

Vitrinite reflectance data and analysis of the 120 - 12,100 foot interval
of the Richfield Oil Corporation White River Unit No. 2 well

Received 9 February 1989

Total of 27 pages in report

Geologic Materials Center Data Report 110

VITRINITE REFLECTANCE ANALYSIS OF THE INTERVAL 120 - 12,100 FT

WHITE RIVER #2, ALASKA

Introduction

This report describes the vitrinite reflectance analysis of 16 cuttings samples from the White River #2 oil exploration well.

Fifty vitrinite reflectance measurements for each sample are taken wherever possible utilizing a Zeiss 01K photometer attachment mounted on a Zeiss Photoscope 1. Each measurement is qualified as to poor (P), good (G) or excellent (E). Depending upon such factors as: particle size, pitting, scratching or the proximity to pyritic particles. The measurements of particles interpreted to be reworked vitrinite are labeled with an "R" while the measurements of particles interpreted to be caved material are labeled with a "C". A table and a plot of all measurements displayed as a histogram for each sample are given in Appendix A.

A vitrinite reflectance log is included which displays each histogram at the level of the sample. The material considered as caved is cross-hatched in blue while the material considered to be reworked is cross-hatched in red. The good and excellent samples are coloured in solid green while the poor measurements are coloured in cross-hatched green. Further colour copies of this log are available through the Bujak Davies Group.

The laboratory procedures for the mounting and polishing of the vitrinite samples follows the methodology described by Davies and Avery (1984) in a triple mount stub with standard 600 grit, .3 micron and .05 micron polishing procedure on Buehler Automet polishing equipment. This methodology results in a polished mount of unoxidized kerogen.

The levels of vitrinite reflectance are compared to the Thermal Alteration Index (TAI) of Bujak, Barss & Williams (1977a,b) in Table 1 and are subdivided into various levels of thermal maturation for the generation of liquid and gaseous hydrocarbons. This generation model will vary from basin to basin depending upon the geohistory and kerogen compositions.

VITRINITE REFLECTANCE SUMMARY**Maturity Zones based on Ro**

120-3,100	Immature
4,040-11,620	Onset of Maturation
12,100-12,340	possibly Marginally Mature

Immature Zone: 120-3,100ft

The two uppermost samples in this zone appear to be entirely reworked. At 2,000ft a high mode on the histogram suggests an in situ vitrinite population with an $R_o=0.4\%$. The 2,940ft sample contains mostly degraded amorphous material with very little vitrinite present. The R_o at this depth is 0.4%.

Onset of Maturation Zone: 4,040-11,620ft

The first sample, at 4,040ft ($R_o=0.594\%$) is bordering on marginal maturity. Deeper samples, however, have a slightly depressed R_o ; some R_o 's are as low as 0.5%. Most samples in this zone have very good histogram distributions, with the exception of the 6,100ft sample which contains mostly inorganic mud additive with very little vitrinite present. The lowermost samples, at 10,900ft and 11,440ft are assumed to be caved. However, these samples may also contain some indigenous vitrinite, but the in situ populations are not distinguishable on the histograms.

Possibly Marginally Mature: 12,100-12,340ft

The one sample in this zone is almost entirely caved, as were the two overlying samples. However, there appears to be a second peak on the histogram indicating an $R_o=0.615\%$ may represent the in situ population, which is just within the marginally mature zone.

REFERENCES

BUJAK, J.P., BARSS, M.S. & WILLIAMS, G.L.

1977 Offshore eastern Canada Part I. Offshore east Canada's organic type and colour and hydrocarbon potential. Oil and Gas Journal, vol.75, pp.198-202.

BUJAK, J.P., BARSS, M.S. & WILLIAMS, G.L.

1977 Offshore eastern Canada Part II. Offshore east Canada's organic type and colour and hydrocarbon potential. Oil and Gas Journal vol.75, pp.96-100.

DAVIES, E.H. & AVERY, M.P.

1984 A system for vitrinite reflectance analysis on dispersed organic matter for offshore eastern Canada. In: Current Research, Part A, Geological Survey of Canada, Paper 84-114, pp.367-372.

TABLE 1: TAI & Ro%

TAI	Spore colour	Approx. Ro equiv.	Amorphous kerogen	Herbaceous-woody kerogen
1	Green/Yellow		Immature	Immature
1+	Yellow	0.35%	Immature	Immature
2-	Yellow/orange	0.45%	Immature	Immature
2-to2	Orange	0.50%	Onset of maturity	Immature
2	Orange/brown	0.60%	Marginally mature	Immature
2to2+	Brown/orange	0.70%	Marginally mature	Onset of maturity
2+	Light brown	0.9%	Peak maturity	Onset of maturity
2+to3-	L.Brown/brown	1.0%	Highly mature	Peak maturity
3-	Brown	1.1%	Highly mature	Peak maturity
3-to3	Med. brown	1.2%	Highly mature	Peak maturity
3	Brown/dr.brown	1.5%	Overmature	Peak maturity
3+	Dark brown	2.0%	Overmature	Highly mature
4-	Black	2.5%	Overmature	Highly mature
4	Black/corroded	4.0%	Overmature	Overmature

Table 1: Comparison of Vitrinite Reflectance (Ro%) and the Thermal Alteration Index scale (TAI) of Bujak, Barss & Williams (1977a,b).

APPENDIX A

VITRINITE REFLECTANCE MEASUREMENTS AND HISTORGRAMS

Client: M.M.S.
Well: WHITERIVER #2
Area: ALASKA

Scientist: DUMCIUS
Date: JULY 1988
Samples are: F

VITRINITE DATA:

=====

Sample Depth : 120.0

0.400	R	0.430	R	0.470	R	0.490	R	0.550	R	0.550	R	0.590	R
0.590	R	0.610	R	0.630	R	0.630	R	0.660	R	0.660	R	0.710	R
0.710	R	0.720	R	0.720	R	0.730	R	0.730	R	0.870	R		

Actual Mean = 0.622 Actual Standard Deviation = 0.117

Comment : Occasional large pyrite grains; very little sample present.

Sample Depth : 1200.0

0.390	R	0.430	R	0.430	R	0.440	R	0.440	R	0.440	R	0.450	R
0.480	R	0.480	R	0.490	R	0.500	R	0.510	R	0.520	R	0.520	R
0.530	R	0.560	R	0.570	R	0.650	R	0.660	R	0.700	R		

Actual Mean = 0.509 Actual Standard Deviation = 0.084

Comment : Occasional pyrite; very little sample present.

Sample Depth : 2000.0

0.250	C	0.280	C	0.290	C	0.300	C	0.310	C	0.320	C	0.320	C
0.320	C	0.340		0.340		0.360		0.360		0.360		0.360	
0.360		0.370		0.370		0.380		0.380		0.380		0.380	
0.390		0.390		0.390		0.400		0.400		0.420		0.420	
0.420		0.430		0.440		0.450		0.460		0.460		0.480	R
0.480	R	0.490	R	0.490	R	0.540	R	0.540	R	0.560	R	0.560	R
0.580	R	0.590	R	0.630	R	0.640	R	0.650	R	0.650	R	0.700	R
0.710	R												

Actual Mean = 0.438 Actual Standard Deviation = 0.116

Edited Mean = 0.393 Edited Standard Deviation = 0.035

Comment : Abundant inorganic amorphous material present.

Sample Depth : 2940.0

0.240	C	0.280	C	0.310	C	0.320	C	0.320	C	0.340		0.360
0.370		0.380		0.380		0.410		0.420		0.440		0.440
0.450		0.470		0.480	R	0.520	R	0.550	R	0.550	R	

Actual Mean = 0.401 Actual Standard Deviation = 0.087

Edited Mean = 0.405 Edited Standard Deviation = 0.042

Comment : Abundant inorganic amorphous material; very little vitrinite present.

Sample Depth : 4040.0

0.380	C	0.390	C	0.400	C	0.410	C	0.420	C	0.440		0.510	
0.520		0.520		0.540		0.540		0.540		0.560		0.570	
0.580	P	0.580		0.580		0.610		0.610		0.610		0.620	
0.630		0.630		0.630		0.640		0.640		0.640		0.660	
0.670		0.690		0.690		0.710	R	0.710	R	0.720	R	0.720	R
0.730	R	0.730	R	0.730	R	0.760	R	0.760	R	0.800	R	0.870	R

Actual Mean = 0.612 Actual Standard Deviation = 0.117

Edited Mean = 0.594 Edited Standard Deviation = 0.061

Comment : Common pyrite; abundant amorphous inorganic material; little vitrinite present.

Sample Depth : 5020.0

0.410		0.410		0.410		0.430		0.430		0.430		0.440
0.440		0.460		0.460		0.470		0.470		0.470		0.480
0.480		0.480		0.480		0.490		0.490		0.500		0.500
0.500		0.500		0.500		0.510		0.510		0.510		0.510
0.520		0.520		0.520		0.520		0.530		0.530		0.540
0.560		0.560		0.560		0.560		0.560		0.580		0.580
0.610		0.620		0.620		0.640		0.660		0.670		0.680
0.910	R											

Actual Mean = 0.524 Actual Standard Deviation = 0.088

Edited Mean = 0.517 Edited Standard Deviation = 0.068

Comment : Common pyrite; abundant amorphous inorganic material; little vitrinite present.

Sample Depth : 6100.0

0.220 C 0.390 C 0.410 C 0.560 0.560 P 0.610 P 0.660 P

Actual Mean = 0.487 Actual Standard Deviation = 0.154

Edited Mean = 0.598 Edited Standard Deviation = 0.048

Comment : Abundant cork; very little vitrinite present.

Sample Depth : 6940.0

0.400 0.410 0.410 0.420 0.420 0.430 0.450
0.460 0.460 0.460 0.470 0.470 0.480 0.490
0.490 0.500 0.500 0.510 0.510 P 0.510 0.520
0.540 0.540 0.540 0.540 0.540 0.540 0.540
0.540 0.540 0.540 0.540 0.550 0.550 0.550
0.550 0.560 0.560 0.560 0.560 0.570 0.580
0.580 0.580 0.600 0.630 0.640 0.650 0.690
0.790 R

Actual Mean = 0.529 Actual Standard Deviation = 0.074

Edited Mean = 0.524 Edited Standard Deviation = 0.064

Comment : Occasional pyrite; abundant degraded amorphous inorganic material; abundant vitrinite present.

Sample Depth : 7820.0

0.410 0.420 0.420 0.430 0.430 0.430 0.440
0.440 0.440 0.440 0.450 0.450 0.460 0.470
0.470 0.480 0.480 0.480 0.480 0.490 0.490
0.500 0.520 0.520 0.520 0.520 0.520 0.540
0.550 0.560 0.560 0.560 0.570 0.580 0.580
0.580 0.590 0.590 0.590 0.590 0.590 0.590
0.610 0.610 0.610 0.620 0.650 0.660 0.670
0.800 R

Actual Mean = 0.529 Actual Standard Deviation = 0.081

Edited Mean = 0.523 Edited Standard Deviation = 0.072

Comment : Occasional pyrite; occasionally oxidized vitrinite present.

Sample Depth : 8540.0

0.370	C	0.440	0.450	0.480	0.490	0.490	0.490
0.510		0.520	0.520	0.530	0.530	0.530	0.530
0.530		0.530	0.540	0.540	0.540	0.550	0.550
0.550		0.550	0.560	0.560	0.560	0.560	0.560
0.570		0.570	0.570	0.570	0.590	0.590	0.600
0.610		0.610	0.620	0.620	0.620	0.630	0.630
0.640		0.650	0.650	0.650	0.660	0.680	0.740
0.770	R						

Actual Mean = 0.568 Actual Standard Deviation = 0.072

Edited Mean = 0.564 Edited Standard Deviation = 0.056

Comment : Occasional pyrite; abundant degraded amorphous material present.

Sample Depth : 9320.0

0.420	0.420	0.430	0.430	0.440	0.440	0.440
0.440	0.440	0.450	0.450	0.450	0.460	0.460
0.460	0.460	0.470	0.470	0.480	0.480	0.480
0.480	0.490	0.490	0.490	0.500	0.500	0.500
0.510	0.510	0.510	0.520	0.520	0.520	0.530
0.530	0.530	0.530	0.540	0.540	0.560	0.560
0.560	0.560	0.560	0.580	0.580	0.630	0.660
0.670						

Actual Mean = 0.503 Actual Standard Deviation = 0.059

Edited Mean = 0.503 Edited Standard Deviation = 0.059

Comment : Occasional pyrite; abundant degraded amorphous material present.

Sample Depth : 9700.0

0.400	0.410	0.410	0.420	0.450	0.460	0.460
0.460	0.480	0.490	0.490	P 0.490	0.500	0.500
0.500	P 0.510	0.510	0.520	0.530	0.530	0.530
0.530	0.540	0.550	0.550	0.550	0.560	0.560
0.560	0.560	0.560	0.580	0.580	0.580	0.590
0.610	0.640	0.670				

Actual Mean = 0.522 Actual Standard Deviation = 0.062

Edited Mean = 0.522 Edited Standard Deviation = 0.062

Comment : Little vitrinite and sample present.

Sample Depth : 10280.0

0.410	0.440	0.440	0.440	0.440	0.440	0.440
0.450	0.450	0.450	0.450	0.460	0.460	0.460
0.460	0.460	0.460	0.470 P	0.470	0.470	0.480
0.480	0.480	0.490	0.490	0.500	0.500	0.510
0.510	0.520	0.520	0.520	0.520	0.520	0.530
0.540	0.540	0.540	0.540	0.550	0.550	0.550
0.550	0.560	0.570	0.590	0.630	0.670	0.690
0.760	R					

Actual Mean = 0.508 Actual Standard Deviation = 0.069

Edited Mean = 0.503 Edited Standard Deviation = 0.060

Comment : Occasional pyrite; abundant degraded amorphous material present.

Sample Depth : 10900.0

0.320	C	0.340	C	0.350	C	0.350	C	0.350	C	0.360	C	0.370	C
0.380	C	0.380	C	0.380	C	0.380	C	0.390	C	0.390	C	0.390	C
0.400	C	0.400	C	0.400	C	0.400	C	0.410	C	0.410	C	0.410	C
0.410	C	0.420	C	0.420	C	0.420	C	0.430	C	0.450	C	0.450	C
0.460	C	0.460	C	0.460	C	0.460	C	0.460	C	0.470	C	0.480	C
0.480	C	0.480	C	0.490	C	0.490	C	0.490	C	0.500	C	0.510	C
0.520	C	0.530	C	0.530	C	0.530	C	0.550	C	0.550	C	0.560	C
0.580	C												

Actual Mean = 0.440 Actual Standard Deviation = 0.065

Comment : Occasional pyrite; abundant degraded amorphous material present.

Sample Depth : 11440.0

0.320	C	0.340	C	0.350	C	0.360	C	0.360	C	0.360	C	0.390	C
0.410	C	0.410	C	0.410	C	0.410	C	0.420	C	0.420	C	0.420	C
0.420	C	0.430	C	0.430	C	0.430	C	0.430	C	0.440	C	0.440	C
0.440	C	0.440	C	0.450	C	0.450	C	0.450	C	0.450	C	0.450	C
0.450	C	0.450	C	0.470	C	0.470	C	0.480	C	0.480	C	0.480	C
0.490	C	0.500	C	0.500	C	0.510	C	0.510	C	0.510	C	0.510	C
0.510	C	0.510	C	0.520	C	0.520	C	0.530	C	0.540	C	0.540	C
0.560	C												

Actual Mean = 0.451 Actual Standard Deviation = 0.056

Comment : Occasional pyrite; abundant degraded amorphous material present.

Sample Depth : 12100.0

0.360	C	0.360	C	0.380	C	0.380	C	0.390	C	0.400	C	0.420	C
0.420	C	0.430	C	0.440	C	0.440	C	0.440	C	0.450	C	0.460	C
0.460	C	0.460	C	0.460	C	0.470	C	0.470	C	0.470	C	0.470	C
0.480	C	0.480	C	0.480	C	0.490	C	0.500	C	0.510	C	0.510	C
0.520	C	0.530	C	0.530	C	0.530	C	0.540	C	0.560	C	0.570	C
0.570	C	0.580	C	0.590		0.590		0.590		0.600		0.600	
0.610		0.610		0.610		0.620		0.630		0.630		0.650	
0.660													

Actual Mean = 0.508 Actual Standard Deviation = 0.082

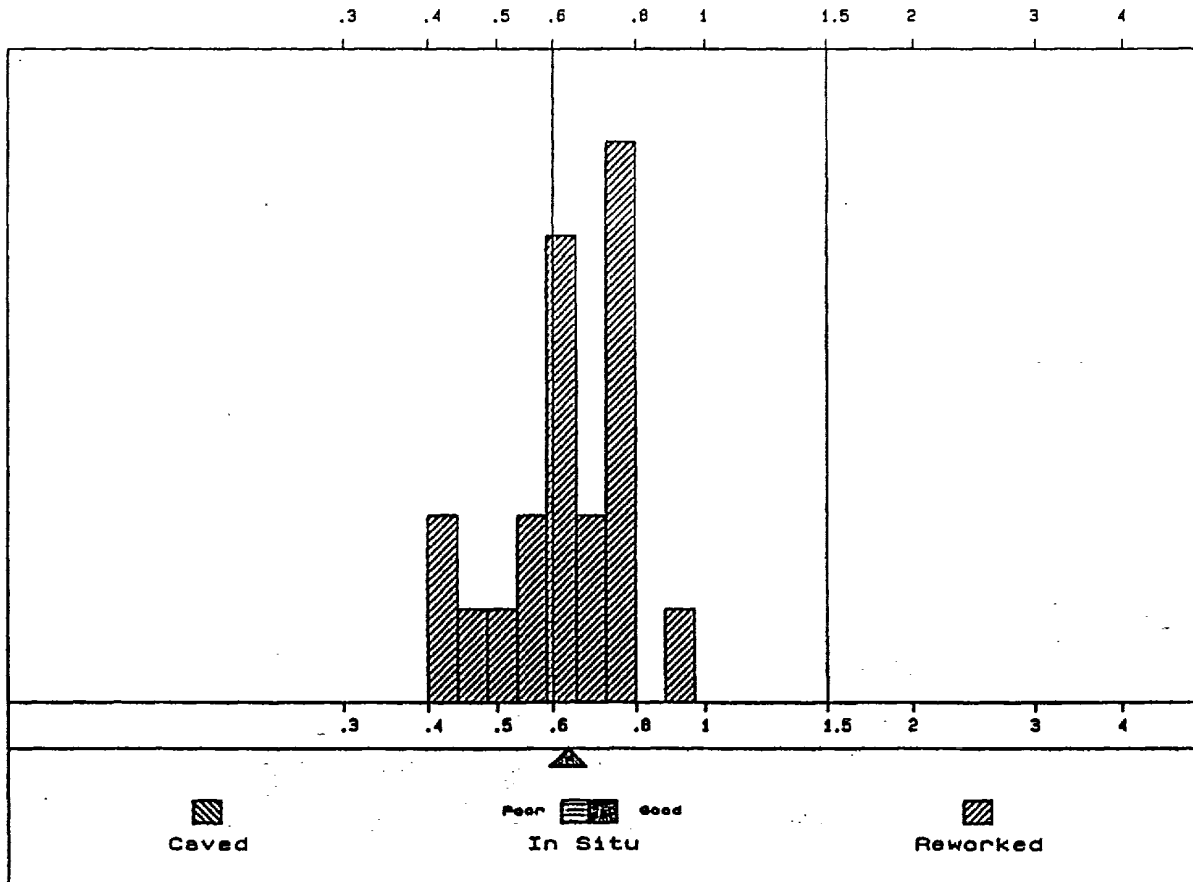
Edited Mean = 0.615 Edited Standard Deviation = 0.023

Comment : Occasional pyrite; abundant degraded amorphous material present.

SAMPLE : 120f

Population	Mean	Standard Deviation
In Situ	-	-
Caved	-	-
Reworked	0.62	0.12
Total	0.62	0.12

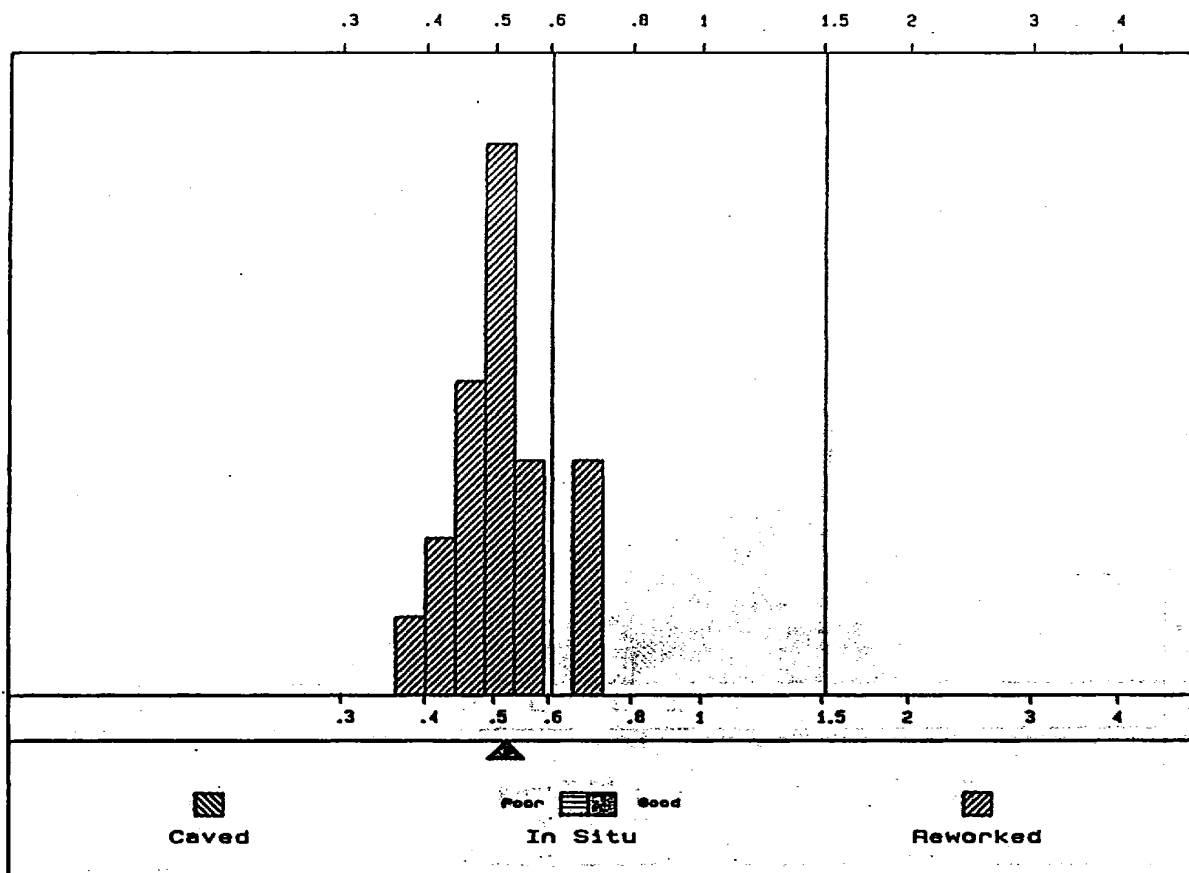
Total measurements this sample : 20



SAMPLE : 1200f

Population	Mean	Standard Deviation
In Situ	-	-
Caved	-	-
Reworked	0.51	0.08
Total	0.51	0.08

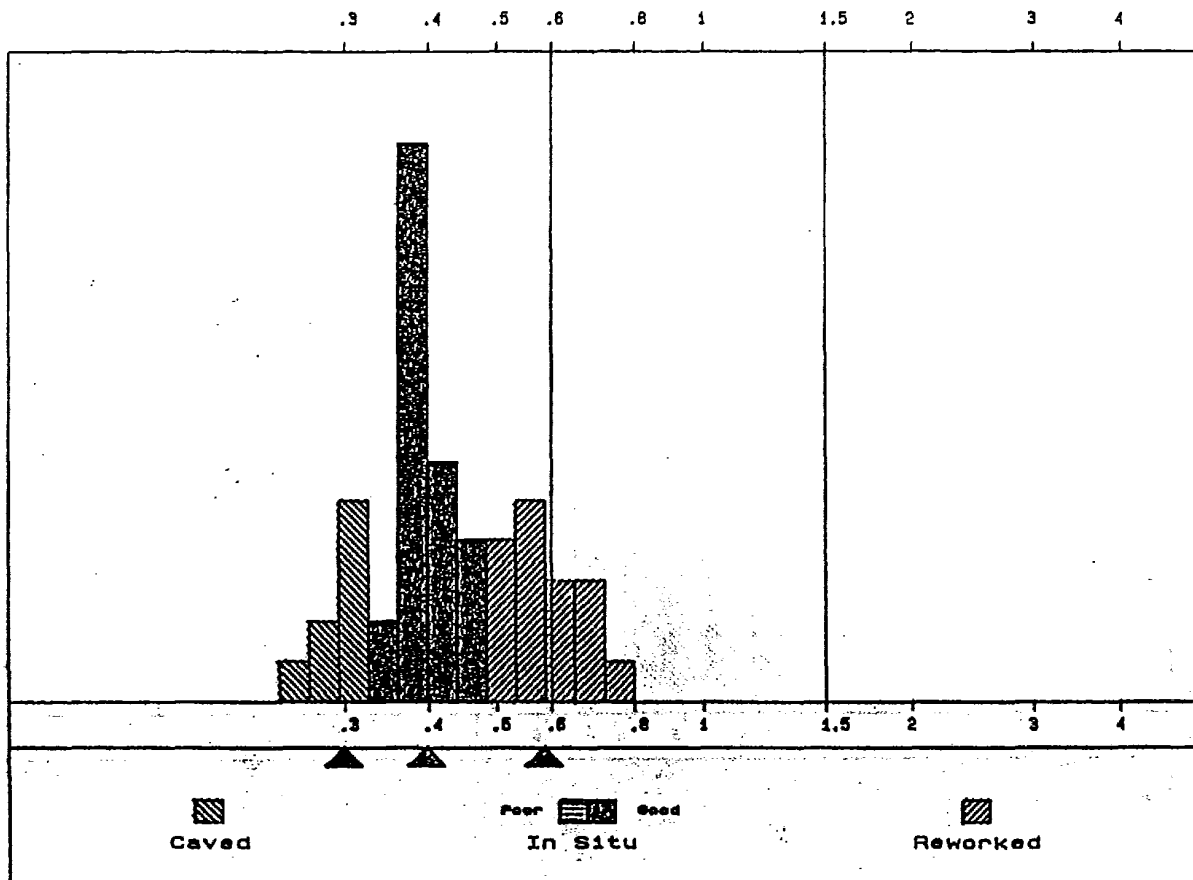
Total measurements this sample : 20



SAMPLE : 2000f

Population	Mean	Standard Deviation
In Situ	0.39	0.04
Caved	0.30	0.02
Reworked	0.58	0.08
Total	0.44	0.12

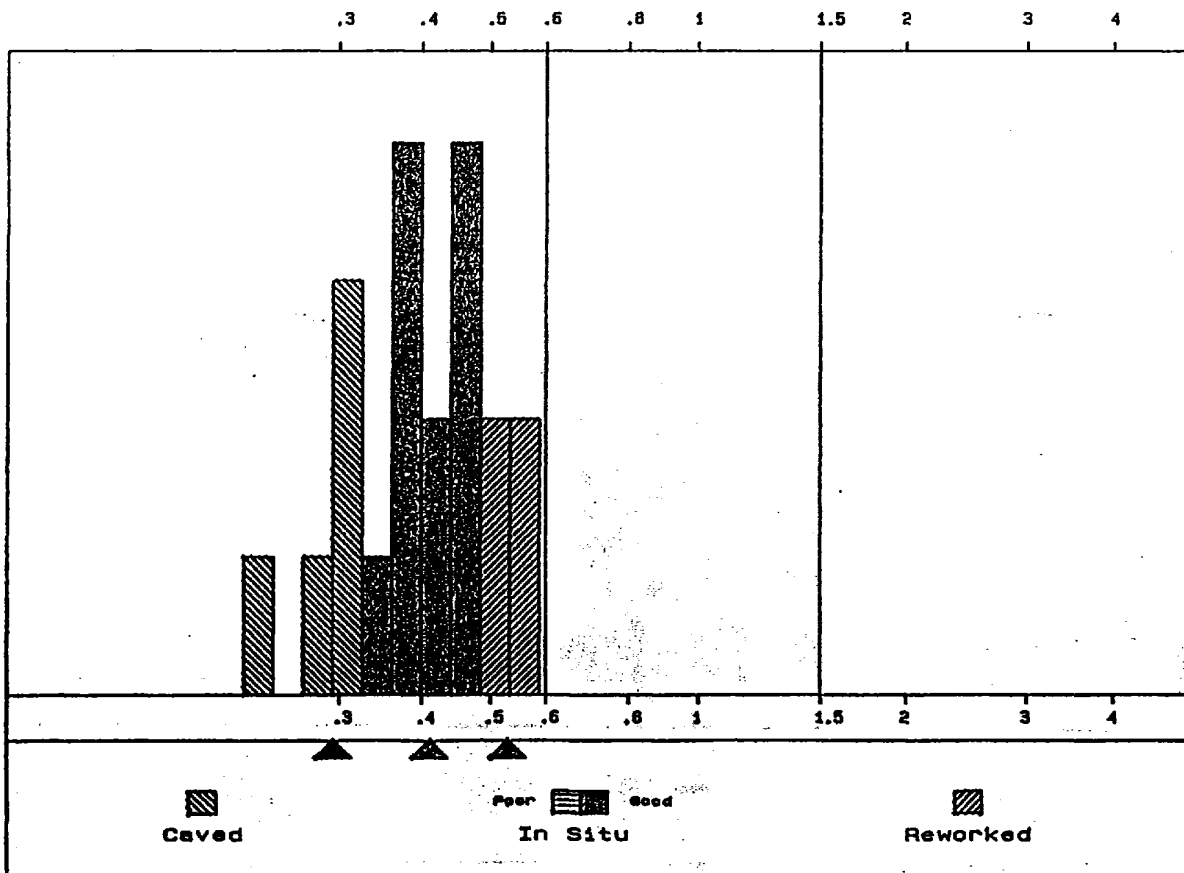
Total measurements this sample : 50



SAMPLE : 2940f

Population	Mean	Standard Deviation
In Situ	0.41	0.04
Caved	0.29	0.03
Reworked	0.53	0.03
Total	0.40	0.09

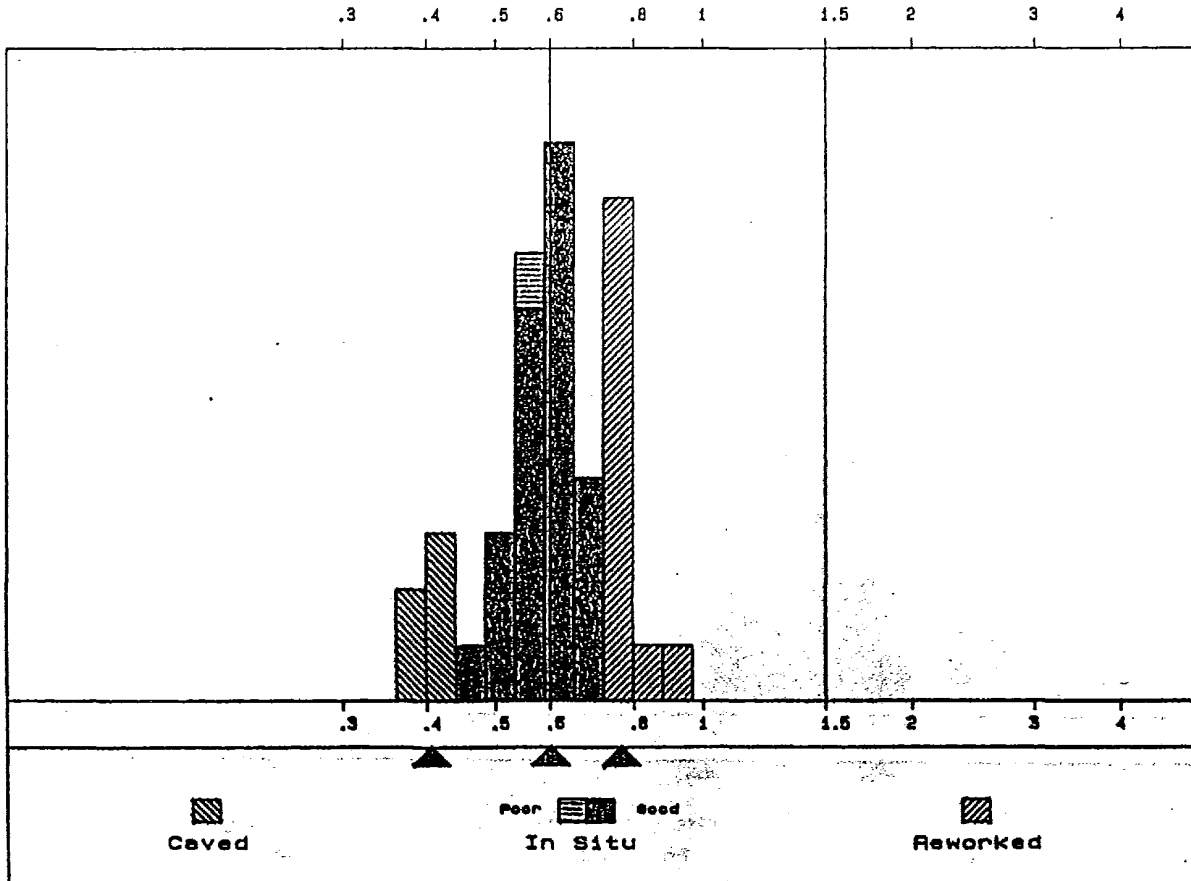
Total measurements this sample : 20



SAMPLE : 4040f

Population	Mean	Standard Deviation
In Situ	0.59	0.06
Caved	0.40	0.02
Reworked	0.75	0.05
Total	0.61	0.12

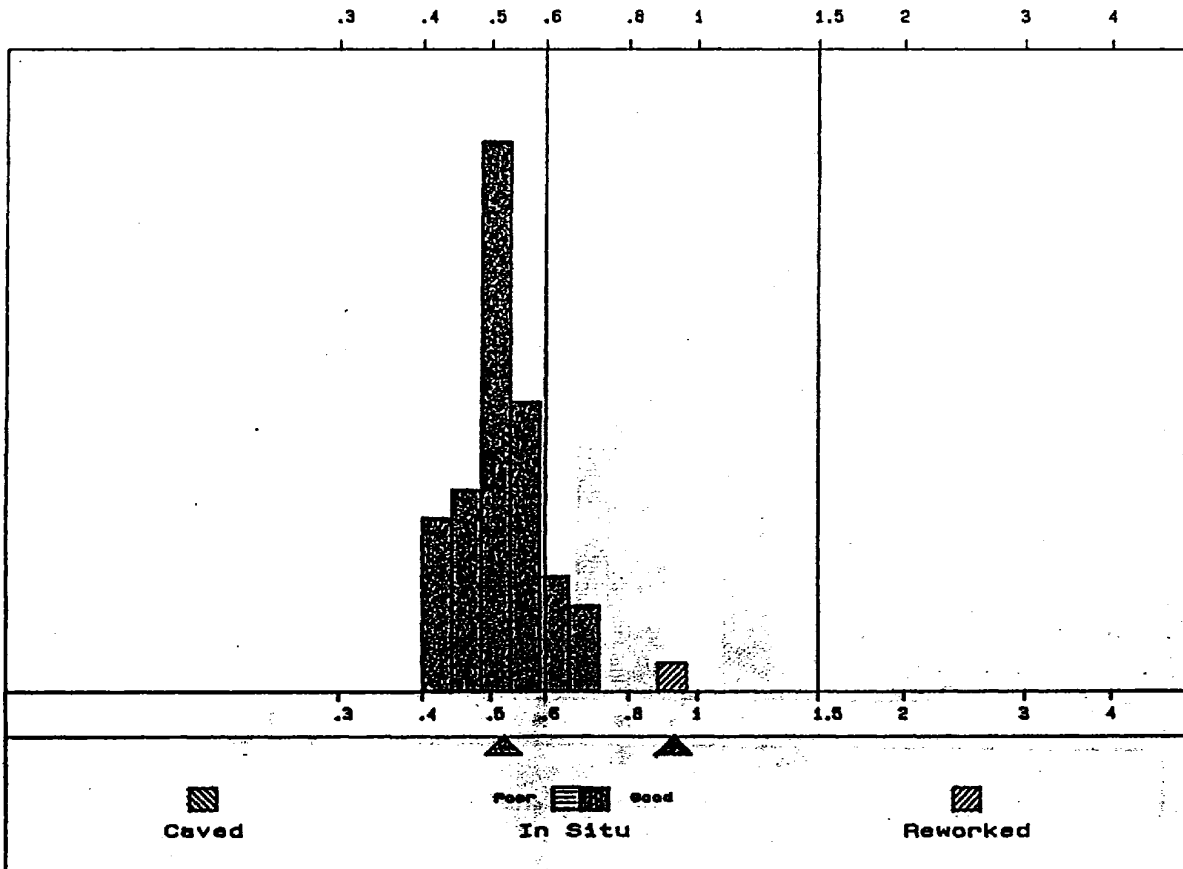
Total measurements this sample : 42



SAMPLE : 5020f

Population	Mean	Standard Deviation
In Situ	0.52	0.07
Caved	-	-
Reworked	0.91	-
Total	0.52	0.09

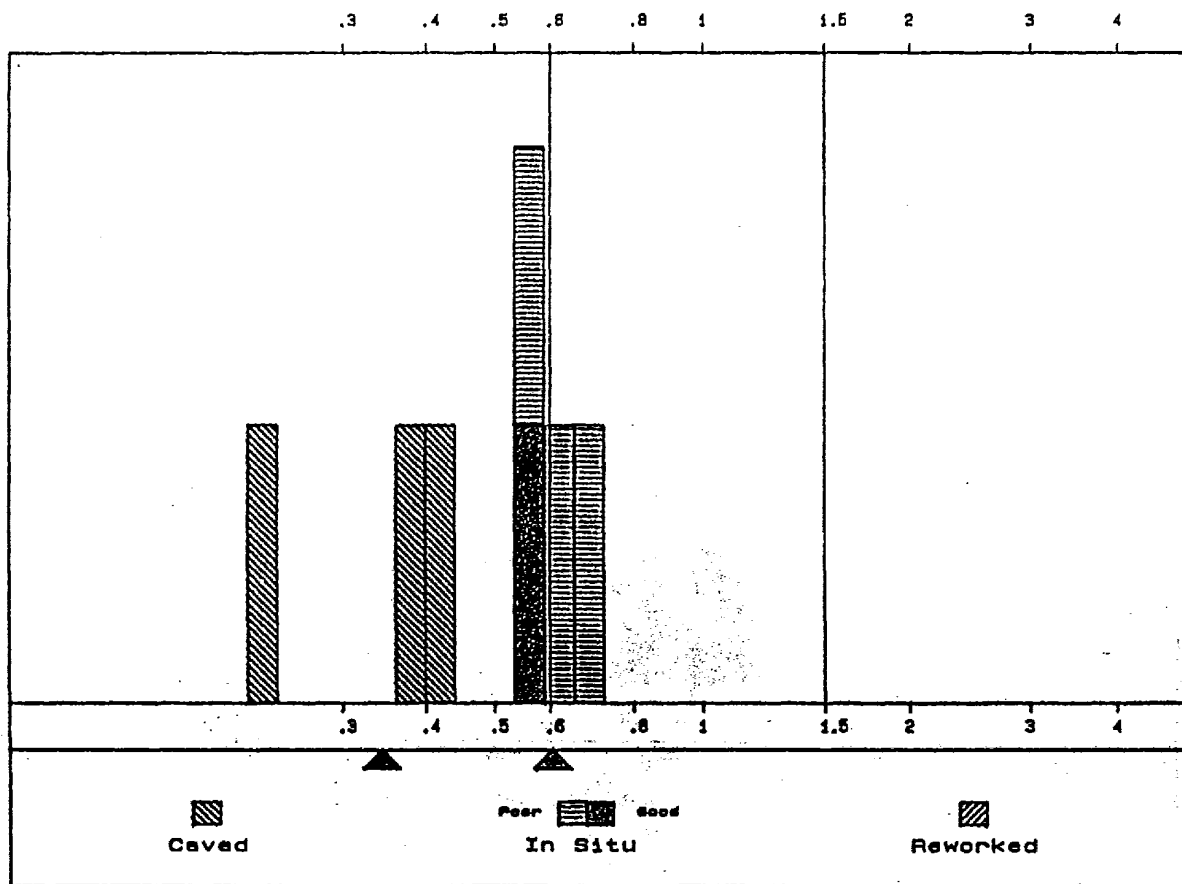
Total measurements this sample : 50



SAMPLE : 6100f

Population	Mean	Standard Deviation
In Situ	0.60	0.05
Caved	0.34	0.10
Reworked	-	-
Total	0.49	0.15

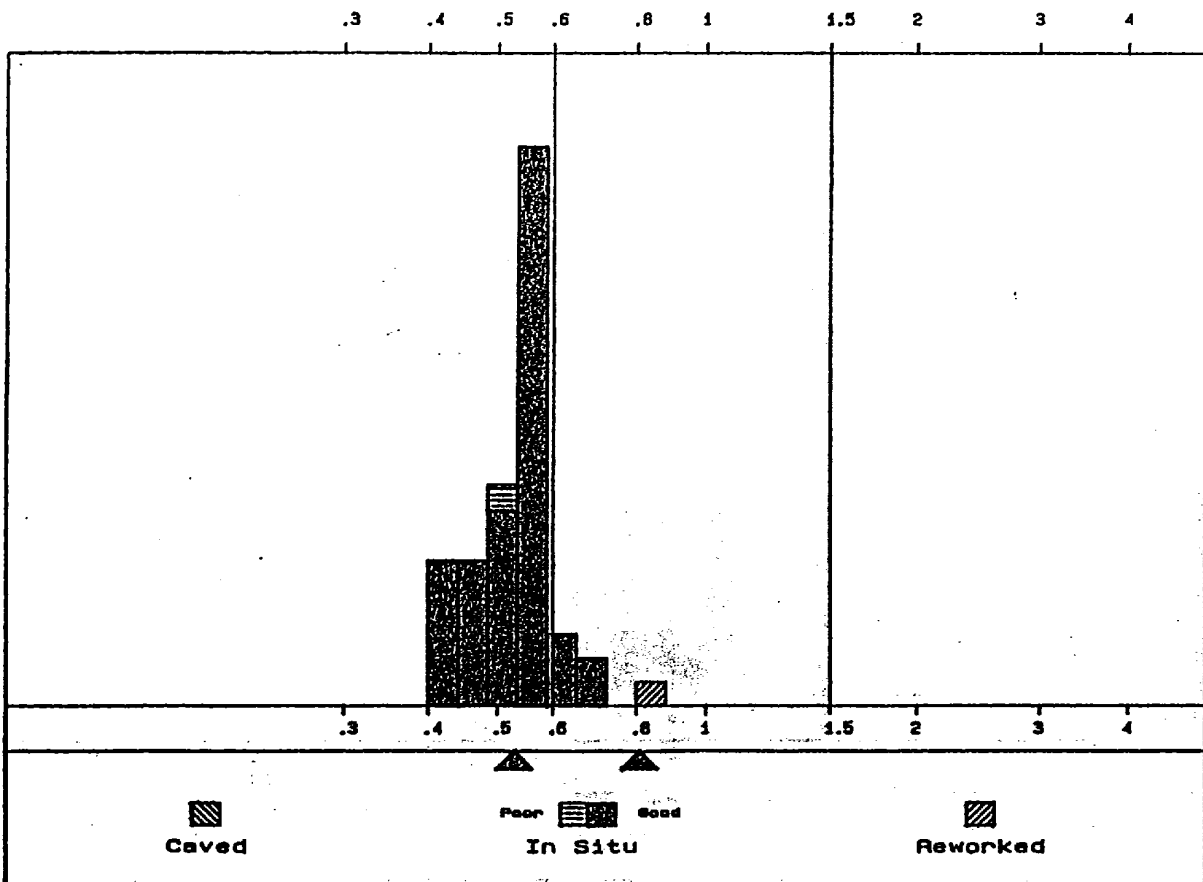
Total measurements this sample : 7



SAMPLE : 6940f

Population	Mean	Standard Deviation
In Situ	0.52	0.08
Caved	-	-
Reworked	0.79	-
Total	0.53	0.07

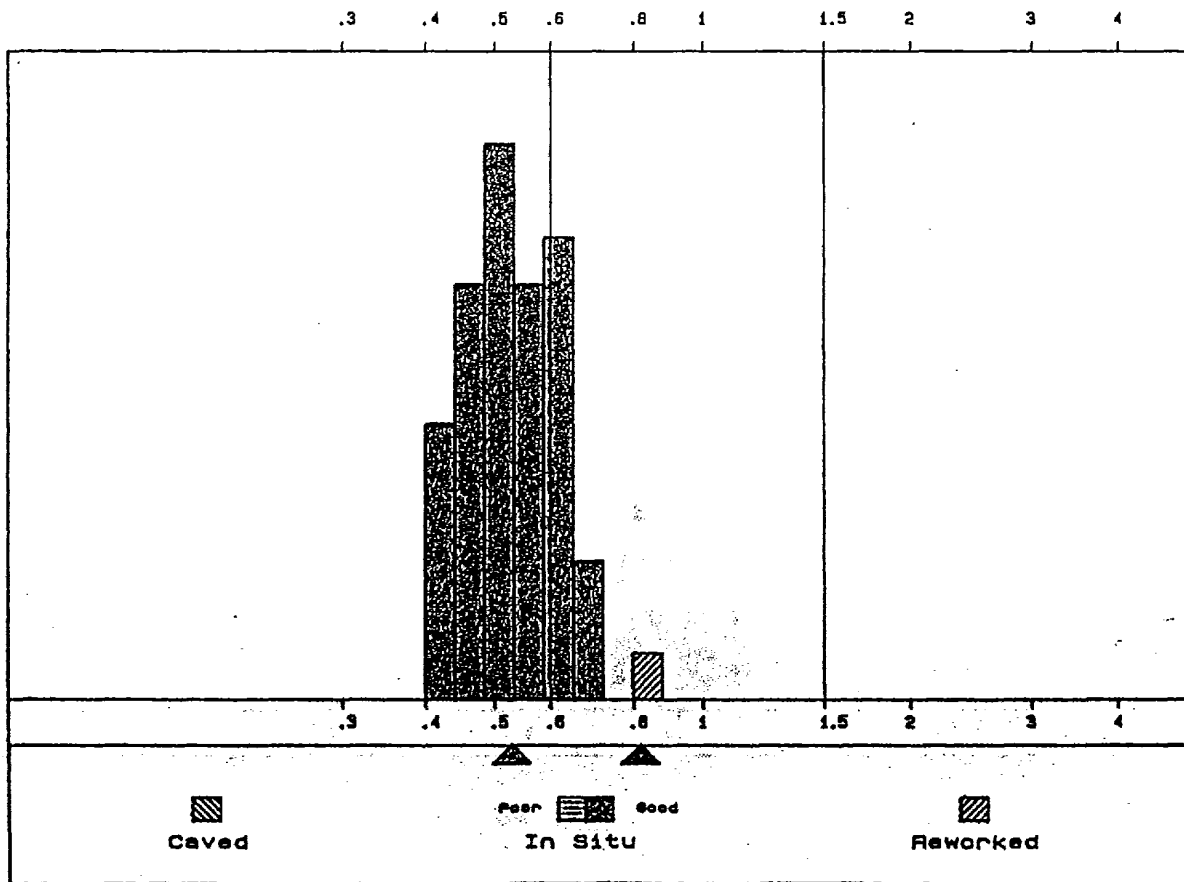
Total measurements this sample : 50



SAMPLE : 7820f

Population	Mean	Standard Deviation
In Situ	0.52	0.07
Caved	-	-
Reworked	0.80	-
Total	0.53	0.08

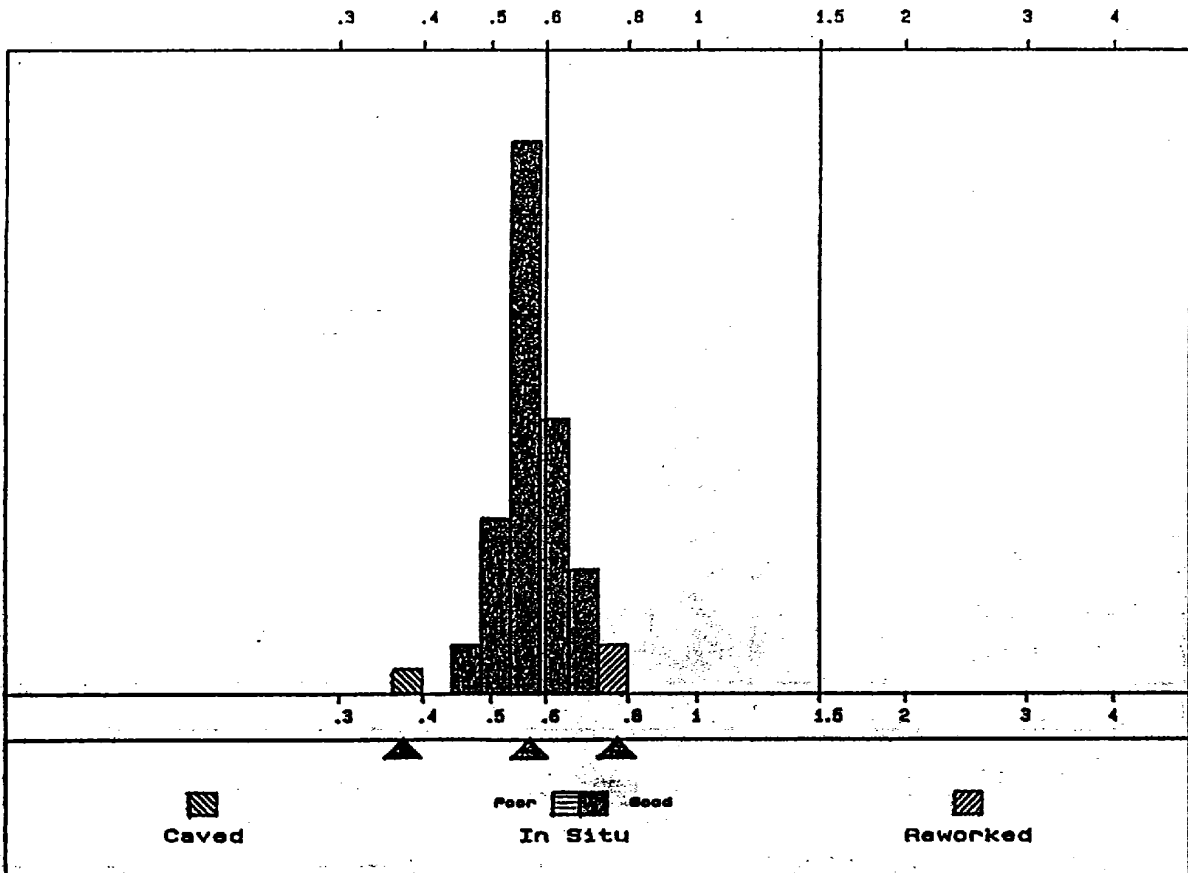
Total measurements this sample : 50



SAMPLE : 8540f

Population	Mean	Standard Deviation
In Situ	0.86	0.06
Caved	0.37	-
Reworked	0.75	0.02
Total	0.57	0.07

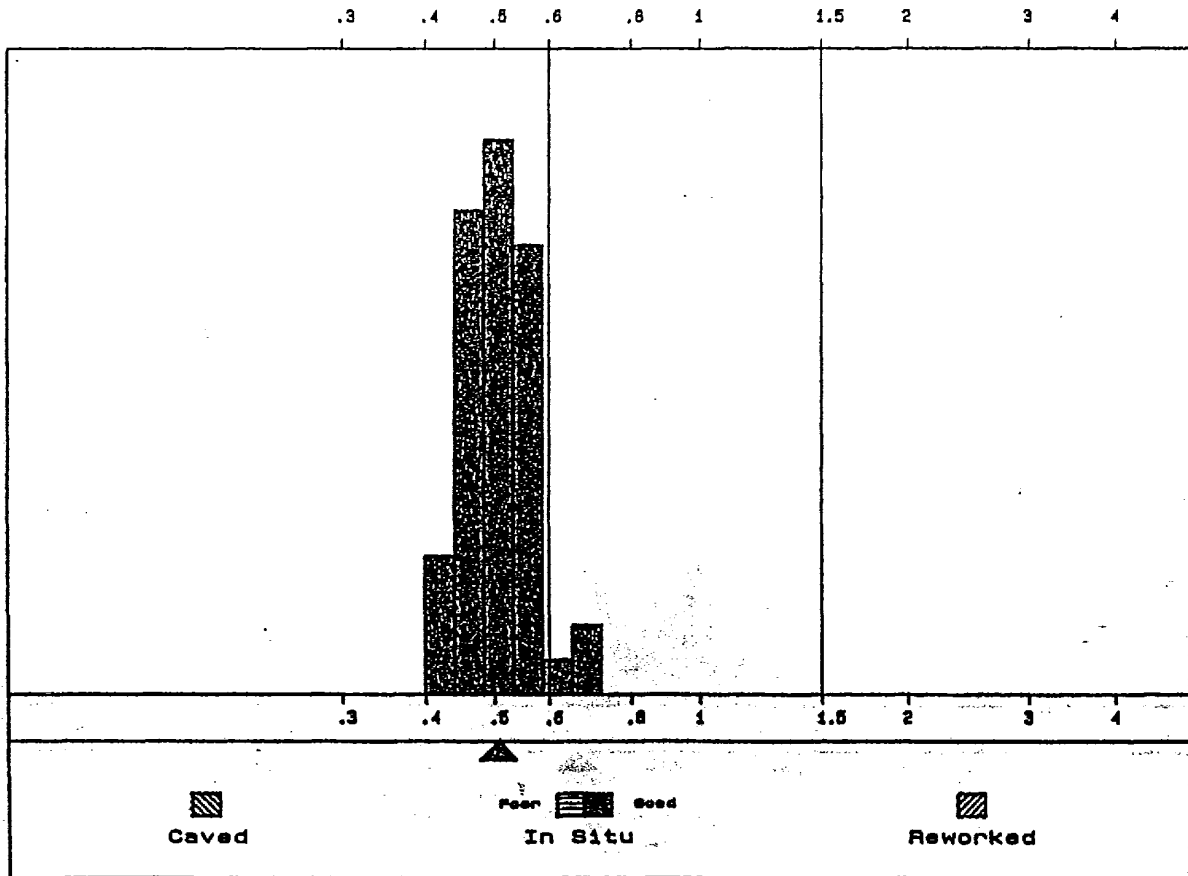
Total measurements this sample : 50



SAMPLE : 9320f

Population	Mean	Standard Deviation
In Situ	0.50	0.06
Caved	-	-
Reworked	-	-
Total	0.50	0.06

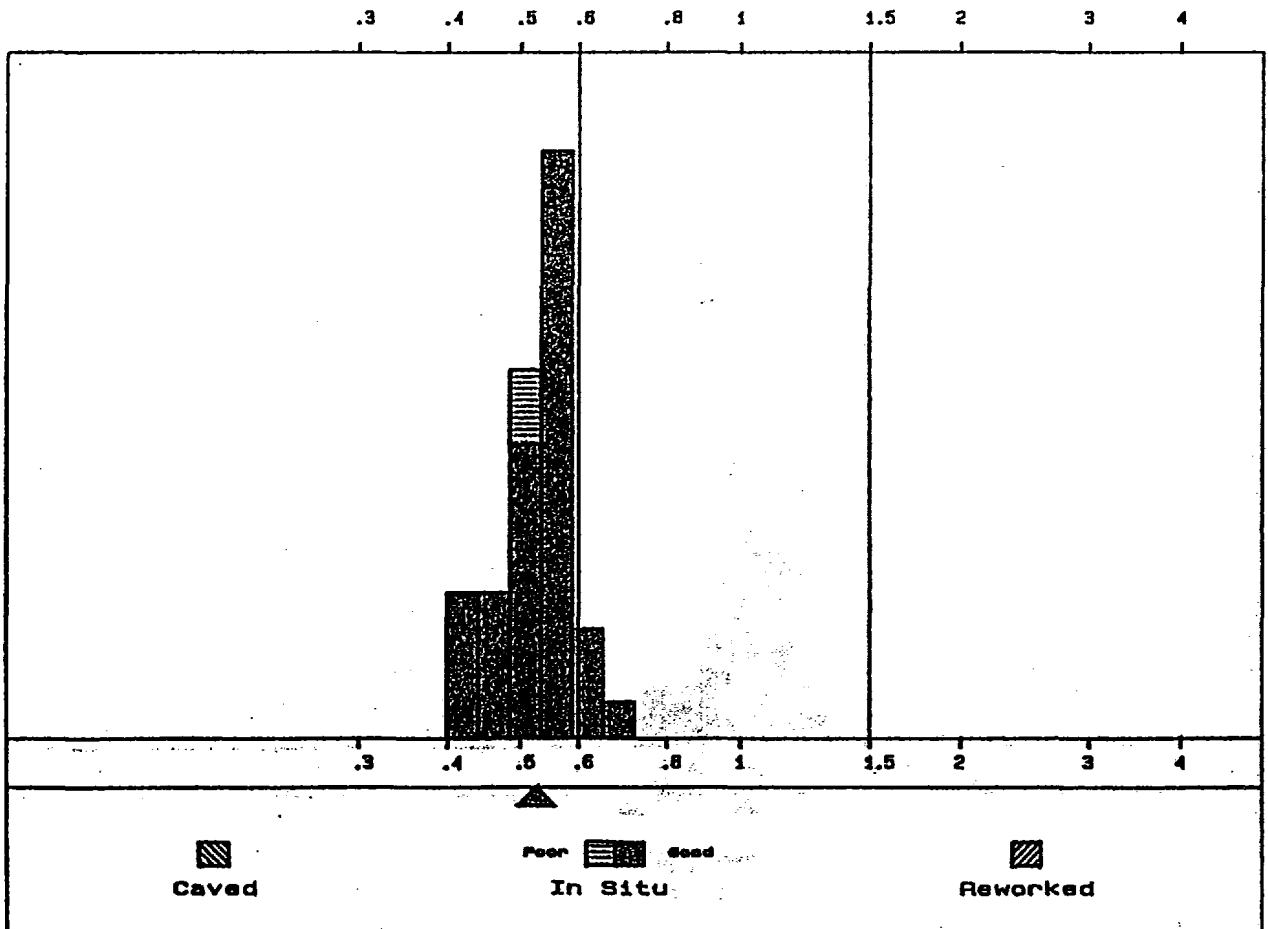
Total measurements this sample : 50



SAMPLE : 9700f

Population	Mean	Standard Deviation
In Situ	0.52	0.06
Caved	-	-
Reworked	-	-
Total	0.52	0.06

Total measurements this sample : 38



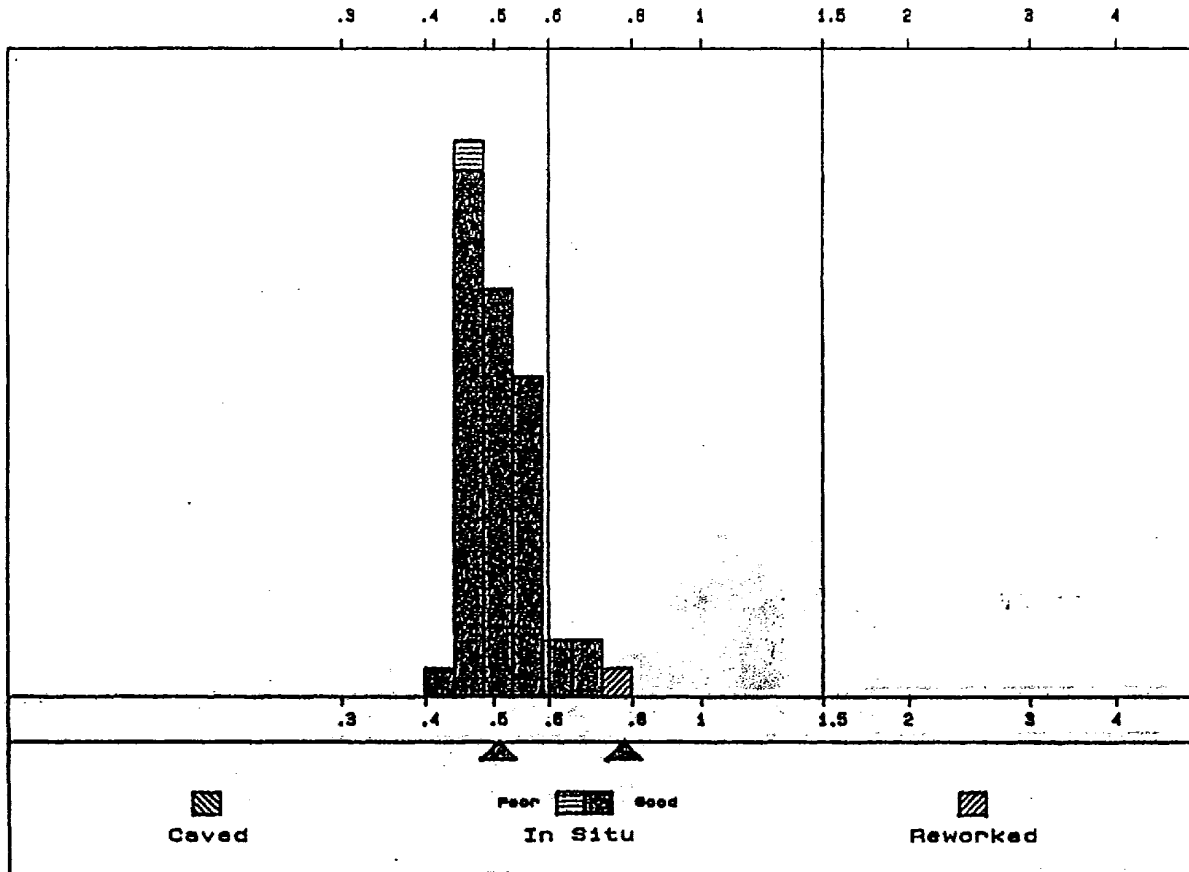
BUJAK DAVIES GROUP : VITRINITE

WHITERIVER #2

SAMPLE : 10280f

Population	Mean	Standard Deviation
In Situ	0.50	0.06
Caved	-	-
Reworked	0.76	-
Total	0.51	0.07

Total measurements this sample : 50



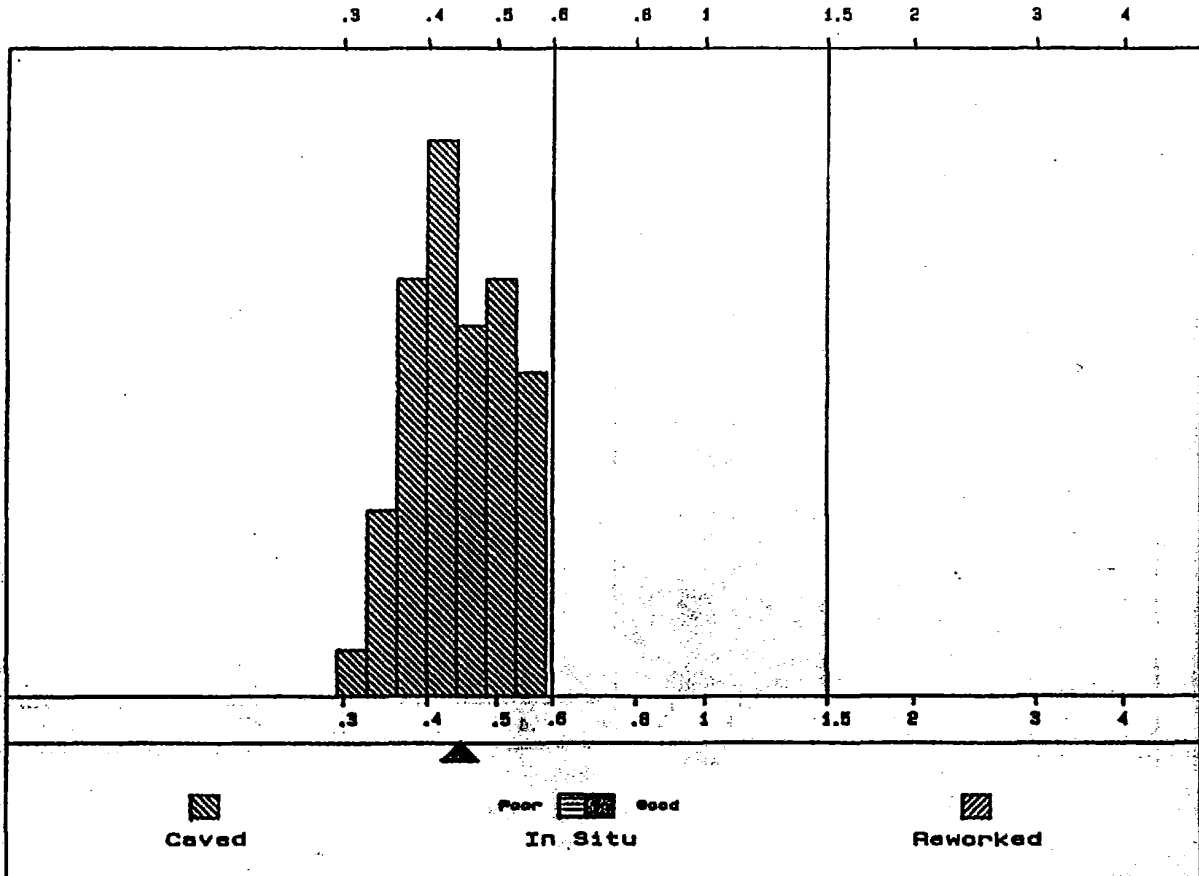
BUJAK DAVIES GROUP : VITRINITE

WHITERIVER #2

SAMPLE : 10900f

Population	Mean	Standard Deviation
In Situ	-	-
Caved	0.44	0.06
Reworked	-	-
Total	0.44	0.06

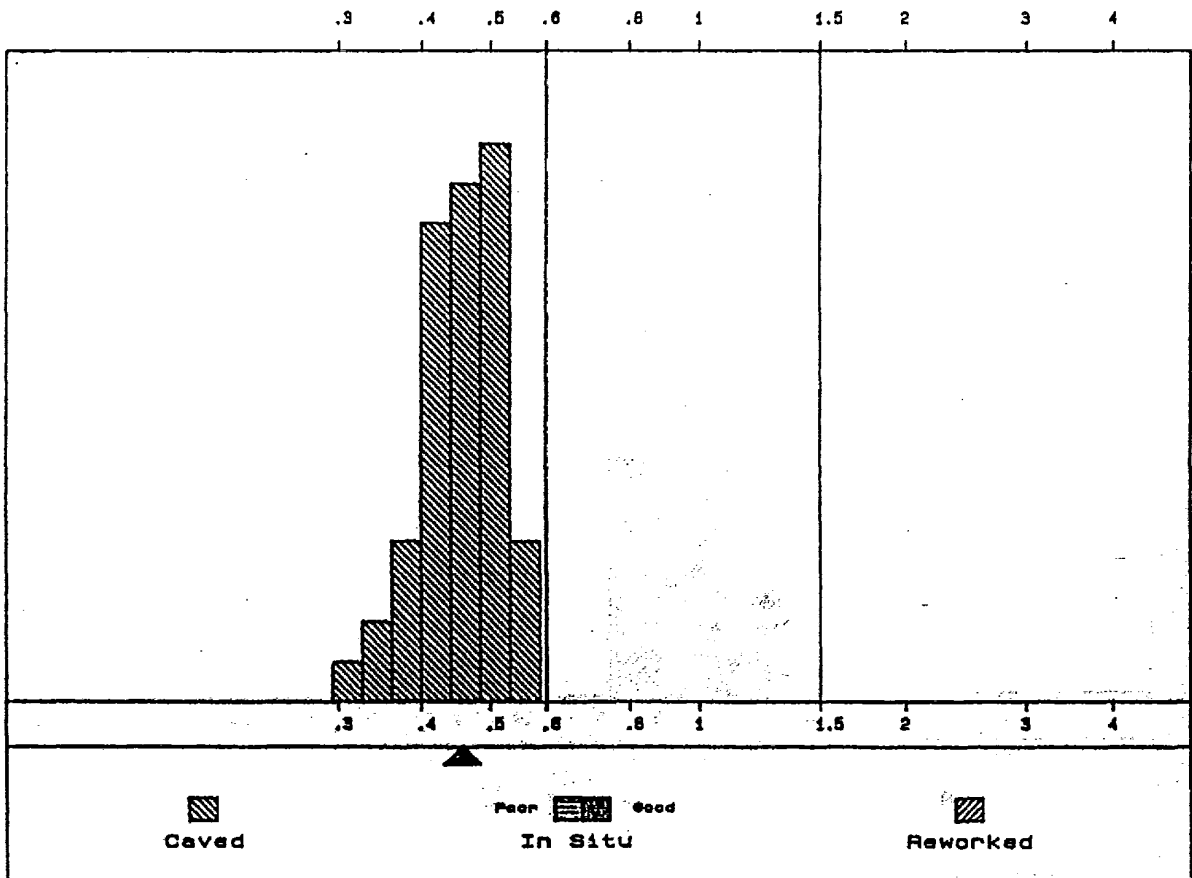
Total measurements this sample : 50



SAMPLE : 11440f

Population	Mean	Standard Deviation
In Situ	-	-
Caved	0.45	0.06
Reworked	-	-
Total	0.45	0.06

Total measurements this sample : 50



BUJAK DAVIES GROUP : VITRINITE

WHITERIVER #2

SAMPLE : 12100f

Population	Mean	Standard Deviation
In Situ	0.61	0.02
Caved	0.47	0.06
Reworked	-	-
Total	0.51	0.08

Total measurements this sample : 50

