33	0.56	4.64				
(Edit)	0.49	0.03	8	0.46	0.56	3.94				

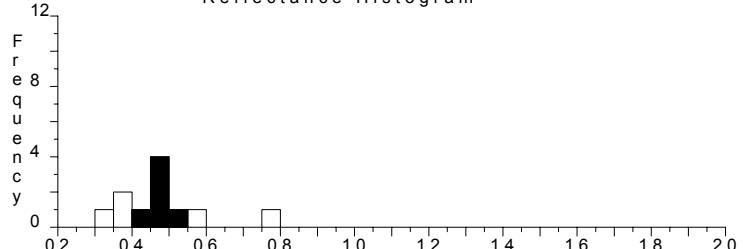
C409-05, 2795m

Col >	1 (0.50)	2 (0.39)	3 (0.46)	4 0.79	5 0.59	6 0.32	7 (0.48)	8 (0.44)	9 (0.46)	0 (0.47)
Row	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.47	0.12	11	0.32	0.79	5.29				
(Edit)	0.47	0.02	6	0.44	0.50	2.81				

Reflectance Histogram



Reflectance Histogram



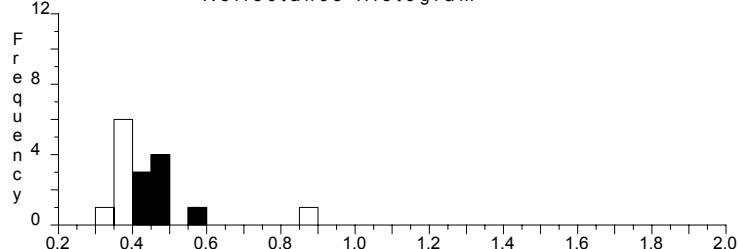
C410-05, 3005m

Col >	1 (0.49)	2 (0.55)	3 (0.42)	4 (0.46)	5 (0.44)	6 0.35	7 (0.45)	8 0.86	9 0.31	0 (0.48)
Row	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.44	0.13	16	0.31	0.86	7.08				
(Edit)	0.46	0.04	8	0.42	0.55	3.71				

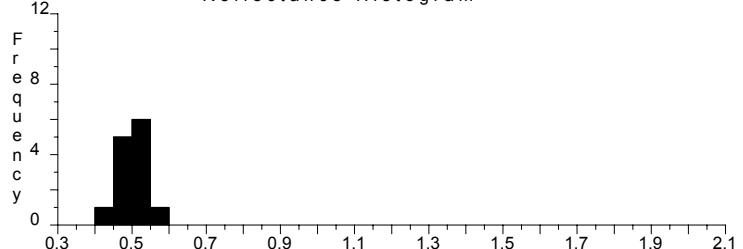
C411-05, 3195m

Col >	1 (0.52)	2 (0.51)	3 (0.57)	4 (0.47)	5 (0.52)	6 (0.51)	7 (0.43)	8 (0.53)	9 (0.52)	0 (0.45)
Row	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.49	0.04	13	0.43	0.57	6.41				
(Edit)	0.49	0.04	13	0.43	0.57	6.41				

Reflectance Histogram



Reflectance Histogram



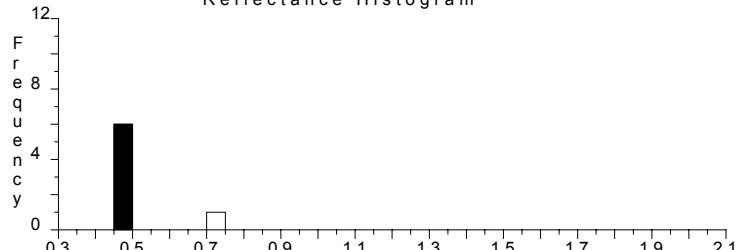
C412-05, 3305m

Col >	1 (0.47)	2 (0.48)	3 0.72	4 (0.47)	5 (0.45)	6 (0.48)	7 (0.45)
Row	Mean	Stand Dev	Pts	Min	Max	Sum	
Total	0.50	0.10	7	0.45	0.72	3.52	
(Edit)	0.47	0.01	6	0.45	0.48	2.80	

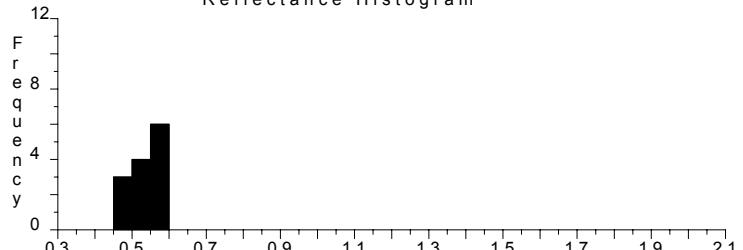
C413-05, 3505m

Col >	1 (0.53)	2 (0.49)	3 (0.52)	4 (0.58)	5 (0.55)	6 (0.54)	7 (0.45)	8 (0.55)	9 (0.56)	0 (0.55)
Row	Mean	Stand Dev	Pts	Min	Max	Sum				
Total	0.53	0.04	13	0.45	0.58	6.90				
(Edit)	0.53	0.04	13	0.45	0.58	6.90				

Reflectance Histogram



Reflectance Histogram



Data listings and basic statistics for: Pothurst P-19

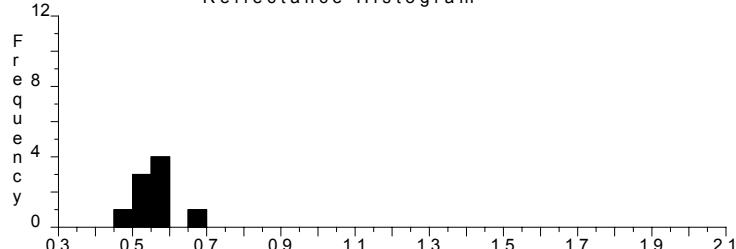
C414-05, 3685m

Col >	1 (0.65)	2 (0.55)	3 (0.50)	4 (0.54)	5 (0.57)	6 (0.59)	7 (0.52)	8 (0.57)	9 (0.47)
Row									
Total	0.55	0.05	9	0.47	0.65	0.65	4.96		
(Edit)	0.55	0.05	9	0.47	0.65	0.65	4.96		

C415-05, 3835m

Col >	1 (0.49)	2 (0.57)	3 (0.63)	4 (0.58)	5 (0.65)	6 (0.63)	7 (0.59)	8 (0.59)	9 (0.61)	0 (0.70)
Row										
Total	0.62	0.06	12	0.49	0.70	7.39				
(Edit)	0.62	0.06	12	0.49	0.70	7.39				

Reflectance Histogram



Reflectance Histogram

