(37)

ORGANIC GEOCHEMICAL DATA REPORT

GRI JOB NO. R519

PA-2 Well, Allegheny Co., Pennsylvania

prepared

by

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ORGANIC GEOCHEMICAL DATA

GRI JOB NO. RS19

PA-2 WELL

Table I
Sample Description

GRI Sample Number	Depth (Ft.)	Sample Identification
R519-001	6962 (.16-.37)	Pa-2-1
002	6982 (.31-.60)	Pa-2-2
003	7002 (.36-.56)	Pa-2-3
004	7020 (.42-.62)	Pa-2-4
005	7040 (.31-.51)	Pa-2-5
006	7060 (.46-.70)	Pa-2-6
007	7079 (.19-.42)	Pa-2-7
008	7099 (.29-.56)	Pa-2-8
009	7119 (.39-.62)	Pa-2-9
010	7198 (.25-.47)	Pa-2-10
all	7218 (.12-.34)	Pa-2-11
012	7238 (.20-.42)	Pa-2-12
013	7258 (.33-.61)	Pa-2-13
014	7278 (.57-.78)	Pa-2-14
015	7298 (.46-.74)	Pa-2-15
016	7319 (.40-.65)	Pa-2-16
017	7339 (.44-.70)	Pa-2-17
018	7387 (.37-.55)	Pa-2-18
019	7402 (.31-.61)	Pa-2-19
020	7422 (.28-.54)	Pa-2-20
021	7442 (.26-.47)	Pa-2-21
022	7462 (.42-.64)	Pa-2-22
R519-023	7482 (.44-.60)	Pa-2-23

Table II
Density of Core Sample

GeoChem Sample Number	Density - By Water Displacement
R519-001	2.68
002	2.69
003	2.64
004	2.62
005	2.61
006	2.46
007	2.72
008	2.72
009	2.73
010	2.68
011	2.62
012	2.69
013	2.72
014	2.71
015	2.70
016	2.70
017	2.55
018	2.66
019	2.60
020	2.59
021	2.44
022	2.52
R519-023	2.36

Table III

GeoChem Sampl.e Number	Well Interval	Gross Lithological Description	GSA Color Code
RSl9-00l	6962	100% Shale, very slightly calcareous, tabular, hard, dark gray	N3
	6982	100% Shale, very slightly calcareous, tabular, hard, dark gray	N3
	7002	100% Shale, very slightly calcareous, tabular, hard, dark gray	N3
	7020	100% Shale, extremely slight calcareous, tabular, moderately hard, dark gray	N3
	7040	100% Shale, extremely slight calcareous, tabular, moderately hard, dark gray	N3
	7060	100% Shale, noncalcareous, very slightly pyritic, tabular, hard, dark gray	N3
	7079	100% Hicrite, extremely argillaceous, massive, very hard, medium dark gray	N4
	7099	100% Shale, very calcareous, anhydritic, massive to tabular, hard, medium dark gray	N4
	7119	100% Shale, very calcareous, anhydritic, massive to tabular, hard, medium dark gray	N4
	7198	100% Shale, noncalcareous, massive to tabular, hard, medium dark gray	N4
	7218	100% Shale, noncalcareous, tabular, hard, dark gray	N3
	7238	100% Shale, very slightly calcareous, tabular, moderately hard, medium dark gray	N4
	7258	100% Shale, noncalcareous, slightly anhydritic, tabular, moderately hard, dark gray	N3
	7278	100% Shale, very slightly calcareous, very slightly anhydritic, very slightly micromicaceous, tabular, moderately hard, dark gray	N3
R519-015	7298	100% Shale, very slightly calcareous, slightly anhydritic, tabular, moderately hard, dark gray	N3

L

L

GeoChem Sample Number	Well Interval	Gross Lithological Description	GSA Color Code
R519-016	7319	100% Shale, very slightly calcareous, slightly anhydritic, tabular, moderately hard, dark gray	N3
017	7339	100% Shale, very slightly calcareous, tabular, moderately soft, dark gray	N3
018	7387	100% Shale, slightly calcareous, very slightly anhydritic, tabular, moderately hard, dark gray	N3
019	7402	100% Shale, nonca1careous, tabular, very fissile, moderately hard, medium dark gray	N4
020	7422	100% Shale, noncalcareous, tabular, moderately hard, dark gray	N3
021	7442	100% Shale, very slightly calcareous, massive to tabular, quartz fractures - partially pyritized, hard, grayish black	N2
022	7462	100% Shale, very slightly calcareous, massive to tabular, very fissile, moderately hard) grayish black	N2
R5l9-023	7482	100% Shale) very slightly calcareous, very slightly carbonaceous, very slightly micromicaceous, tabular, moderately hard, grayish black	N2

Table IV
Organic Carbon Content

GRI Sample Number	Organic Carbon Content (Wt.%)
R519-001	0.7.9
002	0.73
003	1.47
004	2.08
005	1.37
006	5.37
007	0.10
008	0.22
009	0.31
010	0.60
011	1.48
012	0.48
013	0.40
014	0.42
015	0.39
016	0.41
017	3.86
018	1.51
019	2.72
020	2.11
021	0.73
022	5.29
R519-023	7.19

Tahle Y - A
Pressure/Vacuum in Container

GRI Sample Number	Volume Displacement (cc of water)
RS19-00l	o
002	Slight vacuum
003	o
004	o
005	o
006	Slight vacuum
007	**112**
008	Slight pressure
009	31
010	o
all	Slight pressure
012	Slight pressure
013	Slight vacuum
014	Slight vacuum
015	Slight vacuum
016	Slight vacuum
017	Slight vacuum
018	Slight pressure
019	64
020	50
021	a
022	a
RS19-023	Slight vacuum

Table V - B

C_{1-C7} HYDROCARBON ANALYSES OF AIR SPACE

GeoChem Sample Number	Methane C1 PPM	Ethane C2 PPM	Propane C3 PPM	Isobutane iC4 PPM	Butane nC4 PPM	Total C5-C7 PPM	Total C1-C4 PPM	Total C2-C4 PPM	Gas Wetness %	iC4/nC4
R519-001	237573	*30483*	*1405*	94	232	130	269787	32214	11.9	0.41
002	166854	28512	816	11	34	0	196227	29373	14.9	0.32
003	26204	30987	950	8	25	49	58199	31995	54.9	0.32
004	282142	66608	1661	0	22	0	350428	68286	19.5	
005	159600	40702	1358	9	19	0	201688	42088	20.9	0.47
006	43945	27169	478	7	18	0	79718	35773	44.9	0.39
007	151084	3198	87	2	8	0	154377	3293	2.1	0.25
008	264422	10560	300	2	11	0	275293	10871	3.9	0.18
009	254967	11338	319	2	8	0	266632	11665	4.4	0.25
010	129388	34136	1644	18	40	0	165226	35838	21.7	0.45
011	137133	44621	1432	11	28	0	183225	46092	25.1	0.39
012	23889	10561	663	4	15	0	35128	11239	32.0	0.27
013	1800	254	0	0	0	0	2054	254	12.4	
014	168360	36182	2181	61	116	0	206900	38540	18.6	0.52
015	2235	374	41	33	49	0	2732	497	18.2	0.67
016	56162	11332	615	30	48	0	68187	12025	17.6	0.62
017	147234	66821	1523	9	22	0	215609	68375	31.7	0.41
018	209955	49479	1107	13	24	0	260578	50623	19.4	0.54
019	312496	*65805*	1528	13	25	0	379867	67371	17.7	0.52
020	279270	63136	1527	13	28	0	343974	64704	18.8	0.46
021	8297	4513	126	8	12	0	12956	4659	35.9	0.67
022	179955	64198	1595	16	27	0	245791	65836	26.8	0.59
R519-023	146554	97699	2599	31	50	0	246933	100379	40.7	0.62

Table V - C

Cl-C7 HYDROCARBON ANALYSES OF CORE NATERIAL

GeoChem Sample Number	Methane Cl PPM	Ethane C2 PPM	Propane C3 PPM	Isobutane iC4 PPM	Butane nCL, PPM	Total C5-C7 PPM	Total C1-C4 PPM	Total C2-C4 PPM	Gas Wetness %	iC4/nCL,
R519-001	11503	13633	1186	20	41	0	26383	14880	56.4	0.49
002	16\001	11187	1361	62	90	0	28701	12700	L,4.2	0.69
003	25747	15070	1609	24	49	0	42499	16752	39.4	0.49
004	18579	22229	1686	17	38	0	42549	23970	56.3	0.45
005	15701	13168	1961	24	45	0	30899	15198	L9.2	0.53
006	9785	35417	1705	14	31	0	46952	37167	79.2	0.45
007	23230	990	171	31	31	13	24453	1223	5.0	1.00
008	12731	3605	600	13	29	0	16978	42L,7	25.0	O.45
009	13808	2799	452	13	25	0	17097	3289	19.2	0.52
010	2623	2931	748	13	28	0	63L13	3720	58.6	0.46
Oll	14959	22040	2138	25	58	0	39220	24261	61.9	0.43
012	5128	5019	1840	41	84	0	12112	6984	57.7	O.f,9
013	7039	4548	1539	47	94	0	13267	6228	46.9	0.50
014	10601	5271	1664	45	85	0	17666	7065	39.9	0.53
015	8056	5089	1507	43	79	0	1477L,	6718	45.5	0.54
016	12449	4664	1882	69	130	0	19194	6745	35.1	0.53
017	12135	34131	1869	16	35	0	48186	36051	74.8	0.46
018	37295	27274	1937	19	39	0	66564	29269	4L,.0	0.49
019	15145	25438	1319	17	32	0	41951	26806	63.9	0.53
020	6782	19517	1468	14	30	0	27811	21029	75.6	0.47
021	106!588	50110	3904	47	86	0	160735	54147	33.7	0.55
022	45815	65843	33L,4	34	66	0	115102	69287	60.2	0.52
R519-023	11904	23941	1251	15	25	0	37136	25232	67.9	0.60

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Table V - D

CI-C7 HYDROCARBON ANALYSES OF AIR SPACE AND CORE MATERIAL

GeoChem Sample Number	Methane Cl PPM	Ethane C2 PPM	Propane C3 PPM	Isobutane iCLj PPM	Butane nCLI PPM	Total C5-C7 PPM	Total Cl-C4 PPM	Total C2-Ct1 PPM	Gas Wetness %	iC4/nC4
R519-001	249076	44116	2591	114	273	130	296170'	4709LI	15.9	0.42
002	182855	39699	2177	73	124	0	224928	42073	18.7	0.59
003	51951	46057	2559	32	74	49	100673	48722	L18.4	0.43
004	300721	88837	33117	28	55	0	392988	92267	23.5	0.51
005	175301	53870	3319	33	64	0	232587	57286	24.6	0.52
006	53730	62586	2183	21	49	'0	118569	64839	54.7	a.lf3
007	174314	4188	258	33	39	13	178832	LI518	2.5	0.85
008	277153	14165	900	15	40	a	292273	15120	5.2	0.38
009	268775	14137	771	15	33	0	283731	14956	5.3	0.45
010	132011	37067	2392	31	68	0	171569	39558	23.1	o.l16
011	152092	66661	3570	36	86	0	222445	70353	31. 6	O.42
012	29017	15580	2503	45	99	0	47244	18227	38.6	0.45
013	8839	4802	1539	47	97	0	15324	6485	L12.3	0.48
014	180500	41453	3845	106	201	0	226105	45605	20.2	0.53
015	10291	5463	1548	76	128	0	17506	7215	41. 2	0.59
016	68611	15996	2497	99	178	a	87381	18770	21.5	0.56
017	159369	100952	3392	25	57	0	363795	104426	28.7	0.44
018	247250	76753	3044	32	63	0	324003	76753	23.7	0.51
019	327641	91243	2847	30	57	0	421818	94177	22.3	0.53
020	286052	82653	2995	27	58	0	371785	85733	23.1	0.47
021	114885	54623	4030	55	98	a	173691	58806	33.9	0.56
022	225770	130041	4939	50	93	0	360893	135123	37.4	0.54
R519-023	158458	121640	3850	46	75	0	284069	125611	44.2	0.61

TABLE VI

VISUAL KEROGEN ASSESSMENT WORKSHEET

R519

TYPE OF ORGANIC MATTER	COLOR OF ORGANIC MATTER	STATE OF ORGANIC MATTER	MATURATION INDEX	DEPOSITIONAL ENVIRONMENT

GEOCHEM No.	DEPTH	RECOGNIZABLE ALGAE	AMORPHOUS - SAPROPEL	RELIC AMORPHOUS	SPORES - POLLEN	DEGRADED HERBACEOUS	CUTICLE - MEMBRANOUS DEBRIS	WOODY - STRUCTURED DEBRIS	COALY - INERTINITE DEBRIS	PYROBITUMEN	NONFLUORESCENT DEBRIS	GREENISH LIGHT YELLOW	YELLOW	YELLOW ORANGE	ORANGE BROWN	LIGHT BROWN	BROWN	DARK BROWN	BLACK	FINELY DISSEMINATED	FINE	MEDIUM	COARSE	EXCELLENT	GOOD	FAIR	POOR	UNALTERED	SLIGHTLY ALTERED	MODERATELY ALTERED	STRONGLY ALTERED	SEVERELY ALTERED	METAMORPHOSED	OFFSHORE MARINE	NEARSHORE MARINE	RESTRICTED NEARSHORE - MARSH	LACUSTRINE	CONTINENTAL	REMARKS	SUMMARY ORGANIC MATTER TYPE
R519-001	6962																																								
002	6982																																								
003	7002																																								
004	7020																																								
005	7040																																								
006	7060																																								
007	7079																																								
008	7099																																								
009	7119																																								
010	7198																																								
011	7218																																								
012	7238																																								
013																																									
014																																									
015																																									
016	7319																																								
017	7339																																								
018	7387																																								
019	7402																																								
519-020	7422																																								

TABLE

VISUAL KEROGEN ASSESSMENT WORKSHEET

R519 -

GEOCHEM No.	DEPTH	TYPE OF ORGANIC MATTER	COLOR OF ORGANIC MATTER	STATE OF ORGANIC MATTER	MATURATION INDEX	DEPOSITIONAL ENVIRONMENT	REMARKS	SUMMARY ORGANIC MATTER TYPE
RS19-021	7442							
022	7462							
RS19-023	7482							

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
R519-001	6962.4	CORE	NO VITRINITE						
R519-002	6982.6	CORE	(1)	40	2.22	2.92	2.56*	0.154	
R519-003	7002.6	CORE	(1)	1	1.01	1.01	1.01		
			(2)	17	2.16	.2.83	2.42*	0.213	
R519-004	7020.6	CORE	(1)	26	2.01	2.66	2.34*	0.172	
			(2)	9	2.93	3.38	3.12	0.157	
R519-005	7040.5	CORE	NO VITRIN ITE						
R519-006	7060.7	CORE	(1)	34	1.90	2.54	2.27*	0.122	
			(2)	16	2.63	3.26	2.79	0.173	
R519-007	7079.4	CORE	INSUFFICIENT KEROGEN FLOAT						
R519-008	7099.6	CORE	INSUFFICIENT KEROGEN FLOAT						
R519-009	7119.6	CORE	(1)	45	2.14	2.73	2.49*	0.128	
			(2)	5	2.86	3.27	3.06	0.175	
R519-010	7198.5	CORE	(1)	50	2.04	3.07	2.56*	0. 248	
R5119-011	7218.3	CORE	(1)	48	2.05	3.12	2.56*	0.235	
			(2)	2	3.57	3.93	3.75		
R519-012	7238.4	CORE	(1)	39	2.15	3.09	2.53*	O. 218	
			(2)	1	3.41	3.41	3.41		
R5119-013	7258.6	CORE	(1)	8	2.32	3.20	2.69*	0.305	

* Indigenous Population

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
RS19-014	7278.8	CORE	NO VITRINITE						
RS19-01\S	7298.7	CORE	(1)	36	2.17	2.9S	2.SS-	0.182	
			(2)	4	3.12	3.41	3.22	0.135	
RS19-016	7319.7	CORE	(1)	1	1.55	1.55	1.55		
			(2)	36	2.16	3.09	2.59*	0.237	
			(3)	3	3.40	3.76	3.53	0.200	
R519-017	7339.7	CORE	NO VITRINITE						
RS19-018	7387.6	CORE	(1)	38	1.98	2.84	2.36*	0.201	
			(2)	2	3.12	3.62	3.37		
R519-019	7402.6	CORE	NO VITRINITE						
R519-020	7422.S	CORE	(1)	3	1.55	1.82	1.66	0.140	
			(2)	42	2.02	2.88	2.49*	0.220	
RS19-021	7442.5	CORE	INSUFFICIENT KEROGEN FLOAT						
RS19-022	7462.6	CORE	(1)	40	1.98	2.71	2.34*	0.172	
R519-023	7482.6	CORE	(1)	40	2.05	2.90	2.48*	0.179	

* Indegenous Population

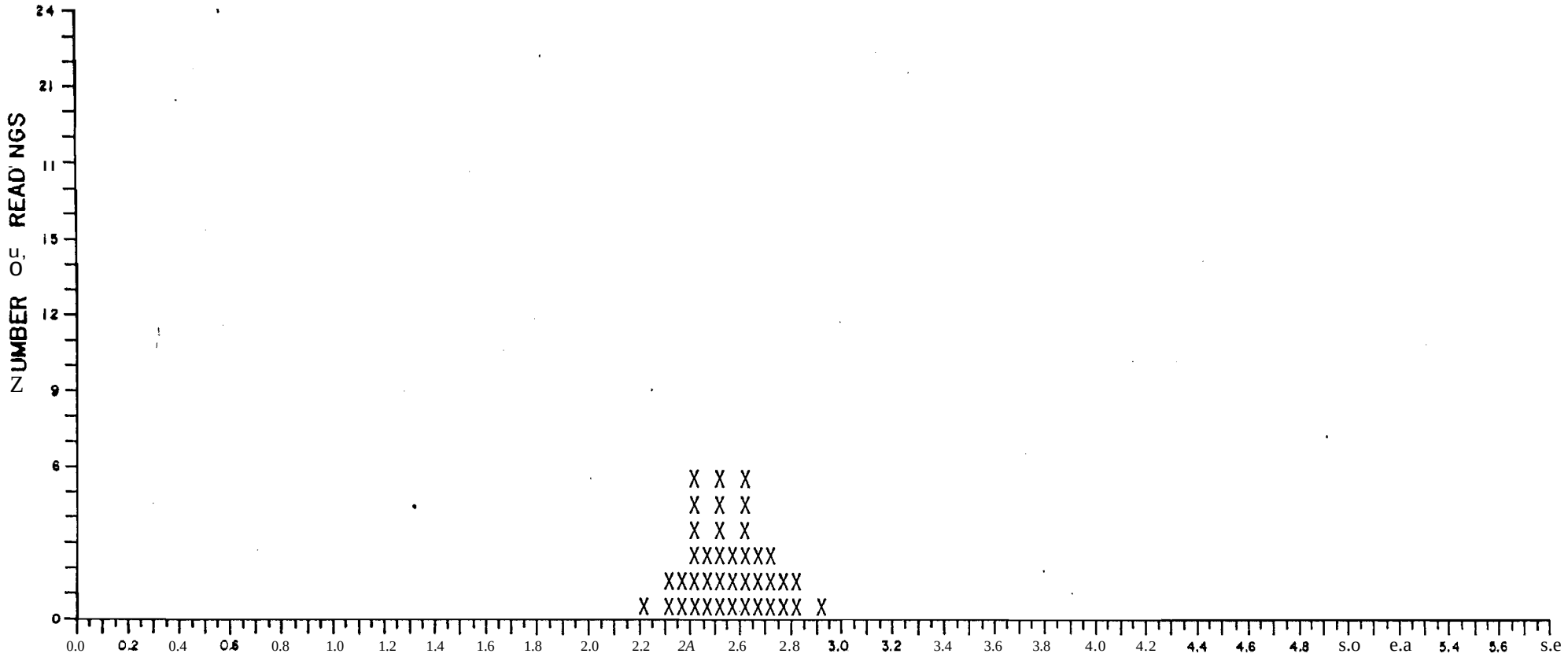
Table VIII

R519-002 CORE

MONSANTO

(NO. OF READINGS = 40) 2.22 2.34 2.34 2.35 2.35 2.40 2.42 2.43 2.43 2.44 2.44 2.45 2.45 2.49
2.52 2.52 2.53 2.53 2.53 2.54 2.55 2.58 2.59 2.60 2.60 2.61 2.62 2.62 2.62 2.66 2.66 2.69
2.70 2.73 2.74 2.75 2.76. 2.82 2.82 2.92

POpULATION	NO. Of READINGS	MIN. Ro{%)	MAX. Ro (%)	MEAN Ro{%)	STD. DEV. (%)	REMARKS
(1)	40	2.22	2.92	2.56	0.154	



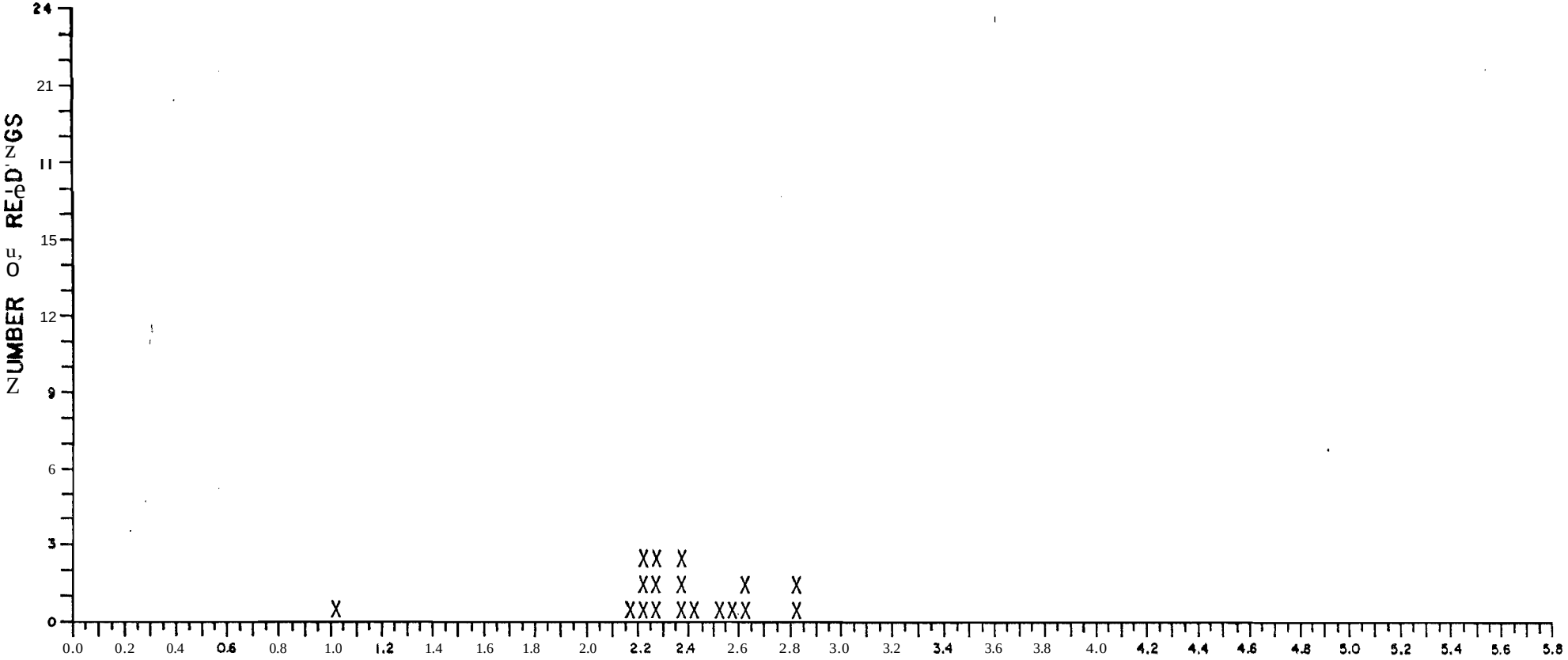
VITRINITE REFLECTANCE HISTOGRAM

R519-003 CORE

MONSANTO WELL NAME

(NO. OF READINGS = 18) 1.01 2.16 2.20 2.20 2.22 2.25 2.25 2.28 2.37 2.37 2.38' 2.43 2.50 2.58 2.60 2.64 2.82 2.83

POPULATION	NO. Of READINGS	MIN, Ro (%)	MAX. Ro (%)	MEAN Bo(%)	SID, DEV. (%)	REMARKS
(1)	1	1.01	1.01	1.01		
(2)	17	2.16	2.83	2.42	0.213	



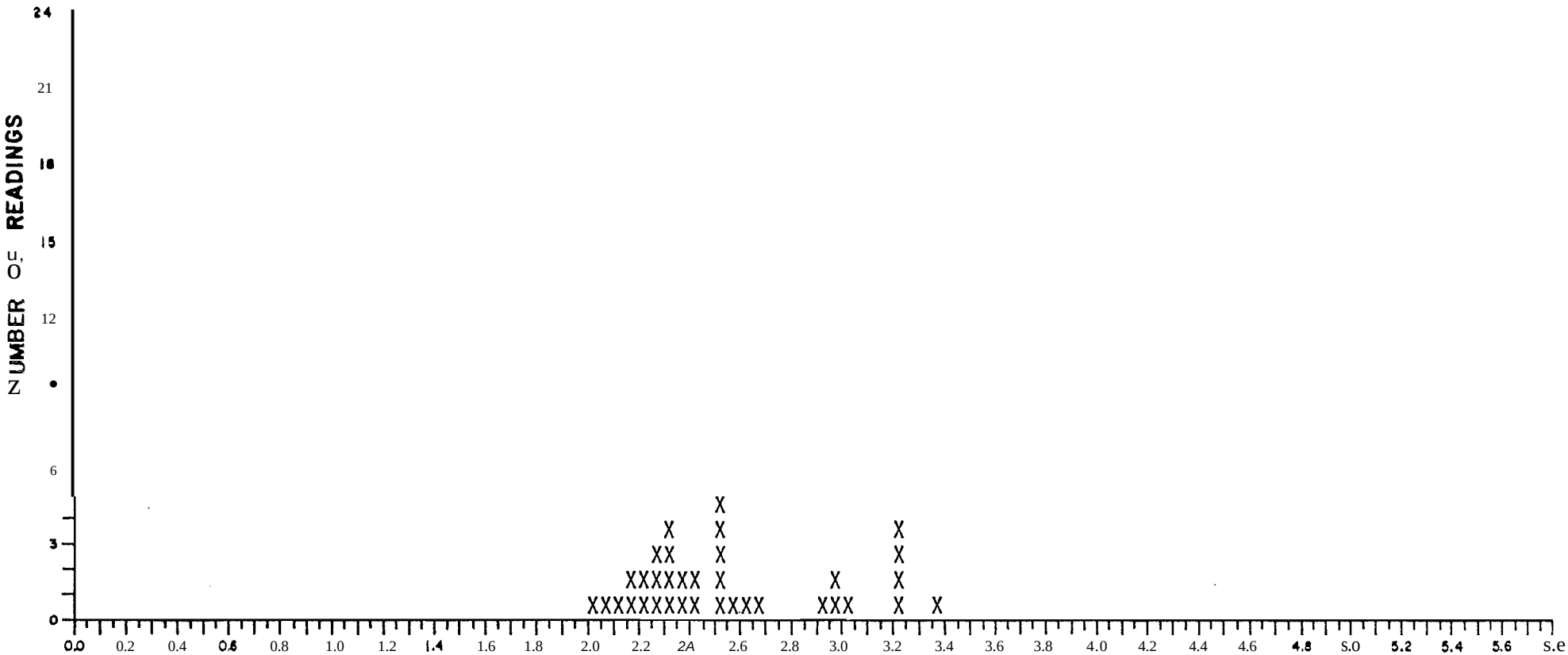
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519-004 TYPE OF SAMPLE: CORE DEPTH /SAMPLE NO. 7020.6

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #2

(NO. OF READINGS = 35) 2.01 2.06 2.11 2.17 2.18 2.20 2.20 2.25 2.26 2.26 2.31 2.31 2.33 2.33 2.35 2.37 2.42 2.43 2.50 2.51 2.51 2.52 2.54 2.55 2.60 2.66 2.93 2.96 2.96 3.04 3.20 3.20 3.22 3.23 3.38

POPULATION	NO. Of READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	26	2.01	2.66	2.34	0.172	
(2)	9	2.93	3.38	3.12	0.157	



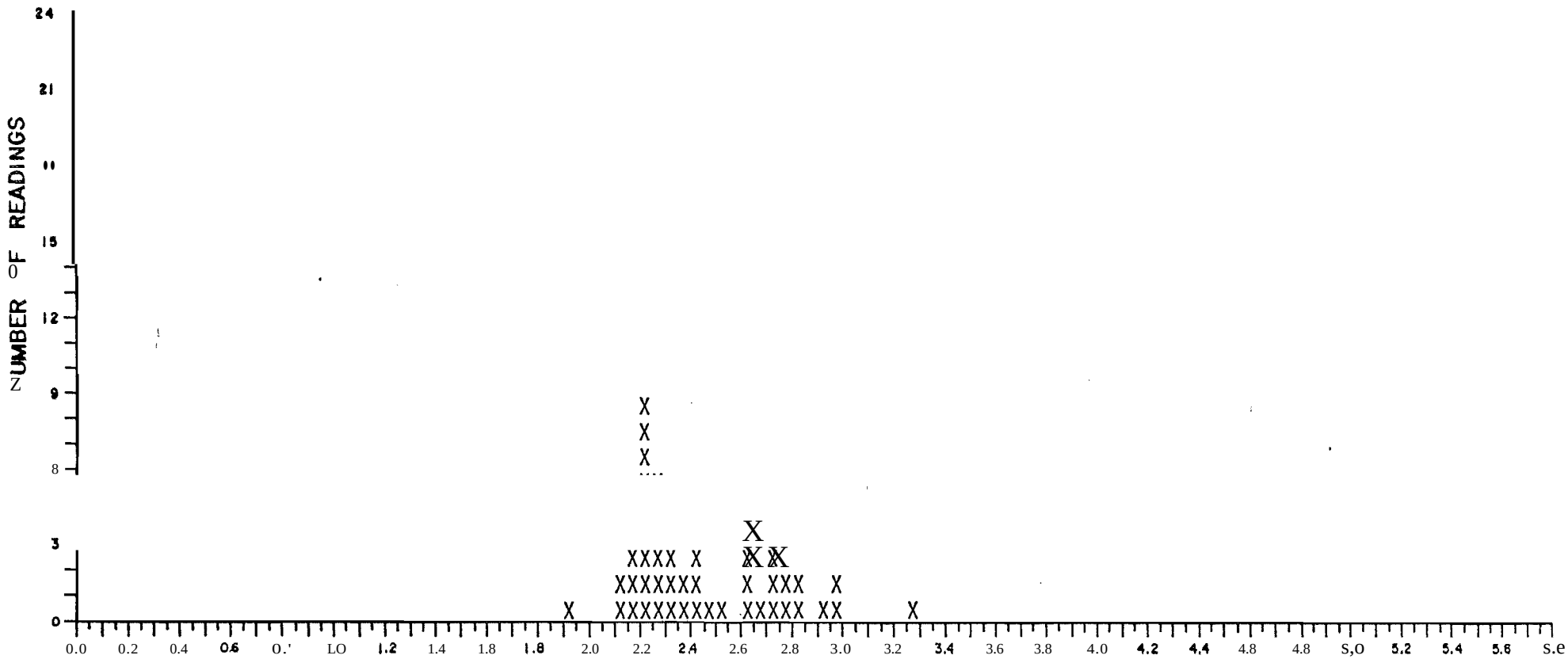
VITRIN ITE REFLECTANCE HISTOGRAM

R519-006 CORE

CLIENT'S NAME MONSANTO WELL NAME

(NO. OF READINGS = 50) 1.90 2.13 2.14 2.15 2.15 2.17 2.20 2.20 2.21 2.22 2.22 2.22 2.22 2.22
2.23 2.25 2.26 2.27 2.27 2.28 2.28 2.33 2.33 2.33 2.33 2.34 2.37 2.38 2.41 2.41 2.43 2.43
2.48 2.54 2.63 2.63 2.63 2.64 2.66 2.70 2.71 2.73 2.77 2.77 2.81 2.83 2.92 2.98 2.98 3.26

POPULATION	NO. Of READINGS	MIN, Ro (%)	MAX. Ro (%)	MEAN Ro(%)	SID. DEV. (%)	REMARKS
(1)	34	1.90	2.54	2.27	0.122	
(2)	16	2.63	3.26	2.79	0.173	



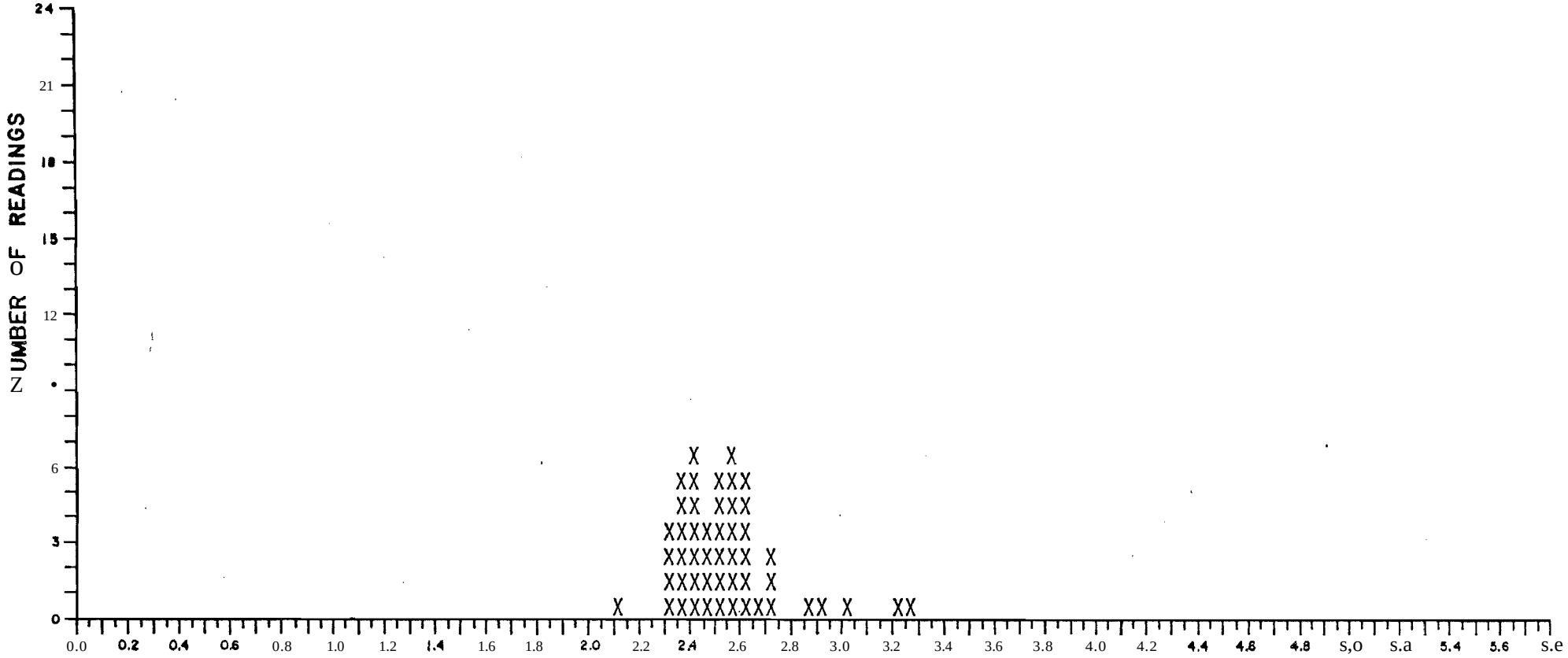
VITRINITE REFLECTANCE HISTOGRAM

R519-009 CORE

CLIENT'S NAME MONSANTO WELL NAME

(NO. OF READINGS = 50) 2.14 2.30 2.30 2.33 2.34 2.35 2.36 2.36 2.36 2.37 2.37 2.40 2.40 2.41
2.41 2.43 2.44 2.44 2.45 2.45 2.46 2.47 2.50 2.51 2.51 2.53 2.54 2.54 2.55 2.55 2.55 2.56
2.56 2.57 2.58 2.60 2.61 2.63 2.63 2.63 2.64 2.65 2·.71 2.72 2.73 2.86 2.94 3.02 3. 21 3.27

POPULATION	NO. Of READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN RQ(%}	SID. DEV. (%)	REMARKS
(1)	45	2.14	2.73	2.49	0.128	
(2)	5	2.86	3.27	3.06	0.175	



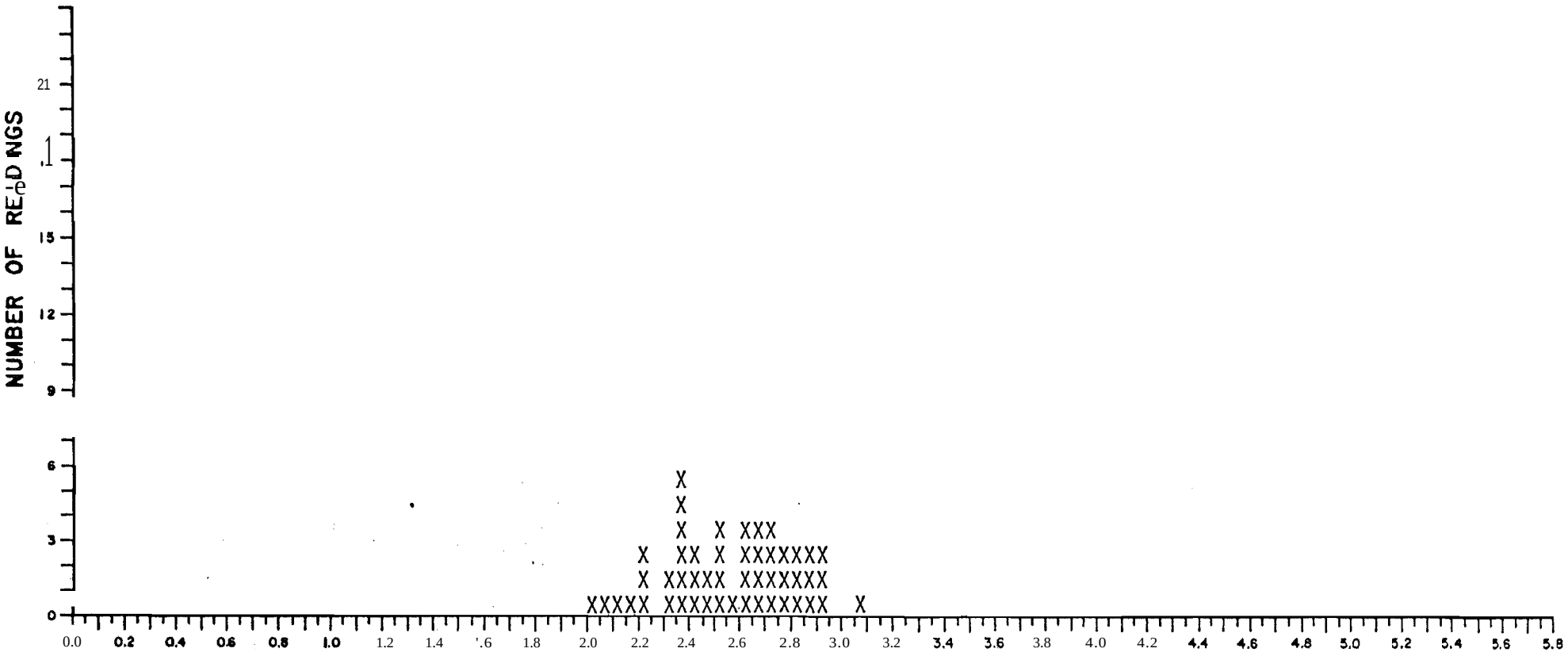
VITRINITE REFLECTANCE HISTOGRAM

R519-010 CORE

CLIENT'S NAME MONSANTO WELL NAME

(NO. OF READINGS = 50) 2.04 2.07 2.14 2.16 2.20 2.23 2.24 2.32 2.34 2.35 2.35 2.35 2.37 2.37
2.39 2.40 2.41 2.44 2.47 2.48 2.52 2.52 2.53 2.54 2.55 2.61 2.64 2.64 2.64 2.65 2.65 2.68
2.68 2.71 2.71 2.71 2.72 2.75 2.75 2.77 2.80 2.83 2.84 2.85 2.85 2.89 2.91 2.91 2.91 3.07

POPULATION	NO, Of READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	SID. DEV. (%)	REMARKS.
(I)	50	2.04	3.07	2.56	0.248	



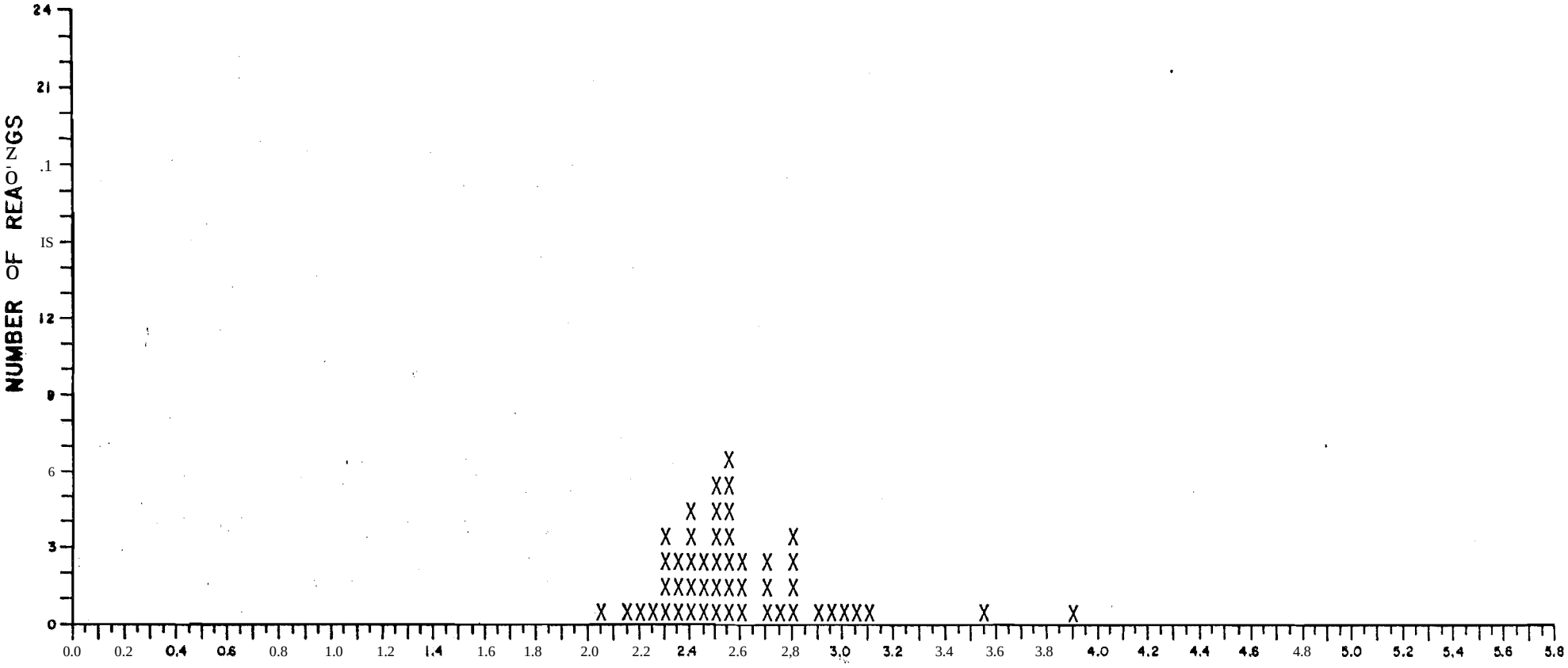
VITRINITE REFLECTANCE HISTOGRAM

R5119-011 CORE

CLIENT'S NAME MONSANTO WELL NAME

(NO. OF READINGS = 50) 2.05 2.17 2.23 2.25 2.32 2.34 2.34 2.34' 2.35 2.36 2.37 2.40 2.41 2.41
2.42 2.43 2.45 2.45 2.48 2.50 2.52 2.52 2.52 2.52 2.54 2.55 2.55 2.55 2.56 2.58 2.58 2.59
2.61 2.63 2.63 2.73 2.74. 2.74 2.75 2.80 2.82 2.83 2.84 2.91 2.96 3.03 3.08 3.12 3.57 3.93

POPULATION	NO, OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro(%)	SID. DEV. (%)	REMARKS
(1)	48	2.05	3.12	2.56	0.235	
(2)	2	3.57	3.93	3.75		



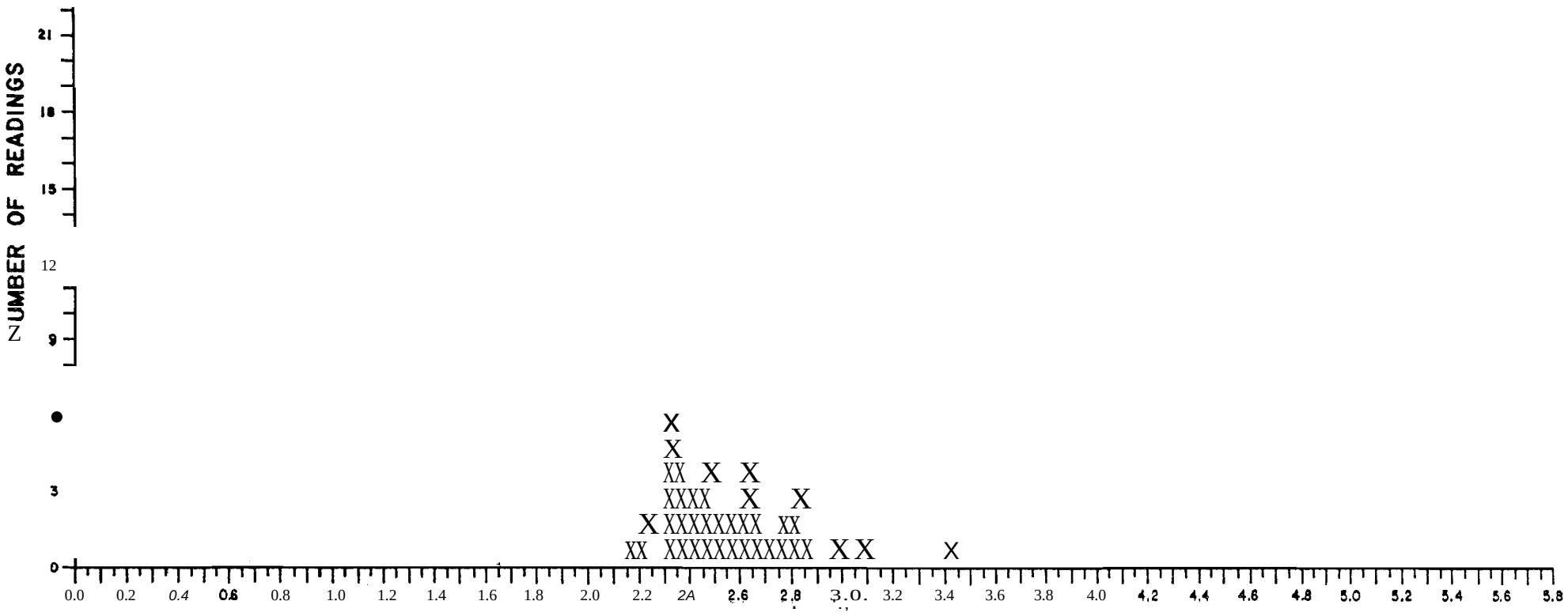
VITRIN ITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519-012 TYPE OF SAMPLE: CORE DEPTH /SAMPLE NO. 7238.4

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #2

(NO. OF READINGS =40) 2.15 2.21 2.24 2.31 2.32 2.34 2.34 2.34 2.34 2.36 2.37 2.37 2.39 2.40
2.42 2.43 2.45 2.46 2.47 2.48 2.50 2.52 2.55 2.56 2.61 2.61 2.63 2.64 2.65 2.68 2.71 2.76
2.78 2.81 2.81 2.84 2.85 2.96 3.09 3.41

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	39	2.15	3.09	2.53		
(2)	1	3.41	3.41	3.41		



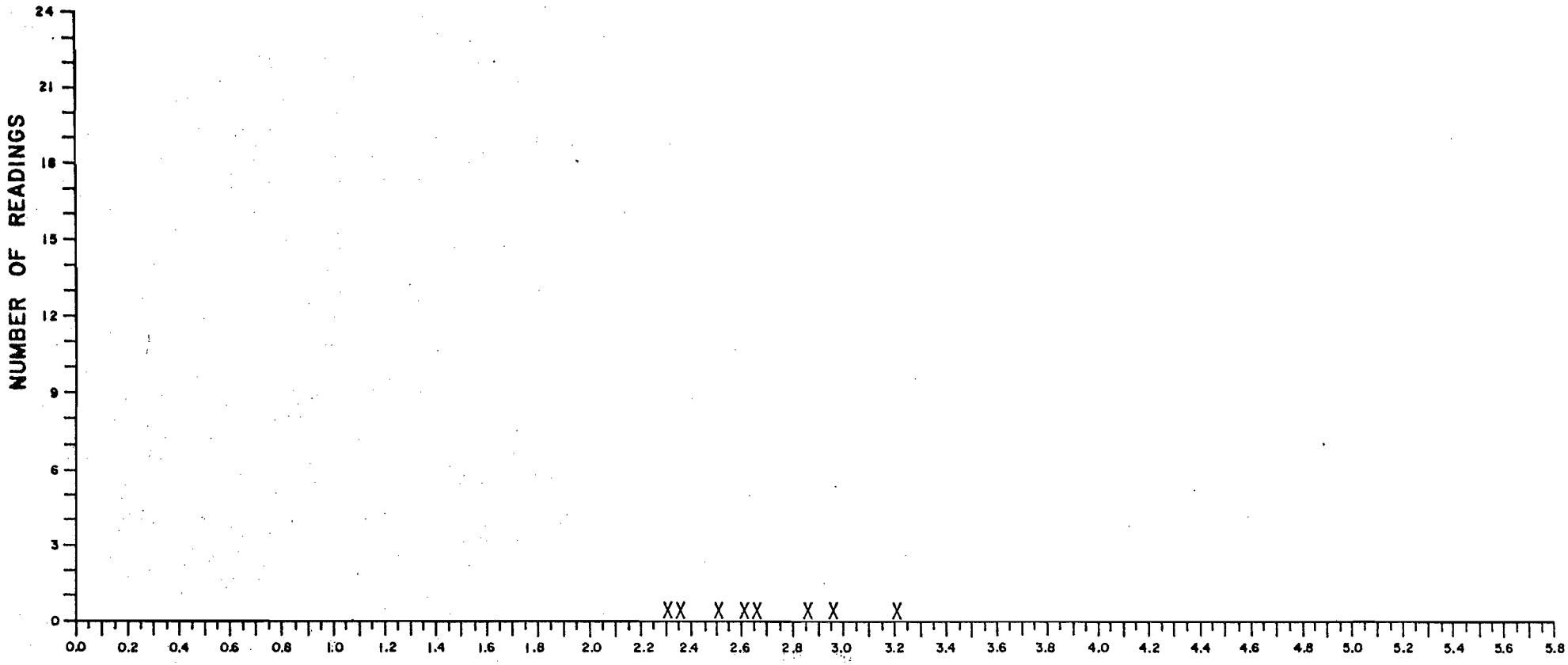
VITRINITE REFLECTANCE HISTOGRAM

R5U9-013 CORE

CLIENTtS NAME MONSANTO WELL NAME _____

(NO. OF READINGS = 8) 2.32 2.362.54 2.60 2.65 2.86 2.98 3.20

POPULATION	NO.' OF READINGS	MIN. Ro(%)	MAX. Ro (%)	MEAN Ro(%)	STD. DEV. (%)	REMARKS
(1)	8	2.32	3.20	2.69	0.305	



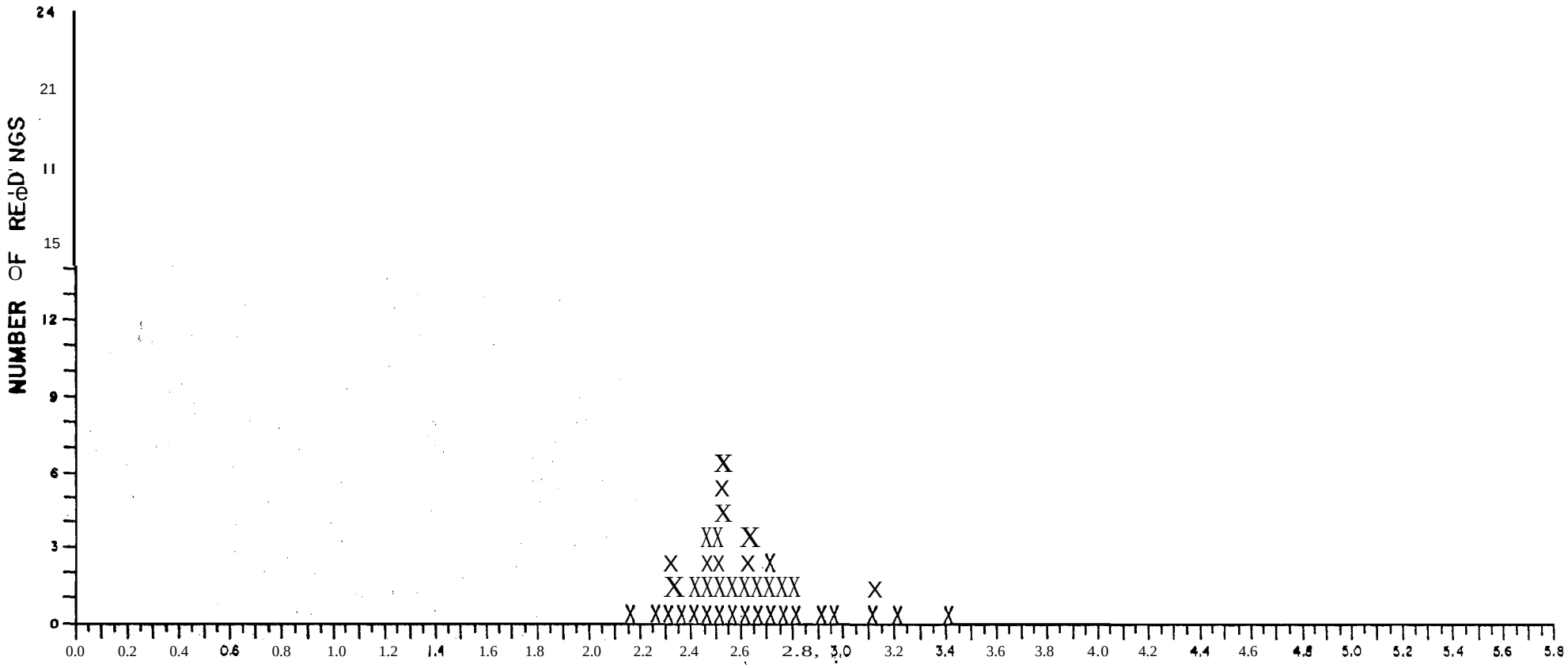
VITRIN ITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519-015 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 7298.7

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #2

(NO. OF READINGS = 40) 2.17 2.26 2.31 2.32 2.33 2.38 2.41 2.44 2.45 2.46 2.46 2.48 2.50 2.51
2.51 2.-52 2.53 2.54 2.54 2.55 2.55 2.63 2.64 2.64 2.64 2.67 2.68 2.71 2.72 2.74 2.75 2.77
2.80 2.84 2.92 2.95 3.12 3.13 3.21 3.41

POPULATION	NO. Of READINGS	MIN, Ro (%)	MAX, Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	36	2.17	2.95	2.56	0.182	
(2)	4	3.12	3.41	3.22	0.135	



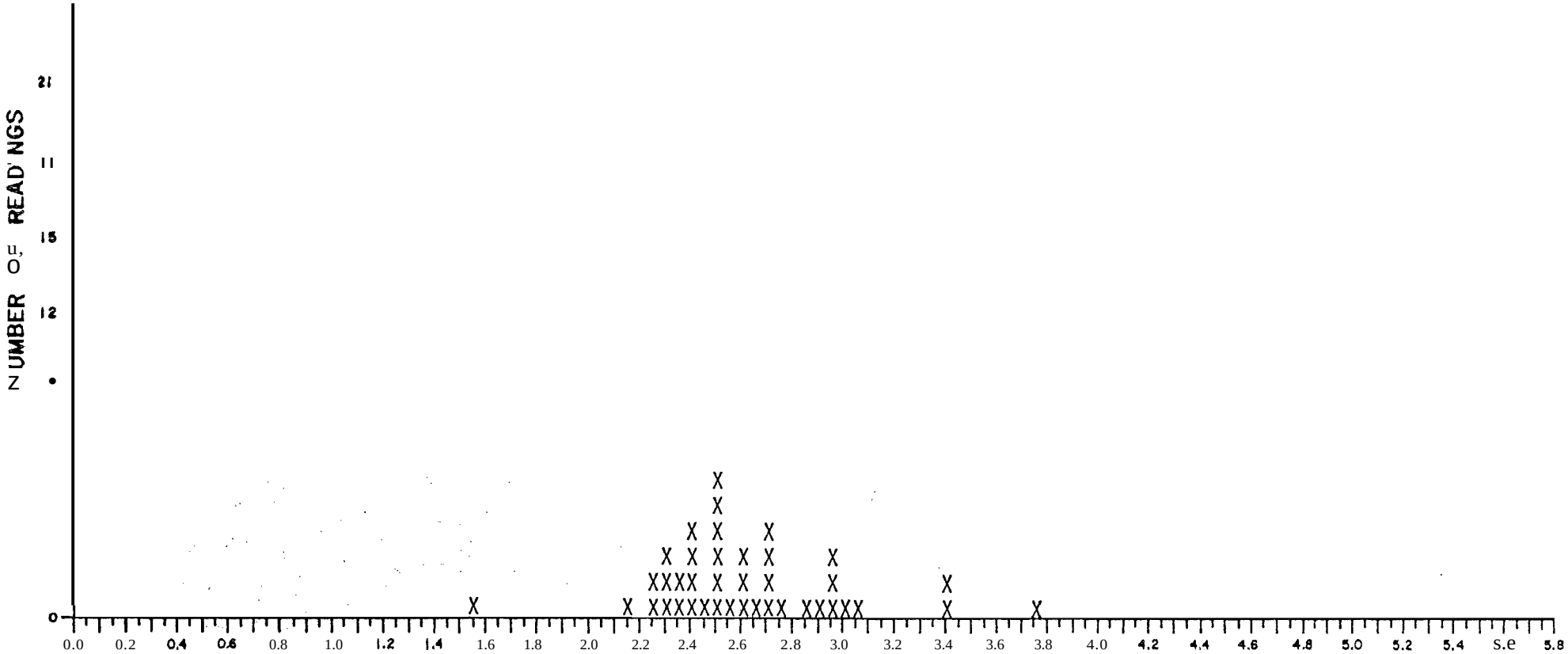
VITRIN ITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519-016 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 7319.7

CLIENT'S NAME MONSANTO WELL NAME EGS P- PA #2

(NO. OF READINGS =40) 1.55 2.16 2.29 2.29 2.33 2.33 2.34 2.36 2.38 2.41 2.42 2.43 2.43 2.47
2.50 2.52 2.52 2.52 2.53 2.54 2.57 2.62 2.62 2.63 2.68 2.70 2.72 2.73 2.74 2.76 2.85 2.90
2.97 2.98 2.99 3.01 3.09 3.40 3.43 3.76

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN RQ(%)	STD. DEV. (%)	REMARKS
(1)	1	1.55	1.55	1.55		
(2)	36	2.16	3.09	2.59	0.237	
(3)	3	3.40	3.76	3.53	0.200	



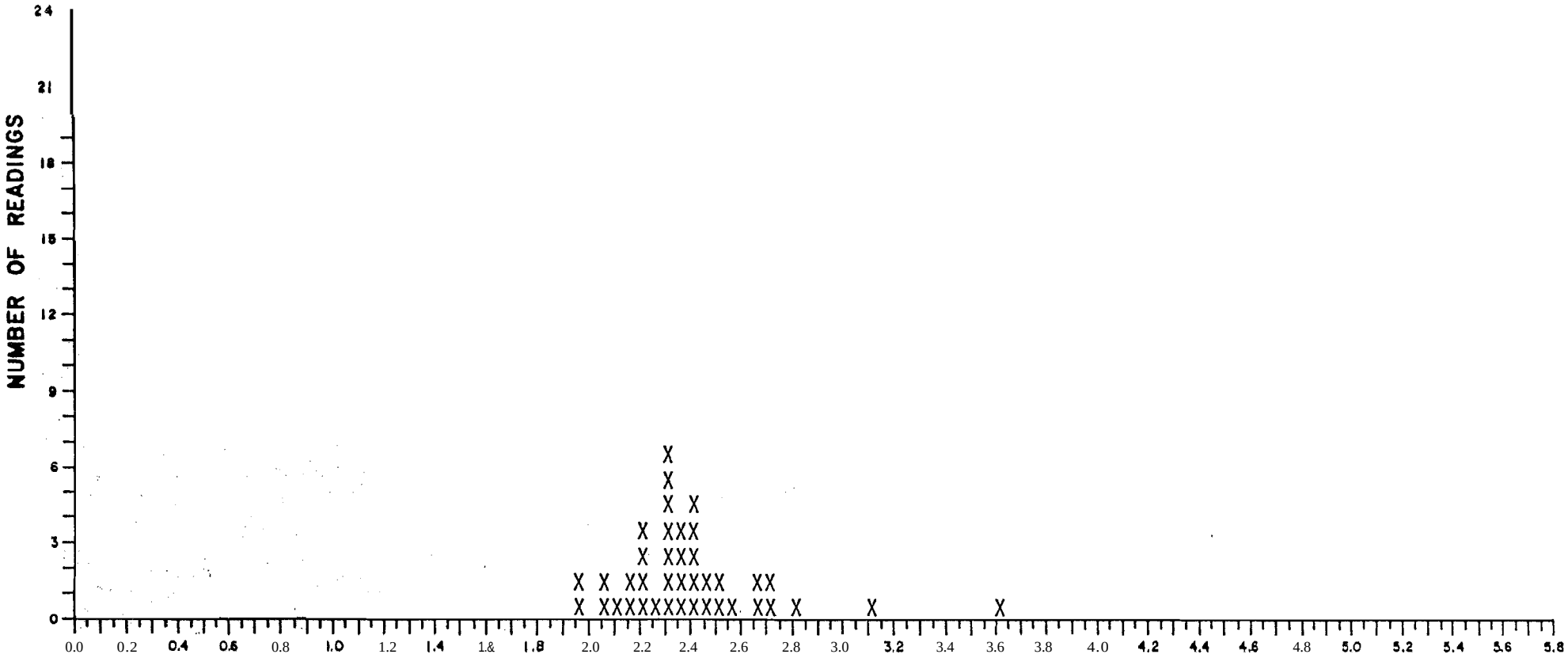
VITRIN ITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519-018 TYPE OF SAMPLE: CORE DEPTH /SAMPLE NO. 7387.6

CLIENT·S NAME MONSANTO WELL NAME EGSP - PA #2

(NO. OF READINGS = 40) 1.98 1.98' 2.07 2.08 2.14 2.18 2.19 2.20 2.21 2.22 2.24 2.27 2.30 2.30
2.32 2.33 2.33 2.33 2.34 2.36 2.37 2.37 2.39 2.41 2.41 2.42 2.42 2.44 2.46 2.47 2.51 2.54
2.55 2.65 2.68 2.73 2.74 2.84 3.12 3.62

POPULATION	NO. Of READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro(%l	STD. DEV. (%)	REMARKS
(1)	38	1.98	2.84	2.36	0.201	
(2)	2	3.12	3.62	3.37		



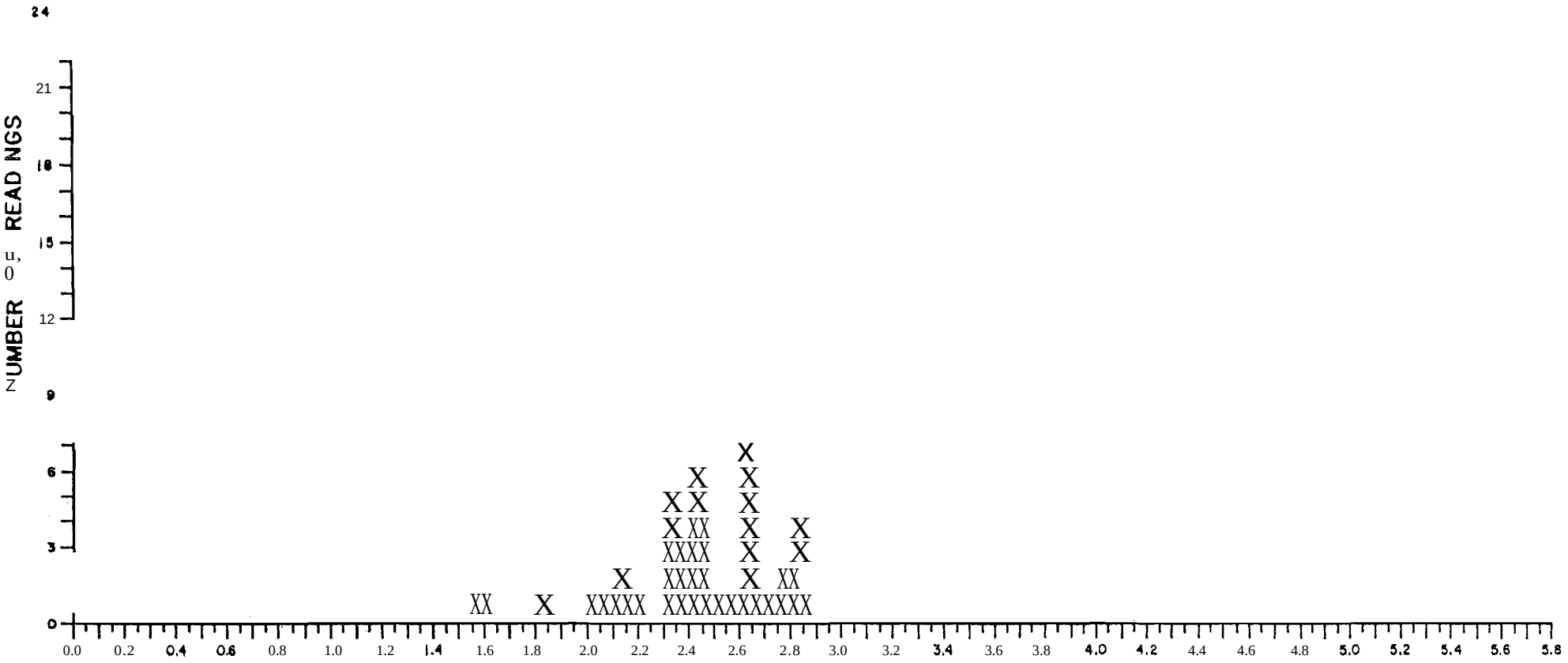
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519..020 TYPE OF SAMPLE: CORE DEPTH/SAMPLE NO. 7422.5

CLIENT'S NAME MONSANTO WELL NAME EGSP .. PA #2

(NO. OF READINGS = 45) 1.55 1.62 1.82 2.02 2.08 2.14 2.14 2.16 2.24 2.32 2.32 2.33 2.33 2.33
2.36 2.36 2.36 2.40 2.41 2.42 2.44 2.44 2.44 2.45 2.46 2.48 2.48 2.51 2.57 2.61 2.61 2.62
2.62 2.63 2.64 2.64 2.68 2.73 2.76 2.77 2.81 2.81 2.83 2.83 2.88

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. 80 (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	3	1.55	1.82	1.66	0.140	
(2)	42	2.02	2.88	2.49	0.220	



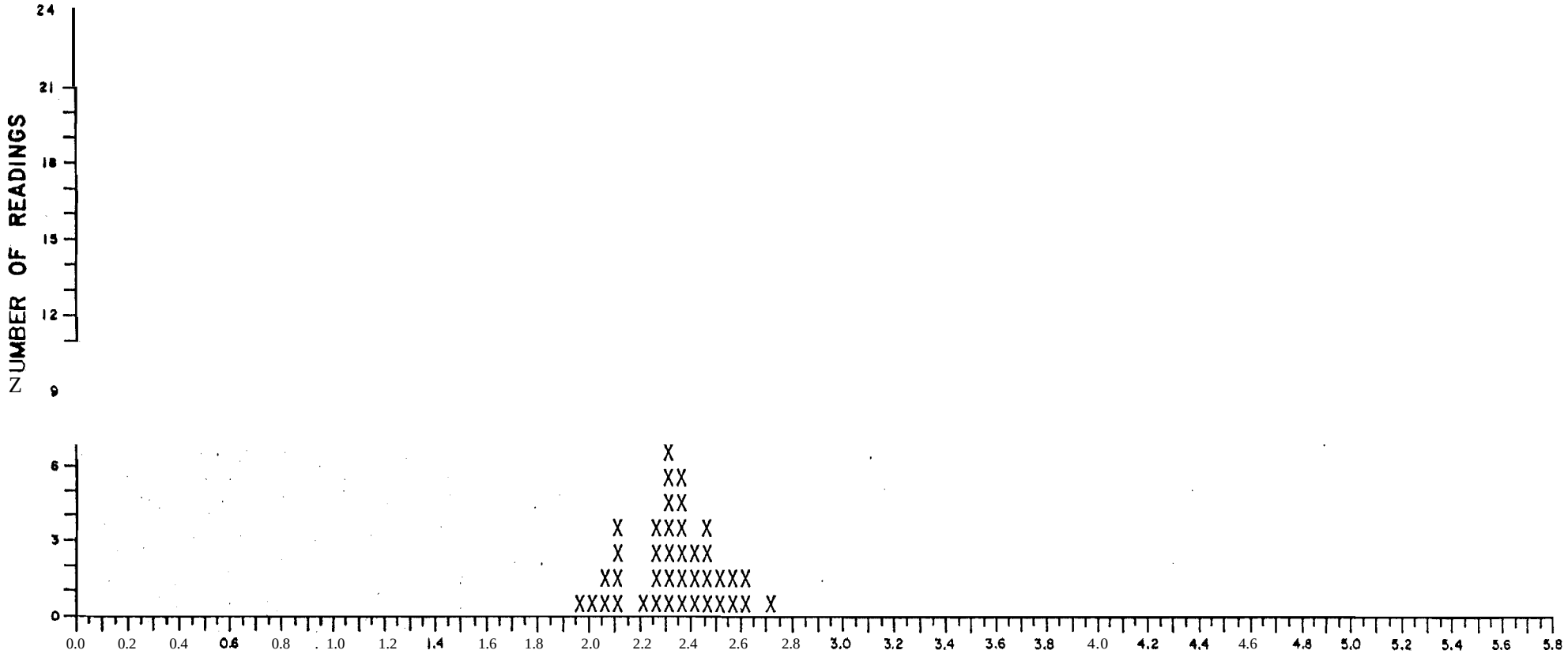
VITRIN ITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R519-022 TYPE OF SAMPLE: CORE DEPTH/SAMPLE NO. 7462.6

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #2

(NO. OF READINGS = 40) 1.98 2.04 2.05 2.08 2.11 2.12 2.13 2.14 2.22 2.25 2.26 2.26 2.26 2.30
2.30 2.31 2.31 2.32 2.33 2.34 2.35 2.35 2.36 2.36 2.37 2.37 2.40 2.44 2.44 2.45 2.47 2.47
2.48 2.51 2.54 2.57 2.57 2.60 2.63 2.71

fOP:ULAIION	NO. Of READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN RO (%1	SID, DEV. (%)	REMARKS
(1)	40	1.98	2.71	2.34	0.172	



VITRIN ITE REFLECTANCE HISTOGRAM

Table IX
Summary of C15+ Extraction, Deasphaltening
and Liquid Chromatography

A. Weights of Extracts and Chromatographic Fractions

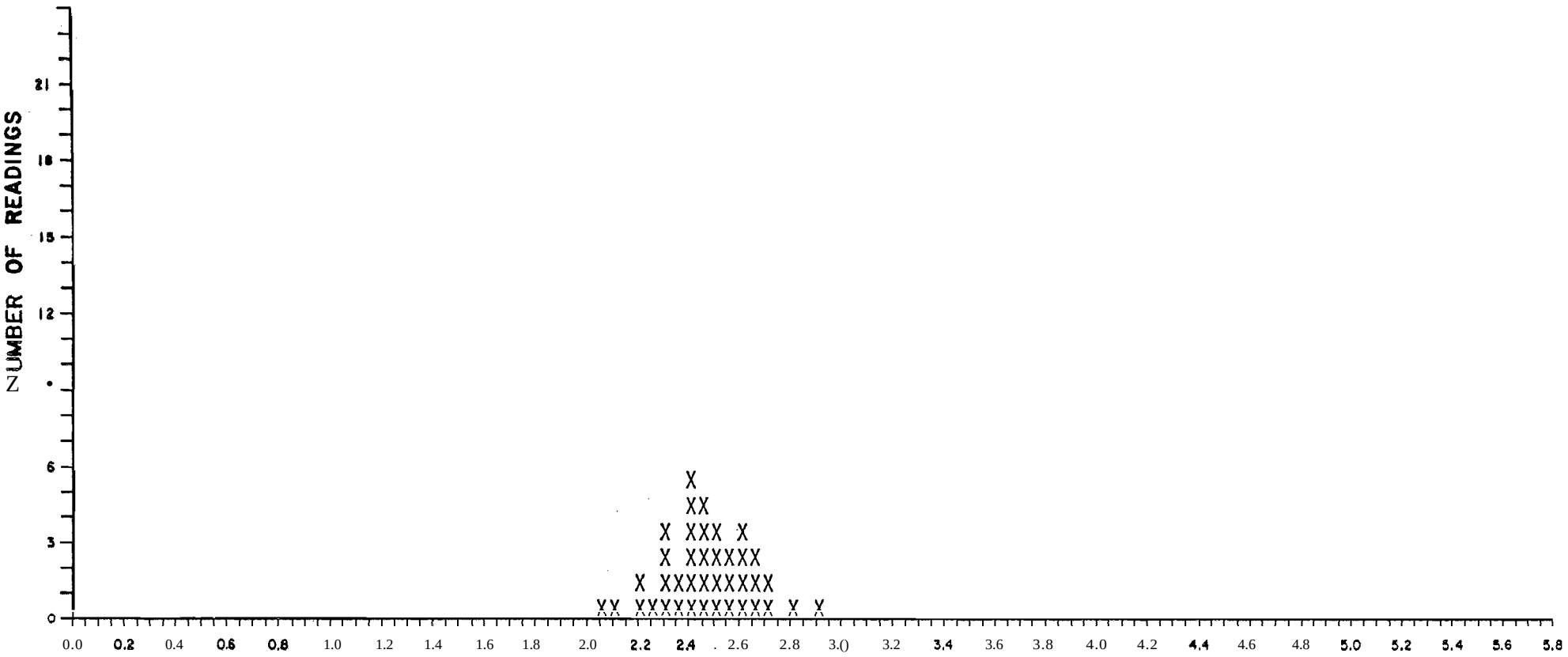
GeoChem Sample Number	Weight of Rock Extd. (grams)	Total. Extract (grams)	Precipitated Asphaltenes (grams)	N-C5 Soluble (grams)	Paraffins-Naphthenes (grams)	Aromatics (grams)	Eluted NSO's (grams)	None1uted NSO's (grams)
R5l9-001	99.5	0.0109	0.0069	0.0040				
003	87.7	0.0068	0.0031	0.0037				
005	96.1	0.0092	0.0026	0.0066				
007	97.2	0.0061	0.0016	0.0045				
009	81.3	0.0078	0.0035	0.0043				
011	99.8	0.0051	0.0024	0.0027				
013	93.4	0.0076	0.0028	0.0048				
015	69.0	0.0101	0.0035	0.0066				
017	99.2	0.0060	0.0015	0.0045				
019	76.5	0.0052	0.0017	0.0035				
020	89.6	0.0098	0.0060	0.0038				
R519-023	99.2	0.0057	0.0022	0.0035				

GEOCHEM NO. R519-023 TYPE OF SAMPLE: CORE DEPTH/SAMPLE NO. 7482.6

CLIENT'S NAME MONSANTO WELL NAME EGS P- PA #2

(NO. OF READINGS = 40) 2.05 2.13 2.22 2.23 2.25 2.30 2.31 2.32 2.34 2.35 2.36 2.41 2.41 2.43
2.44 2.44 2.44 2.45 2.47 2.47 2.48 2.49 2.50 2.52 2.53 2.53 2.55 2.56 2.57 2.60 2.61 2.61
2.61 2.65 2.66 2.66 2.72. 2.74 2.82 2.90

POPULATION	NO. Of READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN 80 (%)	SID. DEV. (%)	REMARKS
(1)	40	2.05	2.90	2.48	0.179	



VITRINITE REFLECTANCE HISTOGRAM

B. Concentration of Extracted Materials In Rock

GeoChem Sample Number	Total Extract (ppm)	Hydrocarbons: Paraffin-Naphthene (ppm)	Hydrocarbons: Aromatic (ppm)	Hydrocarbons: Total (ppm)	Nonhydrocarbons: Preciptd. Asphaltene (ppm)	Nonhydrocarbons: Eluted NSO's (ppm)	Nonhydrocarbons: Noneluted NSO's (ppm)	Nonhydrocarbons: Total (ppm)
R519-001	110				69			
003	78				35			
005	96				27			
007	63				16			
009	96				43			
011	51				24			
013	81				30			
015	146				51			
017	60				15			
019	68				22			
020	109				67			
R519-023	57				22			

C. Composition of Extracts

GeoChem Sample Number	Hydrocarbons Paraffin-Naphthene %	Hydrocarbons Aromatic %	Hydrocarbons PN/Arom	Nonhydrocarbons Eluted NSO's %	Nonhydrocarbons Noneluted NSO's %	Nonhydrocarbons Precipitd. Asphaltene %	Nonhydrocarbons Asph/NSO	HC's %	HC/Non HC
R519-00i						63.3			
003						45.6			
005						28.3			
007						26.2			
009						44.9			
011						47.1			
013						36.8			
015						34.7			
017						25.0			
019						32.7			
020						61. 2			
R519-023						38.6			

Table X

BIOSTRATIGRAPRY

PA-2 WELL

ALLEGHENY COUNTY, PENNSYLVANIA

Twenty three (23) samples of core chips were studied by standard Palynologic methods. Detailed age determinations were not possible because of the poor preservation of the palynomorphs.

Although the kerogen was a dark brown, palynomorph silhouettes were distinctive for large portions of the kerogen and kerogen biofacies could be determined. In this 520' stratigraphic interval there were four influxes of the Tasmanites biofacies although there were no thick accumulations. There is a single sample which may represent deposition terrestrial or transitional environments. All other samples were deposited in marine conditions.

AGE

Ages could not be determined for these samples because of their high thermal maturity. Corrosion around secondary crystal growth (especially pyrite) within the spores further worsened spore preservation. Chitinozoans were seen only in silhouette and the preservation of their ornamentation is too poor to make species identification possible. No acritarchs or scolecodents were seen in these samples. The leiospheres, spheromorphs, and Tasmanites retained their general morphologic Identiffcattons but are not useful for age determination.

ENvmONMENTS AND KEROGEN ACCUMULATION

The oldest sediments represented in this core were deposited in Tasmanites-rich near shore marrne environment. There is a strange, three-dlmenstonal kerogen in this sample that may represent degraded Tasmanites, but the .preservation is too bad that it obscures the original shapes. In the distribution table it is counted under Unidentifiable? Plant Debris.

The Tasmanites-rich sediment from 7482' to 7462' are succeeded by a more terrestrial facies rich in woody debris and poor in marine debris (at 7442') which is succeeded by a rich Tasmanites layer 7422' and a 41' section with some Tasmanites (7339' to 7402').

This was succeeded by deposition of terrestrial debris in a marine environment (7238' to 7319'). A limited Tasmanites facies (7218') was succeeded by possible terrestrial sedimentation of very limited quantity and diversity (7198'). This was followed by deposition of terrestrially derived kerogen (7079' to 7119').

A Tasmanites interval of varying strength followed (7002' to 7060') although the quantity of Tasmanites material which accumulated did vary with the strata at 7002' and 7060' appearing to be richer in volume precent Tasmanites than the intervening strata.

The uppermost strata sampled were rich in leiospheres and spaeromorphs as well as in woody debris. They represent marine, near shore deposition.

PA-2 WELL

ALLEGHENY COUNTY, PENNSYLVANIA

GEOCHEM No.	DEPTH		FIRST CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATiONALE	SECOND CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE
R519-001 -021	6962-7442	D	U			Gross similarities to other Upper Devonian strata.				
R519-022	7462	D	U or M			Presence of spores with grapne shaped processes				
R519-o23	7482	D	U lor M			Stratigraphic location				

KEY
D Devonian
U Upper
M Middle

PA-2 WELL

ALLEGHENY COUNTY, PENNSYLVANIA

			FIRST CYCLE PALYNOMORPHS														SECOND CYCLE PALYNOMORPHS	
			NONMARINE							RESTRICTED MARINE	MARINE							
GEOCHEM No.	DEPTH	NUMBER OF COUNTS	VASCULAR PLANT DEBRIS	Unidentifiable ?Plant Debris	SPORES WITH GRAPNEL PROCESSES	SACCATE & ZONATE POLLEN & SPORES	SPORES IN TETRADS	OTHER POLLEN AND SPORES	TASMANITES	LEIOSPHERES & SPHAEROMORPHS	ACRITARCHS	CHITINOZOANS	SCOLECODONTS	POLLEN AND SPORES	TASMANITES	ACRITARCHS, CHITINOZOANS, SCOLECODONTS
R519-001	6962	300	67					2	t	31						
R519-002	6982	300	85					1	t	14						
R519-003	7002	300	8					1	51	39	1					
R519-004	7020	300	88					3	1	8						
R519-005	7040	300	85					1	3	11						
R519-006	7060	300	89					t	11	t						
R519-007	7079	300	89					1		10						
R519-008	7099	300	92					2		6						
R519-009	7119' '	300	90					t	t	10		t				
R519-010	7198	76	100%	the oruy iden iftable mater Ial is					oody debrts							
R519-011	7218	300	26					t	66	8						
R519-012,	7238	300	84					2	3	11	t					
R519-013'	7258	300	97					3		t						
R519-014	7278	300	96					3		1						
R519-015	7298	300	97					1		2						
R519-016	9319	300	98					1		1						
R519-017	7339	300	77					1	14	10						
R519-018	7387	300	95					2	t	3						
R519-019	7402	300	78					4	3	18						
R519-020	7422	300	27					1	21	49	. t					
R519-021	7442	300	90					1		9		"t				
R519-022	7462	,300	71		1			6	14	7						
R519-023	7482	300	50	15				2	30	3						

Table XI

FINE PARTICLE SIZE ANALYSIS OF KEROGEN
from the·
PA-2 WELL

ALLEGHENY COUNTY, PENNSYLVANIA

Histograms produced by measurements of kerogen particles using the 200 um aperture tube of a Coulter Counter TAII were made on kerogen recovered from core chips of eight (8) samples fromthe PA-2 Well, Allegheny County, Pennsylvania.

samples were processed according to the standard procedures (Appendix B) to avoid particle size reduction due to processing. The kerogen in this sample is, however, very mature, and even the best of materials are not well preserved. There may have been some particle size reduction due to biochemical 'changes in the kerogen, thus, the sizes measured here represent the kerogen as it now is rather than kerogen as it was deposited.

Studies of other wells in the black shales indicated there were a minimum of twenty-eight different kinds of kerogen. This artificial classification includes more mature equivalents of less mature, better preserved kerogen facies (Appendix *A).* In the PA-2 Well all the kerogen is very mature, and the types of kerogen that are identifiable are limited. The kerogen as it was originally depostted may have been more diverse; differentiation and perception of the diversity have been lost with increasing thermal maturity.

Detailed examination of kerogen strew slides reflected the limited diversity of the kerogen as it now appears. The kerogen distributions and types relative to accumulation in size channels aresummarized on the grid sheets.

Samples for kerogen/Coulter analysis for the PA-2 Well . test the applicability of the histograms for distinguishing wood-etch and Ta.smanites-rich samples by using the Coulter, produced size frequency histograms•.

As was seen in the PA-1 Well, .there has been a shift in the form of the Tasmanites-rich histograms. Instead of being represented by a flattened histogram, the Tasmanite-rich facies at this maturity tends to produce a histogram which appear to be normally distr-ibuted, The maximum accumulation for the Tasmanites facies appears to fall . from 20 um to 40 um which serves to dlsttnguish it from the normal distributions characterizing large quantities of very fine amorphous material (type 09) seen elsewhere in the basin.

The samples can be loosely grouped as 1) samples have large amounts of Tasmanites, 2) samples have large amounts of wood, and 3) samples that are mixtures of wood and Tasmanttes, (See-attached Figure).

All of the cumulative frequency curves have similar forms. The means of the relative cumulative frequency curves are distinctive and may be useful for differentiating kerogen types at this maturity.

The samples which contain large quantities of Tasmanites and Tasmanites debris (021, 022 and 023) have the greatest means on their relative cumulative frequency curves (r. c. f.) (36 um, 27 um and 36 um respectively).

The samples that contain a large amount of woody debris (011, 018, and 020) have smaller values for the means of their r, c. f. 1s (13 urn, 17 um, 20 urn).

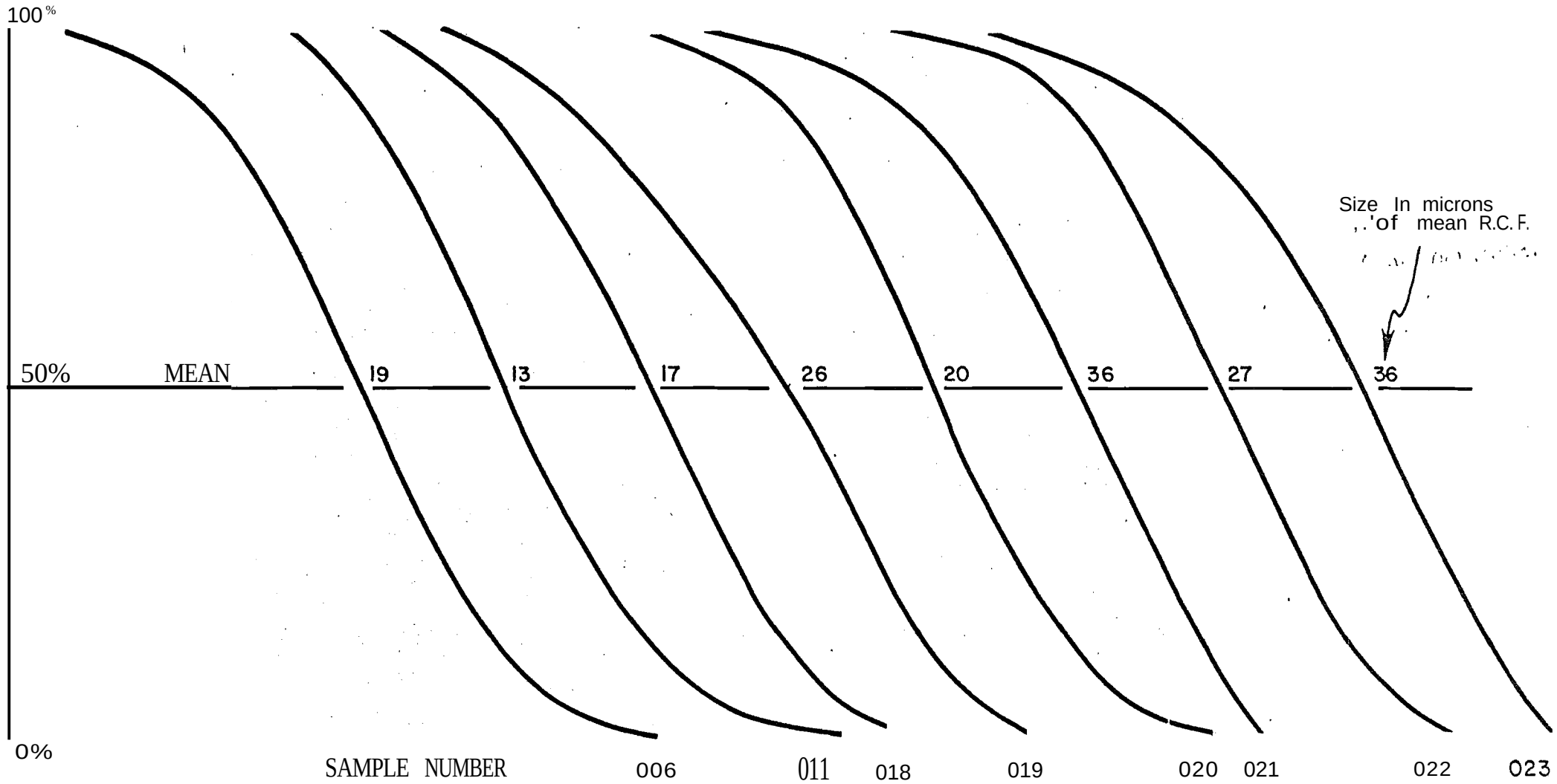
Samples that has a mixture of woody and Tasmanites debris (019) has a mean r. c. f. of 26 urn intermediate between the other two groupings of r, c. f. 's as would be expected,

sample 006 is also a mixture of some woody and a large quantity of Tasmanttes-Iike debris (051), but for some reason, its type 05 kerogen is finer in size than that of the underlying samples such that its r. c.f, mean is 17 urn, different from the pattern -based on the underlying samples.

In conclusion, kerogen facies that are mature have different histograms than they would have, were they immature.

In a sequence of strata in which the kerogen alternates from woody-rich to Tasmanites-rich, the mean size as read from the relative cumulative frequency curve may serve to differential samples rich in woody material and samples rich in Tasmanites.

RELATIVE CUMULATIVE FREQUENCY CURVES PAZ WELL



170.8
179.5
A

AMPLE No. R519-006 DATE 8-1-79 OPERATOR ABR

0 MENTS:

fVPE

'ISUAL

SIZE RANGE

	7.94	100	.26	1.59	2.00	2.52	317	4.00	5.04	6.35	8.00	10.08	127	16.0	20.2	25.4	32.0	40.3	50.8	64.0	806	101.6	128	161
01																								
'2																								
03																								
4																								
05										3	7	11	10	8	9	9	9	6	4	1	t			
6													1	2	2	2	1							
07																								
8								2	3	2	1													
09																								
0																								
11																								
2																								
"13																								
4																								
15																								
6																								
17																								
8																								
'9																								
0																								
21																								
2																								
23																								
4																								
25																								
5																								
27													2	3	3	1								
23																								
TOTAL PERCENTAGE								2	3	5	8	11	13	13	14	12	10	6	4	1	t			
PERCENTAGE FROM COULTER								2	3	5	8	11	13	13	14	12	10	6	4	1	t			

Geochem Laboratories, Inc.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

(OUITER COUNTER® Model T & T_A Worksheef

Ceo Chem # /R519-011 Sample 1.0

ELECTROLYTE 4% {Na PO_2)$_6$ DISPERSANT

EOUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. n:a,	Ser; No.	CALIBRATION DATA	Part. Dia.	W	±[A	A
50	11007	LATEX	? n?	6	1 6	170
200	2400	MICROSPHERES	10.11	7	3.2	170

$k = d\sqrt[3]{\frac{2^w}{A}}$ FOR MODEL T

±JA	1.613.2	
CALIS. A	174.2;169.3	
APERTURE DIA.	50 200	

$\frac{A_2}{A_1} = (\frac{d_2}{d_1})^3$ 2 (Wz . WI) For Model T

~~$\frac{A_2}{A_1} = (\frac{d_1}{d_2})^3$ 2(Wz , W,) For Model T~~ A

SAMPLE DATA

Geometric Mean μ³	Volume μ³	Diameter μ	Channel (WI				50	?On			
, .00575	.004091	.198	50	?nn							
.0115	.008181	.250									
.0231	.01636	.315									
.0462	.03272	.397									
.0925	.06545	.500									
.1851	.1309	.630	1								
.3702	.2618	.794	2								
.7405	.5236	1.00	3								
1.481	1.047	1.26	4								
2.962	2.094	1.59	5								
5.924	4.189	2.00	fi								
11.85	8.378	2.52	7	1				.--			
23.70	16.76	3.17	8	?				--			
47.39	33.51	4.00	9	3				6.9			
94.78	67.02	5.04	10	4				8.0			
189.6	134.0	6.35	11	5				'10. 1			
379.1	268.1	8.00	12	6				113.0			
75B.3	536.2	10.08	13	7				13.7			
1516.	1072.	12.7	14	8				13.3			
3033.	2145.	16.0	15	Q				,10.7			
6066.	4289.	20.2	16	10				9.8			
12.13 x 10³	8579.	25.4		11				6.9			
24.27 x 10³	17.16 x 10³	32.0		12				4.4			
48.54)(10³	34.31)(10³	40.3		13				:1.8			
97.18)(10³	68.63)(10³	50.8		14				'1. 0			
194.4 x 10³	137.3 x 10³	64.0		15				0.4			
388.7 x 10³	274.5)(10³	80.6		Hi				0.0			
777,4 x 10³	549.0)(10³	101.6									
1.555 x 10⁶	1.098)(10⁶	128.									
3.109)(10⁶	2.196)(10⁶	161.									
6.219)(10⁶	,4.392)(10⁶	203.									
12.44 x 10⁶	8.784)(10⁶	256.									
24.88 x 10⁶	17.57 x 10⁶	322.									
49.75 x 10⁶	35.14 x 10⁶	406.									
99.50)(10⁶	70.27 x 10⁶	512.									
199.0)(10⁶	140.6" 10⁶	645.									
398.0 x 10⁶	281,1 x 10⁶	812.									
796.0 x 10⁶	562.2 x 10⁶	1024.									

4221008

AMPLE No. R519-011 DATE 8-1-79 OPERATOR ABR

C MENTS:

TYPE

IISUAL SIZE RANGE

	.794	1.00	1.26	1.59	2.00	2.52	317	4.00	5.04	6.35	8.00	10.08	127	16.0	20.2	25.4	32.0	40.3	50.8	64.0	10.6	101.6	128	161
01																								
02																								
03																								
04																								
05																								
06																								
07																								
08								1	2	6	7	6	6	2	1									
09								4	3															
10																								
11																								
12																								
13														2	3	3	2							
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26																								
27								2	·3	4	6	8	7	7	6	4.	2	2	·1	t				
28																								
TOTAL PERCENTAGE								7	8	10	13	14	13	11	10	7	4	2	·1	t				
PERCENTAGE FROM COULTER								7	8	10	13	14	13	11	10	7	4	2	1	t				

COULTER COUNTER® Model T & T_A Worksheet

GeoChem Laboratories, Inc.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

Geo Chem # R519-OlB Sample 1.0

ELECTROLYTE 4% $(Na\ PO_3)_6$ DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N. R. DATE

Aper. Die.	S». No.	CALIBRATION DATA	Pert. Oia.	W	±IA	A
50	11007	I ATFX	? 02	6	, 6	17Q'
200	2400	MICROSPHERES	10.11	7	3.2	170

$$k = d\sqrt[3]{\frac{2^W}{A}}$$

FOR MODEL T

± I A	1.613.2	
CALIB. A	174.2 j169.3	
APERTURE DJA.	50	200

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3 2^{(W_2 - W_1)}$ For Model T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3 2^{(W_2 - W_1)}$ For Model T_A

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI		50	200
.00575	.004091	.198	50	?nn		
.0115	.008181	.250				
.0231	.01636	.315				
.0462	.03272	.397				
.0925	.06545	.500				
.1851	.1309	.630	,			
.3702	.2618	.794	?			
.7405	.5236	1.00	3			
1.481	1.047	1.26	4			
2.962	2.094	1.59	5			
5.924	4.189	2.00	6			
11.85	8.378	2.52	7	1		--
23.70	16.76	3.17	8	2		--
47.39	33.51	4.00	9	3		4.2
94.78	67.02	5.04	10	4		5.2
189.6	134.0	6.35.	11	5		6.5
379.1	268.1	8.00	12	6		8.8
158.3	536.2	10.08	13	7		10.6
1516.	1072.	12.7	14	8		12.0
3033.	2145.	16.0	15	9		12.0
6066.	4289.	20.2	16	10		13.0
$12.13.10^3$	8579.	25.4		1		11.6
$24.27.10^3$	17.16×10^3	32.0		1?		8.5
48.54×10^3	34.31×10^3	40.3		13		5 -4
$97.18.,0^3$	68.63×10^3	50.8		'11		2 it
194.4×10^3	$'37.3.,0^3$	64.0		15		0.0
$388.7.,0^3$	$274.5 \times 10.3'$	80.6		16		0.0
777.4×10^3	549.0×10^3	101.6				
1.555×10^6	$1.098.10^6$	128.				
3.109×10^6	2.196×10^6	161.				
6.219×10^6	$4.392.,0^6$	203.				
12.44×10^6	8.784×10^6	256.				
24.88×10^6	17.57×10^6	322.				
49.75×10^6	35.14×10^6	406..				-
99.50×10^6	$70.27.10^6$	512.				
199.0×10^6	140.6×10^6	645.				
398.0×10^6	281.1×10^6	812.				
196.0×10^6	562.2×10^6	1024.				

4221008

..MPLE No. R518-018.1 DATE 8-1-79 ' OPERATOR "ABR

COMMENTS:

TYPE VISUAL	SIZE RANGE .794	ROC	1.26	1.59	2.00	2.52	3.17'	",00	5.04	6.35	aoo	10.08	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	128	161
01																								
02																1	1	2	2					
03																								
04																								
05																								
06																								
07																								
08									2	4	6	4	4	4	2									
09								9	'3	2														
10																								
/ I																								
/2																								
13														1	4	5	2							
/4																								
/5																								
16																								
17																								
J8																								
19																								
20																								
21																								
22																								
23																								
24																								
.25																								
26																								
27										1	3	7	8	7	7	6	6	3						
L28																								
TOTAL PERCENTAGE								4	5	7	9	11	12	12	13	12	9	5	2					
PERCENTAGE FROM COULTER								4	5	7	9	.n	12	12	13	12	9	5	2					

COULTER COUNTER® Model T & T_A Worksheet

CeoChem Laboratories, Inc.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

CeD Chern # /-R519-019 , Sample I.D

ELECTROLYTE 4% $(Na\ PO_2)_6$ DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Extremely small amount of Sample

Present

Ap.r. Di".	Stir. No.	CALIBRATION DATA	Part. Di".	w	±IA	A
50	11007	I ATFX	? n?	6	1 6	17Q
200	2400	MICROSPHERES	10.11	7	3.2	170 B

$K = d\sqrt[3]{\frac{2^w}{A}}$

FOA MODEL T

±}A	1.6	3.2
CALfB, A	174.2 ;169.3	
APE RTURE DIA.	50	200

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3 2^{(W_2 - W_1)}$ For Model T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3 2^{(W_2, W_1)}$ For Model T_A

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI				50	?nn			
.00575	.004091	.198	50	?nn							
.0115	.008181	.250									
.0231	.01636	.315									
.0462	.03272	.397									
.0925	.06545	.500									
.1851	.1309	.630	1								
.3702	.2618	.794	?								
.7405	.5236	1.00	3								
1.481	1.047	1.26	4								
2.952	2.094	1.59	5								
5.924	4.189	2.00	6								
11.85	8.378	2.52	7	1				'_ -			
23.70	16.76	3.17	8	?				. -			
47.39	33.51	4,00	q	3				·2.5			
94.78	67,02	5.04	10	4				3.8			
189.6	134.0	6.35	11	5				4.8			
379.1	268.1	8.00	12	6				6.3			
758.3	536.2	10.08	13	7				7.1			
1516.	1072.	12.7	14	8				7.8			
3033.	2145.	16.0	15	Q				8.0			
6066.	4289.	20.2	16	10				9.5			
12.13×10^3	8579.	25.4		1				9.8			
24.27×10^3	17.16×10^3	32.0		. 1?				13.2			
48.54×10^3	34.31×10^3	40.3		13				,11.2			
97.18×10^3	68.63×10^3	. 50.8		14				.'8.4			
194.4×10^3	137.3×10^3	64.0		15				5 ?			
388.7×10^3	274.5×10^3	80.6		16				2.5			
777.4×10^3	549.0×10^3	101.6									
1.555×10^6	1.098×10^6	128.									
3.109×10^6	2.196×10^6	161-									
6.219×10^6	4.392×10^6	203.									
12.44×10^6	8.784×10^6	256.									
24.88×10^6	17.57×10^6	322.									
49.75×10^6	35.14×10^6	406.									
99.50×10^6	70.27×10^6	512.									
199.0×10^6	140.6×10^6	645.									
398.0×10^6	281.1×10^6	812.									
796.0×10^6	562.2×10^6	1024.									

4221008

SAMPLE No. R519-019 DATE 8-1-79 OPERATOR ABR

COMMENTS:

TYPE VISUAL — SIZE RANGE

	.794	LOO	L26	L59	2.00	2.52	3.17	4.00	5.04	6.35	aoo	10.08	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	'0.6	101.5	IZS	161
01																								
02																	2-	5	5	;2	1			
03																								
04																								
05																								
06																								
07																								
08									2	4	:4	4	-4	4.	5	8	8	6	1					
09								-3	2	1														
10																								
11																								
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26													11	1	2				12.-	3	1			
27											2	3	-3	3	-3	2	3							
28																								
TAL CENTAGE								3	4	5	6	7	8	8	'\0	10	13	11	8	5	2			
PL :CENTAGE FROM COULTER								3	4	5	6	7	8	8	10	10	13	11	8	5	2			

L

COULTER COUNTER® Model T & T_A Worksheet

GeoChem Laboratories, Inc.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

Geo Chem # R519-020 Sample I.D

ELECTROLYTE 4% $(Na\ PO_3)_6$ DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Extremely Small .Amount of Sample

Ap.r. Dia.	S.r. No.	CALIBRATION DATA	Pert. Dill.	W	±IA	A
50	11007	LATEX	? ()?	6	1 6	17Q
200	24nn	MICROSPHERES	10.11	7	3.2	170.8

$$k = d\sqrt[3]{\frac{2^W}{A}}$$

FOR MODEL'r

$$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3 2^{(W_2 - W_1)}$$ For ModelT

$$\frac{A_2}{A_1} - \left(\frac{d_1}{d_2}\right)^3 2^{(W_2 - W_1)}$$ For Model TA

±IA	1.6	3.2		
CALIB. A	174.2;169.3			
APERTURE DIA.	50	200		

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI		50	?()n
.00575	.004091	.198	50	?()n		
.0115	.008181	.250				
.0231	.01636	.315				
.0462	.03272	.397				
.0925	.06545	.500				
.1851	.1309	.630	1			
.3702	.2618	.794	?			
.7405	.5236	1.00	3			
1.481	1.047	1.26	4			
2.962	2.094	1.59	5			
5.924	4.189	2.00	6			
11.85	8.378	2:52	7	1		
23.70	16.76	3.17	8	?		
47.39	33.51	4.00	9	3		:1.3
94.78	67.02	5.04	10	4		.1.8
189.6	134.0	6.35	11	5		3.4
379.1	268.1	8.00	12	6		5.8
758.3	536.2	10.08	13	7		8.6
1516.	1072.	12.7	14	8		12.5
3033.	2145.	16.0	15	9		13.9
6066.	4289.	20.2	16	10		14.1
12.13×10^3	8579.	25.4		-1		11 8
24.27×10^3	17.16×10^3	32.0		12		10.0
48.54×10^3	34.31×10^3	40.3		13		8.3
97.18×10^3	$68.63)(10^3$	50.8		14		4.9
194.4×10^3	137.3×10^3	64.0		15		2.0
388.7×10^3	274.5×10^3	80.6		16		1 0
777.4×10^3	549.0×10^3	101.6				
$1.555" 10^6$	1.098×10^6	128.				
3.109×10^6	2.196×10^6	161.				
6.219×10^6	4.392×10^6	203.				
12.44×10^6	8.784×10^6	256.				
24.88×10^6	17.57×10^6	322.				
49.75×10^6	35.14×10^6	406.				
99.50×10^6	$70.27)(10^6$	512.				
199.0×10^6	140.6×10^6	645.				
398.0×10^6	281.1×10^6	812.				
796.0×10^6	562.2×10^6	1024.				

A...PIE No. '85'19-020' DATE 8-1-79 OPERATOR ABR

a "MENTS:

1 TYPE

"/SUAL ---11 SIZE RANGE

	.794	LOO	L26	L59	2.00	2.52	317	4.00	5.04	6.35	a00	1008	127	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	128	161
01																								
02																								
03																								
04																			2	3				
05																								
06															3	2	2							
07																								
'18										1	4	7	8	7	4	3	2	1						
09								1	2	2	2													
10																								
11																								
12																								
13																								
4																								
15																								
6																								
17																								
8																								
19																								
0																								
21												1	1	1	1	2	1	1						
2																								
23																								
4																								
25																								
6																	1	1	2	2	1			
27												1	4	6	6	5	4	3						
8																								
TOTAL								1	2	3	6	9	13	14	14	12	10	8	5	2	1			
PERCENTAGE								1	2	3	6	9	13	14	14	12	10	8	5	2	1			

FROM COULTER

GeoChem Laboratories, Inc.

1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

COULTER COUNTER® Model T & T_A Worksheet

Geo Chem # R519-021 Sample I.D

ELECTROLYTE 4% $(Na\ PO_3)_6$ DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Dia.	S.r. Ne.	CALIBRATION DATA	Pert. Dia.	W	± IA	A
50	11007	LATFX	2 02	6	1 6	17Q
200	2400	MICROSPHERES	10.11	7	3.2	170

$$k = d\sqrt[3]{\frac{2^W}{A}}$$

FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^{2(W_2, WI)}$ For Model T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^{3\ 2(W^2 + W')}$ For Mcdel Tj,

±IA	1.6	3.2	
CALIB. A	174.2	:169.3	
APERTURE DIA.	50	200	

SAMPLE DATA

Geometric Mean μ3	Volume μ3	Diameter μ	Channel (W)		50	200
.00575	.004091	.198	50	?nO		
.0115	.008181	.250				
.0231	.01636	.315				
.0462	.03272	.397				
.0925	.06545	.500				
.1851	.1309	.630	1			
.3702	.2618	.794	2			
.7405	.5236	1.00	3			
1,481	1.047	1.26	4			
2.962	2.094	1.59	5			
5.924	4.189	2.00	6			
11.85	8.378	2.52	7	1		
23.70	'16.76	3.17	8	2		
47.39	33.51	4.00	9	3		0.4
94.78	67.02	5.04	10	4		0.7
189.6	134.0	6.35	11	5		1.2
379.1	268.1	8.00	12	6		2 3
758.3	536.2	10.08	13	7		3 9
1516.	1072.	12.7	14	8		5.7
3033.	2145.	16.0	15	9		7.5
6066.	4289.	20.2	16	10		10.7
12.13×10^3	8579.	25.4		11		11 5
24.27×10^3	17.16×10^3	32.0		12		12.4
48.54×10^3	34.31×10^3	40.3		13		12.5
97.18×10^3	68.63×10^3	50.8		14		12 ?
194.4×10^3	137.3×10^3	64.0		15		11.3
388.7×10^3	274.5×10^3	80.6		16		7 6
777.4×10^3	549.0×10^3	101.6				
1.555×10^6	1.098×10^6	128.				
3.109×10^6	2.196×10^6	161.				
6.219×10^6	4.392×10^6	203.				
12.44×10^6	8.784×10^6	256.				
24.88×10^6	17.57×10^6	322.				
49.75×10^6	35.14×10^6	406.				
99.50×10^6	70.27×10^6	512.				
199.0×10^6	140.6×10^6	645.				
398.0×10^6	$281;1 \times 10^6$	812.				
796.0×10^6	562.2×10^6	1024.				

4221008

A..MPLE No. IR519-021 DATE 8-1-79' OPERATOR /ABR

(1MENTS:

TYPE VISUAL

SIZE RANGE

	.794	1.00	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	10.015	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	128	161
OJ																								
02																								
03																								
04																								
05													3	6	10	12.	12	13	12	11	18			
06																								
07																								
08										1	2	4	3	2	1									
'09								t	1															
10																								
11																								
12																								
13																								
14																								
/5																								
/6																								
17																								
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19																								
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23																								
24																								
25																								
26																								
27																								
28																								
TOTAL ""CENTAGE								t	1	1	2	4	6	8	11	12	12	13	12	11	,8			
PI tCENTAGE FROM COULTER								t	1	1	2	4	6	8	11	12	12	13	12	11	8			

GeoChem Laboratories, Inc.
1143-C Baltimore Road
Houston, Texas 77043

COULTER COUNTER® Model T & T_A Worksheet

Geo Chem # R519-022 Sample 1.0

ELECTROLYTE 4% $(Na\ PO_2)_6$ DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Dia.	Ser. No.	CALIBRATION DATA	Part. Dia.	W	±IA	A
50	11007	LATEX	2 01'	6	1 6	17·Q
200	2400	MICROSPHERES	10.11	7	3.2	170

$$k = d\sqrt[3]{\frac{2^W}{A}}$$

FOR MODEL T

± I A	1.613.2	
CALIB. A	174.2	169.3
APERTURE DIA.	50	200

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3 2^{(W_2 - W_1)}$ For Model T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3 2^{(W_2 - W_1)}$ For Model T_A

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (W)		50	200
.00575	.004091	.198	50	200		
.0115	.008181	.250				
.0231	.01636	.315				
.0462	.03272	.397				
.0925	.06545	.500				
.1851	.1309	.630	1			
.3702	.2618	.794	2			
.7405	.5236	1.00	3			
1.481	1.047	1.26	4			
2.962	2.094	1.59	5			
5.924	4.189	2.00	6			
11.85	8.378	2.52	7	1		
23.70	16.76	3.17	8	?		
47.39	33.51	4.00	9	3		0.5
94.78	67.02	5.04	10	4		.0.S
189.6	134.0	6.35	11	5		1.7
379.1	268.1	8.00	12	6		3.4
758.3	536.2	10.08	13	7		5.9
1516.	1072.	12.7	14	8		9.7
3033.	2145.	16.0	15	9		12.0
6066.	4289.	20.2	16	1)		13.4
12.13×10^3	8579.	25.4		11		11 8
24.27×10^3	17.16×10^3	32.0		12		13.0
48.54×10^3	34.31×10^3	40.3		13		12.2
97.18×10^3	68.63×10^3	50.8		14		8 4
194.4×10^3	137.3×10^3	64.0		15		4.7
388.7×10^3	274.5×10^3	80.6		16		2.2
777.4×10^3	549.0×10^3	10t.6				
1.555×10^6	1.098×10^6	128.				
3.109×10^6	2.196×10^6	161.				
$6.219'' 10^6$	$4.392'' 10^6$	203.				
12.44×10^6	8.784×10^6	256.				
24.88×10^6	17.57×10^6	322.				
49.75×10^6	$35.14'' 10^6$	406.				
$99.50 \times .10^6$	70.27×10^6	512.				
199.0×10^6	140.6×10^6	645.				
398.0×10^6	$281.1'' 10^6$	812.				
796.0×10^6	562.2×10^6	1024.				

4221008

SAMPLE No. R519-022 DATE 8-1-79 OPERATOR ABR

COMMENTS:

TYPE VISUAL

SIZE RANGE

	.794	1.00	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	10.08	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	128	161
01																								
02																								
03																								
04																								
05											1	4	8	11	13	12	13	12	7	4	2			
06																								
07																								
08								1	1	2	2	2	2	1										
09																								
10																								
11																								
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26																			1	1				
27																								
28																								
TOTAL PERCENTAGE								1	1	2	3	6	10	12	13	12	13	12	8	5	2			
PERCENTAGE FROM COULTER								1	1	2	3	6	10	12	13	12	13	12	8	5	2			

GeoChem Laboratories, Inc.
1143-C BALTIMORE ROAD
HOUSTON, TEXAS 77043

(OUITER COUNTER® Model T & T_A Worksheet

Geo Chem # /R519-023 Sample I.D

ELECTROLYTE 4% $(Na\ PO_3)_6$ DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

250m Sieved Used

Aper. 018.	5.r. No.	CALIBRATION DATA	Pert. Dia.	W	± fA	A
50	11007	I ATFX	2 02	6	1 6	17q
200	2400	MICROSPHERES	10.11	7	3.2	170

$$k = d\sqrt[3]{\frac{2^W}{A}}$$

FOR MODEL T

± I A	1.613.2	
CALIS. A	174.2!169.3	
APE RTURE DIA.	50 200	

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ 2 (Wz· W,) For ModelT

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ 2IWz'W,) ForModelTA

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel {WI		50	200
.00575	.004091	.198	50	?nn		
.0115	.008181	.250				
.0231	.01636	.315				
.0462	.03272	.397				
.0925	.06545	.500				
.1851	.1309	.630	1			
.3702	.2618	.794	?			
.7405	.5236	1.00	3			
1,481	1.047	1.26	4			
2.962	2.094	1.59	5			
5.924	4.189	2.00	6			
11.85	8.378	2.52	7	1		—
23.70	16.76	3.17	8	2		—
47.39	33.51	4.00	9	3		1.0
94.78	67.02	5.04	10	4		1.5
IB9.6	134.0	6.35	11	5		2.2
379.1	268.1	B.00	12	6		3.3
758.3	536.2	10.08	13	7		4.4
1516.	1072.	12.7	14	8		5.6
3033.	2145.	16.0	15			.6.6
6066.	4289.	20.2	16	11		9.3
12.13×10^3	8579.	25.4		1		10 7
24.27×10^3	17.16×10^3	32.0		12		13.0
48.54×10^3	34.31×10^3	40.3		13		13.0
97.18×10^3	68.63×10^3	50.8		14		11.'9
194.4×10^3	137.3×10^3	64.0		15		10.3
388.7×10^3	$274.5' \times 10^3$	80.6		16		7.2
777.4×10^3	549.0×10^3"	101.6				
1.555×10^6	1.098×10^6	128.				
3.109×10^6	2.196×10^6	161.				
6.219×10^6	4.392×10^6	203.				
12.44×10^6	8.784×10^6	256.				
24.88×10^6	17.57×10^6	322.				
49.75×10^6	35.14×10^6	406.				
99.50×10^6	70.27×10^6	512.				
199.0×10^6	140.6×10^6	645.				
$398.0'' 10^6$	281.1×10^6	812.				
796.0×10^6	$562. \times 10^6$	1024.				

4221008

LAB RUN No. R519-023 DATE 8-1-79 OPERATOR ABR

COMMENTS:

1 TYPE

VISUAL

SIZE RANGE

	7.94	1.00	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	10.08	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	128	161
01																								
02																								
03																								
04																								
05												1	4	5	8	11	13	13	12	10	7			
06																								
07																								
08										1	3	3	2	2	1									
09								1	2	1														
10																								
11																								
12																								
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20																								
21																								
22																								
23																								
24																								
25																								
26																								
27																								
28																								
TOTAL PERCENTAGE								1	2	2	3	4	6	7	9	11	13	13	12	10	7			
PERCENTAGE FROM COULTER								1	2	2	3	4	6	7	9	11	13	13	12	10	7			

COULTER **COUNTER**® Model T & TA

PARTICLE SIZE ANALYSIS

.15 – 200μ
x PERCENT

GEOCHEM **LABORATORIES, INC.**
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043 • 713/467-7011

ORGANIZATION

OPERATOR

EQUIPMENT

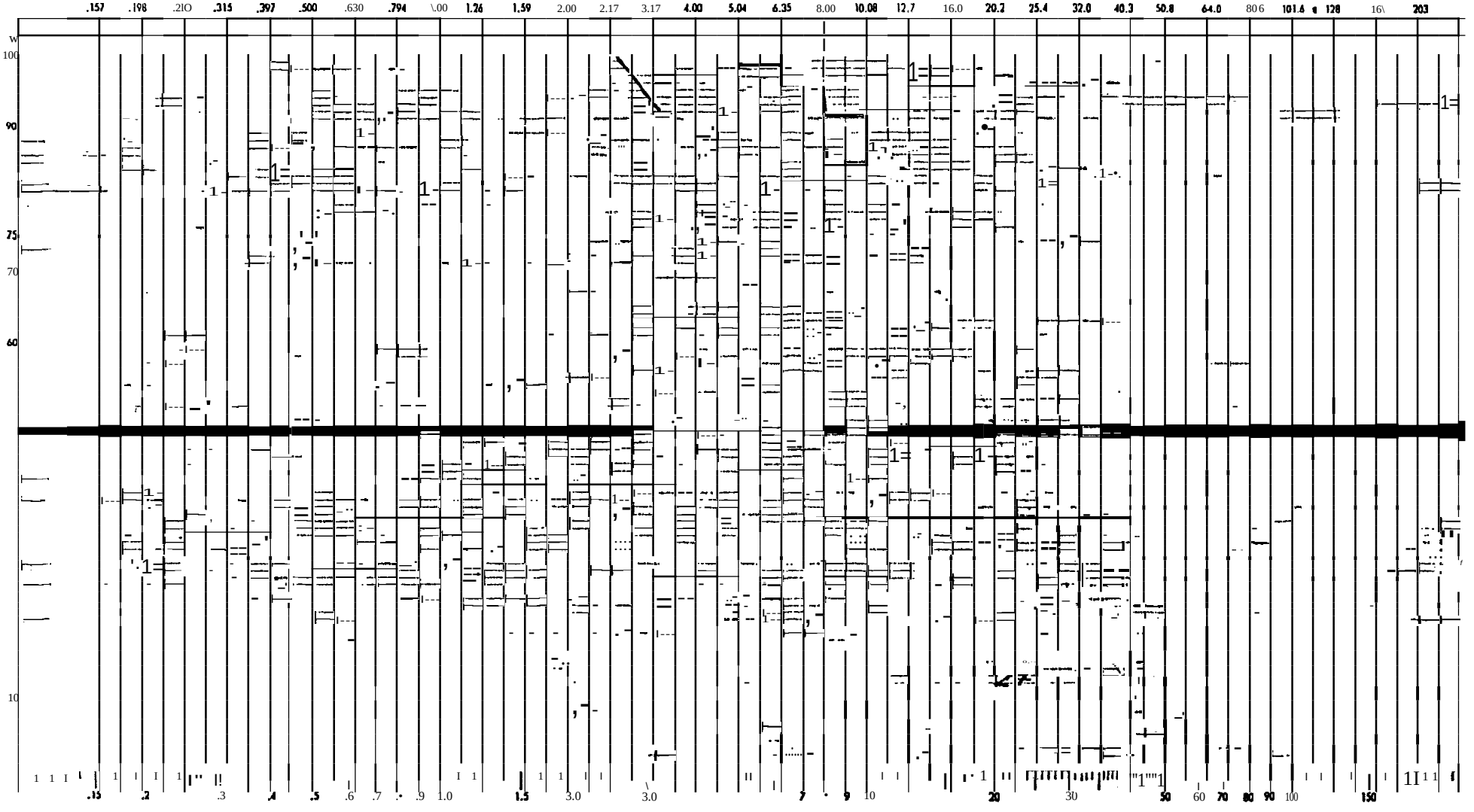
$k = d\sqrt[3]{2w}$ FOH MODEL T

$\frac{A2}{A1} = \left(\frac{d2}{d1}\right)^3$ when W1·W1

$\frac{A2}{A1} = \left(\frac{d1}{d2}\right)^3$ when $W2 = W_1$ FOR MODEL TA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	:1.'''	A	01".	W	±IA	A
			200										
R519-006													
T-1159.1 ,.													
TG - 150075													

SA..PLE SETTINGS



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COULTER **COUNTER**® Model T & TA

PARTICLE SIZE ANALYSIS

.15 ... 200μ
X PERCENT

GEOCHEM **LABORATORIES, INC.**
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043 • 713/467-7011

ORGANIZATION

OPERATOR

EQUIPMENT

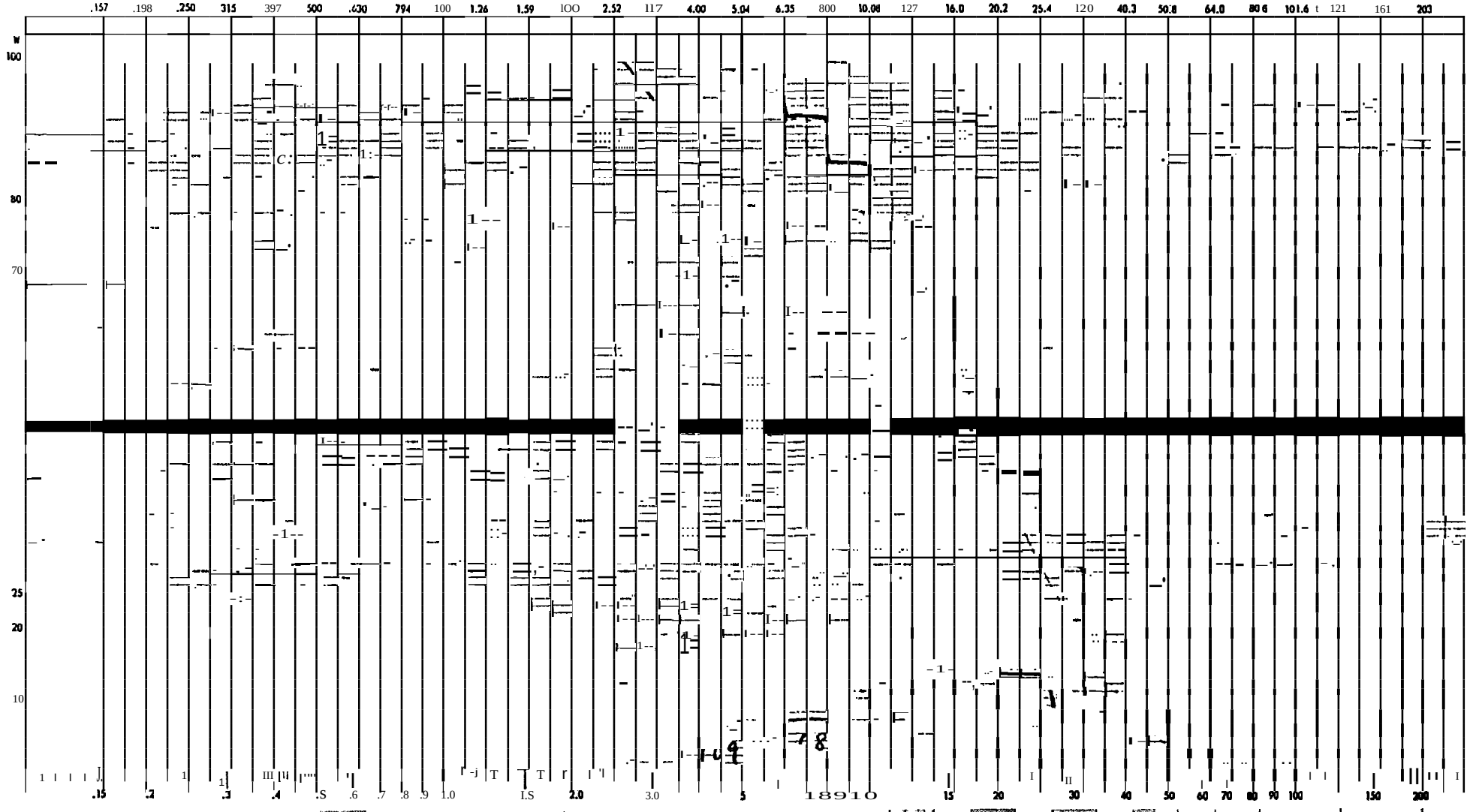
$k = d\sqrt{2\pi}$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when WI- WI

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ "hen W? = W1 FOR MODEL TA

SAMPLE SETTINGS

	SAMPLE	ELECTROLYIE	DISPERSANT	APER. SIZE	SERIAL		PART OIA.	•	± IA	A	OIA.	•	± IA	A
				200										
	R519-01S 1													
	T-187v3 !													
	Te - 222216													



L, '| MICR ' ETER L

COULTER **COUNTER®** Model T & TA

PARTICLE SIZE ANALYSIS

.15 - 200μ
X PERCENT

GEOCHEM LABORATORIES, INC.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043 · 713/467-7011

ORGANIZATION
OPERATOR
EQUIPMENT

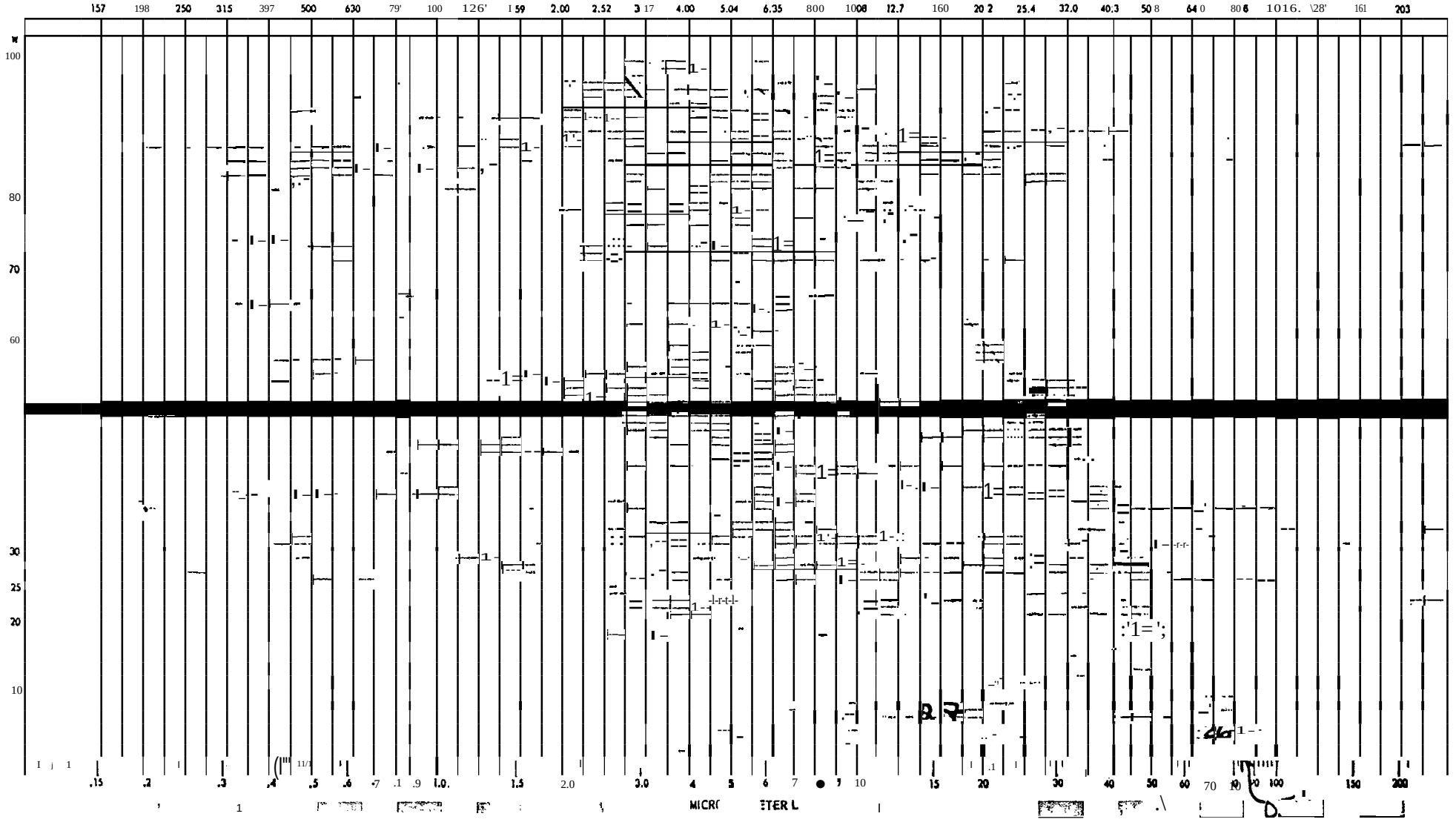
$k = d\sqrt[3]{2^{w}}$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ wh.. W2 = W1

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ .h·· WI. WI fOR MODEL TA

SAMPLE SETTINGS

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	± IA	A	DIA.	W	± IA	A
			200		Extremely Small								
R519-019' :					Amount of Samole								
T-303'.,8					Present								
TC - 125063													



COULTER **COUNTER**® Model T&TA

PARTICLE SIZE ANALYSIS

.15 – 200 μ
X PERCENT

GEOCHEM **LABORATORIES, INC.**
1143-C **BRITTMORE** ROAD
HOUSTON, **TEXAS 77043** • 7131487-7011

ORGANIZATION

OPERATOR

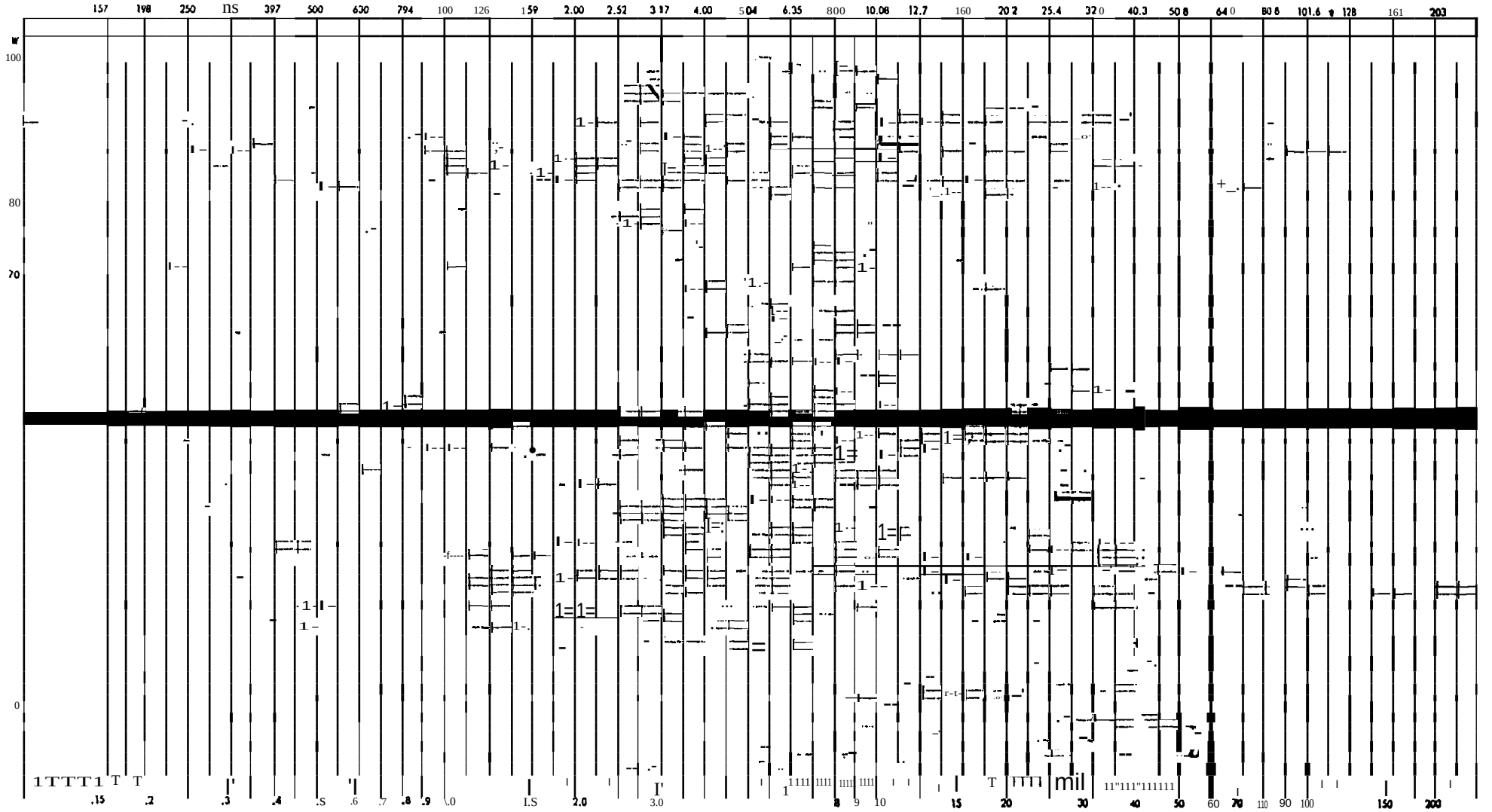
EQUIPMENT

$k = d\sqrt[3]{2^n}$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ wh. W2 - W1

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when W2 = W1 FOR MODEL fA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	± IA	A	SAMPLE SETTINGS DIA.	W	± IA	A
			200		Extremely Small Amount of Samole								
R519-020													
T - 454.6													
TC - 100026													



COULTER **COUNTER**® Model T & TA

PARTICLE SIZE ANALYSIS

.15 – 200μ
x PERCENT

GEOCHEM LABORATORIES, INC.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043 · 713/467-7011

ORGANIZATION

OPERATOR

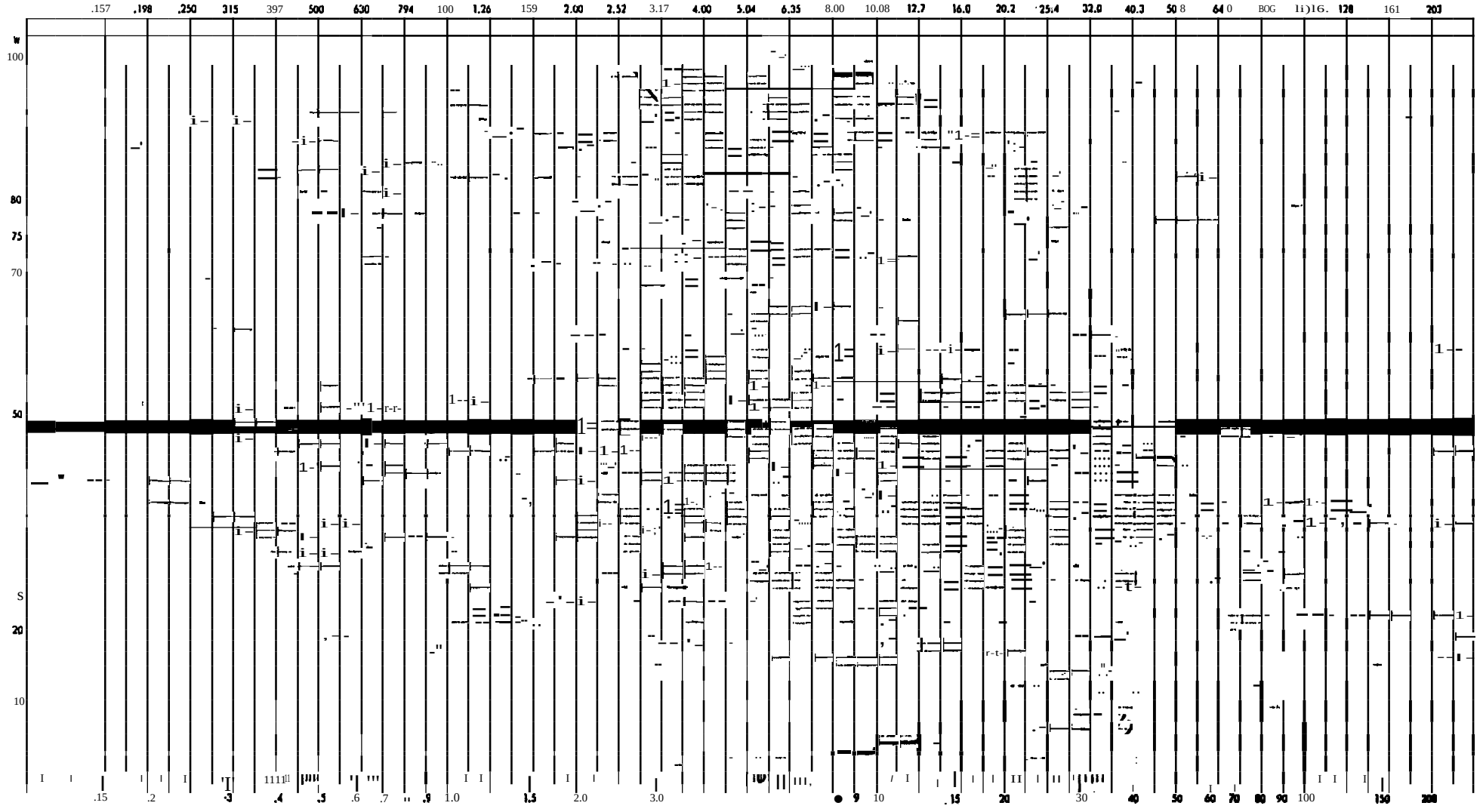
EQUIPMENT

$k = d\sqrt[3]{2w}$ FOR MODEL T

$\frac{A2}{A1} = \left(\frac{d2}{d1}\right)^3$ when W2 = W1

$\frac{A2}{A1} = \left(\frac{d1}{d2}\right)^3$ when W2 = W1 FOR MODEL TA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE				W		A	SAMPLE SETTINGS DIA.	W	± IA	A
			200										
R519-021													
T-124.0													
TC- 76485													



21010

COULTER **COUNTER**® Model T&TA

PARTICLE SIZE ANALYSIS

.15 · 200....
X PERCENT

GEOCHEM **LABORATORIES, INC.**
1143·Q BRITTMORE ROAD
HOUSTON, TEXAS 77043 ·. 713/467-7011

ORGANIZATION

OPERATOR

EQUIPMENT

$k = d\sqrt[3]{2^w}$

FDA MODEL T: $\frac{A2}{A1} = \left(\frac{d2}{d1}\right)^3$ when W2 - W1

FOR MODEL TA: $\frac{A2}{A1} = \left(\frac{d1}{d2}\right)^3$ wh·· W2 _ W1

	SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	± IA	A	SAMPLE SETTINGS DIA.	W	± IA	A
				200		250m Sieve Used								
	R519-023					t.								
	T- 84.7 <.													
	TC - 75128													

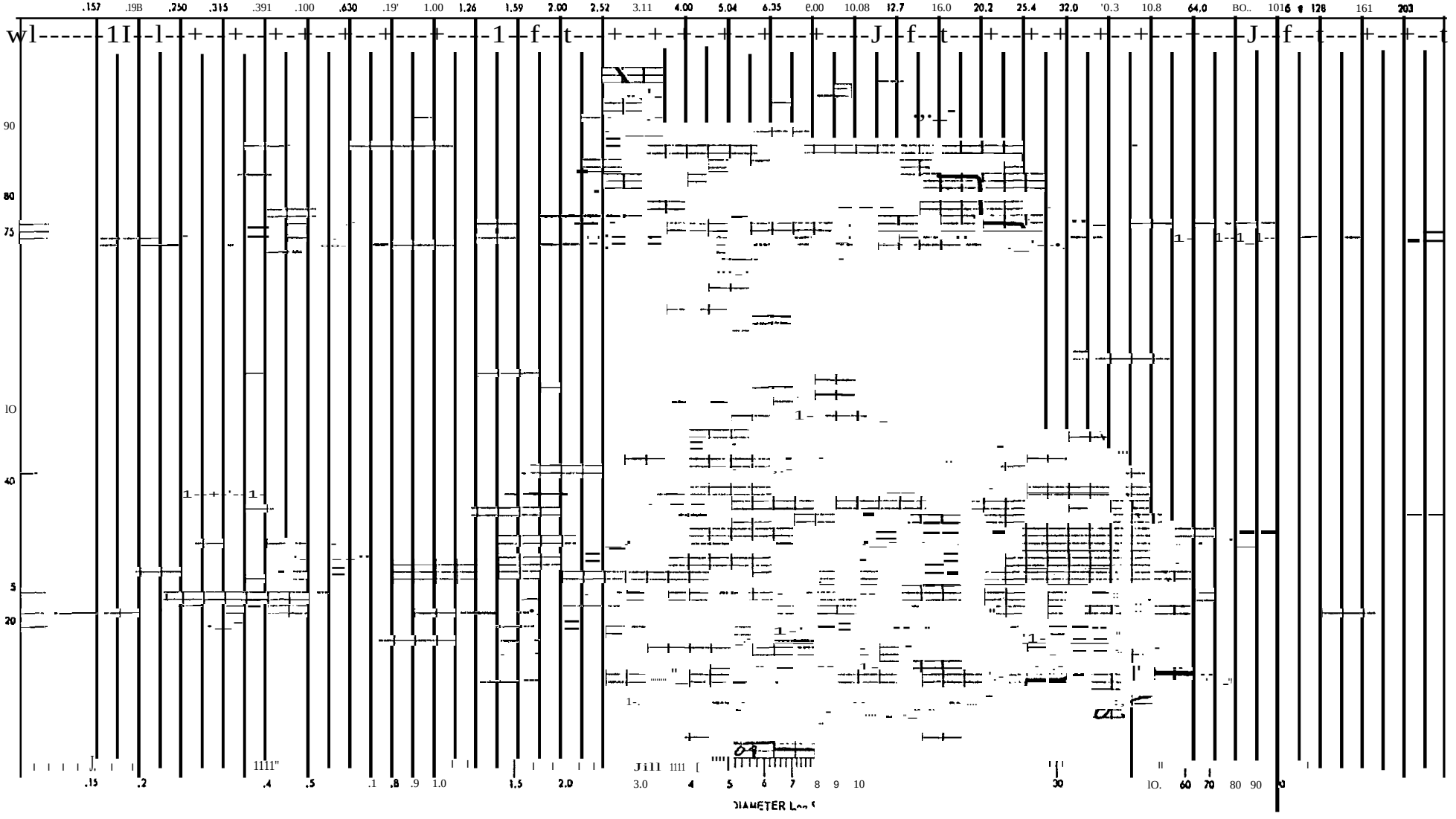


Table XII

KEROGEN COHPOSITION

GeoChem Sample Number	Weight Percent (Ash Free) C	H	N	0	Weight Percent Ash	Atomic *HIC*	Atomic O/e
RS19-001	30.05	2.87	2.10	64.98	85.21	1.14	1.62
-006	87.27	2.37	0.50	9.86	7.82	0.32	0.08
-017	38.49	1.86	2.63	57.02	43.09	0.57	1.11
-018	72.10	2.28	O.	25.61	23.67	0.38	0.27
-019	43.29	2.38	0.15	54.18	74.03	0.65	0.94
-022	60.71	2.53	1.13	35.63	27.27.	0.50	0.44
RS19-023	80.42	2.81	2.49	14.28	4.45	0.42	0.13

Table XIII
Whole Rock Composition

CRr Sample Number	Weight Percent Carbon	Hydrogen	Nitgrogen	Ash
RS19-001	1.21	0.45	0.16	94.20
002	1. 64	0.43	0.12	93.61
003	4.22	0.37	0.17	89.21
004	3.86	0.46	0.18	90.07
005	2.92	0.40	0.14	91.59
006	6.22	0.50	0.28	88.45
007	9.57	0.08	0.15	65.57
008	8.07	0.16	0.13	69.89
009	6.69	0.20	0.18	74.99
010	.88	0.48	0.12	94.37
Oll	2.30	0.51	0.17	92.42
012	1.04	0.49	0.13	92.92
013	1.08	0.51	0.12	93.39
014	1.14	0.46	0.10	93.37
015	.90	0.45	0.11	94.38
016	1.03	0.45	0.10	93.99
017	4.68	0.51	0.26	89.28
018	5.41	0.39	0.18	73.60
019	3.54	0.58	0.27	86.89
020	2.77	0.53	0.27	91.23
021	11.79	1. 68	0.18	84.47
022	7.97	0.44	0.33	89.53
R519-023	11. 69	0.39	0.35	77.44

Table XIV
Clay Hineralogy

GeoChem Sample Number	Illite (%)	Mixed-Layer (%)	Chlorite (%)	Other Minerals	Crystallinit Index
R5l9-005	67	18	15	Calcite	1.4
R5l9-009	52	38	10	Calcite	2.2
R519-0l9	54	37	9		2.0

Major Elements in Whole Core

GeoChem Sample Number	Al_2O_3(%)	Fe_2O_3(%)	CaO(%)	MgO(%)	TiO_2(%)	MnO(%)	Na_2O(%)	K_2O(%)	SiO_2(%)	P_2O_5(%)
R519-001	17.5	5.98	1.24	2.21	1.09	.0460	.842	3.83	63.0	0.07
002	13.8	4.95	5.73	1.89	.891	.0451	.699	3.04	52.4	0.05
003	11.4	4.39	9.49	1.92	.789	.0649	.639	2.57	51.2	0.04
004	13.5	4.66	6.10	2.29	.840	.0564	.748	3.06	52.4	0.05
005	12.8	4.81	5.35	2.11	.752	.0467	.621	2.89	56.1	0.05
006	8.96	4.91	1.26	1.38	.528	.0177	.673	2.02	61.3	0.04
007	3.15	1.73	49.3	1.20	.176	.196	.495	1.04	12.1	0.03
008	7.32	2.60	39.3	1.53	.379	.317	.254	1.95	19.4	0.09
009	9.37	3.32	32.5	1.92	.544	.192	.449	2.40	23.4	0.09
010	18.8	6.56	.930	2.24	.960	.0451	1.23	4.21	57.7	0.09
011	16.6	5.43	2.79	3.32	.711	.0582	.916	3.92	54.4	0.09
012	18.3	6.47	L88	2.57	.807	.0769	.949	4.26'	53.6	0.11
013	18.0	6.69	2.00	3.03	.840	.0923	.728	4.02	55.2	0.ai
014	16.7	6.20	2.71	2.39	.849	.0719	.839	3.81	58.5	0.14
015	17.0	5.78	2.06	2.25	.866	.0667	.951	3.89	57.6	0.13
016	16.4	5.99	2.04	2.32	.848	.0773	1.06	3.37	60.1	0.08
017	13.6	6.37	2.14	1.59	.549	.0302	.827	3.32	56.8	0.09
018	12.9	3.90	15.5	2.11	.579	.0785	.519	3.29	38.7	0.09
019	17.3	5.74	3.22	1.97	.714	.0262	.795	4.40	51.5	0.07
020	16.0	4.94	1.10	1.94	.782	.0247	.901	4.48	56.8	0.06
021	1.27	.858'	48.2	.722	.0551	.0261	.148	.464	4.07	0.08
022	10.1	3.67	13.5	.896	.430	.0221	.678	2.91	44.6	0.07
R519-023	5.02	4.10	22.8	LIS	.231	.0110	.199	1.47	30.1	0.11

N.D. = Not Detected

Table XV

Pyrolysis - CC Analysis

CRI Sample Number	Total Hydrocarbon Yield (Wt.%)	Volatile Hydrocarbon Content (PPM)	Peak II Maximum Temperature (oC)
RS19-00l	0.02	60	443
-002	0.01	55	422
-003	0.03	109	376
-004	0.03	83	640
-005	0.02	67	406
-006	0.05	130	610
-007	0.01	26	424
-008	0.01	29	443
-009	0.01	49	451
-010	0.01	57	443
-011	0.03	93	418
-012	0.02	62	377
-013	0.02	52	463
-014	0.01	31	447
-015	0.01	47	374
-016	0.02	65	374
-017	0.03	105	368
-018	0.02	64	615
-019	0.02	97	367
-020	0.03	103	464
-021	0.08	99	455
-022	0.05	140	632
RS19-023	0.06	105	616

Table XVI

ORGANIC CARBON ISOTOPE RATIO

GeoChem Sample No.	$\delta^{13}C$ of Organic Carbon (PDB)
RS19-001	-29.4
003	-29.3
005	-29.1
007*	-29.4
009	-29.2
011	-29.1
013	-29.5
015	-29.4
017	-29.6
019	-30.2
020	-30.0
RS19-023*	-30.4

* These samples contained very high concentrations of pyrite, which caused difficulties in preparation.

Table XVII

$S^{13}C$ of CH_4

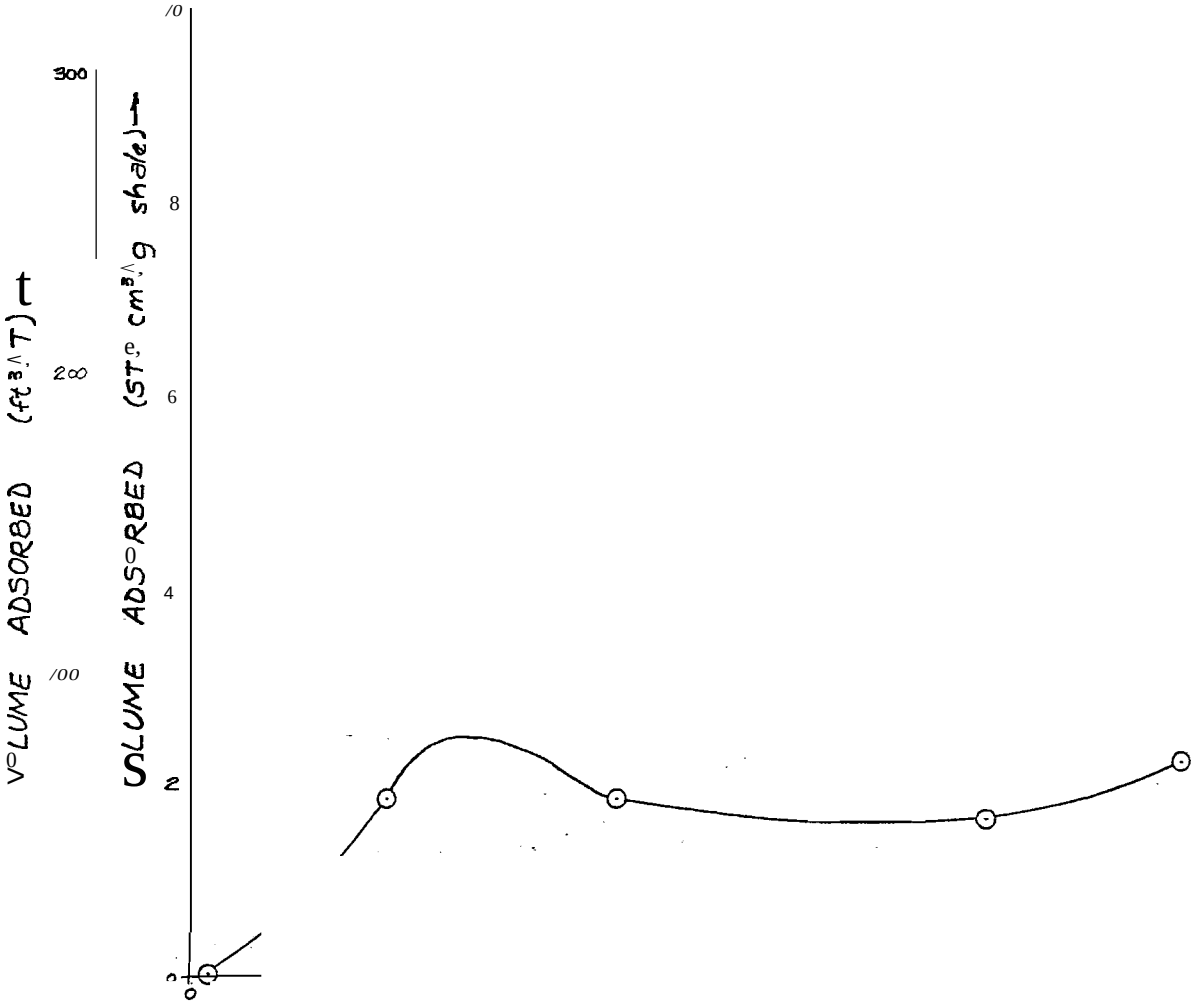
	$\delta^{13}C$ of CH_4 (PDB)
R5l9-007	-35.5
009	-34.7
019	-27.3
R5l9-020	-27.9

Table XIX

METHANE ADSORPTION ISOTHERMS
EASTERN GAS SHALES

PARTICLE SIZE: 4 x 8 mesh (ASTM)
ISOTHERM TEMPERATURE: 20°C.

SAMPLE NUMBER	ABSOLUTE PRESSURE '(atm)	VOLUME METHANE ADSORBED (STP cm^3/g shale)
RS19-015	1.0	0.03
	6.2	0.94
	10.1	1.9
	22.0	1.8
	41.1	1.6
	51. 3	2.2
R519-023	1.0	0.35
	6.6	3.1
	11.1	4.2
	21.4	4.8
	40.7	5.2
	50.4	5.0



SAMPLE NO. R519 - 015
ISOTHERM TEMPERATURE: 60°C.

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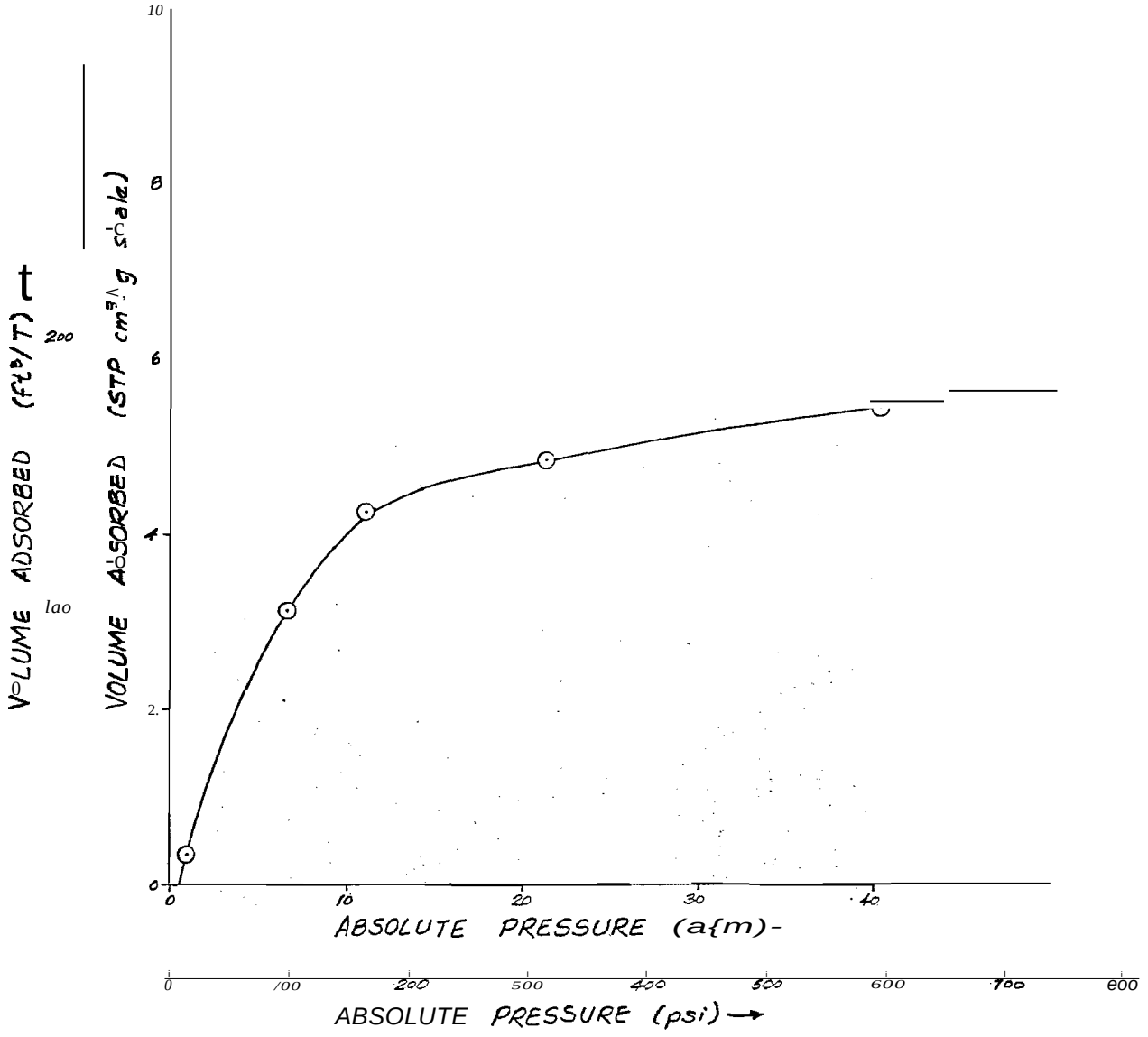

SAMPLE NO. R519-023
ISOTHERM TEMPERATURE: 20°C.

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