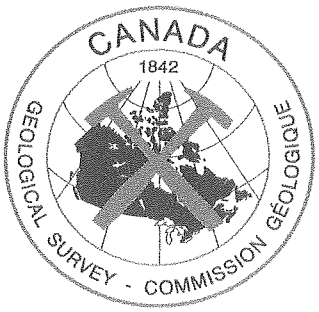

Geological Survey of Canada open file # 3999

Vitrinite reflectance (Ro) of dispersed organic matter from Husky/Bow Valley et al Panther P-52

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Vitrinite reflectance (Ro) of dispersed organic matter from Husky/Bow Valley et al Panther P-52

G.S.C. Locality No.: D266 **Unique Well ID:** 300 P52 47100 47300 **Location:** 47.0315°N, 47.62883°W

R.T. Elevation: 22m **Water Depth:** 191.4m **Total Depth:** 4203.2 m

Sampled Interval: 400-4203.2m **Interval Studied:**635-4203m

Depth Units: Meters referenced to R.T. **Rig Release Date:** January 30, 1986

Vitrinite reflectance has been determined on 25 rotary cuttings samples from Husky/Bow Valley et al Panther P-52, which was classified as an exploratory well and is located on the Grand Banks approximately 388 km east of St. John's, Newfoundland. Well status is Plugged and Abandoned.

Sample preparation followed the procedures listed in Appendix I. Data acquisition and manipulation for this report utilized the Zeiss Photometer III system with a custom interface to a microcomputer which provides data storage and statistical summaries.

Analysis of the well reveals thermal maturity intervals given in Table I. Specific maturity levels, as set out in this report, are based on those of Dow (1977) with modified terminology (Appendix II).

Table I
Inferred Thermal Maturation Levels*

Depths in meters	Vitrinite Reflectance (%Ro)	Significant well/maturity levels for oil generation
191	(0.22)	(Sea floor)
1200	0.3	immature
2170	0.4	immature approaching maturity
2930	0.5	marginally mature
3540	0.6	onset of significant oil generation
4203	(0.73)	(T.D.) within oil window
(4520)	0.8	peak of oil generation

* *Actual hydrocarbon products depend on type of organic matter present.*
** *( )'s indicate depths or Ro's that have been extrapolated at 0.129 log Ro/km.*

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was very good over the section penetrated at Panther P-52. The data were plotted on a log Ro vs. linear depth scale and a regression line was calculated and plotted through the data points (Figure 1). The 'error bars' displayed on the maturity profile indicate one standard deviation on either side of the mean and may be deceivingly small for samples with very few readings. The slope of the maturation line is 0.129 log Ro/km.

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

These vitrinite reflectance data provide evidence that the thermal regime of the lower section of Panther P-52 is suitable to generate and preserve hydrocarbons within the drilled section, between 2930 and 4203m (T.D.), assuming potential source rocks and traps are present.

Discussion

The vitrinite reflectance maturity profile for this Grand Banks well is very similar to that in North Ben Nevis P-93 well (Avery, 2001). The Panther well also shows a stepwise increase from an initial measured value of 0.24%Ro at 645m to 0.76%Ro at 4203m (T.D.). The extensive kerogen sample coverage available for Panther P-52 provides a good view of this feature, which is present in a number of East Coast offshore wells.

The maturity trend for this well is just slightly higher and almost parallel to the trend determined for North Ben Nevis P-93, which is approximately 74km west southwest of Panther P-52.

References

Avery, M.P., 2001. Vitrinite Reflectance (Ro) of dispersed organic matter from Husky/Bow Valley et al North Ben Nevis P-93. Geological Survey of Canada Open File Report 3998.

Dow, W.G., 1977. Kerogen studies and geological interpretations. Journal of Geochemical Exploration, no. 7, p. 77-99

McAlpine, K.D., 1990. Lithostratigraphy of fifty-nine wells, Jeanne d'Arc Basin. Geological Survey of Canada, Open File 2201, 97 p.

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A.E. Jackson, MResG, Dartmouth
MResG Files, Dartmouth
Central Technical Files, Ottawa
K. Osadetz, GSC (Calgary)
N. DeSilva, CNOPB, St. John's (3 copies)
C. Beaumont, Dalhousie Univ., Halifax

Table II

Summary of kerogen - based vitrinite reflectance

Sample Labels	Depths in meters	Mean Ro (SD) non-rotated	Number of Readings Total	Edited
K0890A	635-645	0.24 (±0.03)	13	13
K0890B	815-825	0.24 (±0.04)	13	13
K0890C	905-915	0.27 (±0.04)	19	19
K0890D	1075-1085	0.29 (±0.05)	11	11
K0891A	1255-1265	0.28 (±0.04)	9	7
K0891B	1405-1415	0.33 (±0.04)	17	17
K0891C	1555-1565	0.34 (±0.04)	15	15
K0891D	1705-1715	0.37 (±0.03)	18	18
K0892A	1855-1865	0.37 (±0.06)	19	19
K0892B	1995-2005	0.40 (±0.05)	17	17
K0892C	2125-2135	0.43 (±0.06)	19	19
K0892D	2285-2295	0.41 (±0.06)	22	22
K0893A	2435-2445	0.45 (±0.06)	20	20
K0893B	2585-2595	0.50 (±0.04)	7	7
K0893C	2765-2775	0.48 (±0.04)	18	18
K0893D	2915-2925	0.51 (±0.06)	13	13
K0894A	3035-3045	0.52 (±0.06)	18	18
K0894B	3200-3210	0.54 (±0.07)	9	9
K0894C	3350-3360	0.57 (±0.09)	11	11
K0894D	3500-3510	0.56 (±0.05)	22	22
K0895A	3650-3660	0.61 (±0.04)	3	3
K0895B	3800-3810	0.60 (±0.05)	10	10
K0895C	3950-3960	0.59 (±0.06)	18	18
K0895D	4070-4080	0.73 (±0.04)	7	6
K0896A	4195-4203	0.76 (±0.06)	23	23

Table III

Formation Tops (McAlpine, 1990)

Formation	Depth
Banquereau	in casing
(unconformity)	2642
(unnamed Limestone)	2642
(unconformity)	2653
Fortune Bay Shale	2653
Jeanne D'arc	2846
(unconformity)	3141
Rankin	3141
Egret Mb	3218-3291
Voyager	3790
Total Depth	4203

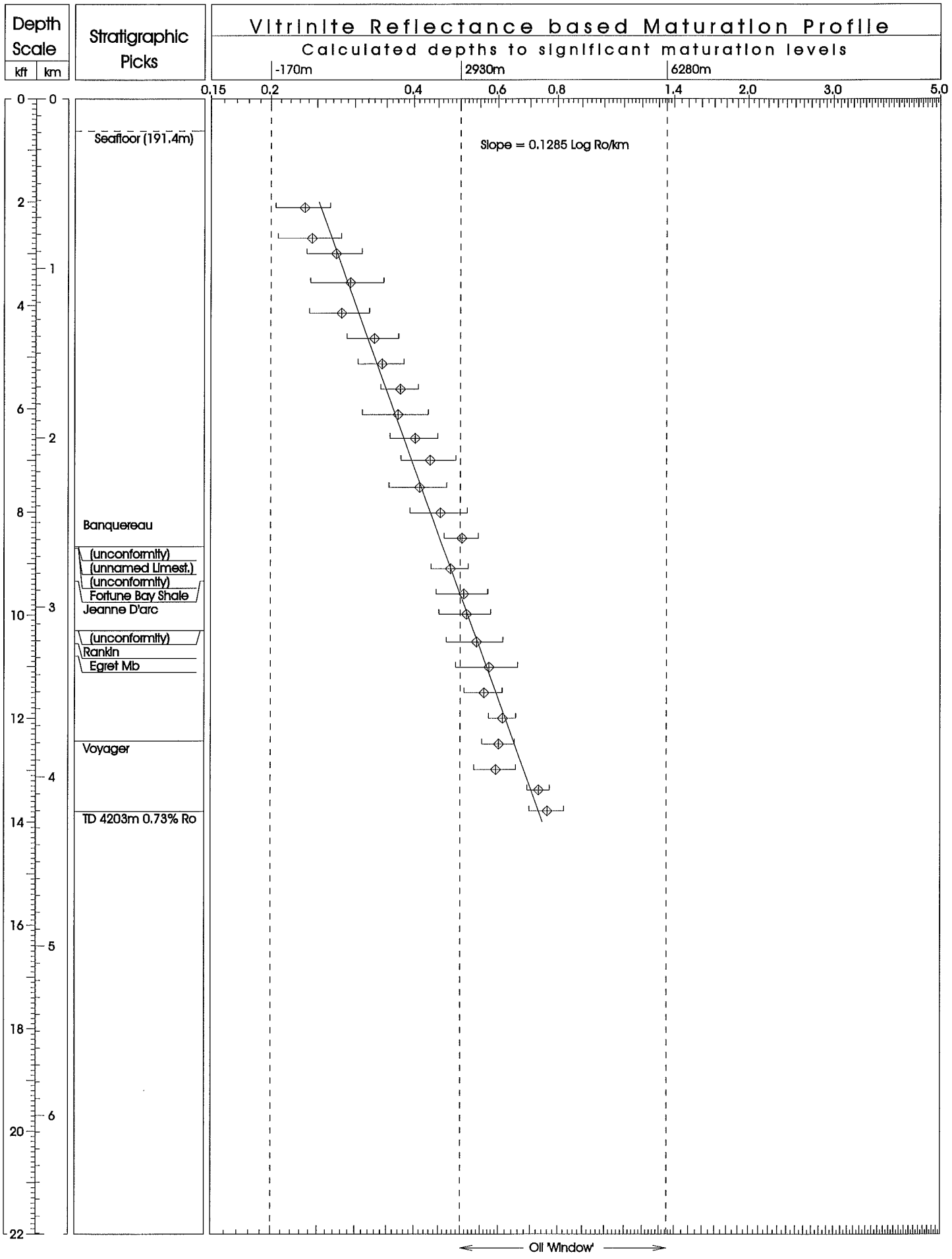


Fig. 1 PANTHER P-52

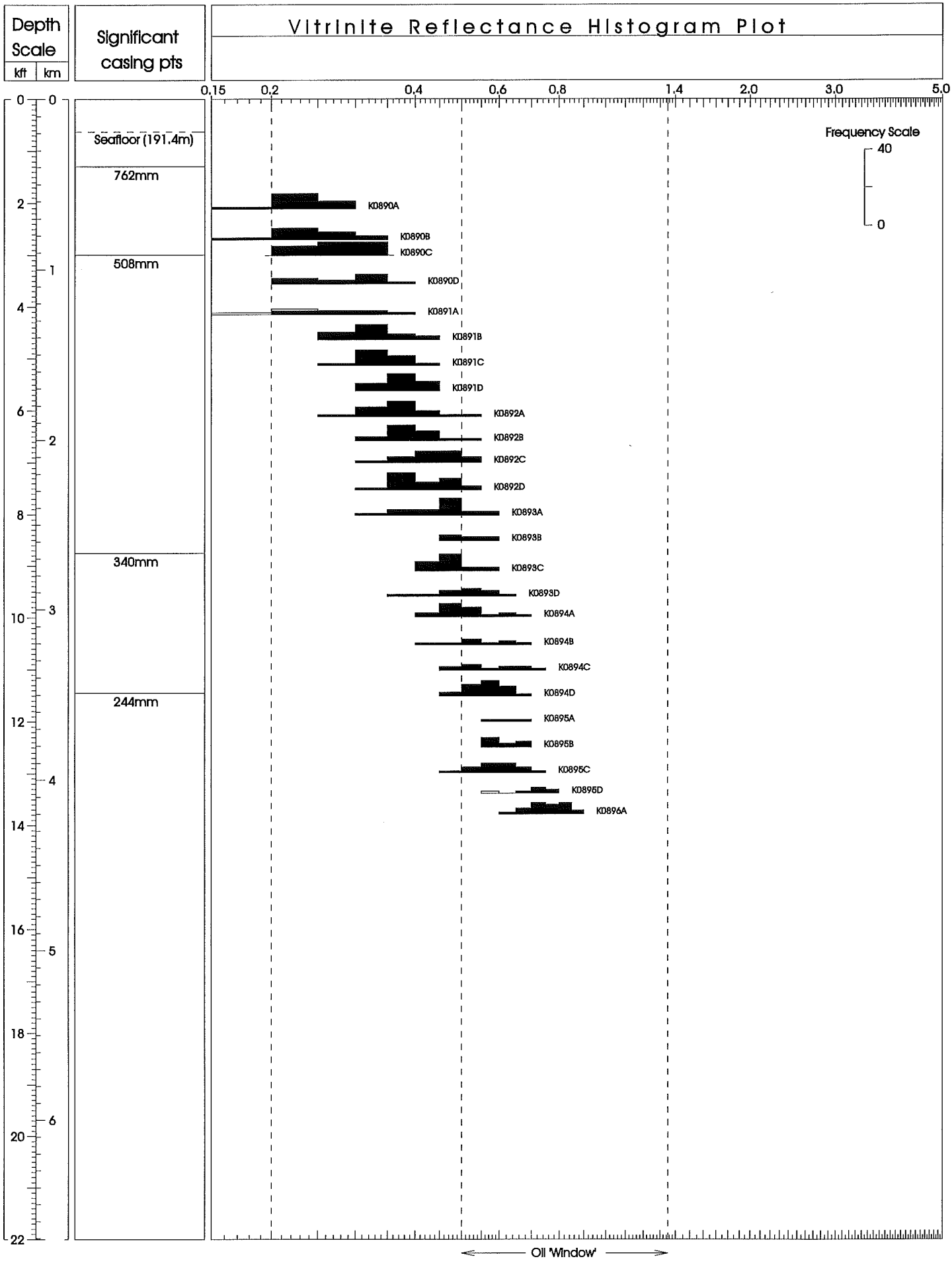


Fig. 2 PANTHER P-52 <Histograms>

Appendix I

Sample Preparation Method

Kerogen Concentrate

Preliminary wash (preparation for cuttings)

Dry samples in oven (25°C).

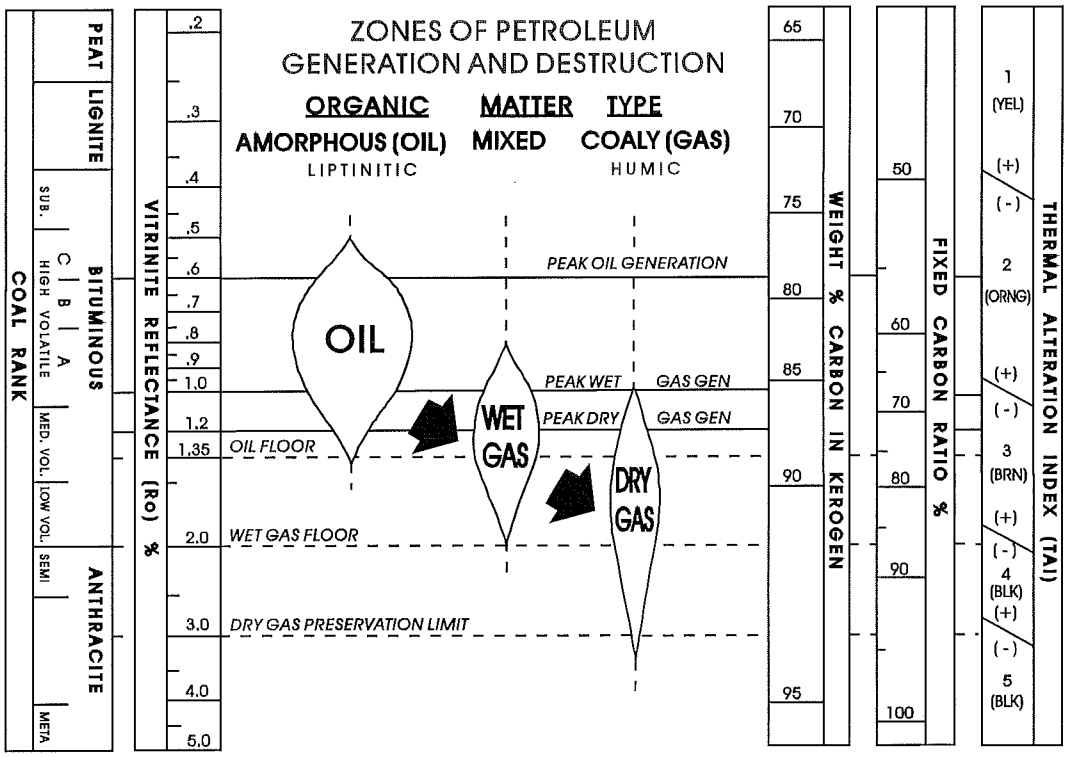
PALYNOLOGY Lab preparation

Place 20-30 grams in 250 ml plastic beaker.
Add 10% HC1 till reaction ceases (removes carbonates).
Rinse 3 times.
Immerse in hot concentrated HF overnight (removes silicates).
Rinsed 3 times.
Heat (60-65°C) in concentrated HC1 (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 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 (Dow, 1977)



Note: In this report, the terminology used to describe the various maturation levels has been modified. The 'peak' designation, as used in this figure, has been changed to 'onset of significant' and 0.8 %Ro is herein used as the 'peak of oil generation' (Table I, Figure 1).

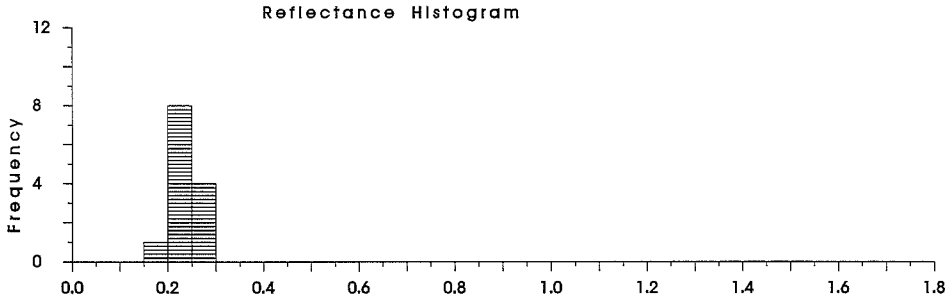
Appendix III

Reflectance Histograms

K0890A, 635-645m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.24)	(0.19)	(0.22)	(0.28)	(0.24)	(0.25)	(0.21)	(0.21)	(0.27)	(0.23)
	(0.23)	(0.29)	(0.20)							

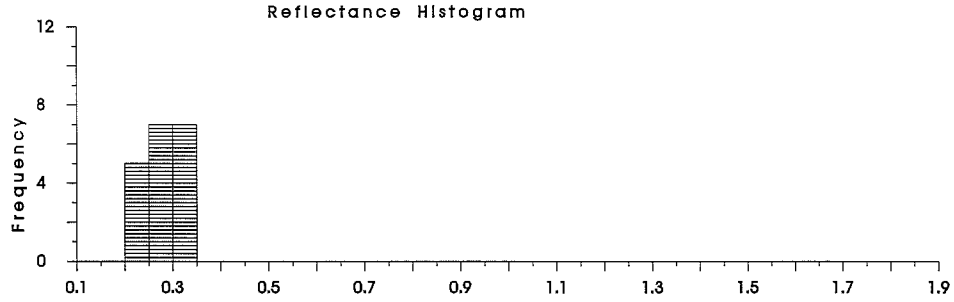
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.24	.03	13	.19	.29	3.06
(Edit)	.24	.03	13	.19	.29	3.06



K0890C, 905-915m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.22)	(0.22)	(0.31)	(0.29)	(0.31)	(0.27)	(0.24)	(0.27)	(0.27)	(0.33)
	(0.32)	(0.21)	(0.30)	(0.30)	(0.26)	(0.29)	(0.24)	(0.31)	(0.25)	

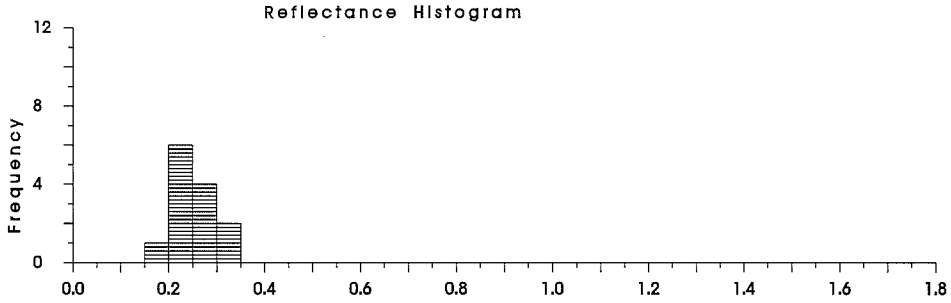
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.27	.04	19	.21	.33	5.21
(Edit)	.27	.04	19	.21	.33	5.21



K0890B, 815-825m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.22)	(0.22)	(0.31)	(0.24)	(0.18)	(0.25)	(0.31)	(0.25)	(0.20)	(0.25)
	(0.26)	(0.24)	(0.24)							

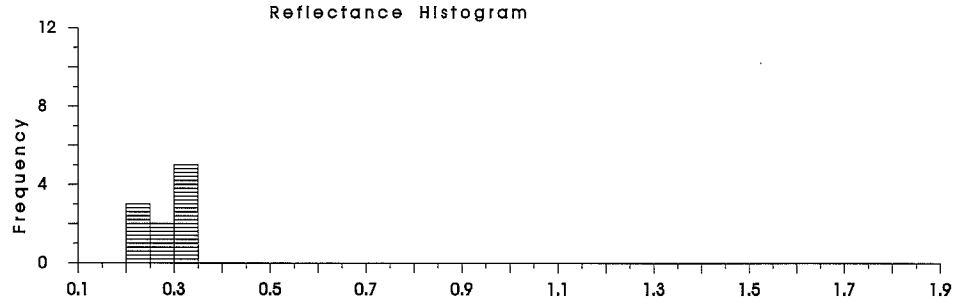
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.24	.04	13	.18	.31	3.17
(Edit)	.24	.04	13	.18	.31	3.17



K0890D, 1075-1085m

Col >	1	2	3	4	5	6	7	8	9	0
Row 1	(0.31)	(0.35)	(0.31)	(0.34)	(0.21)	(0.29)	(0.22)	(0.23)	(0.34)	(0.34)
	(0.29)									

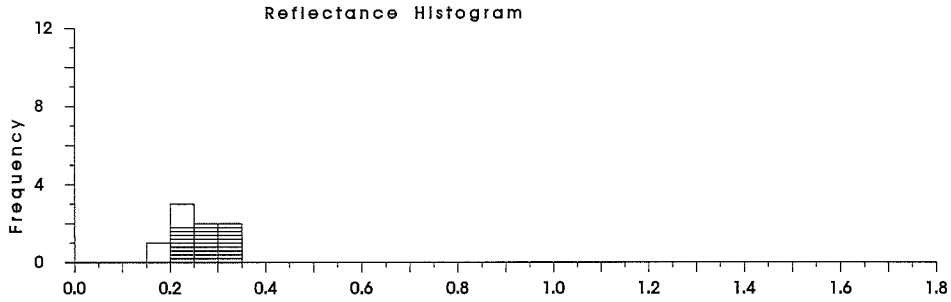
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.29	.05	11	.21	.35	3.23
(Edit)	.29	.05	11	.21	.35	3.23



K0891A, 1255-1265m

Col >	1	2	3	4	5	6	7	8	9
Row	(0.29)	(0.30)	(0.35)	(0.24)	(0.30)	(0.24)	(0.25)	0.19	0.20

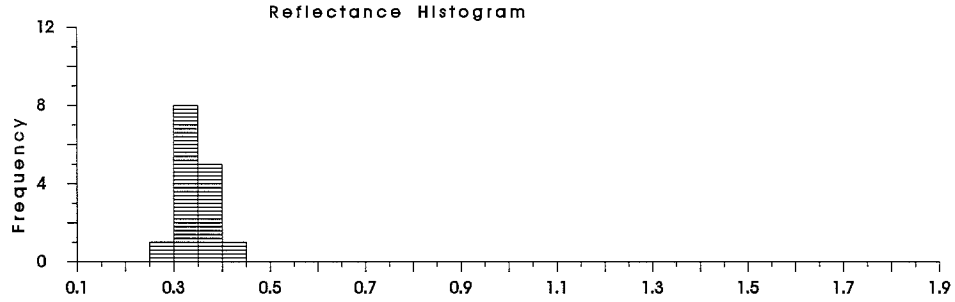
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.26	.05	9	.19	.35	2.36
(Edit)	.28	.04	7	.24	.35	1.97



K0891C, 1555-1565m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.36)	(0.38)	(0.31)	(0.33)	(0.33)	(0.38)	(0.31)	(0.39)	(0.39)	(0.28)
1	(0.32)	(0.30)	(0.34)	(0.32)	(0.40)					

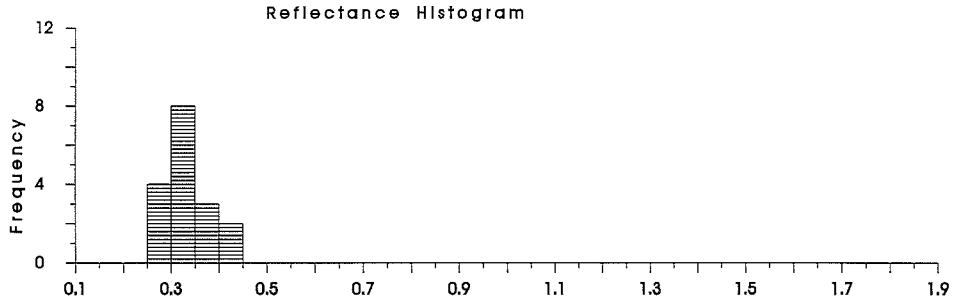
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.34	.04	15	.28	.4	5.14
(Edit)	.34	.04	15	.28	.4	5.14



K0891B, 1405-1415m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.29)	(0.27)	(0.30)	(0.33)	(0.33)	(0.33)	(0.42)	(0.36)	(0.29)	(0.33)
1	(0.31)	(0.35)	(0.41)	(0.34)	(0.29)	(0.30)	(0.36)			

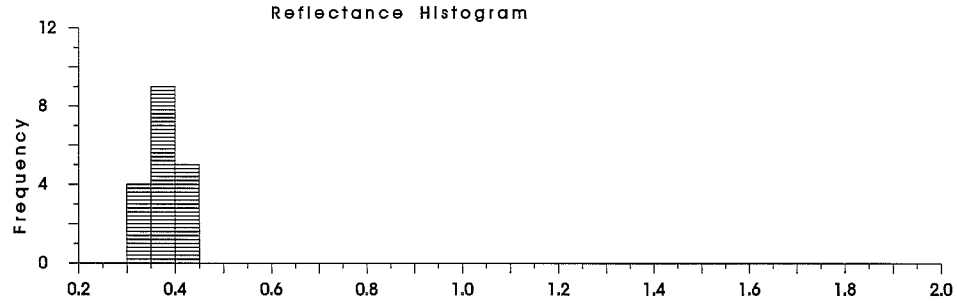
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.33	.04	17	.27	.42	5.61
(Edit)	.33	.04	17	.27	.42	5.61



K0891D, 1705-1715m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.36)	(0.41)	(0.38)	(0.35)	(0.42)	(0.35)	(0.37)	(0.34)	(0.42)	(0.32)
1	(0.34)	(0.44)	(0.38)	(0.33)	(0.40)	(0.38)	(0.36)	(0.39)		

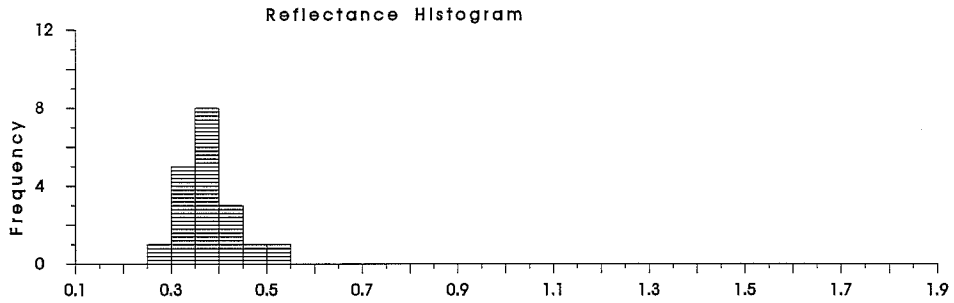
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.37	.03	18	.32	.44	6.74
(Edit)	.37	.03	18	.32	.44	6.74



K0892A, 1855-1865m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.35)	(0.39)	(0.49)	(0.40)	(0.50)	(0.39)	(0.35)	(0.40)	(0.33)	(0.32)
1	(0.38)	(0.31)	(0.42)	(0.30)	(0.27)	(0.36)	(0.38)	(0.36)	(0.33)	

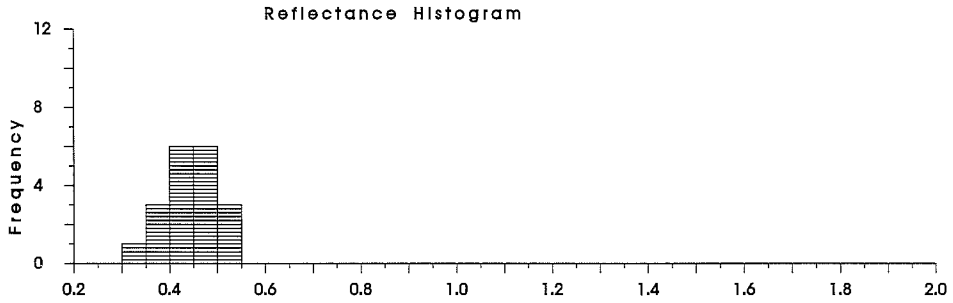
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.37	.06	19	.27	.5	7.03
(Edit)	.37	.06	19	.27	.5	7.03



K0892C, 2125-2135m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.48)	(0.50)	(0.47)	(0.36)	(0.46)	(0.53)	(0.35)	(0.46)	(0.45)	(0.35)
1	(0.51)	(0.33)	(0.40)	(0.41)	(0.41)	(0.43)	(0.47)	(0.44)	(0.41)	

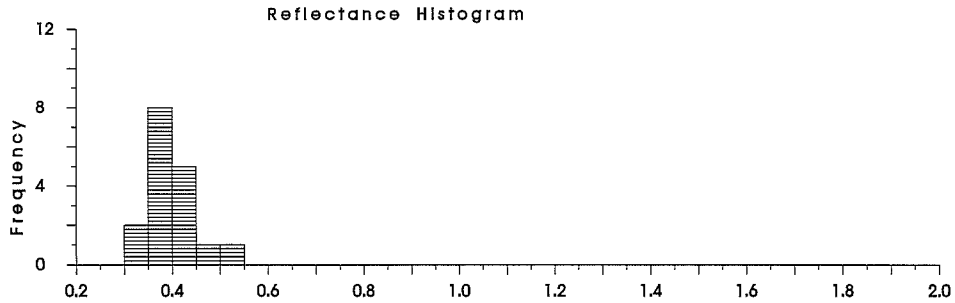
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.43	.06	19	.33	.53	8.22
(Edit)	.43	.06	19	.33	.53	8.22



K0892B, 1995-2005m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.37)	(0.43)	(0.34)	(0.33)	(0.39)	(0.38)	(0.38)	(0.44)	(0.42)	(0.41)
1	(0.39)	(0.39)	(0.52)	(0.40)	(0.39)	(0.48)	(0.38)			

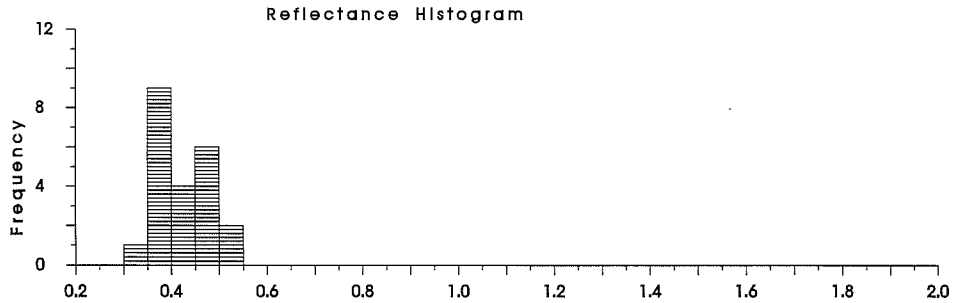
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.4	.05	17	.33	.52	6.84
(Edit)	.4	.05	17	.33	.52	6.84



K0892D, 2285-2295m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.38)	(0.40)	(0.36)	(0.38)	(0.49)	(0.38)	(0.36)	(0.35)	(0.48)	(0.46)
1	(0.45)	(0.46)	(0.50)	(0.37)	(0.41)	(0.36)	(0.47)	(0.43)	(0.50)	(0.36)
2	(0.30)	(0.40)								

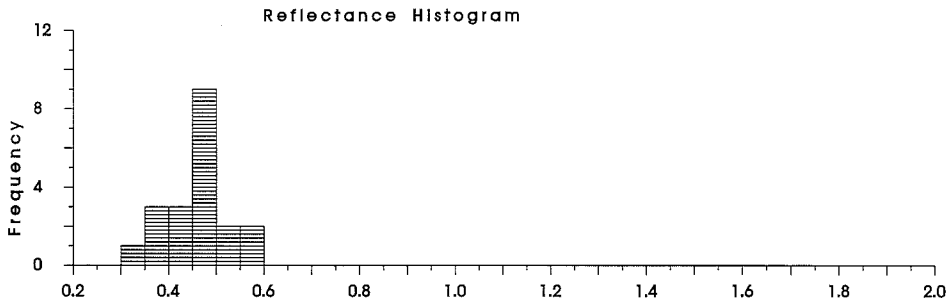
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.41	.06	22	.3	.5	9.05
(Edit)	.41	.06	22	.3	.5	9.05



K0893A, 2435-2445m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.40)	(0.45)	(0.47)	(0.37)	(0.55)	(0.38)	(0.48)	(0.42)	(0.45)	(0.49)
1	(0.47)	(0.41)	(0.50)	(0.48)	(0.53)	(0.49)	(0.46)	(0.58)	(0.38)	(0.34)

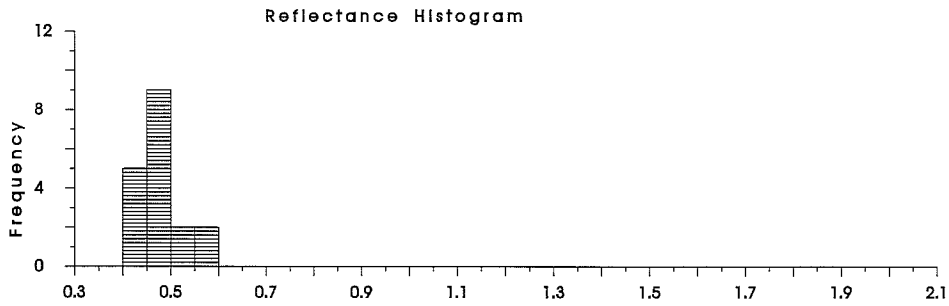
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.45	.06	20	.34	.58	9.1
(Edit)	.45	.06	20	.34	.58	9.1



K0893C, 2765-2775m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.47)	(0.48)	(0.59)	(0.51)	(0.49)	(0.49)	(0.44)	(0.45)	(0.47)	(0.43)
1	(0.44)	(0.55)	(0.52)	(0.44)	(0.46)	(0.46)	(0.46)	(0.44)		

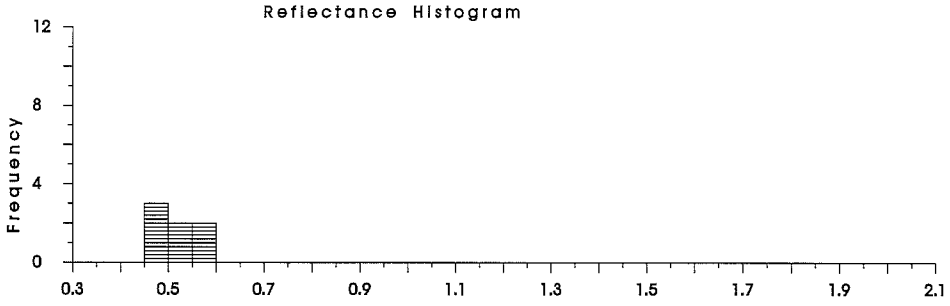
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.48	.04	18	.43	.59	8.59
(Edit)	.48	.04	18	.43	.59	8.59



K0893B, 2585-2595m

Col >	1	2	3	4	5	6	7
Row	(0.46)	(0.57)	(0.47)	(0.55)	(0.50)	(0.50)	(0.48)

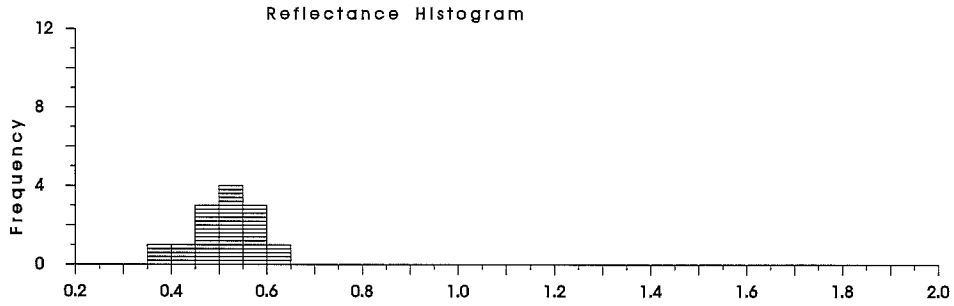
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.5	.04	7	.46	.57	3.53
(Edit)	.5	.04	7	.46	.57	3.53



K0893D, 2915-2925m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.48)	(0.56)	(0.56)	(0.45)	(0.38)	(0.53)	(0.47)	(0.54)	(0.43)	(0.52)
1	(0.61)	(0.55)	(0.53)							

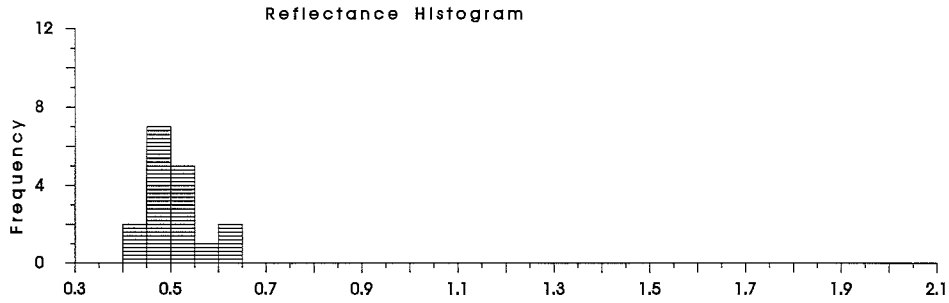
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.51	.06	13	.38	.61	6.61
(Edit)	.51	.06	13	.38	.61	6.61



K0894A, 3035-3045m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.60)	(0.47)	(0.44)	(0.65)	(0.54)	(0.52)	(0.49)	(0.49)	(0.54)	(0.47)
1	(0.49)	(0.50)	(0.47)	(0.46)	(0.53)	(0.42)	(0.57)	(0.63)		

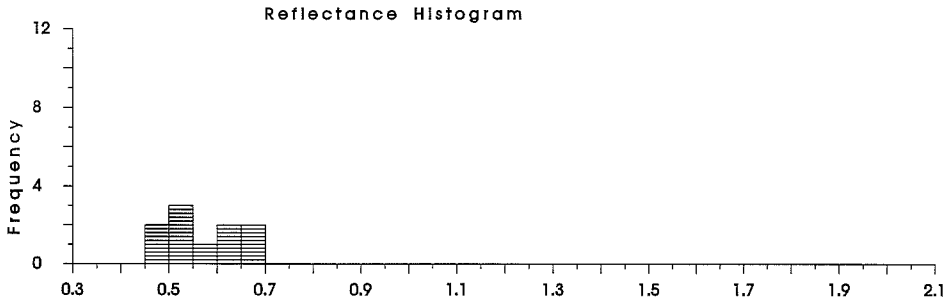
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.52	.06	18	.42	.65	9.28
(Edit)	.52	.06	18	.42	.65	9.28



K0894C, 3350-3360m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.57)	(0.60)	(0.53)	(0.52)	(0.65)	(0.70)	(0.50)	(0.45)	(0.64)	(0.68)
1	(0.48)									

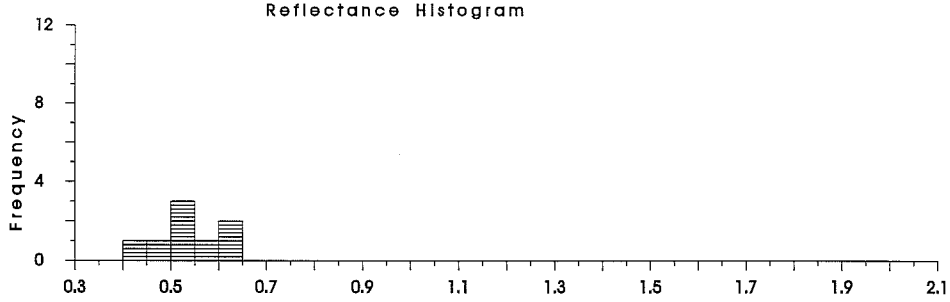
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.57	.09	11	.45	.7	6.32
(Edit)	.57	.09	11	.45	.7	6.32



K0894B, 3200-3210m

Col >	1	2	3	4	5	6	7	8	9
Row	(0.50)	(0.60)	(0.43)	(0.57)	(0.51)	(0.65)	(0.52)	(0.62)	(0.47)

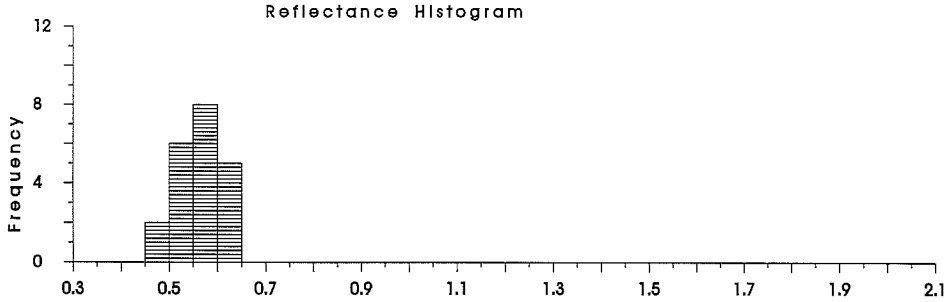
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.54	.07	9	.43	.65	4.87
(Edit)	.54	.07	9	.43	.65	4.87



K0894D, 3500-3510m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.63)	(0.60)	(0.50)	(0.45)	(0.62)	(0.49)	(0.57)	(0.51)	(0.56)	(0.51)
1	(0.58)	(0.63)	(0.58)	(0.56)	(0.53)	(0.56)	(0.60)	(0.53)	(0.52)	(0.59)
2	(0.65)	(0.57)								

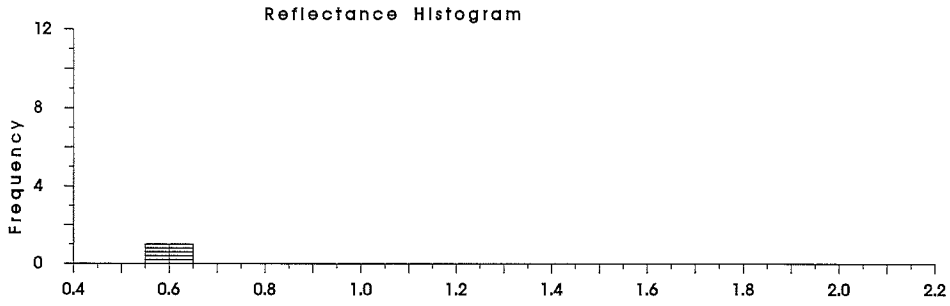
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.56	.05	22	.45	.65	12.34
(Edit)	.56	.05	22	.45	.65	12.34



K0895A, 3650-3660m

Col >	1	2	3
Row	(0.65)	(0.57)	(0.62)

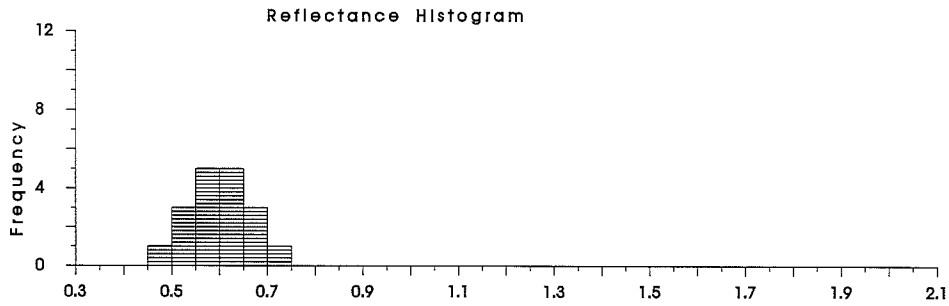
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.61	.04	3	.57	.65	1.84
(Edit)	.61	.04	3	.57	.65	1.84



K0895C, 3950-3960m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.55)	(0.53)	(0.48)	(0.55)	(0.62)	(0.59)	(0.62)	(0.66)	(0.65)	(0.71)
1	(0.56)	(0.63)	(0.52)	(0.58)	(0.54)	(0.63)	(0.66)	(0.61)		

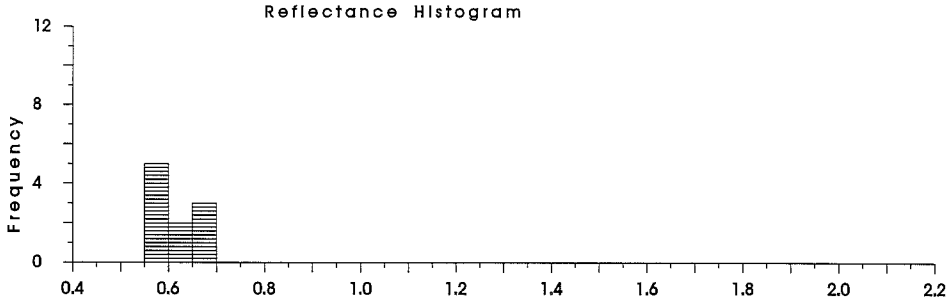
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.59	.06	18	.48	.71	10.69
(Edit)	.59	.06	18	.48	.71	10.69



K0895B, 3800-3810m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.61)	(0.58)	(0.57)	(0.55)	(0.66)	(0.55)	(0.57)	(0.68)	(0.60)	(0.65)

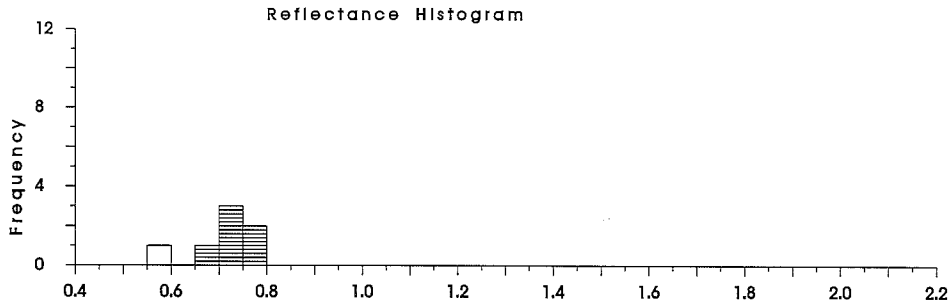
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.6	.05	10	.55	.68	6.02
(Edit)	.6	.05	10	.55	.68	6.02



K0895D, 4070-4080m

Col >	1	2	3	4	5	6	7
Row	(0.73)	0.58	(0.72)	(0.79)	(0.72)	(0.67)	(0.75)

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.71	.07	7	.58	.79	4.96
(Edit)	.73	.04	6	.67	.79	4.38



K0896A, 4195-4203m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.75)	(0.80)	(0.68)	(0.74)	(0.79)	(0.64)	(0.84)	(0.66)	(0.74)	(0.68)
1	(0.81)	(0.75)	(0.74)	(0.77)	(0.74)	(0.80)	(0.81)	(0.88)	(0.72)	(0.84)
2	(0.75)	(0.86)	(0.71)							

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.76	.06	23	.64	.88	17.5
(Edit)	.76	.06	23	.64	.88	17.5