

New Mexico Bureau of Mines and Mineral Resources
Open File Report No. OF 200

HYDROCARBON SOURCE-ROCK EVALUATION STUDY,
CITIES SERVICE NO. 1 CORRALITOS FEDERAL A WELL,
DOÑA ANA COUNTY, NEW MEXICO

by. Douglas A. Muckelroy
GeoChem Laboratories, Inc.
Houston, Texas
November 29, 1982



GEOCHEMICAL ANALYSES
SOURCE ROCK EVALUATION

CRUDE OIL—SOURCE ROCK CORRELATION

CRUDE OIL CHARACTERIZATION
GEOCHEMICAL PROSPECTING

1143-C BRITTMORE ROAD • HOUSTON, TEXAS 77043-5094 • 713/467-7011

November 29, 1982

Clayton S. Valder
Marshall R. Young Oil Co.
750 West Fifth Street
Fort Worth, Texas 76102

Dear Mr. Valder:

Enclosed please find the results of the organic geochemical analyses performed on a suite of forty (40) dry well cuttings samples from the Cities Services No.1 Corralitos Federal A Well, located in Dona Ana County (22S-2W-6), New Mexico.

Upon arrival at GeoChem these samples were assigned the GeoChem Job Number 2371 and were submitted to the following organic geochemical analyses:

<u>Type of Analyses</u>	<u>Table</u>
Total organic carbon analyses and brief lithological descriptions.....	I
Organic carbon analyses and gross lithological descriptions.....	II
Rock-Eval pyrolysis.....	III
Summary of C ₁₅₊ soxhlet extraction deasphaltening and liquid chromato- graphy.....	IV
Saturate hydrocarbon analysis.....	V; chromatograms
Visual kerogen assessment.....	VI
Vitrinite reflectance.....	VII; histograms

RESULTS AND INTERPRETATIONS

A. Thermal Maturity

The thermal maturity of the sediments penetrated by the Cities Service No.1 Corralitos Federal A Well range from an immature Maturation Index Stage 1+ to 2- at 1120+ feet (Upper Hueco Formation) to a mature Maturation Index Stage 3 to 3+ at 5130+ feet T.D., (Bliss Formation).

The sediments of the Upper Hueco Formation (1060+ feet to 1230+ feet) have experienced a fairly low geothermal history and can be rated as immature (mean Stage 1+ to 2-; Table VI). This rating is based on the yellow-orange coloration of the recognizable amorphous, herbaceous and woody organic matter types isolated in the visual kerogen analysis (Table VI).

At this level of thermal maturity these sediments are considered to be above the oil-generating window, wherein biogenic gas and immature oil could have been generated.

The sediments from the Permian (Epitah Formation; 1300+ feet) down through the Pennsylvanian (Magdalena Formation; 2986+ feet) are rated as moderately mature (mean Stage 2 to 2+; Table VI). This state of thermal maturity is based on the orange-brown to light brown coloration of the recognizable amorphous and secondary woody-structured debris contained in the kerogen isolated from the cuttings samples (Table VI). This rating is supported by the moderately mature ratings detected from the vitrinite reflectance analysis on samples 2371-013, -016, -016 and -021 (0.64% Ro avg.; Table VII; chromatograms).

At a moderately mature Maturation Index these sediments are located in the upper portion of the oil-generating window, wherein an immature heavy oil and associated gas could have been generated.

The Mississippian (Lake Valley) and Devonian (Percha) sediments were not available for analyses, but should have a thermal maturity ranging from a moderately mature Maturation Index Stage (approximately 2+) to a mature Maturation Index Stage (approximately 3-).

The remaining sediments, Silurian (Fusselman) down through the Cambrian (Bliss) are rated as thermally mature (mean Stage 3- to 3; Table VI). This rating is based on the light brown to brown coloration of the recognizable amorphous debris contained in the kerogen isolated from the cuttings samples (Table VI).


B. Source Characterization

The Pennsylvanian (Magdalena Formation) sediments have a moderately mature, poor to possibly fair oil and associated gas source character. This interpretation is based on the fair amounts of organic matter (0.22% avg. carbonate total organic carbon; Table I) analyzed, which is comprised of the oil-prone amorphous and secondary gas-prone woody matter types (Table VI). This fair rating is supported by the good amounts of total hydrocarbon (262 ppm; Table IV) detected in the C₁₅₊ soxhlet extraction, deasphalting and liquid chromatography analyses.

The remaining sediments analyzed from the Cities Service No.1 Corralitos Federal A Well contain poor amounts of organic matter (0.07% avg. carbonate total organic carbon and 0.22% avg. clastic total organic carbon; Table I) and are considered to have a poor hydrocarbon source character.

Should we be of any further assistance concerning this study or any other matter, please do not hesitate to call upon us.

Yours truly,



Douglas A. Muckelroy
GEOCHEM LABORATORIES, INC.

st

Enclosures



Summary Table 1
Cities Service
No. 1 Corralitos Fed. A

Age Formation	Depth Interval (Feet)	Lithology	Organic Richness					Predominant Kerogen Type Visual Assessment	Thermal Maturity		Hydrocarbon Source Potential
			Organic Carbon (% rock)	Free H.C.'s Mg HC/g S ₁	Hydrocarbon Generating Potential Mg/ HC/g S ₂	C ₁₅ + Bitumen (ppm)	C ₁₅ + Total H.C. (ppm)		Kerogen Alteration (1-5 Scale)	Vitrinite Reflectance (% rock)	
			MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN		
PERMIAN											
Upper Hueco	1060-1230	Shale, greenish gray; anhydrite, white.	(6) 0.13	(2) 0.04	(2) 0.16	n.a.	n.a.	(2) Am;H-W ₂ -	(2) 1+ to 2-	(2) 0.44	Immature, poor oil and associated gas source potential.
Epitaph	1300-1400	Dolomite, pinkish gray; shale, medium gray.	(2) 0.07	n.a.	n.a.	n.a.	n.a.	(1) Am;W ₂ -	(1) 2 to 2+	n.a.	Possibly moderately mature, poor oil and associated gas source character.
Colina	1400-1740	Dolomite, brownish gray; shale, and chert.	(5) 0.08	n.a.	n.a.	n.a.	n.a.	(1) Am;W ₂ -	(1) 2 to 2+	(1) 0.63	Moderately mature, poor oil and associated gas source character.
Abo	1740-2100	Shale, greenish red; siltstone, grayish red; dolomite, brownish gray.	(2) 0.15	(1) 0.02	(1) 0.06	n.a.	n.a.	(1) W;Am;H	(1) 2 to 2+	n.a.	Moderately mature, poor oil and associated gas source character.
Lower Hueco	2100-2230	Shale, medium dark gray; dolomite and limestone, brownish gray.	(2) 0.37	(2) 0.02	(2) 0.07	n.a.	n.a.	Am-W;H ₂ -	2 to 2+	0.62	Moderately mature, poor to possibly fair oil and associated gas source character.
PENNSYLVANIAN											
Magdalena	2230-2986	Limestone, light brownish gray; shale, medium dark gray.	(8) 0.22	(3) 0.03	(3) 0.14	(1) 464	262	Am;W;H	2 to 2+	0.65	Moderately mature, poor to possibly fair oil and associated gas source character.

Summary Table 1
Cities Service
No. 1 Corralitos Fed. A

Age Formation	Depth Interval (Feet)	Lithology	Organic Carbon (% rock)	Organic Richness			C ₁₅₊ Total H.C. (ppm)	C ₁₅₊ Bitumen (ppm)	Predominant Kerogen Type Visual Assessment	Thermal Maturity		Hydrocarbon Source Potential
				Free H.C.'s Mg HC/g S ₁	Hydrocarbon Generating Potential Mg/ HC/g S ₂	Kerogen Alteration (1-5 Scale)				Vitrinite Reflectance (% rock)		
			MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN	MEAN		
MISSISSIPPIAN												
Lake Valley	2986-3260	No sample available for analyses.										
DEVONIAN												
Porcha	3260-3580	No sample available for analyses.										
SILURIAN												
Fusselman	3580-3890	Dolomite, light brownish gray.	(4) 0.06	n.a.	n.a.	(1) 177	(1) 86	(1) Am;-;-	(1) 3-	(1) 0.69	Mature, poor oil and associated gas source character.	
ORDOVICIAN												
Montoya	3890-4240	Dolomite, brownish gray.	(4) 0.12	(2) 0.08	(2) 0.08	n.a.	n.a.	(1) Am;-;-	(1) 3- to 3	(1) 0.75	Mature, poor oil and associated gas source character.	
El Paso	4240-5060	Dolomite, brownish gray; limestone, brownish gray.	(8) 0.07	(1) 0.04	(1) 0.06	n.a.	n.a.	(1) Am;-;-	(1) 3	n.a.	Mature, poor oil and associated gas source character.	
ORDOVICIAN/CAMBRIAN												
Bliss	5060-5129 T.D.	Dolomite, brownish gray.	(1) 0.04	n.a.	n.a.	n.a.	n.a.	(1) Am;-;-	3 (1) to 3+	n.a.	Mature, poor oil and associated gas source character.	

Table 1

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
*2371-001	1060-1070	60% Shale, grayish red and greenish gray. 40% Anhydrite, white. Traces of tourmaline and biotite.	0.07
*2371-002	1090-1100	60% Shale, grayish red and greenish gray. 40% Anhydrite, white. Traces of tourmaline and biotite.	0.08
*2371-003	1120-1130	70% Shale, greenish gray and grayish red. 30% Anhydrite, white. Traces of tourmaline and biotite.	0.20
*2371-004	1150-1160	80% Shale, greenish gray and grayish red. 20% Anhydrite, white. Traces of tourmaline and biotite.	0.17
*2371-005	1180-1190	85% Shale, greenish gray. 15% Anhydrite, white. Trace of tourmaline and biotite.	0.17/0.177
2371-006	1210-1220	80% Shale, greenish gray. 15% Chert, pinkish gray. 5% Anhydrite, white.	0.10
2371-007	1300-1310	80% Dolomite, pinkish gray. 15% Shale, medium gray. 5% Chert, white. Trace of anhydrite.	0.08
2371-008	1350-1360	65% Dolomite, pinkish gray. 15% Shale, medium gray. 10% Anhydrite, white. 10% Chert, white.	0.06
2371-009	1400-1410	100% Dolomite, brownish gray. Trace of shale.	0.06
2371-010	1420-1430	80% Dolomite, brownish gray. 10% Chert, white. 10% Shale, medium gray.	0.06
2371-011	1520-1530	80% Dolomite, brownish gray. 10% Chert, white. 10% Shale, medium gray.	0.05

Table 1

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2371-012	1620-1630	80% Dolomite grading to limestone, brownish gray. 10% Shale. 10% Chert.	0.09
2371-013	1720-1730	95% Dolomite, brownish gray to grayish red. 5% Shale, dark gray.	0.12/0.12
2371-014	1840-1850	60% Shale, grayish red and medium gray. 40% Dolomite, brownish gray.	0.17
2371-015	2040-2050	70% Siltstone, dolomitic, grayish red. 30% Dolomite, light brownish gray. Trace of shale.	0.12
2371-016	2120-2130	70% Shale, medium dark gray. 30% Dolomite, brownish gray. Trace of siltstone.	0.52
2371-017	2220-2230	65% Limestone, light brownish gray. 25% Shale, medium dark gray. 10% Chert, very pale orange.	0.21
2371-018	2320-2330	90% Limestone grading to dolomite, light brownish gray. 10% Shale, grayish red and medium dark gray.	0.34
2371-019	2420-2430	90% Limestone grading to dolomite, light brownish gray. 10% Shale, grayish red and medium dark gray.	0.12
2371-020	2520-2530	70% Limestone, light brownish gray. 30% Shale, grayish red and medium dark gray.	0.30
2371-021	2620-2630	60% Limestone, light brownish gray. 40% Shale, medium dark gray.	0.28/0.26
2371-022	2720-2730	75% Limestone, light brownish gray. 25% Shale, medium dark gray and grayish red.	0.11
2371-023	2820-2830	85% Limestone, light brownish gray. 15% Shale, medium dark gray and grayish red.	0.06
2371-024	2920-2930	90% Limestone, light brownish gray. 10% Shale, medium dark gray.	0.11

Table I

SCREEN ANALYSIS SUMMARY

GeoChem Sample Number	Well Interval (Feet)	Brief Lithological Description	Total Organic Carbon (% of Rock)
2371-025	3620-3630	100% Dolomite, light brownish gray.	0.05
2371-026	3720-3730	100% Dolomite, light brownish gray.	0.04
2371-027	3820-3830	100% Dolomite, light brownish gray. Trace of anhydrite.	0.04
2371-028	3920-3930	100% Dolomite, light brownish gray. Trace of anhydrite.	0.04
2371-029	4020-4030	100% Dolomite, light brownish gray. Trace of anhydrite.	0.05/0.05
2371-030	4120-4130	100% Dolomite, cherty, brownish gray.	0.24
2371-031	4220-4230	100% Dolomite, brownish gray and dark gray.	0.13
2371-032	4320-4330	100% Dolomite, light brownish gray to brownish gray.	0.05
2371-033	4420-4430	100% Dolomite, light brownish gray to brownish gray.	0.08
2371-034	4520-4530	100% Dolomite, light brownish gray to brownish gray.	0.03
2371-035	4620-4630	100% Dolomite, light brownish gray to brownish gray.	0.09
2371-036	4720-4730	100% Limestone grading to dolomite, light brownish gray to brownish gray.	0.11
2371-037	4820-4830	100% Limestone grading to dolomite, light brownish gray to brownish gray.	0.09/0.08
2371-038	4920-4930	100% Limestone grading to dolomite, light brownish gray to brownish gray.	0.06
2371-039	5020-5030	100% Limestone grading to dolomite, light brownish gray to brownish gray.	0.06
2371-040	5120-5130	100% Dolomite, brownish gray. Traces of shale and sandstone.	0.04

* - Magnetite present but removed.

Table II

ORGANIC CARBON ANALYSIS AND GROSS LITHOLOGICAL DESCRIPTION

GeoChem Sample Number	Well Interval (Feet)	Gross Lithological Description	GSA Color Code	Total Organic Carbon
2371-018				0.42
-A	2230-2400	40% Limestone, micrite, chunky, moderately hard, pinkish gray.	5YR 8/1	
-B		40% Dolomite, cryptocrystalline, argillaceous, chunky, moderately hard, medium dark gray.		
-C		20% Shale, slightly calcareous, chunky, moderately hard, medium dark gray.	5YR 4/1	
2371-025				0.09/0.09
-A	3580-3780	100% Dolomite, microcrystalline, chunky, moderately hard, brownish gray. Trace of quartz fragments.	5YR 4/1	

T.O.C. = Total organic carbon, wt. %
 S1 = Free hydrocarbons, mg HC/g of rock
 S2 = Residual hydrocarbon potential
 (mg HC/g of rock)
 S3 = CO₂ produced from kerogen pyrolysis
 (mg CO₂/g of rock)
 PC* = 0.083 (S1 + S2)
 Hydrogen
 Index = mg HC/g organic carbon
 Oxygen
 Index = mg CO₂/g organic carbon
 PI = S1/S1+S2
 Tmax = Temperature Index, degrees C.

TABLE III
 RESULTS OF ROCK-EVAL PYROLYSIS

GeoChem Sample No.	Depth Interval (Ft.)	Tmax (C)	S1 (mg/g)	S2 (mg/g)	S3 (mg/g)	PI	PC*	T.O.C. (wt. %)	Hydrogen Index	Oxygen Index
2371-003	1120-1130	424	0.05	0.19	0.19	0.21	0.02	0.20	95	95
2371-005	1180-1190	418	0.02	0.12	0.37	0.14	0.01	0.17	70	217
2371-014	1840-1850	334	0.02	0.06	0.33	0.25	0.00	0.17	35	194
2371-016	2120-2130	430	0.03	0.14	0.25	0.19	0.01	0.52	26	48
2371-017	2220-2230	247	0.01	0.00	0.18	0.01	0.00	0.21	0	85
2371-018	2320-2330	442	0.03	0.15	0.36	0.17	0.01	0.34	44	105
2371-020	2520-2530	439	0.02	0.13	0.23	0.14	0.01	0.30	43	76
2371-021	2620-2630	431	0.03	0.14	0.36	0.19	0.01	0.27	51	133
2371-030	4120-4130	440	0.11	0.08	0.30	0.61	0.01	0.24	33	125
2371-031	4220-4230	437	0.04	0.08	0.23	0.33	0.01	0.13	61	176
2371-036	4720-4730	426	0.04	0.06	0.25	0.40	0.00	0.11	54	227

Table IV

Summary of C15+ Soxhlet Extraction, Deasphalting
and Liquid Chromatography

A. Weights of Extracts and Chromatographic Fractions

GeoChem Sample Number	Well Interval	Weight of Rock Extd. (grams)	Total Extract (grams)	Precipitated Asphaltenes (grams)	N-C5 Soluble (grams)	Sulfur (grams)	Paraffins- Naphthenes (grams)	Aromatics (grams)	Eluted NSO'S (grams)	Noneluted NSO'S (grams)
2371-018	2230-2400	100.0	0.0464	0.0118	0.0346	N.D.	0.0168	0.0094	0.0076	0.0008
2371-025	3580-3780	100.0	0.0177	0.0057	0.0120	N.D.	0.0069	0.0017	0.0032	0.0002

B. Concentration of Extracted Materials in Rock

GeoChem Sample Number	Well Interval	Total Extract (ppm)	-----Hydrocarbons-----				-----Nonhydrocarbons-----			
			Paraffin- Naphthene (ppm)	Aromatic (ppm)	Total (ppm)	Sulfur (ppm)	Precipitd. Asphaltene (ppm)	Eluted NSO'S (ppm)	Noneluted NSO'S (ppm)	Total (ppm)
2371-018	2230-2400	464	168	94	262	-	118	76	8	202
2371-025	3580-3780	177	69	17	86	-	57	32	2	91

C. Composition of Extracts

GeoChem Sample Number	Well Interval	-----Hydrocarbons-----				-----Nonhydrocarbons-----					
		Paraffin- Naphthene %	Aromatic %	PN/Arom	Sulfur %	Eluted NSO'S %	Noneluted NSO'S %	Precipitd. Asphaltene %	Asph/NSO	HC'S %	HC/Non HC
2371-018	2230-2400	36.2	20.3	1.79	-	16.4	1.7	25.4	1.40	56.5	1.30
2371-025	3580-3780	39.0	9.6	4.06	-	18.1	1.1	32.2	1.68	48.6	0.95

Table V-A

Saturate Hydrocarbon AnalysesSummary of Paraffin-Naphthene Distribution

GeoChem Sample Number	Well Interval	% Paraffin	% Isoprenoid	% Naphthene	C-P Index A	C-P Index B	ip19/ip20
2371-018	2230-2400	23.2	1.9	74.9	1.03	1.04	0.99
2371-025	3580-3780	20.2	0.8	79.0	1.02	1.15	0.52

Table V-B

Saturate Hydrocarbon AnalysesNormalized Paraffin Distribution

GeoChem Sample Number	Well Interval	% nC15	% nC16	% nC17	% ip19	% nC18	% ip20	% nC19	% nC20	% nC21	% nC22	% nC23	% nC24	% nC25	% nC26	% nC27	% nC28	% nC29	% nC30	% nC31	% nC32	% nC33	% nC34	% nC35
2371-018	2230-2400	0.5	4.0	7.2	3.8	8.2	3.9	8.8	8.2	8.3	9.2	9.2	6.7	4.8	3.9	3.4	2.4	2.1	1.7	1.3	0.9	0.8	0.4	0.2
2371-025	3580-3780	0.0	0.2	2.9	1.3	5.8	2.6	6.9	7.0	9.5	13.6	15.2	12.7	8.1	4.8	3.1	1.8	1.4	1.0	0.7	0.6	0.3	0.3	0.2

**TABLE VI
VISUAL KEROGEN ASSESSMENT WORKSHEET**

GEOCHEM No		DEPTH		INDIGENOUS POPULATION (INTERPRETED)				GENERAL CHARACTERISTICS					CAVED AND/OR REWORKED POPULATION(S)				SUMMARY ORGANIC MATTER TYPE
				TYPE OF ORGANIC MATTER		MATURATION INDEX		COLOR OF ORGANIC MATTER	STATE OF ORGANIC MATTER		%	TYPE OF ORGANIC MATTER		MATURATION INDEX			
				AMORPHOUS	CONDENSED	WAXY	WAXY		VERY LIGHT	VERY LIGHT		VERY LIGHT	VERY LIGHT	VERY LIGHT	VERY LIGHT	VERY LIGHT	
2371-003	1120-1130																H-W;Am;-
2371-005	1180-1190																Am;-;H-W
2371-007	1300-1310			?	?												Am;W;-
2371-013	1720-1730																Am;W;-
2371-014	1840-1850																W;Am;H
2371-016	2120-2130																Am-W;H;-
2371-018	2320-2330																Am;W;-
2371-021	2620-2630																Am;W;H
2371-025	3620-3630																Am;-;-
2371-030	4120-4130																Am;-;-
2371-036	4720-4730																Am;-;-
2371-040	5120-5130																Am;-;-

Note: No age refinements are possible from the kerogen in 003 and 005.
There is an oil-looking material associated with the amorphous kerogen in 018 and 025.

Table VII

VITRINITE REFLECTANCE SUMMARY

GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE (% Ro)	MAXIMUM REFLECTANCE (% Ro)	MEAN REFLECTANCE (% Ro)	STD. DEV. (% Ro)	REMARKS
2371-003	1150	CTG	(1)	5	0.36	0.55	0.45	0.076	INDIGENOUS REWORKED
			(2)	6	0.62	1.43	1.01	0.356	
2371-005	1210	CTG	(1)	1	0.44	0.44	0.44	-	INDIGENOUS REWORKED
			(2)	1	1.25	1.25	1.25	-	
2371-007	1330	CTG	NO VITRINITE						
2371-013	1730	CTG	(1)	2	0.27	0.31	0.29	-	CAVE INDIGENOUS REWORKED
			(2)	1	0.63	0.63	0.63	-	
			(3)	4	0.77	1.42	1.07	0.304	
2371-014	1870	CTG	(1)	2	0.81	1.05	0.93	-	REWORKED
2371-016	2150	CTG	(1)	1	0.30	0.30	0.30	-	CAVE INDIGENOUS REWORKED
			(2)	11	0.52	0.73	0.62	0.071	
			(3)	48	0.77	1.75	1.12	0.255	
2371-018	2350	CTG	(1)	1	0.52	0.52	0.52	-	CAVE INDIGENOUS REWORKED
			(2)	17	0.58	0.81	0.68	0.071	
			(3)	26	0.90	1.93	1.21	0.308	
2371-021	2650	CTG	(1)	1	0.26	0.26	0.26	-	CAVE INDIGENOUS REWORKED
			(2)	12	0.50	0.75	0.62	0.084	
			(3)	14	1.09	1.80	1.36	0.217	
2371-025	3650	CTG	(1)	5	0.58	0.80	0.69	0.091	INDIGENOUS REWORKED
			(2)	7	1.26	2.02	1.67	0.258	
2371-030	4150	CTG	(1)	1	0.37	0.37	0.37	-	CAVE INDIGENOUS REWORKED
			(2)	3	0.72	0.79	0.75	0.038	
			(3)	4	0.91	1.61	1.29	0.353	

Table VII

VITRINITE REFLECTANCE SUMMARY

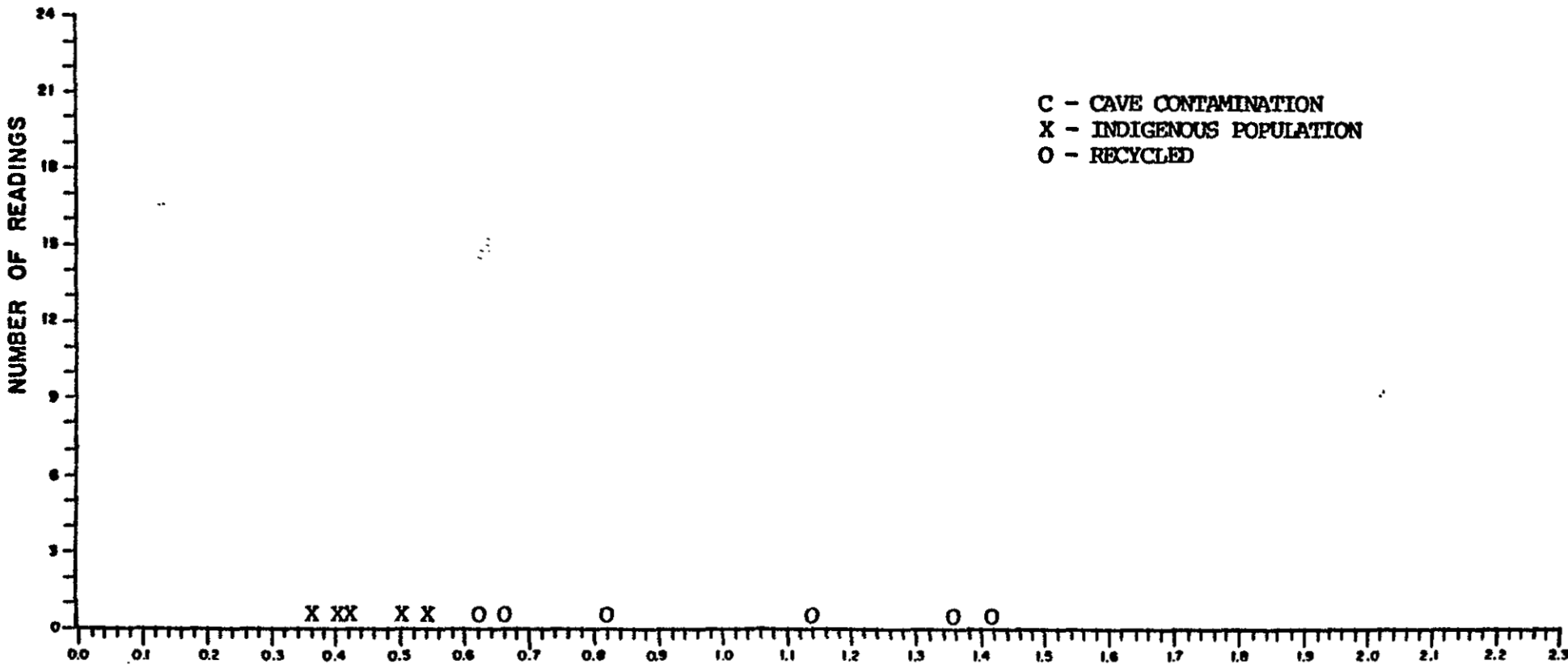
GEOCHEM SAMPLE NUMBER	DEPTH (feet)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE (% Ro)	MAXIMUM REFLECTANCE (% Ro)	MEAN REFLECTANCE (% Ro)	STD. DEV. (% Ro)	REMARKS
2371-036	4750	CTG	(1)	1	1.49	1.49	1.49	-	REWORKED
2371-040	5129	CTG	NO VITRINITE						

GEOCHEM NO. 2371-003 TYPE OF SAMPLE: CIG DEPTH/SAMPLE NO. 1150

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 11) 0.36 0.41 0.42 0.50 0.55 0.62 0.66 0.82 1.14 1.37 1.43

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	5	0.36	0.55	0.45	0.076	
(2)	6	0.62	1.43	1.01	0.356	



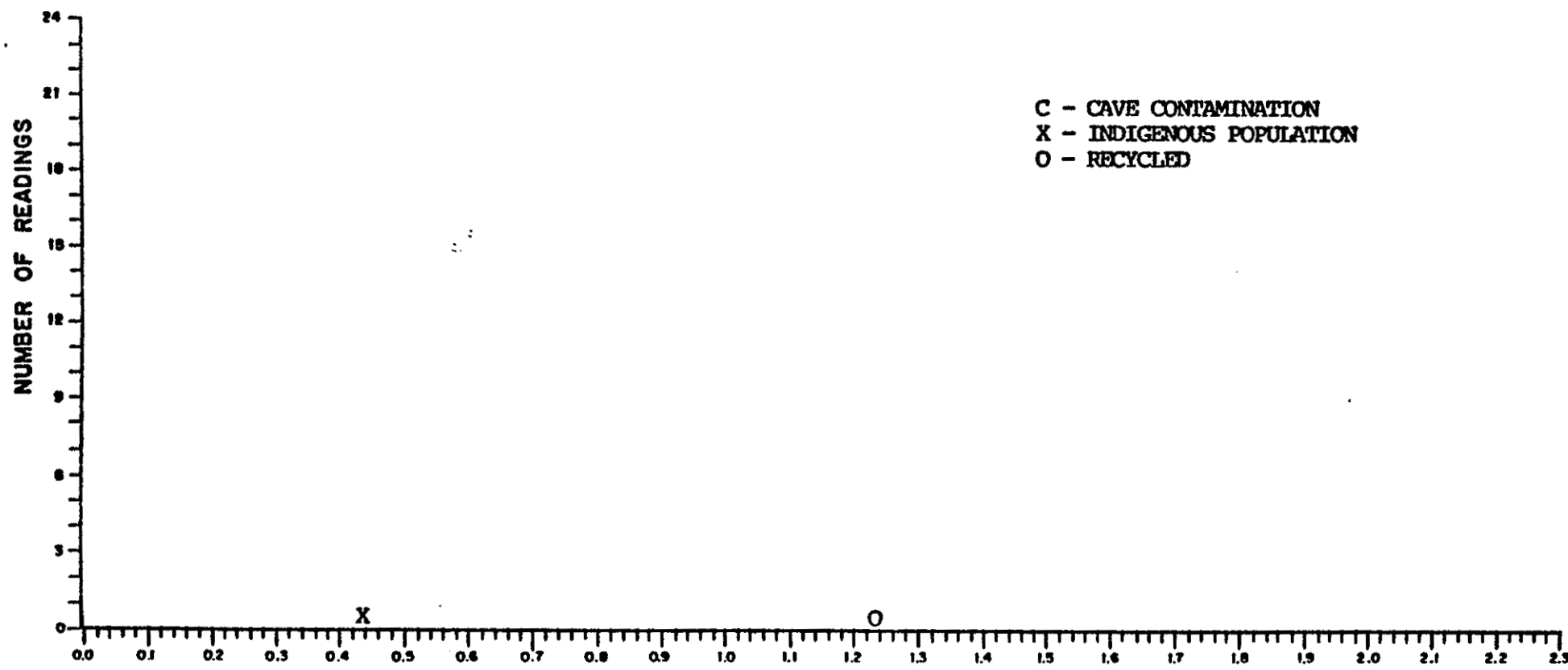
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-005 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 1210

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 2) 0.44 1.25

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	1	0.44	0.44	0.44	-	
(2)	1	1.25	1.25	1.25	-	



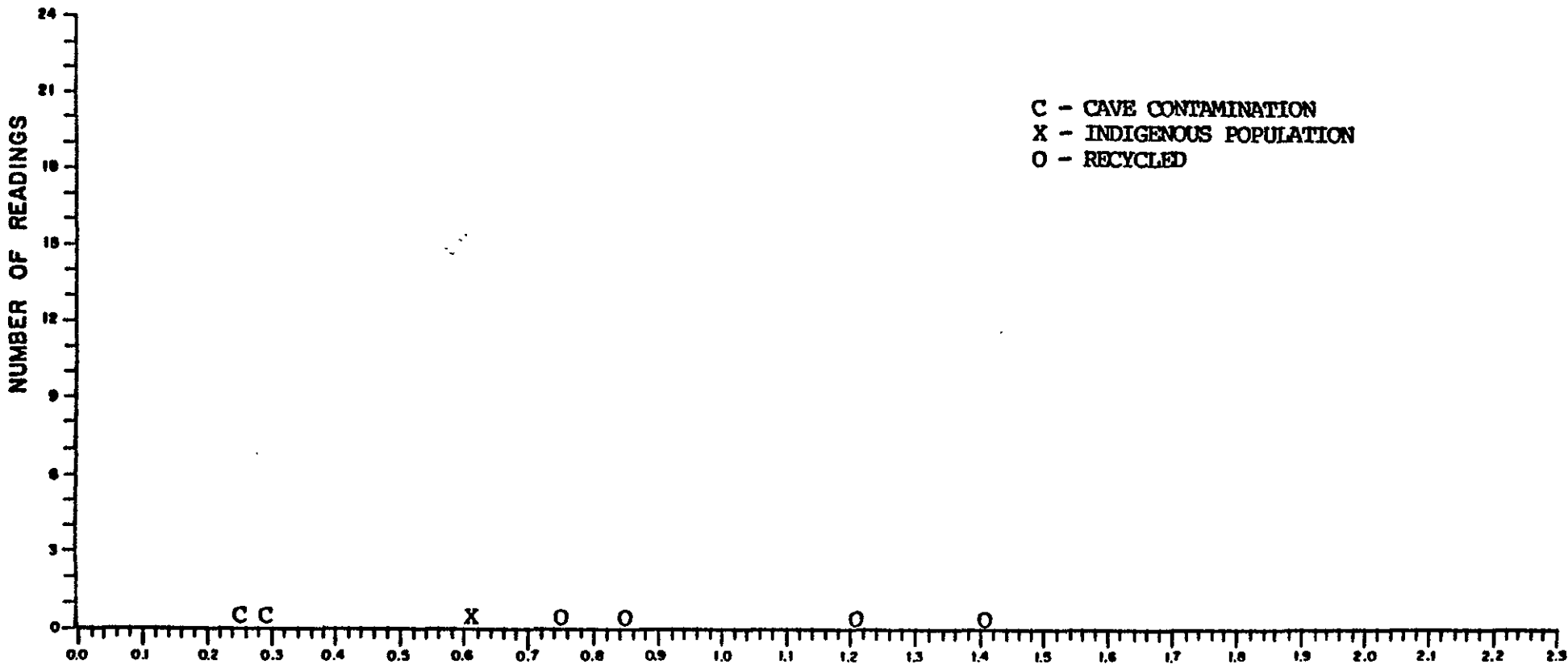
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-013 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 1730

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 7) 0.27 0.31 0.63 0.77 0.87 1.23 1.42

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	2	0.27	0.31	0.29	-	
(2)	1	0.63	0.63	0.63	-	
(3)	4	0.77	1.42	1.07	0.304	



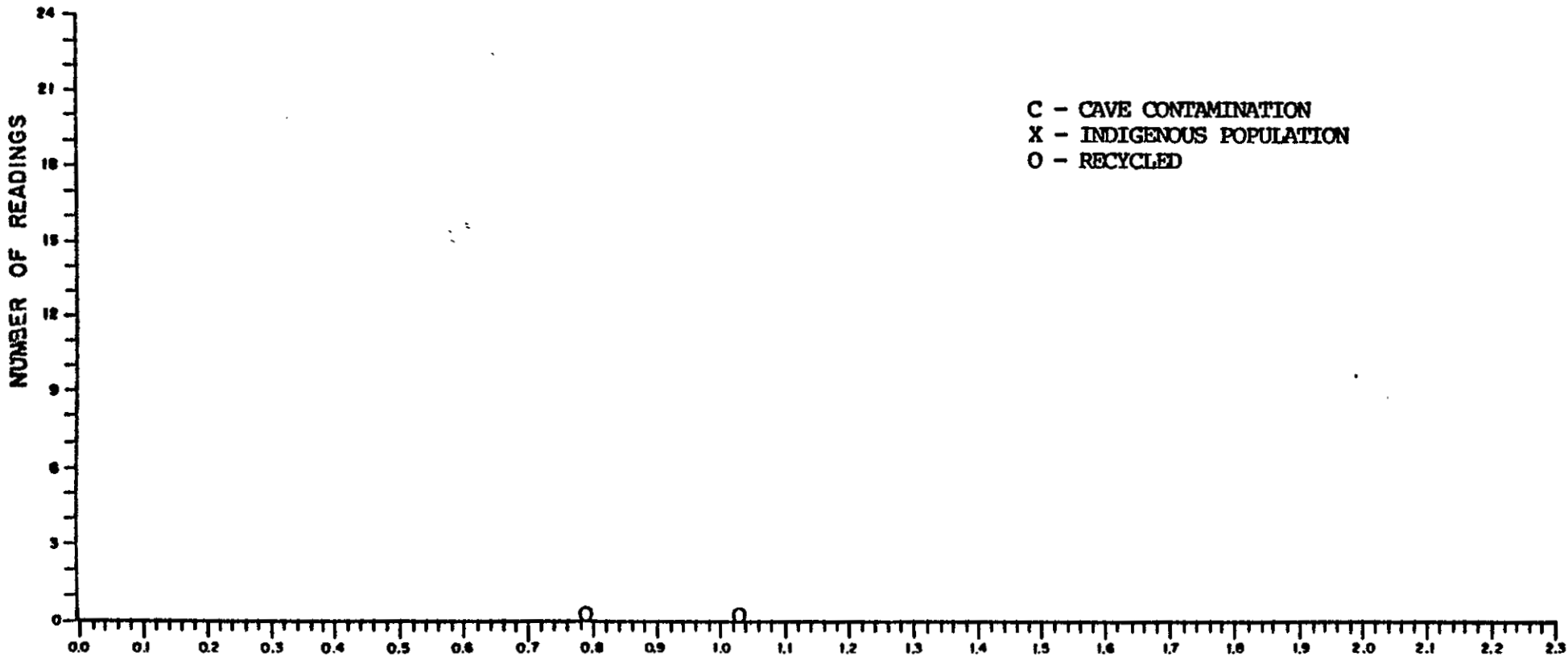
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-014 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 1870

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 2) 0.81 1.05

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	2	0.81	1.05	0.93	-	



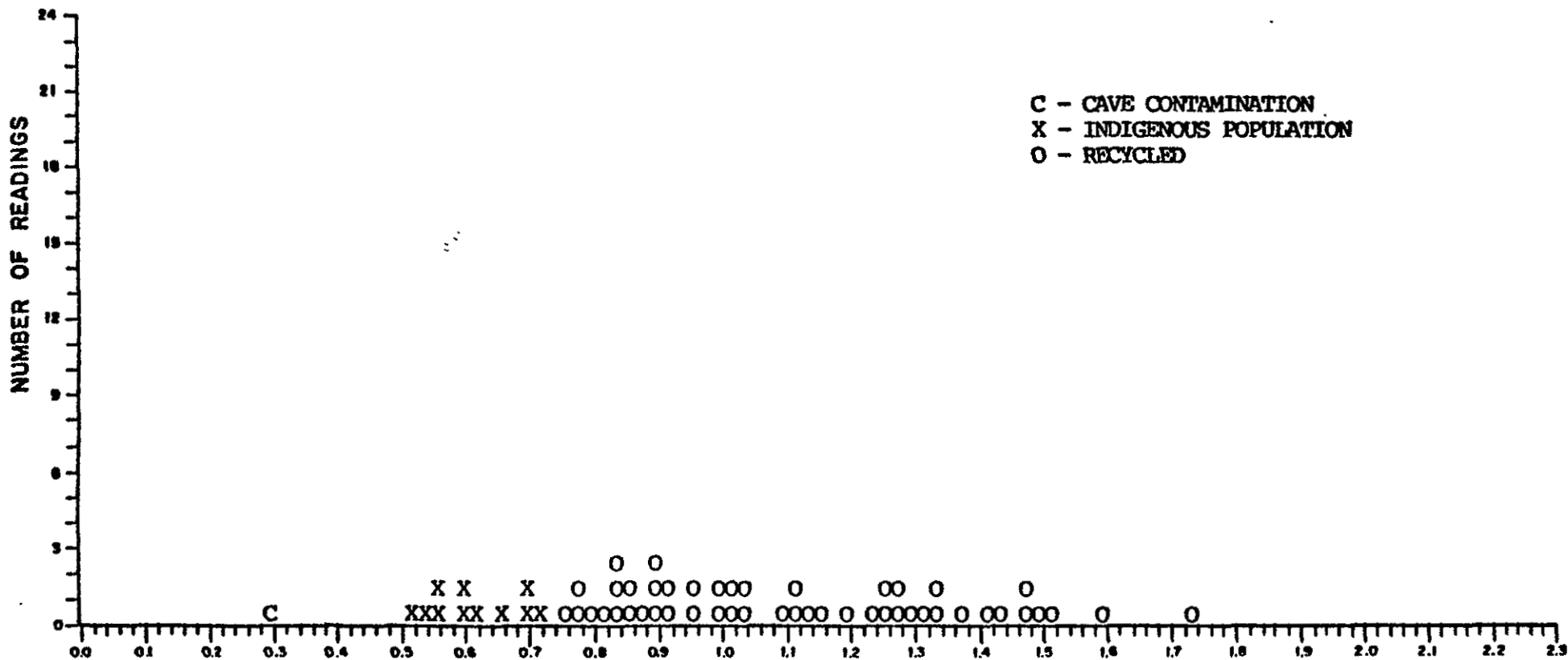
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-016 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 2150

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME _____ CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 60) 0.30 0.52 0.54 0.57 0.57 0.60 0.60 0.62 0.66 0.70 0.71 0.73 0.77 0.78
 0.79 0.80 0.83 0.84 0.85 0.85 0.86 0.87 0.89 0.90 0.90 0.91 0.92 0.93 0.97 0.97 1.00 1.00
 1.02 1.03 1.04 1.05 1.11 1.12 1.12 1.15 1.17 1.21 1.24 1.26 1.27 1.28 1.29 1.30 1.33 1.34
 1.35 1.39 1.42 1.45 1.49 1.49 1.50 1.53 1.60 1.75

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	1	0.30	0.30	0.30	-	
(2)	11	0.52	0.73	0.62	0.071	
(3)	48	0.77	1.75	1.12	0.255	

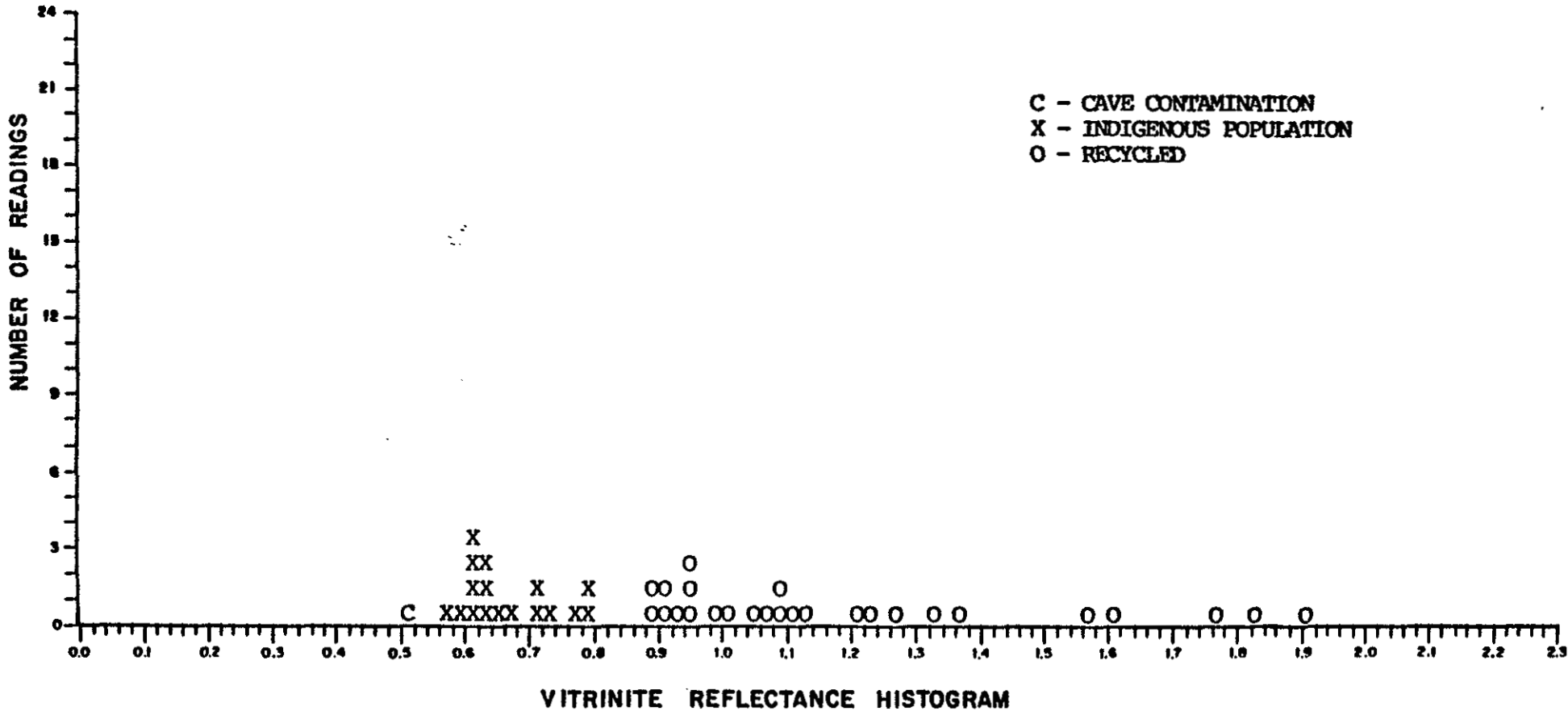


VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-018 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 2350
 CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME _____ CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 44) 0.52 0.58 0.61 0.62 0.62 0.63 0.63 0.64 0.64 0.65 0.67 0.68 0.72 0.73
 0.75 0.78 0.80 0.81 0.90 0.90 0.92 0.93 0.94 0.96 0.96 0.97 1.00 1.02 1.07 1.09 1.10 1.10
 1.12 1.15 1.22 1.24 1.29 1.34 1.38 1.58 1.62 1.79 1.84 1.93

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	1	0.52	0.52	0.52	-	
(2)	17	0.58	0.81	0.68	0.071	
(3)	26	0.90	1.93	1.21	0.308	

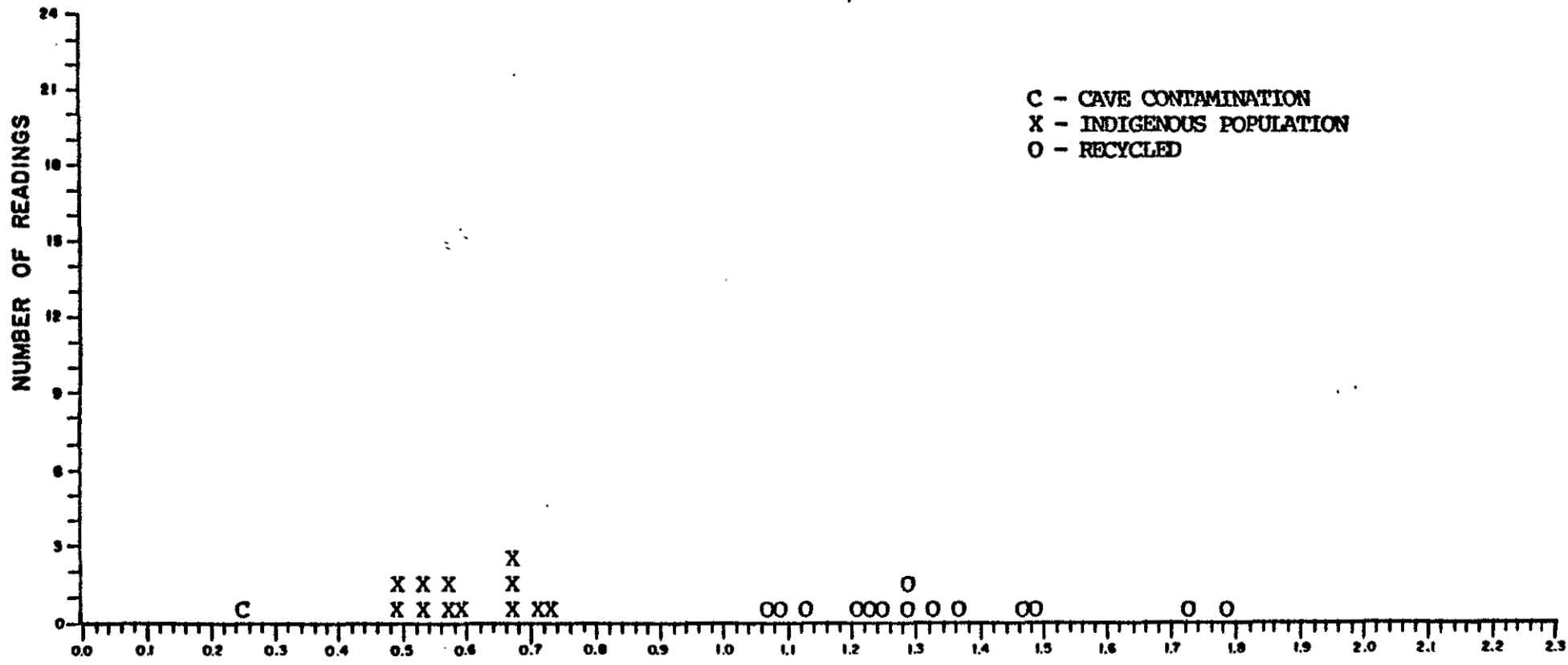


GEOCHEM NO. 2371-021 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 2650

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME _____ CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 27) 0.26 0.50 0.51 0.55 0.55 0.58 0.59 0.60 0.68 0.68 0.69 0.72 0.75 1.09
 1.10 1.15 1.23 1.25 1.27 1.30 1.30 1.35 1.39 1.49 1.51 1.75 1.80

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	1	0.26	0.26	0.26	-	
(2)	12	0.50	0.75	0.62	0.084	
(3)	14	1.09	1.80	1.36	0.217	



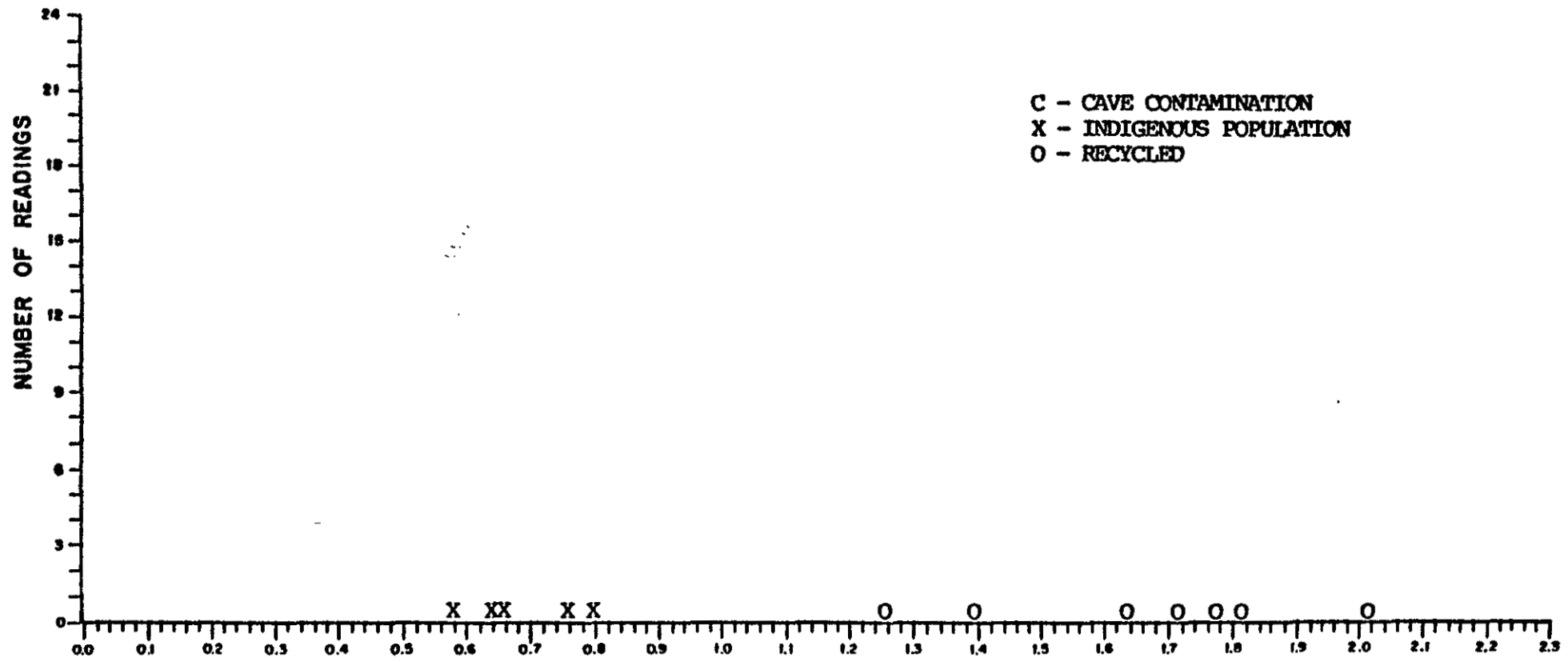
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-025 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 3650

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 12) 0.58 0.64 0.67 0.77 0.80 1.26 1.41 1.64 1.73 1.78 1.83 2.02

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	5	0.58	0.80	0.69	0.091	
(2)	7	1.26	2.02	1.67	0.258	



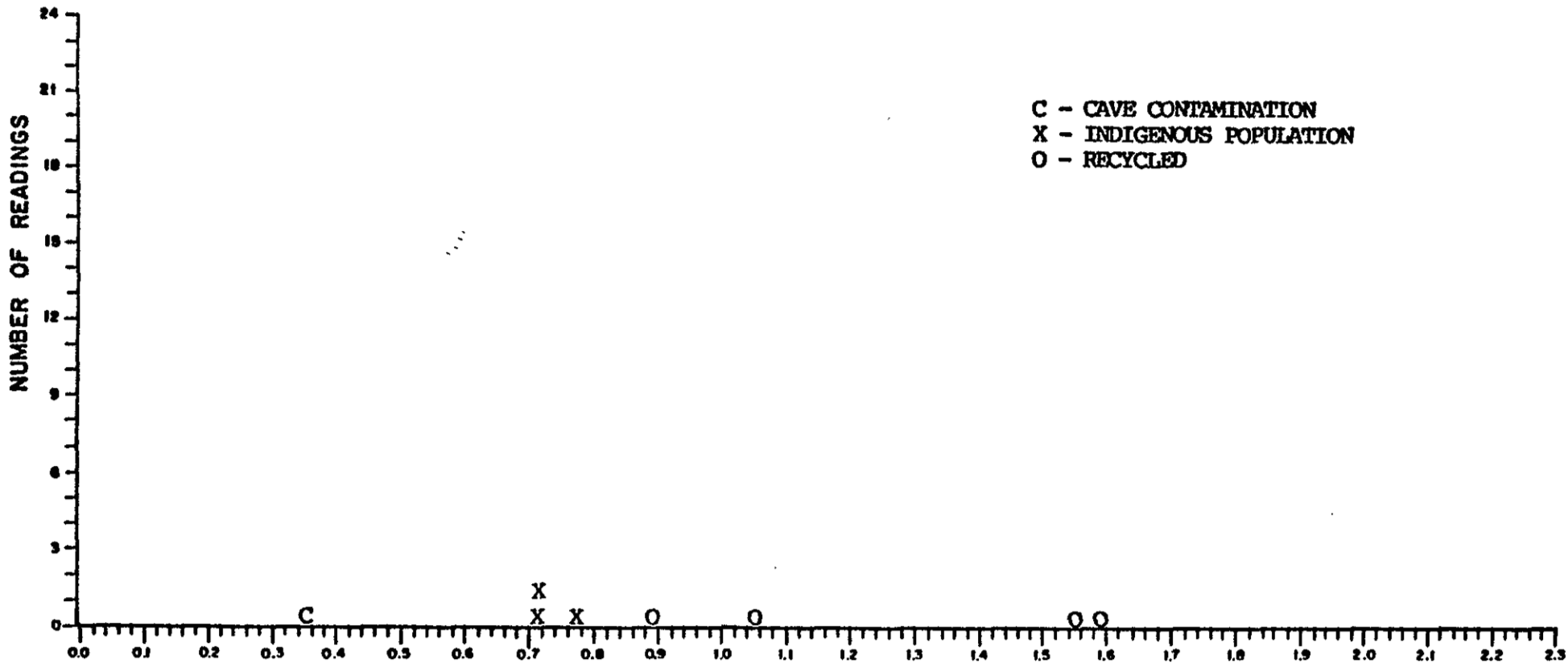
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-030 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 4150

CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME CITIES SERVICE #1 CORRALITOS FED. A

(NO. OF READINGS = 8) 0.37 0.72 0.73 0.79 0.91 1.07 1.57 1.61

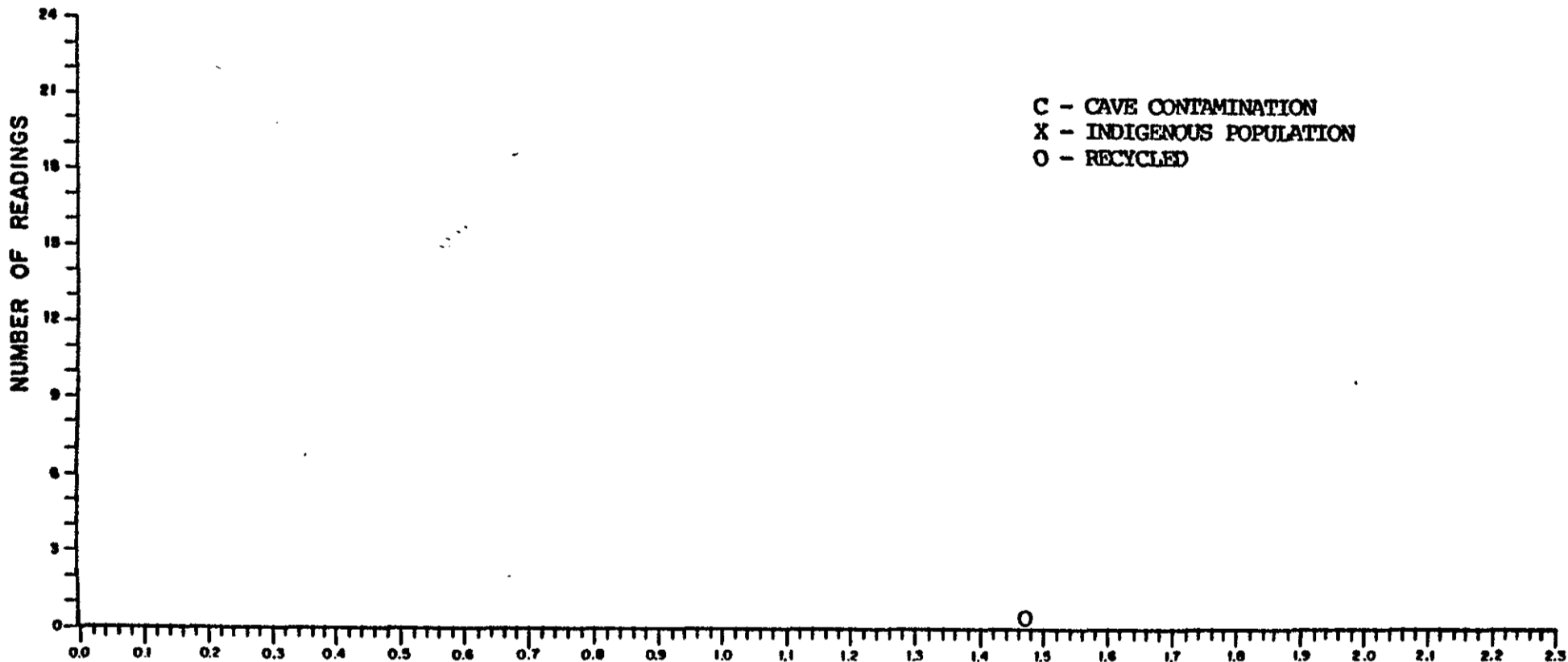
<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	1	0.37	0.37	0.37	-	
(2)	3	0.72	0.79	0.75	0.038	
(3)	4	0.91	1.61	1.29	0.353	



VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. 2371-036 TYPE OF SAMPLE: CTG DEPTH/SAMPLE NO. 4750
 CLIENT'S NAME MARSHALL YOUNG OIL WELL NAME _____ CITIES SERVICE #1 CORRALITOS FED. A
 (NO. OF READINGS = 1) 1.49

<u>POPULATION</u>	<u>NO. OF READINGS</u>	<u>MIN. Ro (%)</u>	<u>MAX. Ro (%)</u>	<u>MEAN Ro (%)</u>	<u>STD. DEV. (%)</u>	<u>REMARKS</u>
(1)	1	1.49	1.49	1.49	-	



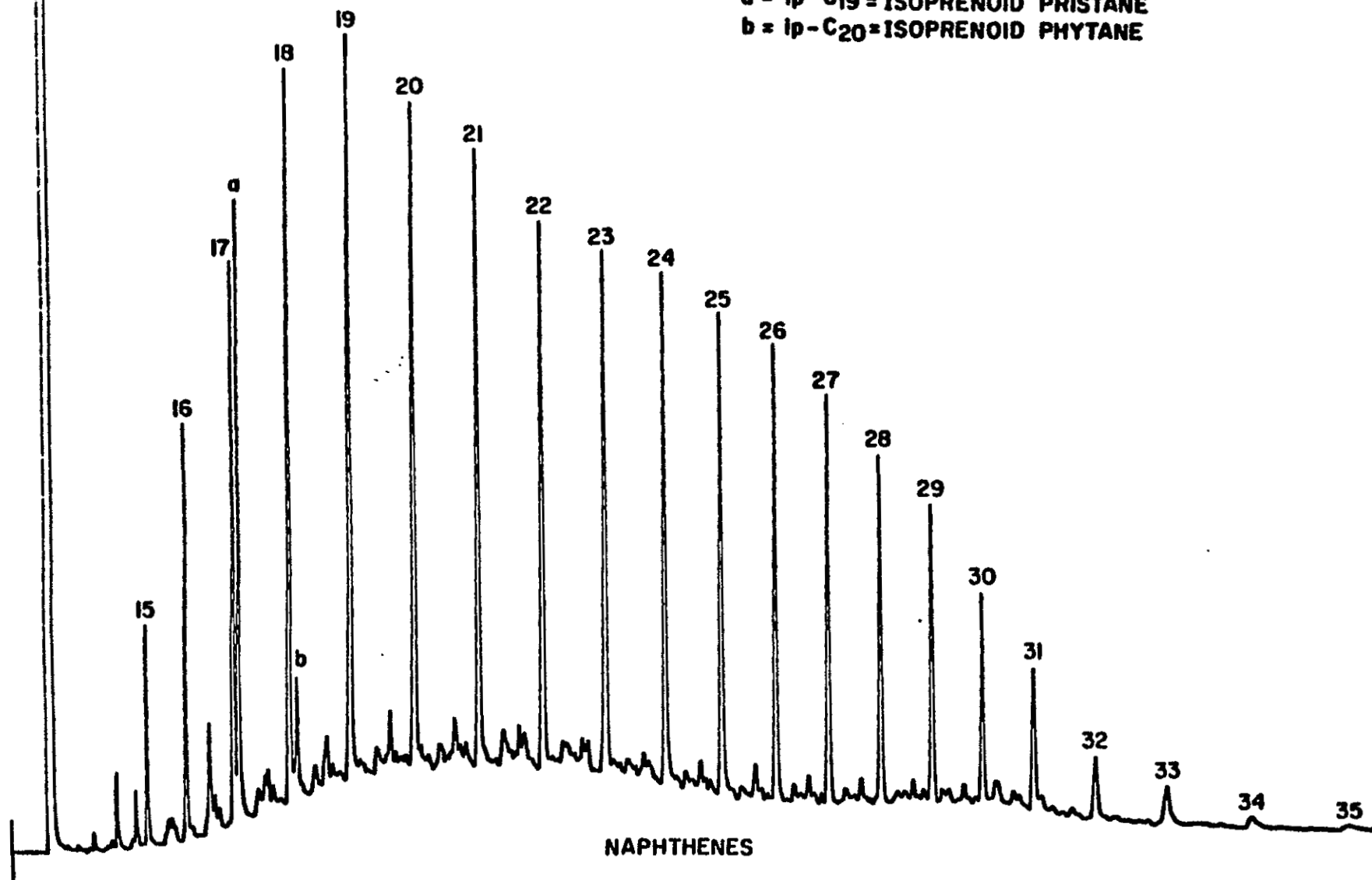
VITRINITE REFLECTANCE HISTOGRAM

Standard

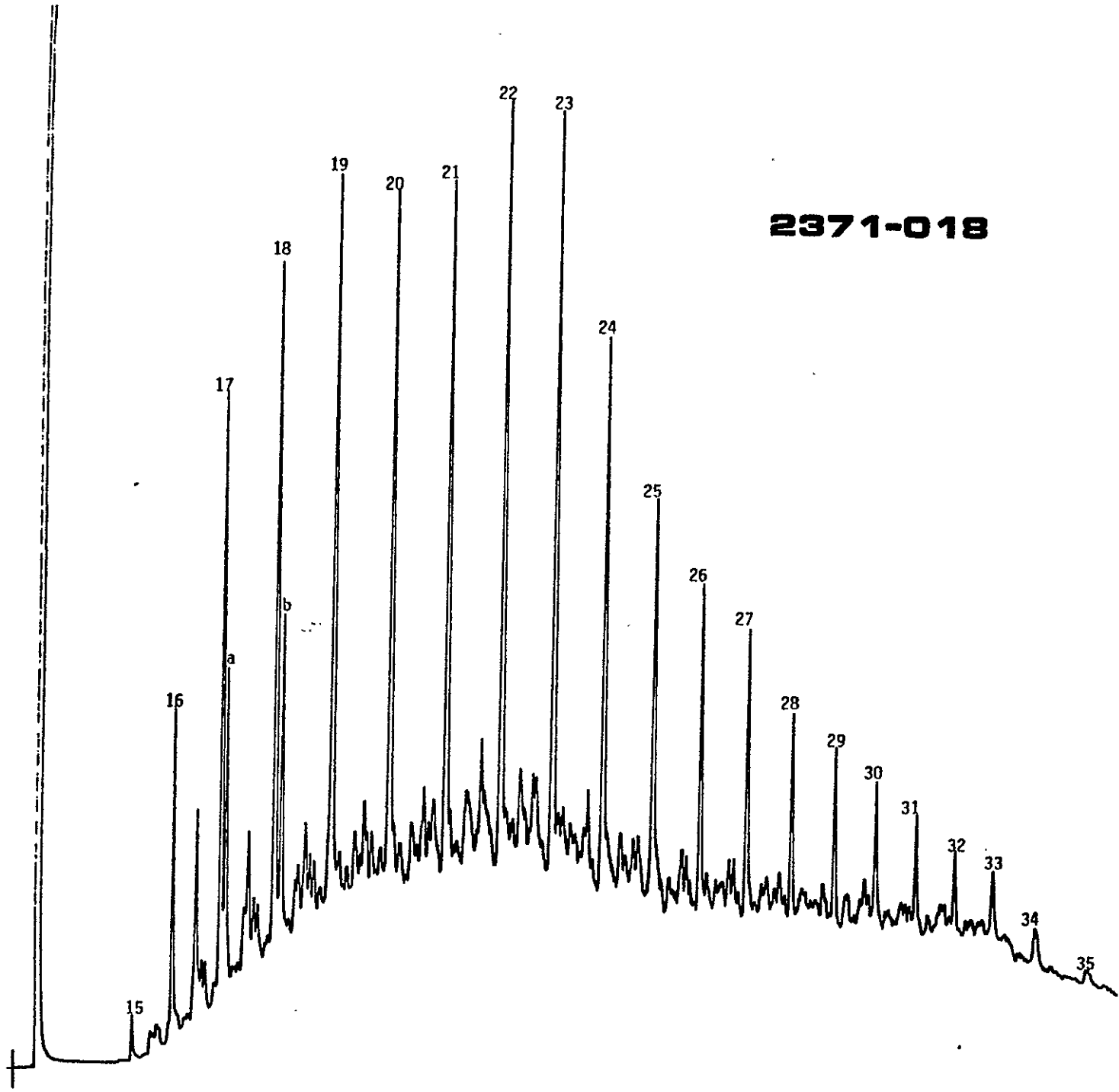
No. DENOTES n -C n PARAFFIN

a = Ip-C₁₉ = ISOPRENOID PRISTANE

b = Ip-C₂₀ = ISOPRENOID PHYTANE



2371-018



2371-025

