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Vitrinite reflectance (Ro) of dispersed organics from Husky-Bow Valley et al. Evangeline H-98

Report No. EPGS-DOM.4-89MPA

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March 14, 1989

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G.S.C. Locality No.: D251 **Location:** 43°17'26.85"N, 60°58'50.60"W

R.T. Elevation: 23.5m to 3365m
20.1m to 5044m **Water Depth:** 174m **Total Depth:** 5044m

Sample Interval: 998 - 5044m **Interval Studied:** 1025 - 5044m

Depth Units: Metres referenced to R.T.

Vitrinite reflectance has been determined on 20 rotary cuttings samples (Table II) from Husky-Bow Valley et al. Evangeline H-98 which was classified as a wildcat well and is located on the Scotian Shelf approximately 260 km east southeast of Halifax, Nova Scotia. The well was plugged and abandoned.

Data acquisition and manipulation for this report utilized the Zeiss Photomultiplier III Zonax system interfaced with a PC AT microcomputer which provides reliable data acquisition and fast statistical summaries.

Sample preparation followed the procedures listed in Appendix I. The analysis of the well revealed the thermal maturation intervals given in Table I. The specific maturation levels, as set out in this report, were based on those of Dow (1977) with modified terminology (Appendix II).

Table I
Inferred Thermal Maturation Levels*

(Seafloor)-1666m	0.18 - 0.4	% Ro	immature
1666-2135m	0.4 - 0.5	% Ro	immature approaching maturity
2135-2519m	0.5 - 0.6	% Ro	marginally mature
2519m	0.6	% Ro	onset of significant oil generation
3125m	0.8	% Ro	peak of oil generation
3595m	1.0	% Ro	onset of significant wet gas generation
3979m	1.2	% Ro	onset of significant dry gas generation
4227m	1.35	% Ro	oil floor
5044m T.D.	1.99	% Ro	beyond oil preservation limit
5055m	(2.0)	% Ro	wet gas preservation limit
7654m	(3.0)	% Ro	dry gas preservation limit

Note: ( ) indicate Ro extrapolated at 0.206 log Ro/km

* Maturation levels are provided for all types of organic matter. Actual hydrocarbon products depend on type of organic matter present.

Remarks

Sample coverage of vitrinite reflectance analysis (Figure 1, Table II) was very good over the section penetrated by Evangeline H-98. The data are plotted on a log Ro vs. linear depth scale and a linear regression line was calculated by the least squares method (Figure 1). The 'error bars' plotted on the maturation 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 0.206 log Ro/km.

Selection of the reflectance population which represented the true maturation of the sediments was aided significantly by the histogram display plot (Figure 2). This interpretation tool helps to reveal linear trends (populations) in the Ro data. It also demonstrates the effects of cavings, geology, casing points and other factors on the vitrinite reflectance populations.

The lithology strip plot (Figure 1) was produced directly from the E.P.G. LITHFILE database which extracts data from digitized CANSTRAT logs.

The vitrinite reflectance data provides evidence that the thermal regime at Evangeline H-98 (between 2135 and 5044m) was suitable for the generation and preservation of hydrocarbons within the drilled section assuming potential source rocks and traps were present.

References

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

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Table II

Summary of kerogen - based vitrinite reflectance

Seq. #	Sample #	Depths in metres	Mean Ro (SD) non-rotated	Number of Readings Total	Edited
1	K0737A	1025-1065	0.27(±.06)	13	12
2	K0737B	1225-1235	0.30(±.06)	11	8
3	K0737C	1375-1410	0.31(±.05)	15	8
4	K0738A	1580-1625	0.35(±.05)	37	34
5	K0738B	1765-1805	0.48(±.07)	32	19
6	K0738C	1975-2015	0.50(±.09)	23	14
7	K0739A	2155-2195	0.62(±.07)	11	6
8	K0739B	2335-2375	0.56(±.06)	12	5
9	K0739C	2665-2705	0.64(±.08)	31	24
10	K0740A	3115-3155	0.82(±.05)	38	18
11	K0740B	3370-3410	0.90(±.04)	18	5
12	K0740C	3610-3650	0.99(±.09)	57	46
13	K0741A	3850-3890	1.22(±.09)	23	11
14	K0741B	4060-4100	1.36(±.20)	11	11
15	K0741C	4240-4280	1.26(±.17)	9	9
16	K0742A	4420-4460	1.37(±.09)	23	19
17	K0742B	4630-4670	1.67(±.13)	61	53
18	K0742C	4780-4790	1.66(±.08)	19	12
19	K0743A	4900-4940	1.86(±.08)	48	31
20	K0743B	5010-5045	1.87(±.09)	33	17

Note: All samples are kerogen concentrate type.

Table III

Formation Tops (Wade, pers. comm.)

Formation	Depth
Banquereau	in casing
Wyandot	1856m
Dawson Canyon	2015m
Petrel Mbr	2352-2371m
Shortland shale	3257m
Fault	4023m
Top OP approx	4023m
Fault	4649m
T.D.	5044m

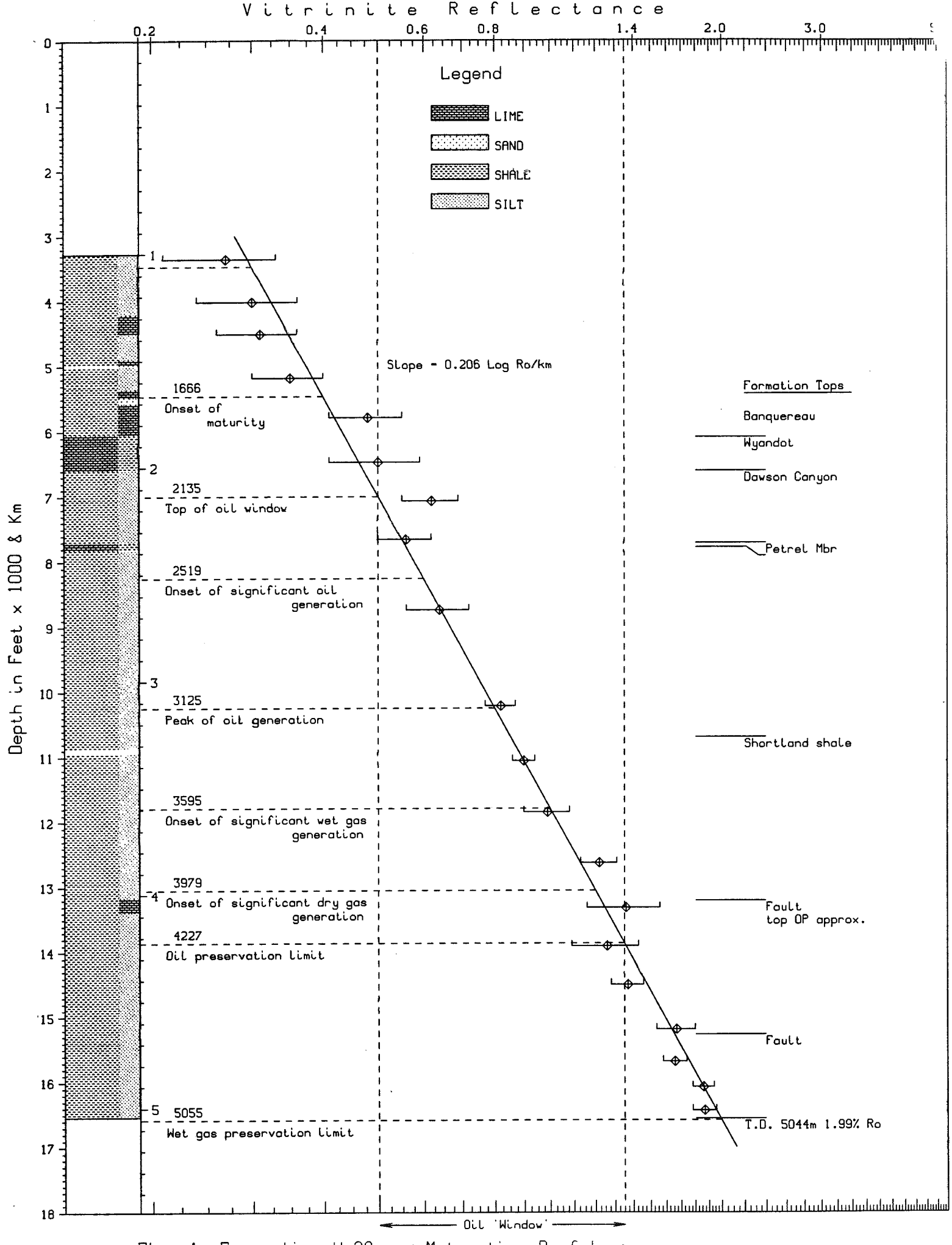


Fig. 1 Evangeline H-98 < Maturation Profile >

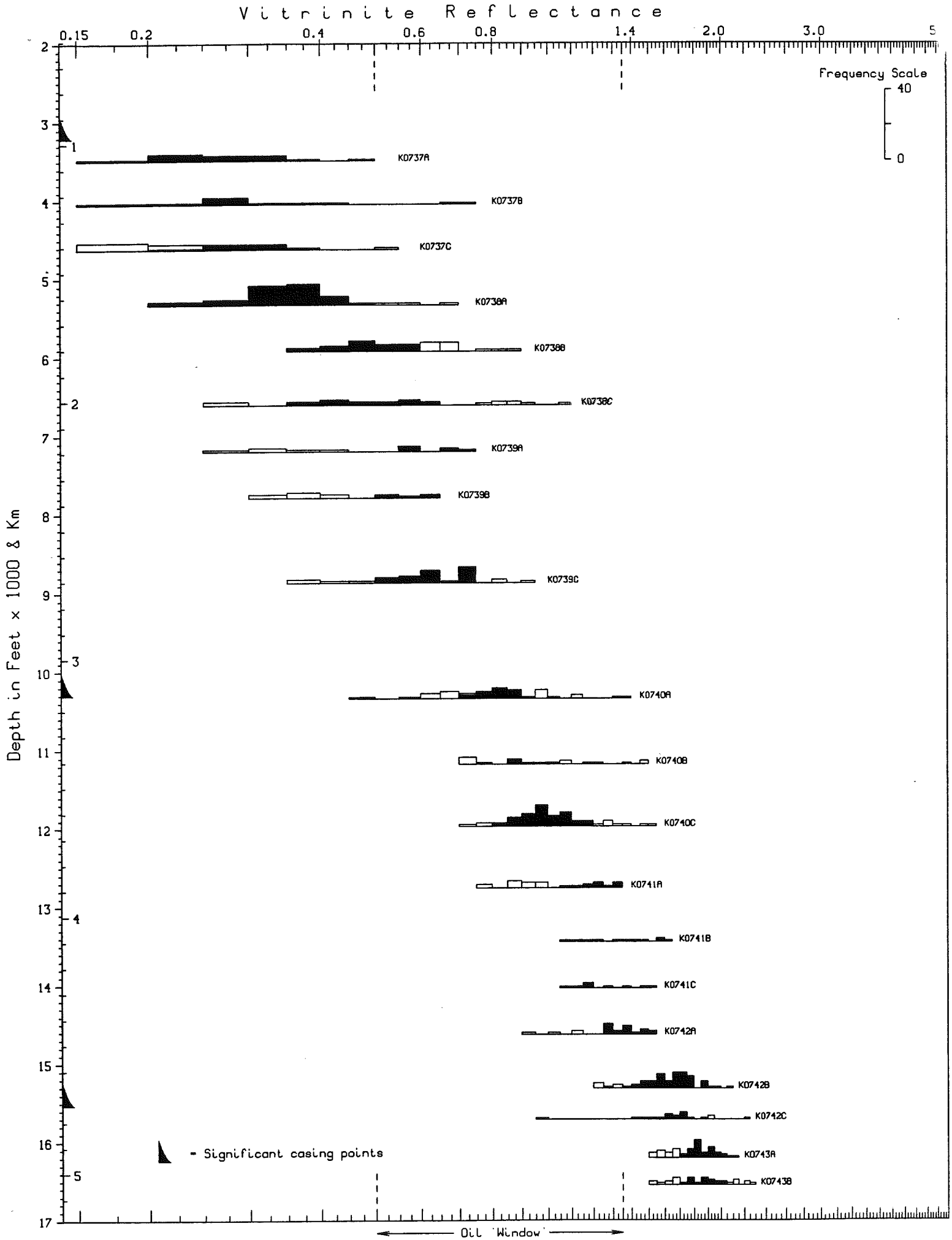


Fig. 2 Evangeline H-98 < Histograms >

APPENDIX I

Sample Preparation Method

COGLA Lab preparation

Preliminary Wash
Samples dried in oven
Split: a. all of coarse to Petrology Lab
b. ½ medium to Palynology Lab
c. rest of medium and all of fine combined for Micropaleo Lab
Split "b" is delivered to Palynology Lab and treated as follows:

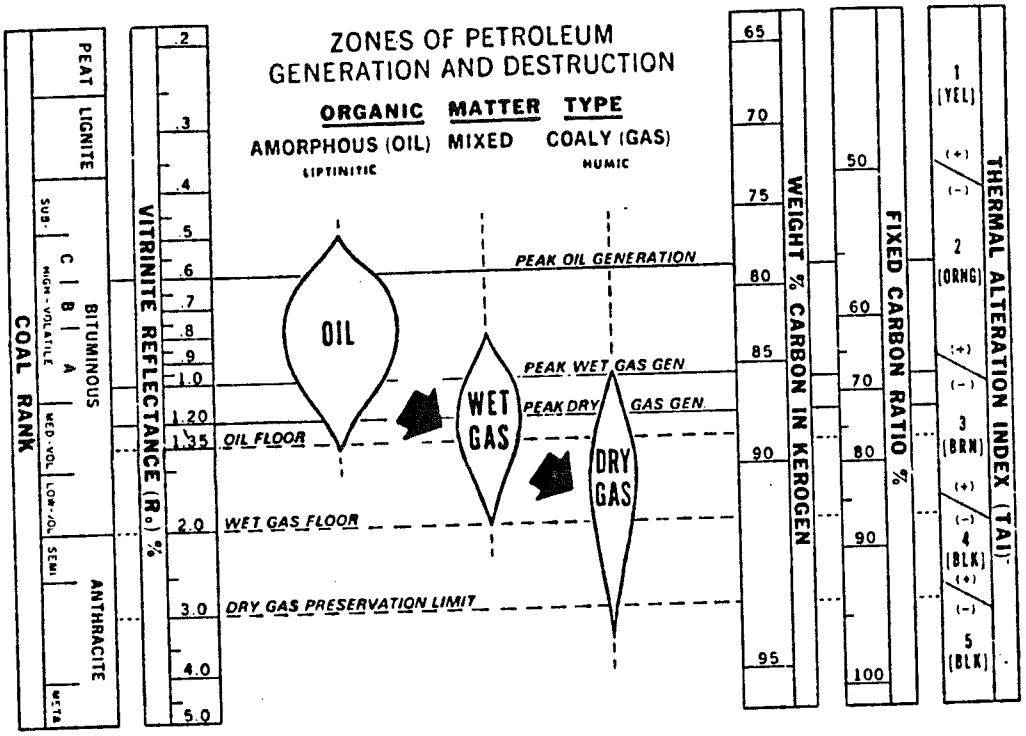
PALYNOLOGY Lab preparation

20-30 grams placed in 250 ml plastic beaker.
Add 10% HC1 till reaction ceases (removes carbonates).
Washed (rinsed) 3 times.
Conc. HF overnight (removes silicates).
Washed (rinsed) 3 times.
Heated (60-65°C) conc. HC1 (remove fluorides caused by HF).
Washed 3 times.
Then put into 15 ml test tube with 4-5 ml 4% Alconox.
Differential centrifuge at 1500 rpm for 90 sec.
Decant.
Wash 3 times with centrifuging.
Float off organic fraction using 2.0 S.G. Znbr solution.
Centrifuge 1000 rpm, 8 min.
Float fraction into second test tube.
Wash 3 times with centrifuging.
Kerogen smear slide made.
Remaining kerogen material delivered to Vitrinite Reflectance Lab.

VITRINITE REFLECTANCE Lab preparation

Excess water pipetted off.
Freeze dried.
Mounted using epoxy resin (EPO-TEK 301) in predrilled plastic stubs.
Polished using modified coal petrology polishing methods.
Examined under oil lens at approximately 800x mag'n.

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 here used as the 'peak of oil generation' (Table I, Figure 1).

Appendix III

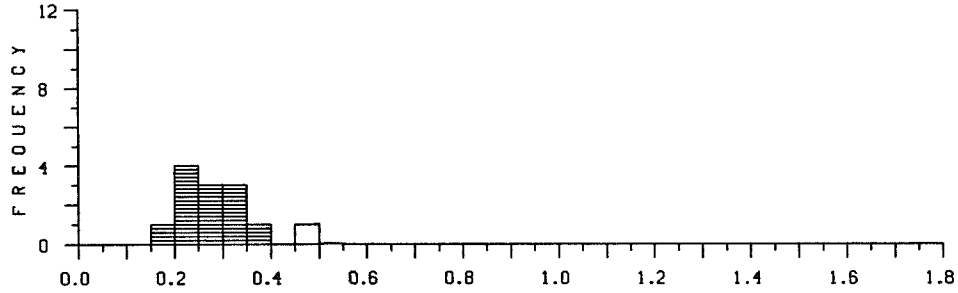
Reflectance Histograms

K0737A,1025-1065M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.19<	.20<	.20<	.22<	.24<	.25<	.28<	.28<	.33<	.34<
1	.34<	.36<	.47							

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.28	.08	13	.19	.47	3.70
EDIT<	.27	.06	12	.19	.36	3.23

REFLECTANCE HISTOGRAM

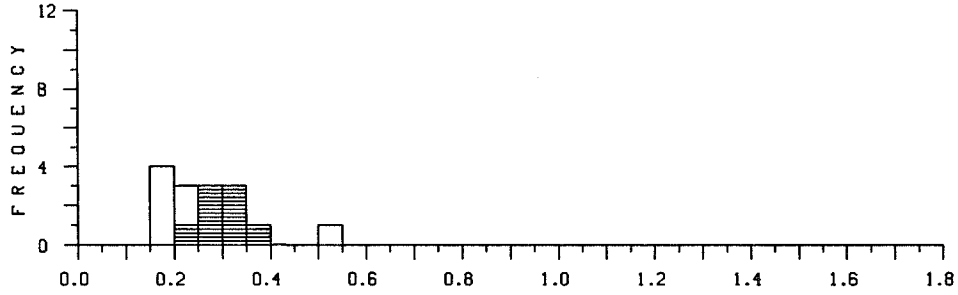


K0737C,1375-1410M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.16	.18	.19	.19	.21	.21	.24<	.27<	.28<	.28<
1	.34<	.34<	.34<	.39<	.50					

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.27	.09	15	.16	.50	4.12
EDIT<	.31	.05	8	.24	.39	2.48

REFLECTANCE HISTOGRAM

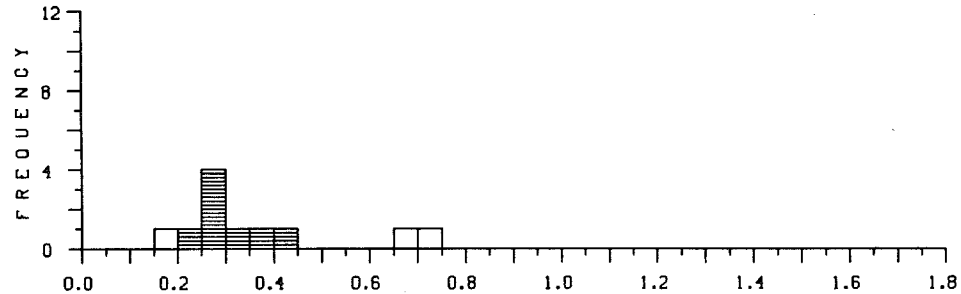


K0737B,1225-1235M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.17	.23<	.26<	.27<	.28<	.28<	.34<	.35<	.40<	.68
1	.71									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.36	.18	11	.17	.71	3.97
EDIT<	.30	.06	8	.23	.40	2.41

REFLECTANCE HISTOGRAM

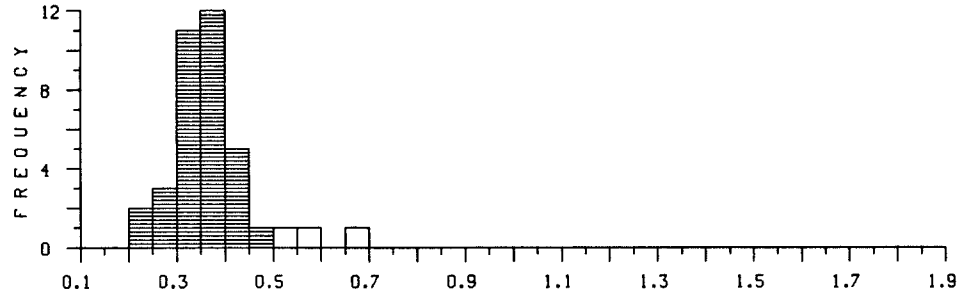


K0738A,1580-1625M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.24<	.24<	.28<	.28<	.29<	.30<	.32<	.32<	.32<	.33<
1	.33<	.33<	.33<	.34<	.34<	.34<	.35<	.35<	.36<	.37<
2	.37<	.37<	.37<	.38<	.39<	.39<	.39<	.39<	.40<	.41<
3	.41<	.41<	.42<	.49<	.54	.59	.66			

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.37	.09	37	.24	.66	13.74
EDIT<	.35	.05	34	.24	.49	11.95

REFLECTANCE HISTOGRAM

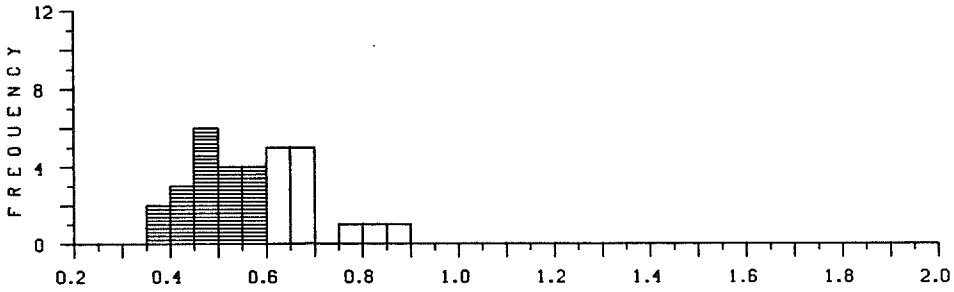


K0738B,1765-1805M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.35<	.36<	.41<	.42<	.44<	.45<	.46<	.47<	.47<	.47<
1	.48<	.51<	.52<	.52<	.54<	.55<	.57<	.57<	.59<	.61
2	.61	.62	.64	.64	.65	.66	.66	.68	.68	.78
3	.83	.87								

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.57	.13	32	.35	.87	18.08
EDIT<	.48	.07	19	.35	.59	9.15

REFLECTANCE HISTOGRAM

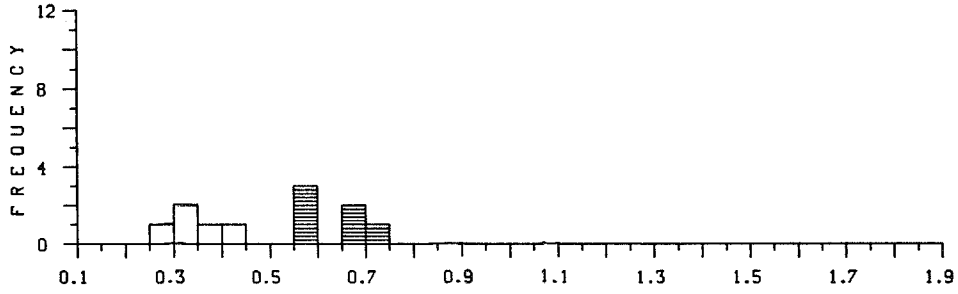


K0739A,2155-2195M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.28	.30	.34	.37	.43	.55<	.55<	.57<	.66<	.68<
1	.70<									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.49	.16	11	.28	.70	5.43
EDIT<	.62	.07	6	.55	.70	3.71

REFLECTANCE HISTOGRAM

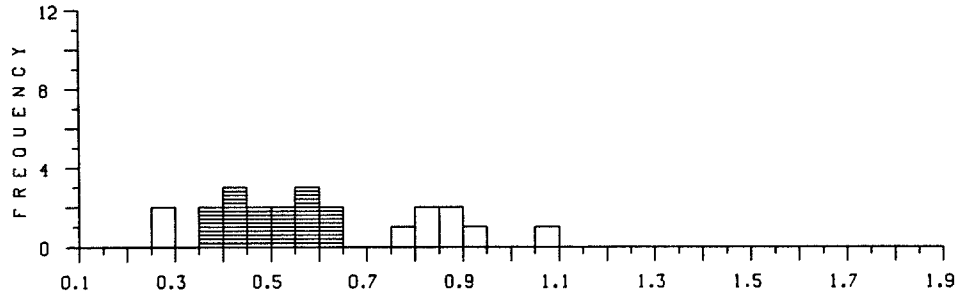


K0738C,1975-2015M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.27	.29	.39<	.39<	.40<	.40<	.44<	.45<	.49<	.52<
1	.54<	.56<	.57<	.57<	.60<	.64<	.78	.82	.82	.86
2	.86	.91	1.05							

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.59	.21	23	.27	1.05	13.62
EDIT<	.50	.09	14	.39	.64	6.96

REFLECTANCE HISTOGRAM

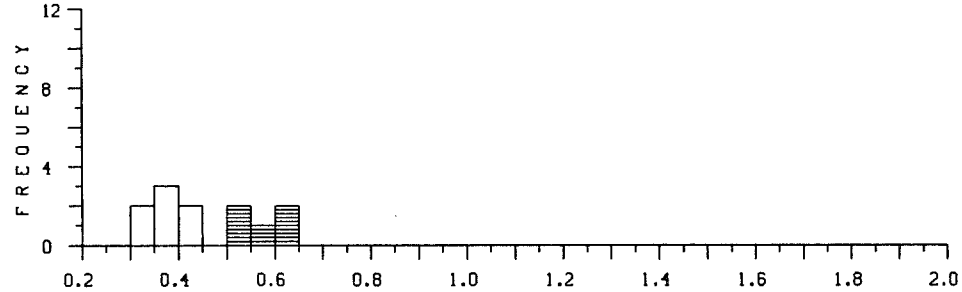


K0739B,2335-2375M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.30	.32	.35	.35	.38	.41	.43	.50<	.52<	.55<
1	.62<	.62<								

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.45	.11	12	.30	.62	5.35
EDIT<	.56	.06	5	.50	.62	2.81

REFLECTANCE HISTOGRAM

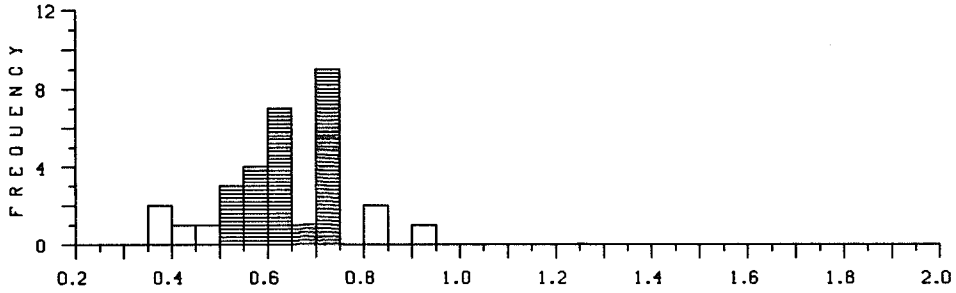


K0739C,2665-2705M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.38	.38	.43	.47	.50<	.51<	.52<	.56<	.56<	.57<
1	.58<	.60<	.61<	.62<	.62<	.62<	.63<	.64<	.68<	.70<
2	.70<	.70<	.71<	.72<	.73<	.74<	.74<	.74<	.80	.82
3	.90									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.63	.12	31	.38	.90	19.48
EDIT<	.64	.08	24	.50	.74	15.30

REFLECTANCE HISTOGRAM

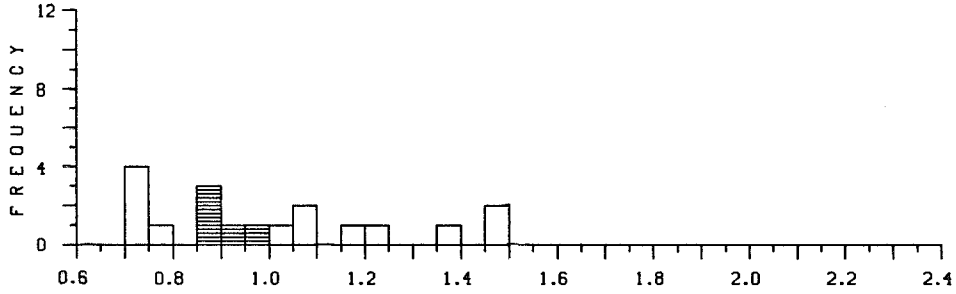


K0740B,3370-3410M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.71	.72	.72	.73	.78	.87<	.87<	.88<	.90<	.96<
1	1.00	1.07	1.09	1.15	1.22	1.37	1.47	1.48		

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.00	.25	18	.71	1.48	17.99
EDIT<	.90	.04	5	.87	.96	4.48

REFLECTANCE HISTOGRAM

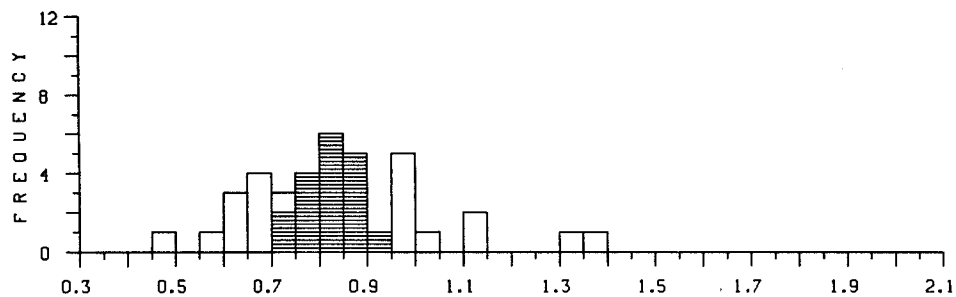


K0740A,3115-3155M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.49	.58	.60	.61	.62	.67	.67	.68	.69	.70
1	.74<	.74<	.75<	.75<	.76<	.78<	.80<	.81<	.82<	.82<
2	.83<	.84<	.85<	.86<	.87<	.87<	.89<	.91<	.95	.95
3	.95	.97	.98	1.00	1.10	1.14	1.31	1.35		

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	.83	.19	38	.49	1.35	31.70
EDIT<	.82	.05	18	.74	.91	14.69

REFLECTANCE HISTOGRAM

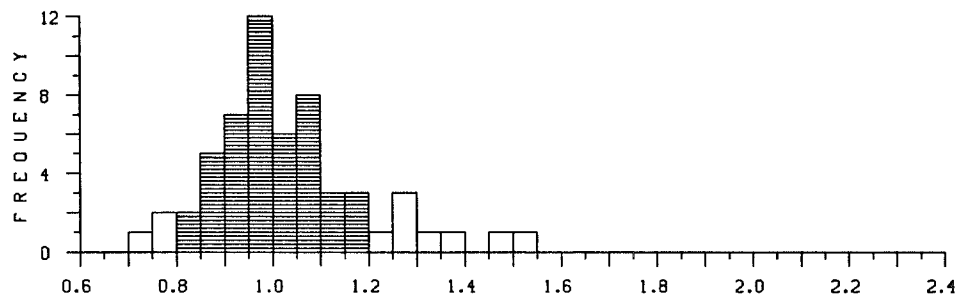


K0740C,3610-3650M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.71	.79	.79	.80<	.83<	.85<	.87<	.88<	.88<	.89<
1	.92<	.92<	.93<	.93<	.94<	.94<	.94<	.95<	.95<	.96<
2	.96<	.96<	.96<	.96<	.97<	.97<	.97<	.97<	.98<	1.00<
3	1.00<	1.02<	1.03<	1.04<	1.04<	1.06<	1.07<	1.08<	1.08<	1.08<
4	1.08<	1.08<	1.08<	1.11<	1.12<	1.13<	1.15<	1.17<	1.17<	1.24
5	1.26	1.27	1.27	1.34	1.39	1.45	1.53			

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.03	.16	57	.71	1.53	58.71
EDIT<	.99	.09	46	.80	1.17	45.67

REFLECTANCE HISTOGRAM

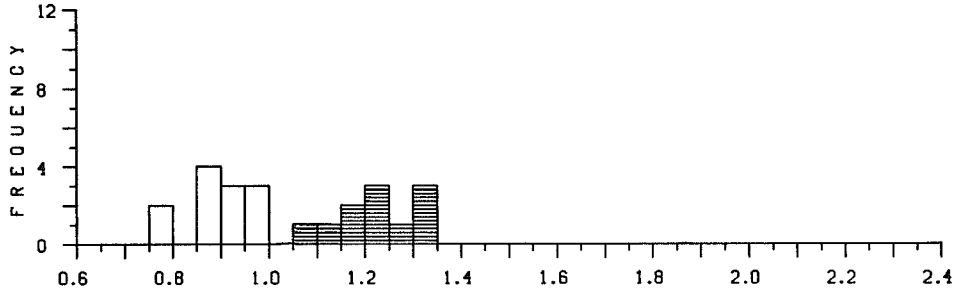


KO741A,3850-3890M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.76	.77	.85	.87	.88	.89	.90	.92	.93	.97
1	.98	.99	1.05<	1.10<	1.16<	1.17<	1.20<	1.21<	1.22<	1.28<
2	1.32<	1.33<	1.33<							

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.05	.18	23	.76	1.33	24.08
EDIT<	1.22	.09	11	1.05	1.33	13.37

REFLECTANCE HISTOGRAM

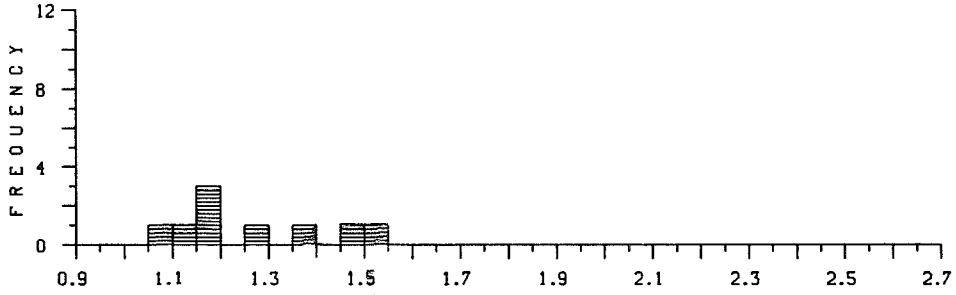


KO741C,4240-4280M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.05<	1.10<	1.16<	1.17<	1.19<	1.27<	1.39<	1.47<	1.54<	

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.26	.17	9	1.05	1.54	11.34
EDIT<	1.26	.17	9	1.05	1.54	11.34

REFLECTANCE HISTOGRAM

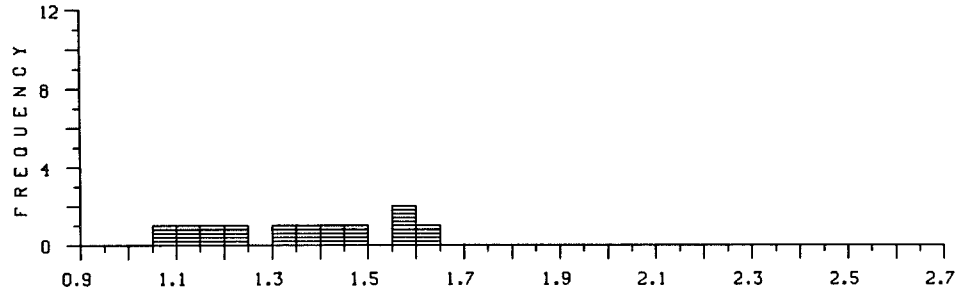


KO741B,4060-4100M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.06<	1.13<	1.19<	1.20<	1.34<	1.36<	1.40<	1.48<	1.57<	1.58<
1	1.64<									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.36	.20	11	1.06	1.64	14.95
EDIT<	1.36	.20	11	1.06	1.64	14.95

REFLECTANCE HISTOGRAM

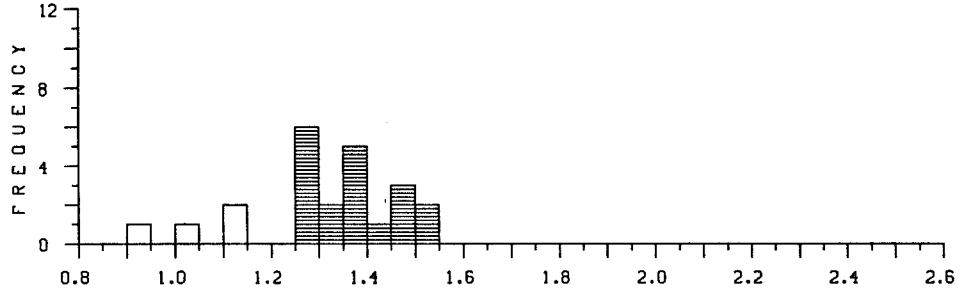


KO742A,4420-4460M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.92	1.03	1.10	1.14	1.26<	1.26<	1.27<	1.27<	1.29<	1.29<
1	1.30<	1.30<	1.35<	1.38<	1.38<	1.38<	1.38<	1.41<	1.46<	1.47<
2	1.48<	1.52<	1.52<							

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.31	.15	23	.92	1.52	30.16
EDIT<	1.37	.09	19	1.26	1.52	25.97

REFLECTANCE HISTOGRAM

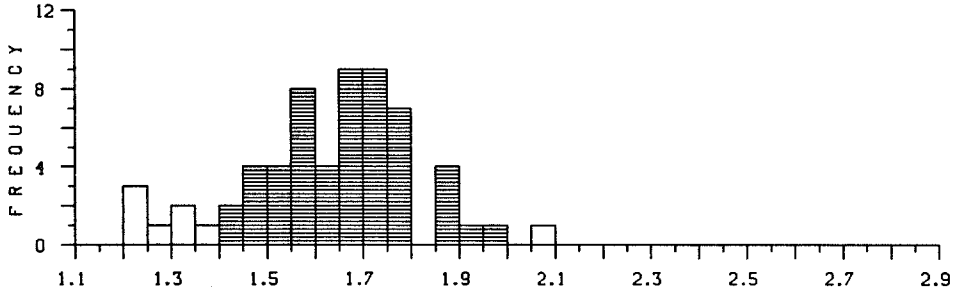


KO742B,4630-4670M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.20	1.21	1.24	1.25	1.32	1.33	1.38	1.42<	1.44<	1.45<
1	1.45<	1.47<	1.48<	1.51<	1.52<	1.52<	1.54<	1.56<	1.58<	1.58<
2	1.59<	1.59<	1.59<	1.59<	1.59<	1.60<	1.63<	1.63<	1.64<	1.65<
3	1.66<	1.66<	1.67<	1.67<	1.68<	1.68<	1.69<	1.69<	1.70<	1.70<
4	1.71<	1.72<	1.73<	1.73<	1.73<	1.74<	1.74<	1.75<	1.75<	1.76<
5	1.76<	1.77<	1.79<	1.79<	1.85<	1.85<	1.87<	1.88<	1.93<	1.98<
6	2.05									

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.63	.18	61	1.20	2.05	99.23
EDIT<	1.67	.13	53	1.42	1.98	88.25

REFLECTANCE HISTOGRAM

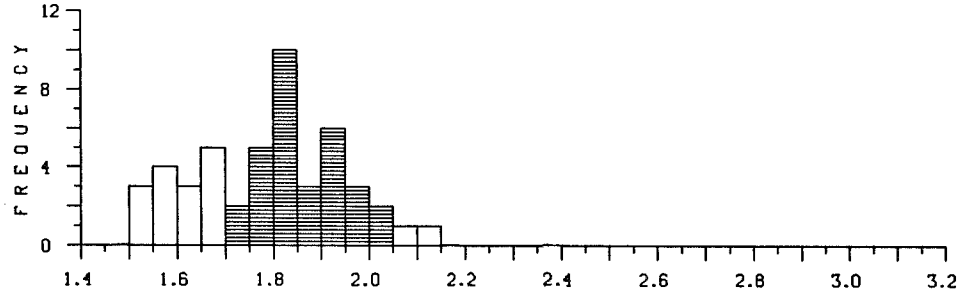


KO743A,4900-4940M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.50	1.50	1.52	1.55	1.56	1.56	1.59	1.60	1.61	1.62
1	1.65	1.65	1.67	1.68	1.68	1.71<	1.73<	1.75<	1.75<	1.78<
2	1.78<	1.79<	1.80<	1.82<	1.82<	1.83<	1.83<	1.83<	1.83<	1.83<
3	1.84<	1.84<	1.86<	1.86<	1.87<	1.90<	1.90<	1.91<	1.91<	1.94<
4	1.94<	1.95<	1.96<	1.99<	2.01<	2.01<	2.09	2.14		

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.79	.16	48	1.50	2.14	85.74
EDIT<	1.86	.08	31	1.71	2.01	57.57

REFLECTANCE HISTOGRAM

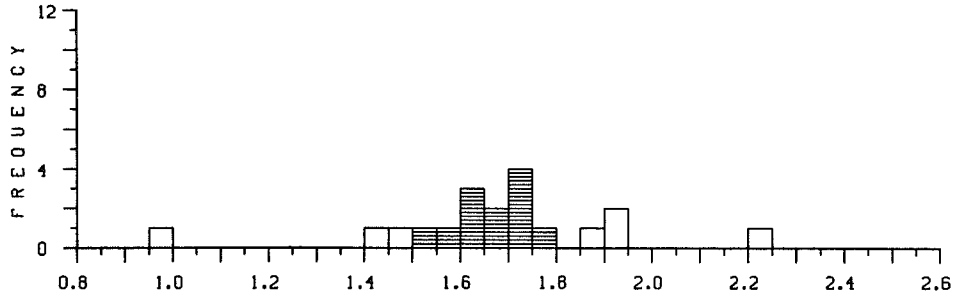


KO742C,4780-4790M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	.97	1.44	1.45	1.52<	1.56<	1.61<	1.61<	1.64<	1.66<	1.67<
1	1.70<	1.71<	1.71<	1.73<	1.79<	1.86	1.92	1.93	2.23	

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.67	.25	19	.97	2.23	31.71
EDIT<	1.66	.08	12	1.52	1.79	19.91

REFLECTANCE HISTOGRAM



KO743B,5010-5045M,EVANGELINE H-98

COL >	1	2	3	4	5	6	7	8	9	0
ROW	1.53	1.54	1.57	1.63	1.64	1.66	1.67	1.68	1.68	1.72<
1	1.75<	1.77<	1.77<	1.79<	1.80<	1.85<	1.87<	1.87<	1.89<	1.90<
2	1.90<	1.93<	1.95<	1.96<	2.01<	2.01<	2.08	2.13	2.13	2.14
3	2.20	2.22	2.28							

	MEAN	STAND DEV	PTS	MIN	MAX	SUM
TOTAL	1.86	.21	33	1.53	2.28	61.52
EDIT<	1.87	.09	17	1.72	2.01	31.74

REFLECTANCE HISTOGRAM