(37)

ORGANIC GEOCHEMICAL DATA REPORT

GRI JOB NO. R518

PA-1 Well, McKean Co., Pennsylvania

prepared

by

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ORGANIC GEOCHEMICAL DATA

GRI JOB NO. RS18

PA-1 WELL

TABLE I

Sample Description

GRI Sample Number	Depth (Ft.)	Sample Identification
R51S-00l	3482 (.32-.60)	Pa-I-l
002	3502 (.47-.73)	Pa-1-2
003	3522 (. SO-. 90)	Pa-1-3
004	4542 (.27-.53)	Pa-I-4
005	4562 (.21-.57)	Pa-1-5
006	4582 (.18-.47)	Pa-1-6
007	4600 (.33-.59)	Pa-I-7
008	4620 (.67-.92)	Pa-1-8
009	4640 (.63-.88)	Pa-1-9
010	4657 (.63-.83)	Pa-I-IO
all	4677 (.27-.54)	Pa-1-11
012	4697 (.23-.50)	Pa-1-12
013	4717 (.13-.41)	Pa-I-13
014	4737 (.12-.36)	Pa-1-14
015	4757 (.12-.33)	Pa-l-1S
016	4775 (.38-.58)	Pa-1-16
017	4795 (.42-.62)	Pa-l-17
018	4815 (.42-.68)	Pa-1-18
019	4835 (.35-. 77)	Pa-1-19
020	4855 (.56-.80)	Pa-1-20
021	4875 (.42-.66)	Pa-l-21
022	4893	Pa-l-22
023	4913 (.23-.46)	Pa-l-23
024	4933 (.11-.39)	Pa-1-24
025	4951 (.31-.56)	Pa-1-25
026	4971 (.18-.57)	Pa-1-26
027	4991 (.40-.75)	Pa-I-27
028	5010 (.30-.61)	Pa-1-28
029	5030 (.23-.49)	Pa-1-29
030	5050 (.30-.66)	Pa-I-30
031	5069 (.38-.53)	Pa-1-31
032	5089	Pa-1-32
033	5109 (.47-.75)	Pa-1-33
034	5149 (.30-.59)	Pa-1-34
R513-035	5169 (.48-.77)	Pa-1-35

TABLE II

GeoChem Sample Number	Well Interval	Gross Lithological Description	GSA Color Code
R518-001	3482	100% Shale, noncalcareous, slightly micro-micaceous, massive to tabular, moderately hard, dark gray	N3
002	3502	100% Shale, noncalcareous, anhydritic, generally massive, moderately hard, medium dark gray	N4
003	3522	100% Siliceous shale, noncalcareous, slightly anhydritic, massive, hard, olive gray	SY4!1
004	4542	100% Shale, noncalcareous, very slightly carbonaceous, platy, extremely fissile, crumbly, moderately hard, brownish black	SYR2!1
005	4562	100% Shale, noncalcareous, very slightly carbonaceous, platy, extremely fissile, crumbly, moderately hard, brownish black	5YR2!1
006	4582	100% Shale, noncalcareous, very slightly carbonaceous, platy, extremely fissile, crumbly, moderately hard, brownish black	SYR2!1
007	4600	100% Shale, noncalcareous, very slightly carbonaceous, tabular, moderately hard, brownish black	SYR2!1
008	4620	100% Shale, noncalcareous, slightly anhydritic, tabular, moderately hard, medium dark gray	N4
009	4640	100% Shale, very slightly calcareous, very slightly anhydritic, very slightly micromicaceous, tabular, moderately hard, medium dark gray	N4
010	4657	100% Shale, very slightly calcareous, slightly anhydritic, very slightly micromicaceous, tabular, moderately hard, medium dark gray	N4
011	4677	100% Shale, very slightly calcareous, slightly anhydritic, very slightly micromicaceous, tabular, moderately hard, medium dark gray	N4
R518-012	4697	100% Shale, very slightly calcareous, tabular to platy, moderately hard, medium dark gray	N4

GeoChem Sample Number	Well Interval	Gross Lithological Description	GSA Color Code
R518-013	4717	100% Shale, slightly calcareous, tabular to platy, moderately hard, medium dark gray	N4
014	4737	100% Shale, noncalcareous, tabular to platy, very fissile, moderately hard, medium dark gray	N4
015	4757	100% Shale, noncalcareous, tabular to platy, crumbly, very fissile, moderately hard, grayish black	N2
016	4775	100% Shale, very slightly calcareous, tabular to platy, crumbly, very fissile, moderately hard, dark gray	N3
017	4795	100% Shale, slightly calcareous, fossiliferous, very slightly anhydritic, tabular, moderately hard, dark gray	N3
018	4815	100% Shale, very slightly calcareous, very slightly anhydritic, very slightly carbonaceous, tabular, moderately hard, medium dark gray	N4
019	4835	100% Micrite, massive, very hard, medium dark gray	N4
020	4855	100% Shale, slightly calcareous, anhydritic, tabular, moderately hard, medium dark gray	N4
021	4875	100% Shale, calcareous, slightly anhydritic, massive to tabular, moderately hard, medium dark gray	N4
022	4893	100% Shale, slightly calcareous, tabular, moderately hard, dark gray	N3
023	4913	100% Shale, slightly calcareous, tabular, moderately hard, dark gray	N3
024	4933	100% Shale, slightly calcareous, very slightly anhydritic, tabular, moderately hard, dark gray	N3
025	4951	100% Shale, slightly calcareous, slightly anhydritic, tabular, moderately hard, medium dark gray	N4
026	4971	100% Shale, calcareous, tabular, moderately hard, dark gray	N3
R518-027	4991	100% Shale, slightly calcareous, anhydritic, massive to tabular, moderately hard, medium dark gray	N4

GeoChem Sample Number	Well Interval	Gross Lithological Description	GSA Color Code
R518-028	5010	100% Shale, slightly calcareous, anhydritic, massive to tabular, moderately hard, medium dark gray	N4
029	5030	100% Shale, calcareous, slightly anhydritic, tabular to massive, hard, dark gray	N3
030	5050	100% Shale, very slightly calcareous, tabular to platy, moderately hard, crumbly, medium dark gray	N4
031	5069	100% Shale, slightly calcareous, slightly anhydritic, tabular, moderately hard, medium dark gray	N4
032	5089	100% Shale, very slightly calcareous, platy, crumbly, moderately hard, brownish black	5YR2!1
033	*5109*	100% Shale, slightly calcareous, platy, crumbly, moderately hard, brownish black	5YR2!1
034	5149	100% Shale, very slightly calcareous, tabular to platy, moderately hard, brownish black	5YR2!1
Rs18-035	5169	100% Shale, slightly calcareous, tabular to platy, crumbly, moderately hard, fossiliferous, brownish black	5YR2!1

TABLE III

Density of Core Sample

GeoChem Sample Number	Density - By Water Displacement
R518-001	2.74
002	2.77
003	2.60
004	2.52
005	2.55
006	2.43
007	2.48
008	2.54
009	2.65
010	2.68
011	2.69
012	2.53
013	2.62
014	2.41
015	2.08
016	2.61
017	2.63
018	2.63
019	2.73
020	2.72
021	2.70
022	2.67
023	2.67
024	2.66
025	2.65
026	2.50
027	2.71
028	2.70
029	2.68
030	2.51
031	2.64
032	2.46
033	2.57
034	2.58
R518-035	2.84

TABLE IV

Organic Carbon Content

GRI Sample Number	Organic Carbon Content (Wt.%)
R518-00l	0.37
002	0.07
003	0.11
004	2.52
005	1.79
006	2.57
007	2.90
008	0.38
009	0.90
010	0.55
Oll	0.65
012	2.13
013	1.34
014	4.47
015	8.51
016	1.32
017	1.03
018	0.79
019	0.10
020	0.27
021	0.45
022	0.49
023	0.69
024	0.46
025	0.55
026	1.84
027	0.23
028	0.28
029	0.37
030	1.43
031	0.81
032	3.39
033	1.44
034	1.30
RS18-D35	3.71

TABLE V-A

Pressure/Vacuum in Container

GRI Sample Number	Volume Displacement (cc of water)
R5l8-00l	94
002	O
003	69
004	Slight pressure
005	153
006	80
·007	139
008	Slight pressure
009	372
010	40
011	549
012	2
013	9
014	Slight vacuum
015	Slight vacuum
016	31
017	159
018	2
019	O
020	180
021	245
022	O
023	200
024	Slight pressure
025	385
026	114
027	264
028	188
029	385
030	68
031	6
032	3
033	21
034	88
R5l8-o35	O

TABLE V-B

C I-C7 HYDROCARBON ANALYSES OF AIR SPACE

GeoChem Sample Number	Methane C1 PPM	Ethane C2 PPM	Propane C3 PPM	Isobutane iC4 PPM	Butane nCLI PPM	Total C5-C7 PPM	Total ,Cl-CLI PPM	Total C2-C4 PPM	Gas Wetness %	1C4/nC4
R51.8-001	223954	72600	24940	2120	5836	3558	329450	105496	32.0	0.36
002	62582	10430	2384	202	444	0	76042	13463	17.7	0.45
003	96847	41488	44039	12948	32608	50699	227930	131083	57.5	0.39
004	44631	90921	99349	17817	45259	32149	297977	253346	85.0	0.39
005	132390	102201	65746	9729	23065	16554	333131	2007L.l	60.2	0.59
006	133101	97237	80792	15416	35307	25149	361853	228752	63.2	0.44
007	136609	155989	112784	17520	41203	27299	464105	327496	70.6	0.43
008	402919	100702	34185	4030	10782	8839	552618	149699	27.1	0.37
009	414388	183956	92116	12054	29590	21272	732104	317716	43.4	0.zi
fJ1.0	446l.72	194587	85309	10040	24916	18683	761.324	314852	41.4	0.40
Oll	419795	183838	84101	10374	25844	19517	723952	304157	42.0	0.SO
Oi2	29894	5526l,	65042	14696	34292	26015	199188	169294	85.0	0.43
013	43592	74456	82733	17074	l,0321	31829	258176	214584	83.1	0.42
014	21058	91503	123686	20998	l,7808	26011	305053	283995	93.1	0.44
015	15330	99992	135162	21354	l,7574	52022	319412	304082	95.2	0.45
016	75500	104150	98916	16898	42696	35342	338160	262660	77.7	0.40
017	117907	132989	101582	17448	38687	27597	408613	290706	71.1	0.45
018	105408	88427	70484	12998	28572	20909	305889	200481	65.5	0.45
019	26740	6398	3493	560	1460	_1175	38651	11911	30.8	0.38
020	159101	53818	24661	3532	7816	5070	248928	89827	36.1	0.45
021	309610	115698	52065	7057	15374	10032	499704	190094	38.0	0.46
022	99215	98082	75851	13782	29690	21960	316620	217405	68.7	0.46
023	2L19812	110311	56763	9193	20128	16607	446217	196395	44.0	0.46
024	273889	168838	108787	18244	38822	20199	608580	334691	55.0	0.47
025	297347	151248	70283	9207	20326	15145	548411	251064	45.8	0.45
026	71806	125397	59260	11109	.24429	18014	292001	220195	75.4	0.45
027	228780	67961	23485	2613	55lf8	3105	328387	99607	30.3	0.47
028	239874	795Lf3	30871	3757	8135	4997	362180	122306	33.8	0.46
029	346601	97914	32561	3571	8816	6907	489463	142862	29.2	0.41
030	61966	92079	92292	18448	41792	33570	306577	24lf611	79.8	0.44
031	38507	34731	25987	4299	10537	8326	114061	75554	66.2	0.41
032	19496	67114	94966	19192	46434	30790	247202	227706	92.1	0.41
033	59543	90651	89177	16101	36624	24684	292096	232553	79.6	0.44
034	139528	134518	97085	13289	32504	17069	416924	277396	66.5	0.41
R5J 8--035	30547	85525	77615	10134	21525	8568	2253l.6	194799	86.4	0.47

TABLE V-C

CI-C7 HYDROCARBON ANALYSES OF CUTTINGS GAS

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
R518-001	3735	2L1538	40826	9784	20504	17075	99387	95652	96.2	0.48
002	4532	3566	2888	L162	1235	943	12683	8151	64.3	0.37
003	5392	1888	4053	2862	9062	48772	23257	17865	76.8	0.32
00L1	198	1021	3058	996	2722	6918	7995	7797	97.5	0.40
005	1937	5585	11135	3658	9237	12171	31552	29615	93.9	0.40
006	1507	3149	9331	3511	10845	16969	28343	26836	94.7	0.32
007	3546	13995	34096	10453	23983	25220	86073	82527	95.9	0.41
008	8201	17218	24498	6003	12236	12811	68156	59955	87.9	0.49
009	12584	20452	47245	14439	30529	33660	155778	143194	91.9	0.47
010	5796	10237	25553	8162	12407	24995	62155	56359	90.7	0.66
all	6883	7L158	20432	8169	17899	29689	60841	53958	88.7	0.46
012	15L143	5144	14259	6819	171.97	26858	58862	43419	73.8	0.40
013	23827	6994	13470	6555	15993	23624	66839	43012	64.3	0.41
oiz	1796	8148	28501	8351	21200	15817	67996	66200	97.3	0.39
015	4557	14993	39770	8714	20363	11750	88397	83840	94.8	0.43
016	2407	3001	8078	4189	10584	19069	28259	25852	91.5	0.40
017	L1606	7958	15173	6736	16630	27996	51103	46497	90.9	0.40
018	7166	8412	1687 L1	858L1	20559	L1793	61595	54429	88.4	0.42
019	20876	2L199	1368	362	821	2279	25926	5050	19.5	0.44
020	3695	1695	4298	2168	4975	11279	16831	13136	78.0	0.44
021	10109	3250	6916	3719	8094	16022	32088	21979	68.5	0.46
022	3664	2295	6790	4146	9647	19924	26542	22878	86.2	0.43
023	L1912	2938	4268	1484	4520	11636	18122	13210	72.9	0.33
024	6L183	L.389	7460	3050	8474	23637	29856	23373	78.3	0.36
025	10981	7343	19480	7432	16140	30215	61376	50395	82.1	0.46
026	9114	3079	7L121	3834	9699	13116	33147	24033	72.5	0.40
027	9067	3438	6562	2154	L1918	8062	26139	17072	65.3	0.44
028	7614	4616	6595	1824	4169	8481	24818	17204	69.3	0.44
029	31545	19021	16885	4179	9298	18170	80928	49383	61.0	0.45
030	5622	5503	13982	5469	16681	32653	47257	41635	88.1	0.33
031	25312	5920	17923	9289	21059	42017	79503	54191	68.2	0.44
032	16527	3813	5785	2992	10686	19854	39803	23276	58.5	0.28
033	10332	2681	627L.	2687	8317	16703	30291	19959	65.9	0.32
034	9539	3894	8296	2827	8172	9565	32728	23189	70.8	0.35
R518-035	3949	6247	18323	4769	12189	8136	45477	41528	91.3	0.39

TABLE V-D

Cl-C7 HYDROCARBON ANALYSES OF AIR SPACE AND CUTTINGS GAS

GeoChem Sample Number	Methane Cl 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
R518-001	227689	97138	65766	11904	26340	20633	428837	201148	46.9	0.45
002	67114	13996	5272	664	1679	943	88725	21611	24.4	0.40
003	102239	43376	48092	15810	41670	99471	251187	148948	59.3	0.38
004	44829	91942	102407	18813	47981	39067	305972	261143	85.3	0.39
005	134327	107786	76881	13387	32302	28725	364683	230356	63.2	0.41
006	134608	100386	90123	18927	46152	42118	390196	255588	65.5	0.41
007	140155	169984	146880	27973	65186	52519	550178	410023	74.5	0.43
008	411120	117920	58683	10033	23108	21650	620864	209744	33.8	0.43
009	426972	204408	139361	26493	60119	54932	857353	430381	50.2	0.44
010	452268	204824	110862	18202,	37323	43678	823479	371211	45.1	0.49
011	426678	191296	104533	18543	43743	49206	784793	358115	45.6	0.42
012	45337	60408	79301	21515	51489	52873	258050	212713	82.4	0.42
013	67419	81450	96203	23629	56314	55453	325015	257596	79.2	0.42
014	22854	99651	152187	29349	69008	41828	373049	350195	93.9	0.43
015	19887	114985	174932	30068	67937	63772	427696	407809	95.6	0.44
016	77907	107151	106994	21087	53280	54411	366419	288512	78.7	0.40
017	122513	140947	116755.	24184	55317	55593	459716	337203	73.3	0.44
018	112574	96839	87358	21582	49131	62702	367484	254910	69.4	0.44
019	47616	8897	4861	922	2281	3454	64577	16961	26.3	0.40
020	162796	55513	28959	5700	12791	27628	265759	102963	38.7	0.44
021	319719	118948	58981	10776	15151	26054	523575	203856	38.9	0.71
022	102879	100377	82641	17928	39337	41884	343162	240283	70.0	0.46
023	254734	113249	61031	10677	24648	28243	464339	209605	45.1	0.43
024	280372	173227	116247	21294	47296	53836	638436	358064	56.1	0.45
025	308328	158591	89763	16639	36466	45360	609787	301459	49.4	0.46
026	80920	128476	66681	14943	34128	31130	325148	244228	75.1	0.44
027	237847	71399	30047	4767	10466	11167	354526	116679	32.9	0.45
028	247488	84159	37466	5581	12304	13478	386998	139510	36.0	0.45
029	378146	116935	49446	7750	18114	25077	570391	192245	33.7	0.43
030	67588	,97582	106274	23917	58473	66223	353834	286246	80.9	0.41
031	63819	40651	43910	13588	31596	50343	193564	129745	67.0	0.43
032	36023	70927	100751	22184	57120	97078	240571	204548	85.0	0.39
033	69875	93332	95451	18788	44941	41387	322387	252512	78.3	0.42
034	149067	138412	105381	16116	40676	26634	449652	300585	66.8	0.40
R518-035	34496	91772	95938	14903	33714	16704	397091	362595	91.3	0.44

TABLE VI

VISUAL KEROGEN ASSESSMENT WORKSHEET

TYPE OF ORGANIC MATTER	COLOR OF ORGANIC MATTER	STATE OF ORGANIC MATTER	MATURATION INDEX	DEPOSITIONAL ENVIRONMENT	REMARKS	SUMMARY ORGANIC MATTER TYPE
RECOGNIZABLE ALGAE; AMORPHOUS - SAPROPEL; RELIC AMORPHOUS; SPORES - POLLEN; DEGRADED HERBACEOUS; CUTICLE - MEMBRANOUS DEBRIS; WOODY - STRUCTURED DEBRIS; COALY - INERTINITE DEBRIS; PYROBITUMEN; NONRECOGNIZABLE DEBRIS	GREENISH LIGHT YELLOW; YELLOW; YELLOW ORANGE; ORANGE BROWN; LIGHT BROWN; BROWN; DARK BROWN; BLACK	PARTICLE SIZE: FINELY DISSEMINATED; FINE; MEDIUM; COARSE. PRESERVATION: EXCELLENT; GOOD; FAIR; POOR	UNALTERED; SLIGHTLY ALTERED; MODERATELY ALTERED; STRONGLY ALTERED; SEVERELY ALTERED; METAMORPHOSED	OFFSHORE MARINE; NEARSHORE MARINE; RESTRICTED MARINE; LACUSTRINE; NEARSHORE - MARSH; CONTINENTAL		

012

013

01[illegible]

TABLE

VISUAL KEROGEN ASSESSMENT WORKSHEET

RS18		TYPE OF ORGANIC MATTER	COLOR OF ORGANIC MATTER	STATE OF ORGANIC MATTER	MATURATION INDEX	DEPOSITIONAL ENVIRONMENT	SUMMARY ORGANIC MATTER TYPE
GEOCHEM No.	DEPTH					REMARKS	
RS18-021	4875						
022	4893						
023	4913						
024	4933						
025	4951						
026	4971						
027	4991						
028	5010						
029	5030'.						
030	5050						
031	5069						
032'	5089						
033	5109						
034	5149						
RS18-035	5169						

TABLE VII.

VITRINITE REFLECTANCE SUMMARY

GEOCHEM SAMPLE NUMBER	DEPTH (fee t)	TYPE OF SAMPLE	POPULATION	NUMBER OF READINGS	MINIMUM REFLECTANCE (% Ro)	MAXIMUM REFLECTANCE (% Ro)	MEAN REFLECTANCE (% Ra)	STD. DEV. (% Ro)	REMARKS
R518-001	3482.6	CORE	(l)	18	0.62	0.91	0.75*	0.075	
			(2)	18	0.97	1.42	1.15	0.131	
			(3)	4	1.51	1. 78	1.64	0.135	
R518-002	3502.7	CORE	(l)	5	0.92	1.19	1.04*	0.107	
			(2)	6	1.35	1.56	1. 50	0.082	
			(3)	3	1.88	2.13	1.97	0.139	
R518-003	3522.9	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-004	4542.5	CORE	(1)	1	0.99	0.99	0.99*		
			(2)	2	1.23	1.31	1.27		
			(3)	14	1.53	1.81	1.69	0.093	
			(4)	6	2.02	2.27	2.11	0.086	
R518-005	4562.8	CORE	(1)	8	0.66	0.94	0.84*	0.094	
			(2)	14	1.10	1.47	1.25	0.132	
			(3)	15	1.53	1.91	1.71	0.118	
			(4)	3	2.12	2.21	2.18	0.052	
R518-006	4582.5	CORE	(1)	9	0.71	1.04	0.93*	0.109	
			(2)	5	1.16	1.32	1.24	0.060	
			(3)	11	1.49	1.72	1.61	0.074	
			(4)	12	1.82	2.20	1. 98	0.114	
R518-007	4600.6	CORE	(1)	6	0.68	0.98	0.88*	0.114	
			(2)	7	1.11	1.28	1.18	0.071	
			(3)	25	1.40	1.96	1.69	0.146	
			(4)	2	2.20	2.28	2.24		
1286-008	4620.9	CORE	NO VITRIN ITE						

* 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
R518-009	4640.9	CORE	NO VITRINITE						
R518-010	4657.8	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-011	4677.5	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-012	4697.5	CORE	NO VITRINITE						
R518-013	4717.4	CORE	NO VITRINITE						
R518-014	4737.4	CORE	(1)	4	1.02	1.27	1.17*	0.112	
			(2)	13	1.48	1.87	1.68	0.143	
			(3)	2	2.00	2.14	2.07		
R518-015	4757.3	CORE	(1)	4	0.99	1.15	1.06*	0.080	
			(2)	33	1.26	1.70	1.51	0.116	
			(3)	3	1.80	1.99	1.91	0.098	
R518-016	4775.6	CORE.	NO VITHINITE						
R518-017	4795.6	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-018	4815.7	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-019	4835.8	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-020	4855.8	CORE	(1)	3	1.31	1.36	1.34*	0.026	
			(2)	7	1.52	1.94	1.71	0.156	
			(3)	6	2.02	2.29	2.17	0.121	
R518-021	4875.7	CORE	(1)	4	1.26	1.61	1.50*	0.161	
			(2)	6	1.76	2.10	1.94	0.125	

* 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
R518-022	4893.0	CORE	(1)	2	1.40	1.43	1.42*		
			(2)	5	1.64	1.84	1.73	0.098	
R518-023	4913.5	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-024	4933.4	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-025	4951.6	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-026	4971.6	CORE	(1)	5	0.87	1.16	1.02*	0.110	
			(2)	2	1.54	1.55	1.55		
			(3)	6	1.73	2.06	1.89	0.109	
R518-027	4991.8	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-028	5010.6	CORE	NO VITRINITE						
R518-029	5030.5	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-030	5050.7	CORE	NO VITRINITE						
R518-031	5069.5	CORE	INSUFFICIENT KEROGEN FLOAT						
R518-032	5089.0	CORE	(1)	3	0.70	0.84	0.76	0.074	
			(2)	1	1.18	1.18	1.18*		
			(3)	1	1.81	1.81	1.81		
R518-033	5109.8	CORE	(1)	3	0.72	0.88	0.79	0.081	
			(2)	3	1.40	1.51	1.44*	0.061	
			(3)	9	1.73	1.93	1.83	0.068	

* Indigenous Population

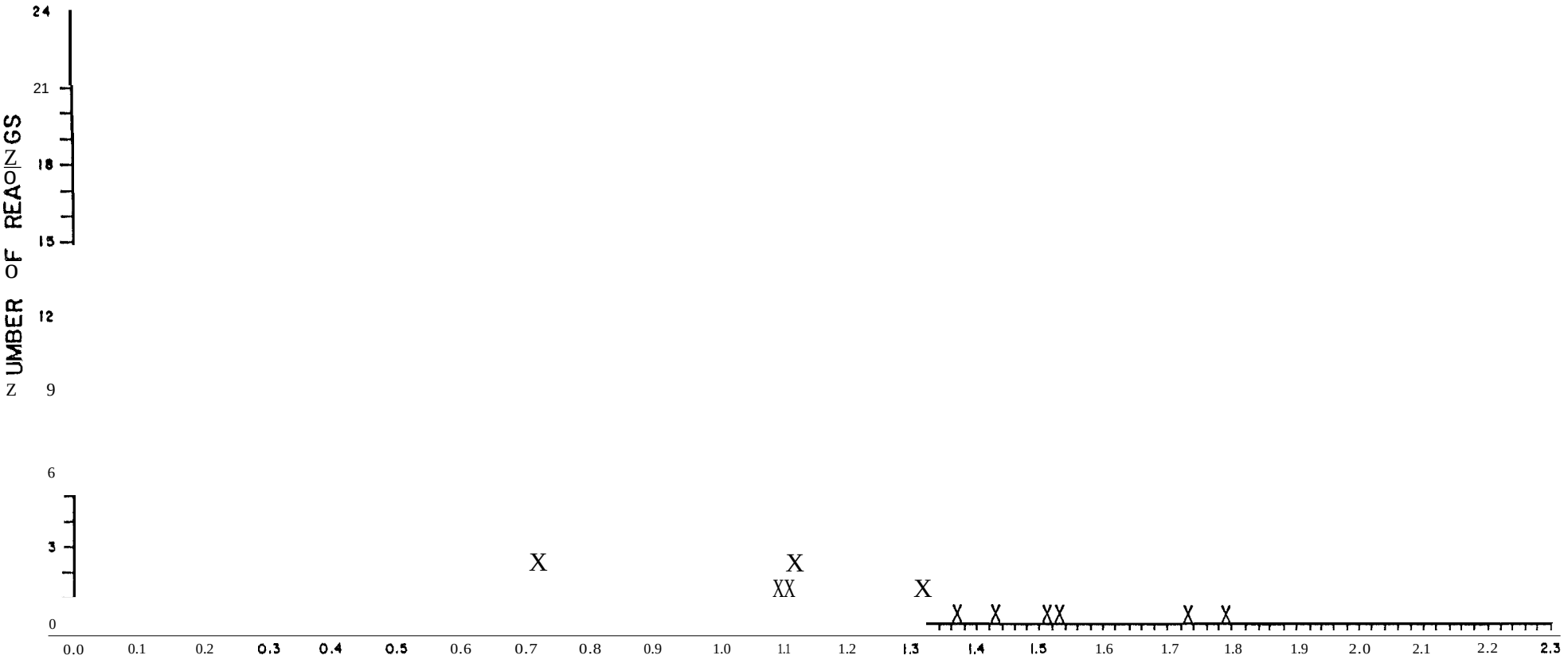
VITRINITE REFLECTANCE SUMMARY

GEOCHEM NO. R518-001 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 3482.6

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 40) 0.62 0.64 0.67 0.68 0.70 0.70 0.70 0.73 0.75 0.76 0.77 0.77 0.77 0.77
0.79 0.81 0.87 0.91 0.97 1.00 1.01 1.03 1.05 1.08 1.08 1.10 1.10 1.11 1.14 1.17 1.22 1.24
1.30 1.31 1.36 1.42 1.51 1.53 1.72 1.78

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	18	0.62	0.91	0.75	0.075	
(2)	18	0.97	1.42	1.15	0.131	
(3)	4	1.51	1.78	1.64	0.135	



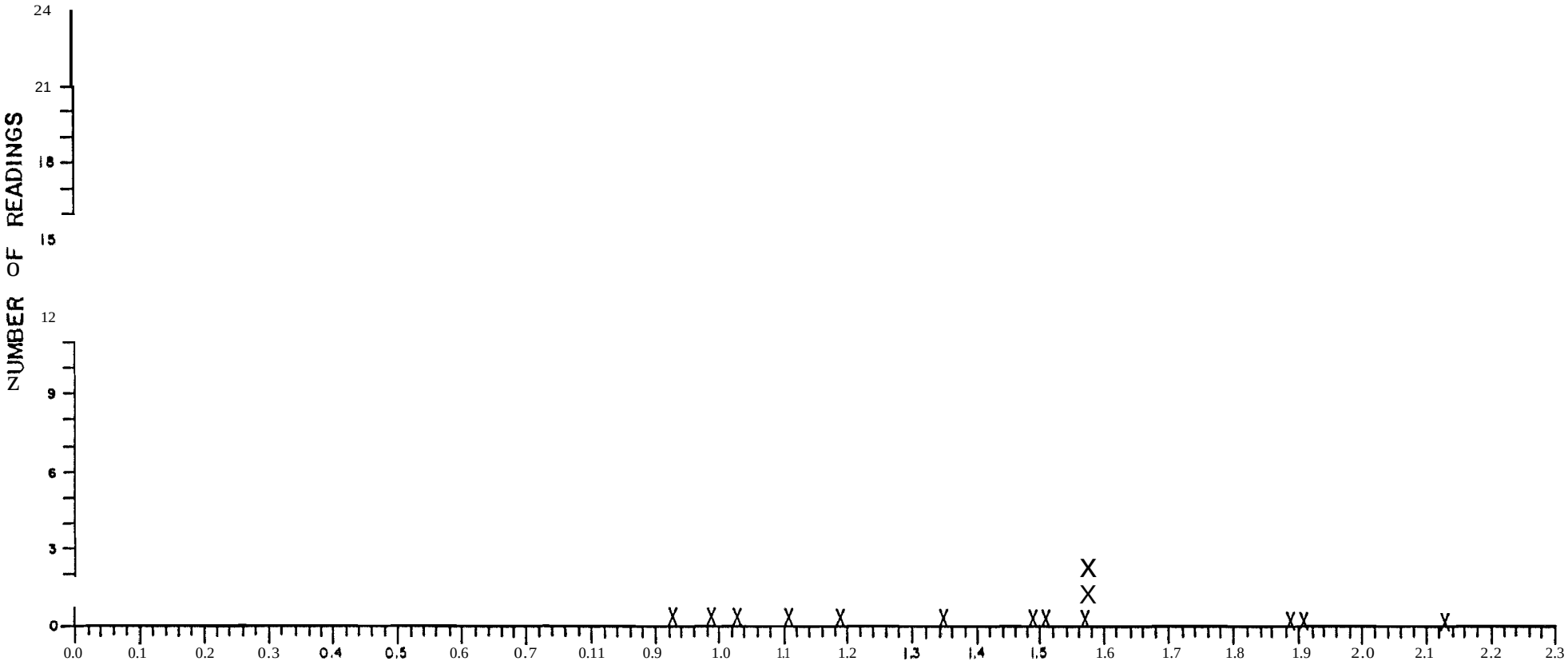
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-002 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 3502.,7

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 14) 0.92 0.98 1.02 1.11 1.19 1.35 1.48 1.50 1.56 1.56 1.56 1.88 1.90 2.13

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	5	0.92	1.19	1.04	0.107	
(2)	6	1.35	1.56	1.50	0.082	
(3)	3	1.88	2.13	1.97	0.139	

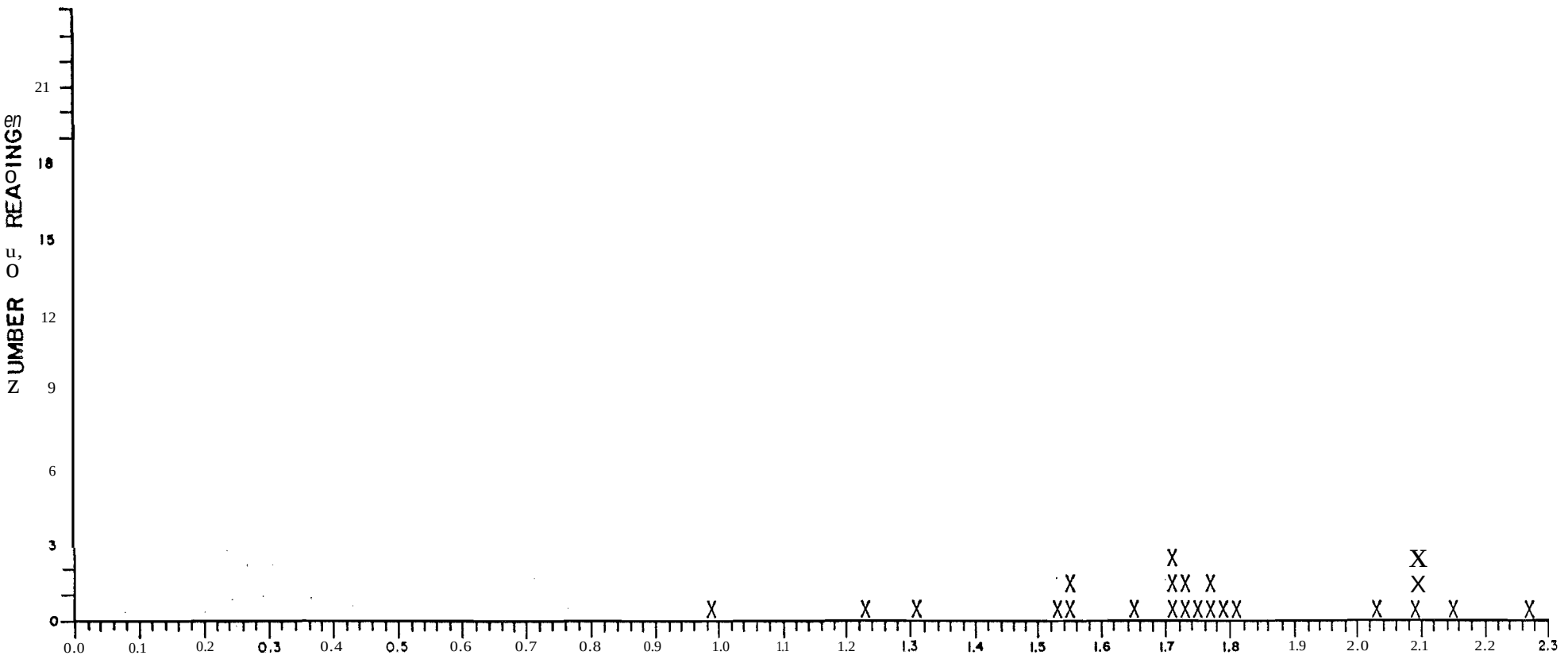


VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-004 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4542.5

CLIENT'S NAME MONSANTO WELL NAME EGS P - PA #1

(NO. OF READINGS = 23) 0.99 1.23 1.31 1.53 1.54 1.55 1.64 1.70 1.71 1.71 1.72 1.73 1.74 1.77 1.77 1.78 1.81 2.02 2.08 2.08 2.09 2.14 2.27



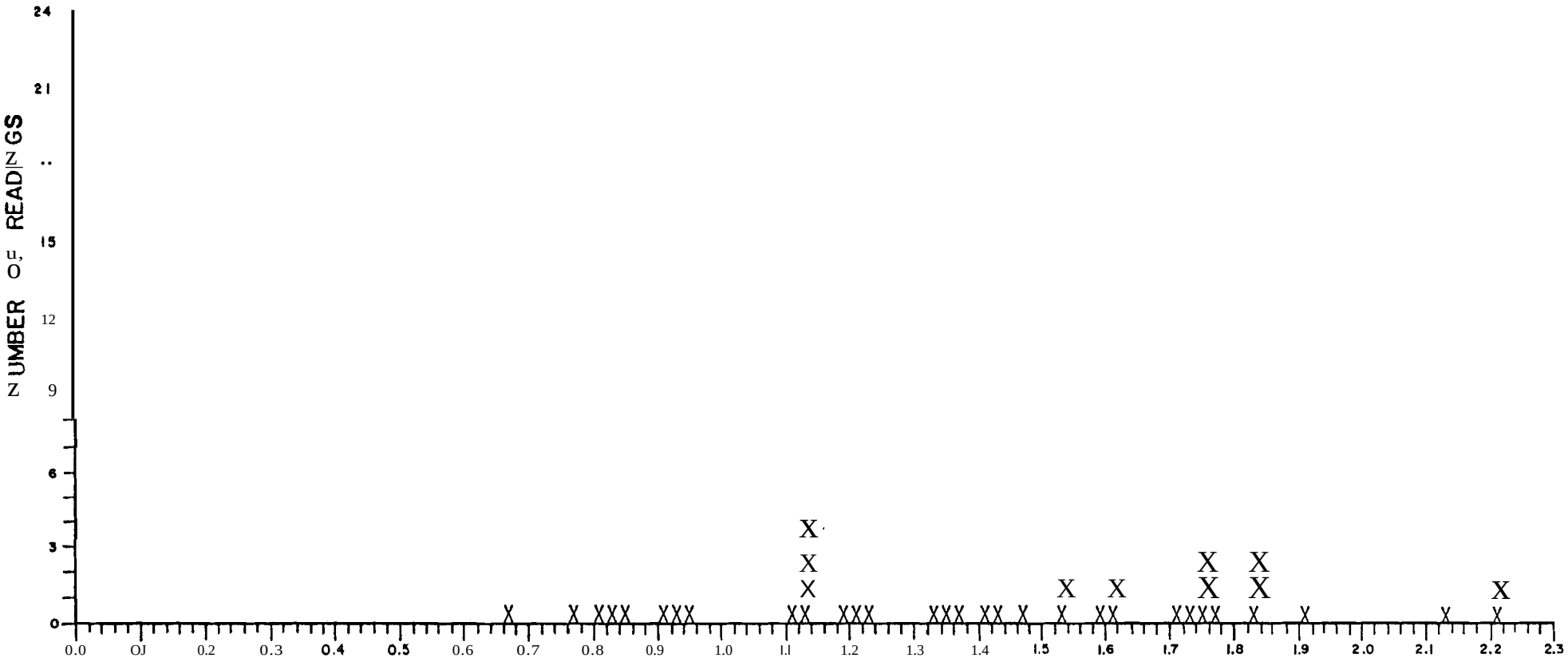
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-005 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4562.8

CLIENT'S NAME MONSANTO WELL NAME EGS P- PA #1

(NO. OF READINGS = 40) 0.66 0.77 0.80 0.82 0.85 0.91 0.93 0.94 1.10 1.12 1.12 1.13 1.13 1.18
1.20 1.23 1.33 1.35 1.36 1.41 1.43 1.47 1.53 1.53 1.58 1.60 1.61 1.70 1.72 1.74 1.75 1.75
1.77 1.83 1.83 1.83 1.91 2.12 2.21 2.21

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	8	0.66	0.94	0.84	0.094	
(2)	14	1.10	1.47	1.25	0.132	
(3)	15	1.53	1.91	1.71	0.118	
(4)	3	2.12	2.21	2.18	0.052	

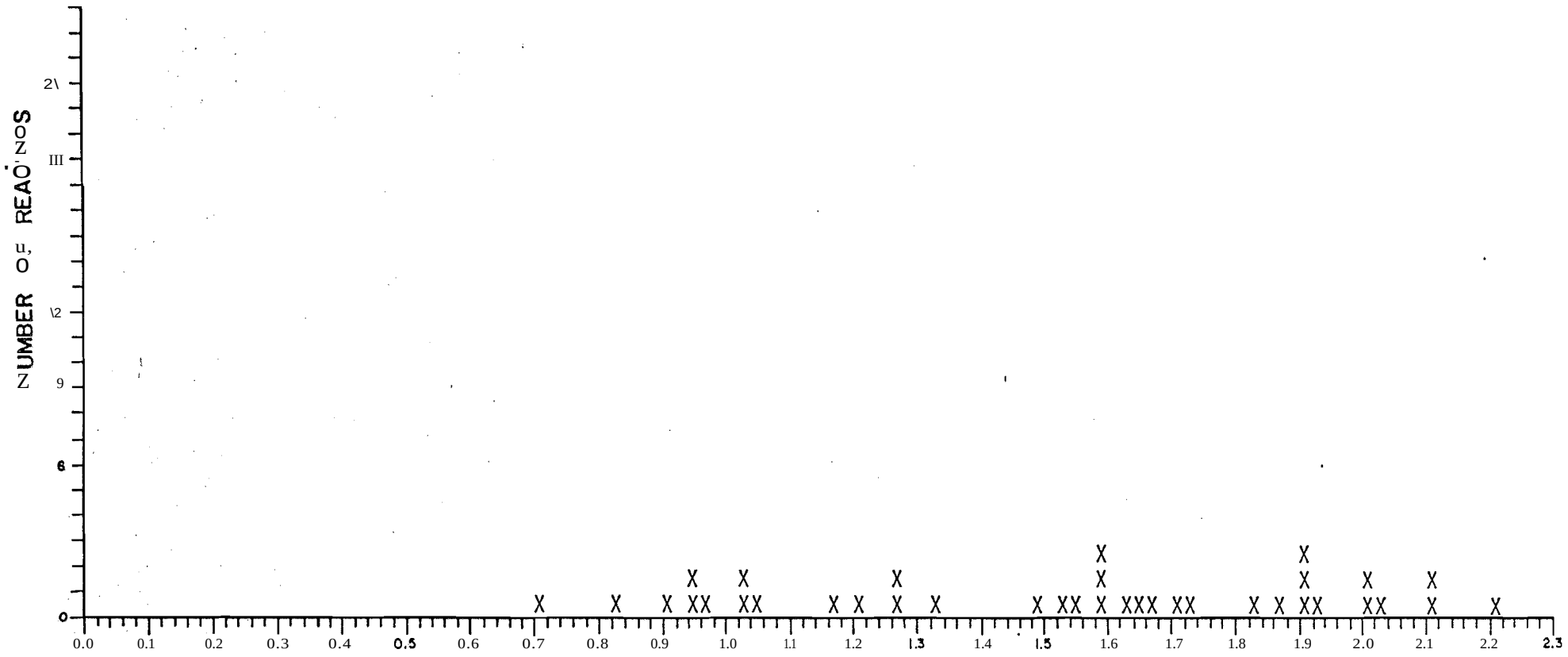


VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-006 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4582.5

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 37) 0.71 0.82' 0.91 0.94 0.95 0.97 1.03 1.03 1.04 1.16 1.21 1.26 1.26 1.32
1.491.521.551.581.581.581.631.641.661.71 1.72 1.82 1.86 1.90 1.911.911.922.00
2.01 2.03 2.10 2.11 2.20

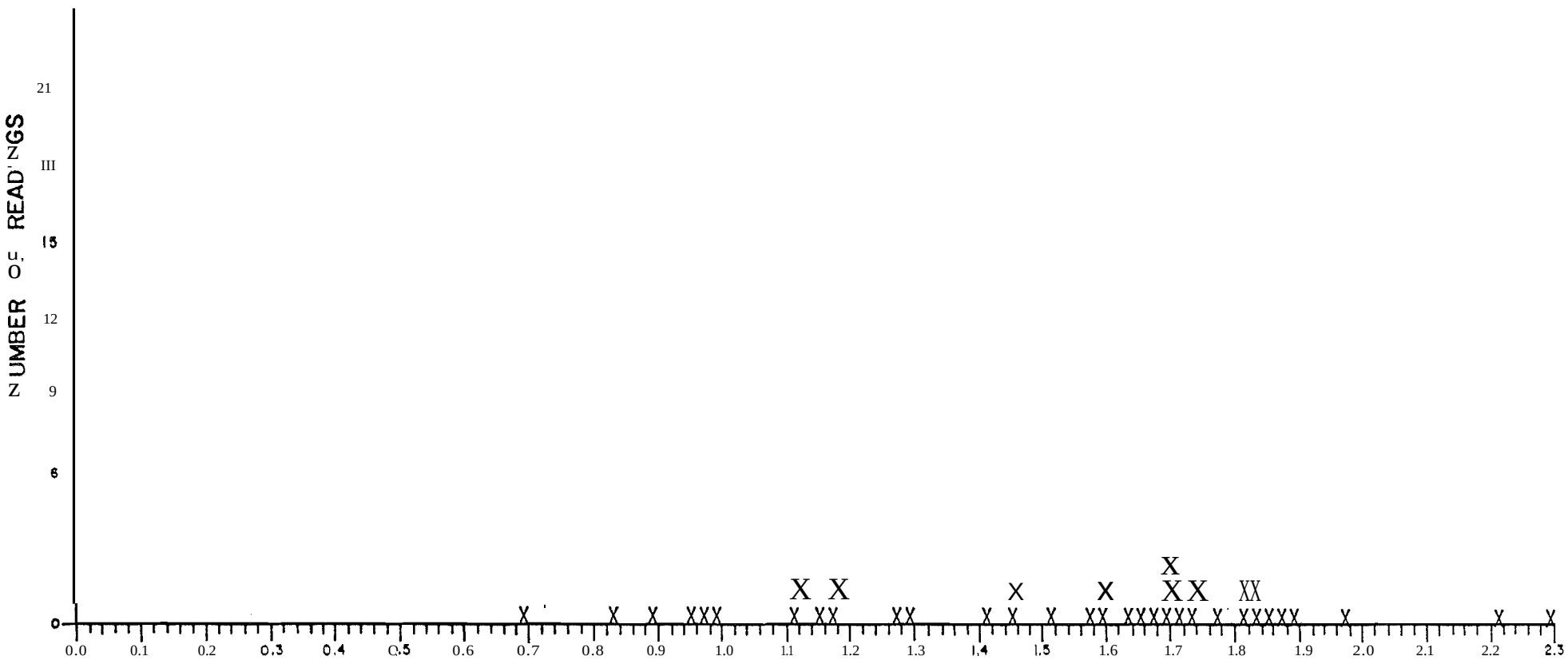


VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-007 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4600.6

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 40) 0.68 0.82 0.89 0.95 0.96 0.98 1.11 1.11 1.14 1.16 1.17 1.27 1.28 1.40
1.45 1.45 .1.51 1.57 1.58 1.58 1.63 1.64 1.67 1.68 1.68 1.68 1.71 1.72 1.73 1.77 1.80 1.80
1.82 1.83 1.84 1.87 1.88 1.96 2.20 2.28



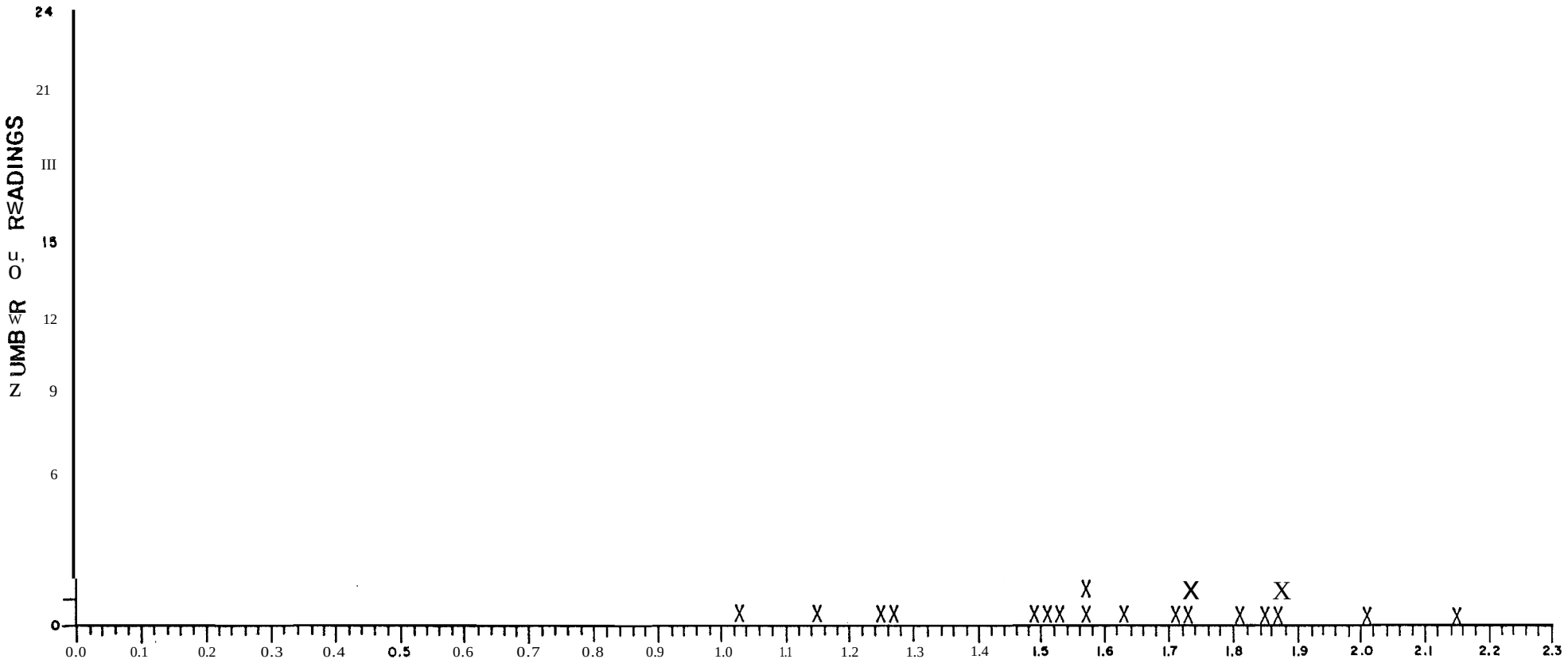
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-014 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4737.4

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 19) 1.02 1.15 1.24 1.27 1.48 1.51 1.53 1.56 1.57 1.62 1.71 1.72 1.73 1.81 1.85 1.87 1.87 2.00 2.14

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	4	1.02	1.27	1.17	0.112	
(2)	13	1.48	1.87	1.68	0.143	
(3)	2	2.00	2.14	2.07		



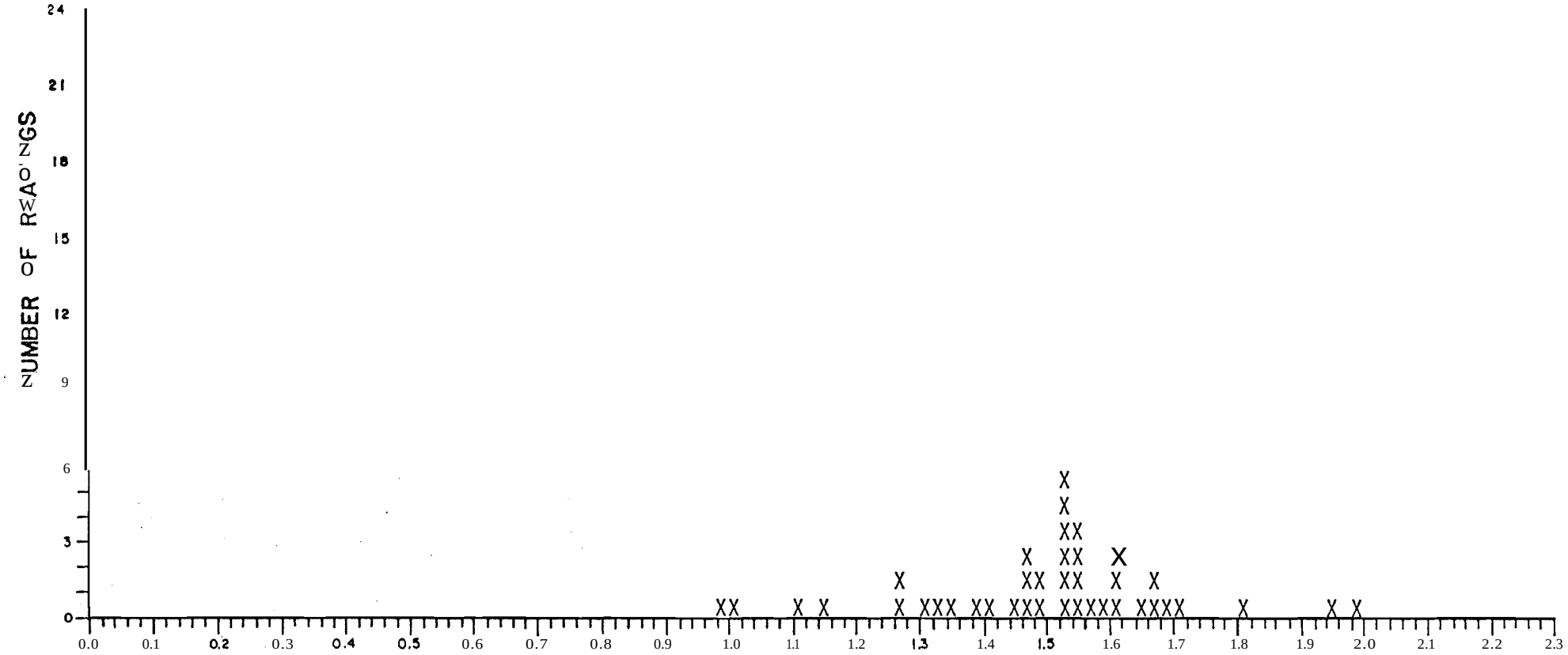
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-015 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4757.3

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 40) 0.99 1.00 1.11 1.15 1.26 1.26 1.31 1.33 1.35 1.38 1.41 1.44 1.46 1.46
1.47 1.48 1.48 1.52 1.52 1.52 1.53 1.53 1.53 1.54 1.54 1.55 1.55 1.56 1.58 1.60 1.61 1.61
1.64 1.66 1.66 1.68 1.70 1.80 1.94 1.99

POPULATION.	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro(%)	STD. DEV. (%)	REMARKS
(1)	4	0.99	1.15	1.06	0.080	
(2)	33	1.26	1.70	1.51	0.116	
(3)	3	1.80	1.99	1.91	0.098	



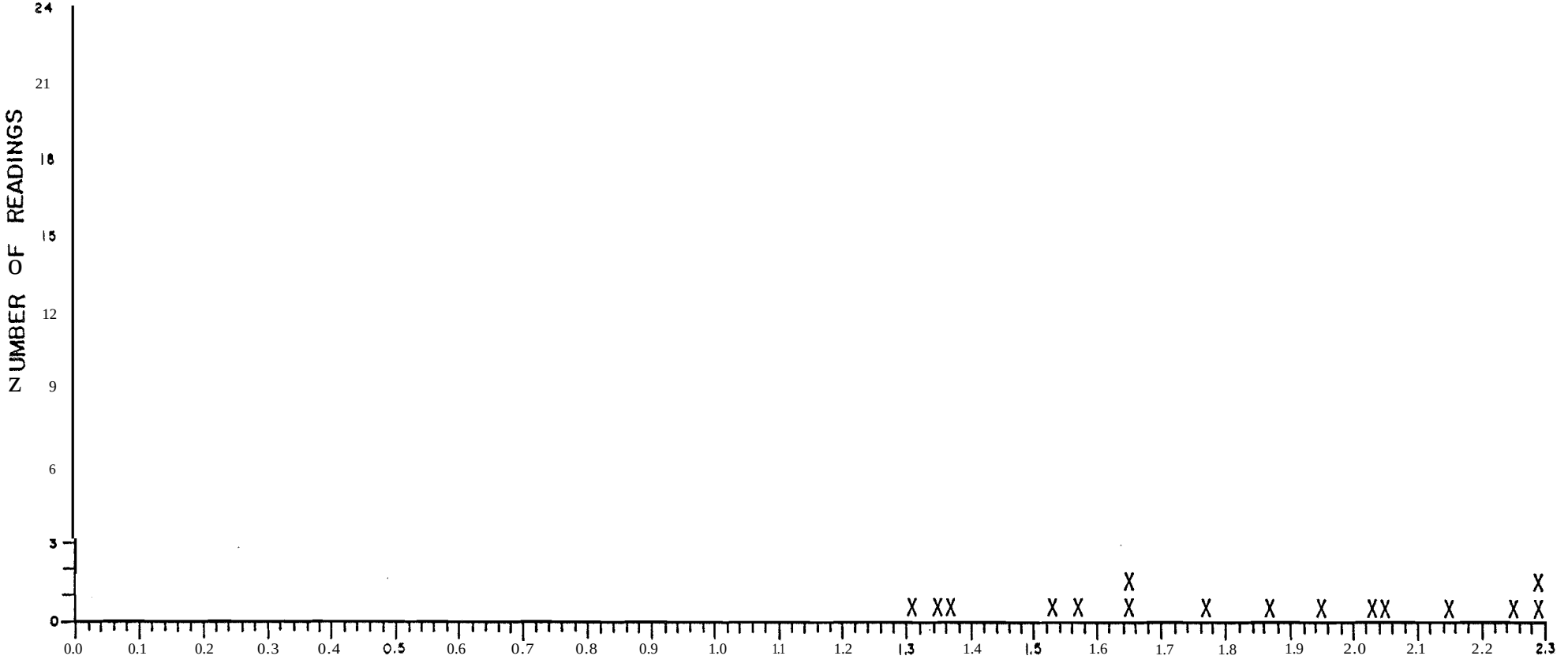
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-020 TYPE OF SAMPLE: CORE DEPTH/SAMPLE NO. 4855.8

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 16) 1.31 1.35 1.36 1.52 1.57 1.64 1.65 1.76 1.87 1.94 2.02 2.04 2.15 2.25 2.28 2.29

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	3	1.31	1.36	1.34	0.026	
(2)	7	1.52	1.94	1.71	0.156	
(3)	6	2.02	2.29	2.17	0.121	



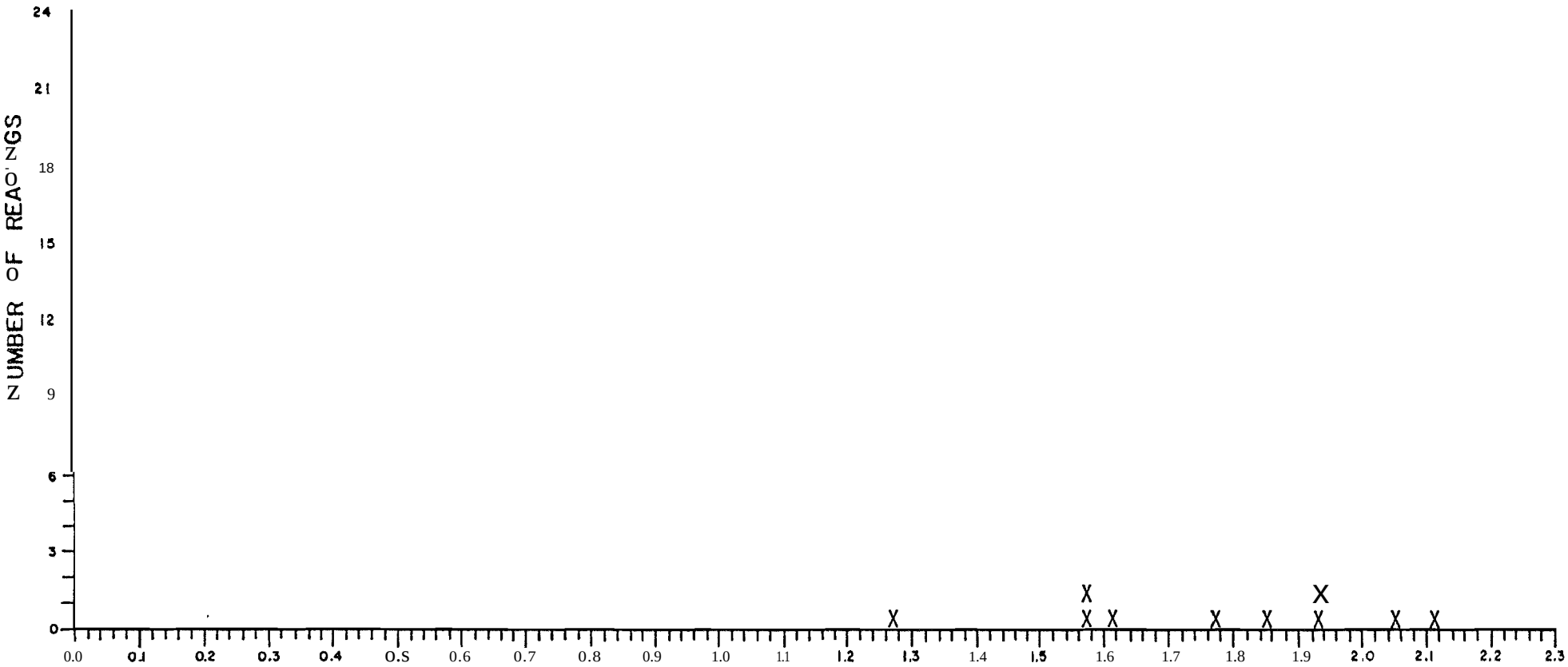
VITRINITE REFLECTANCE HISTOGRAM

R518-021 CORE

CLIENT'S NAME MONSANTO WELL NAME EGS P - PA #1

(NO. OF READINGS = 10) 1.26 1.56 1.57 1.61 1.76 1.85 1.92 1.93 2.05 2.10

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	4	1.26	1.61	1.50	0.161	
(2)	6	1.76	2.10	1.94	0.125	



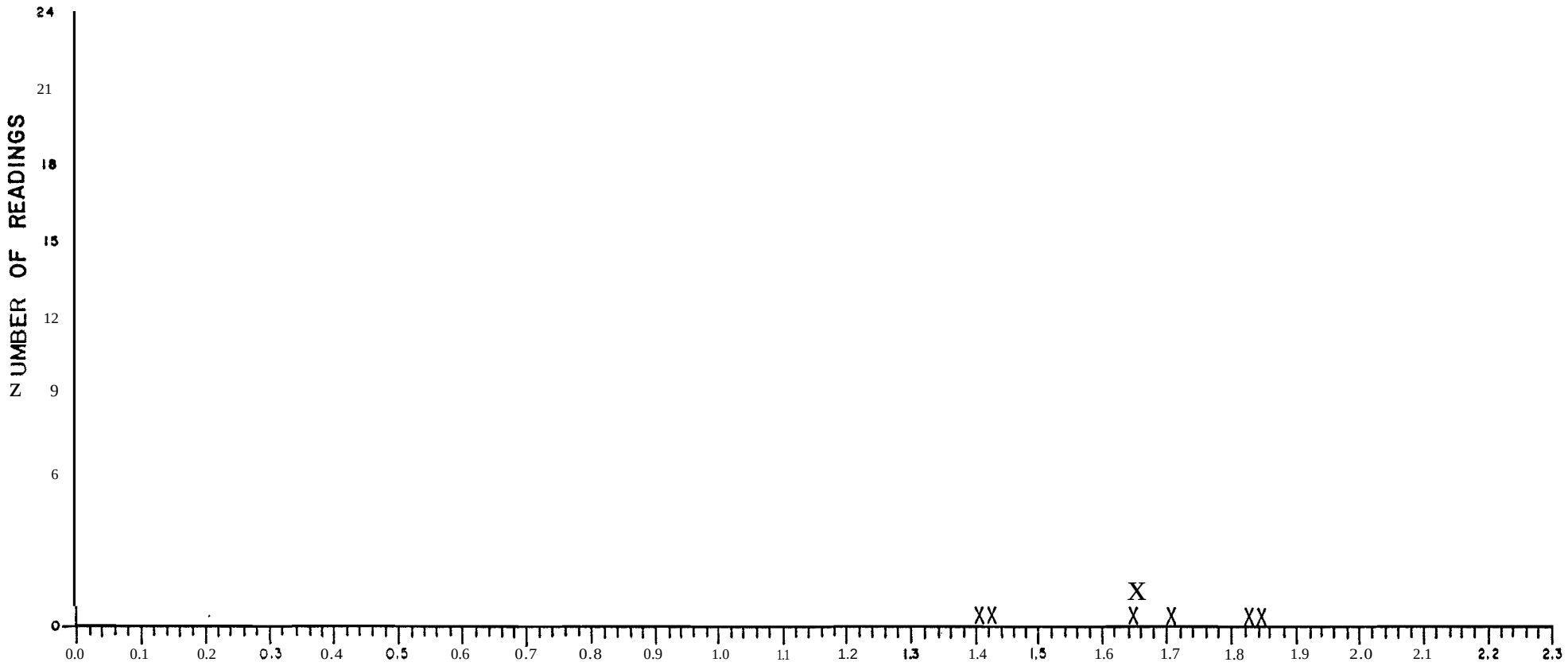
VITRINITE REFLECTANCE HISTOGRAM

R518-022 CORE

CLIENT'S NAME MONSANTO WELL NAME _____

(NO. OF READINGS = 7) 1.40 1.43 1.64 1.64 1.71 1.83 1.84

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	2	1.40	1.43	1.42		
(2)	5	1.64	1.84	1.73	0.098	



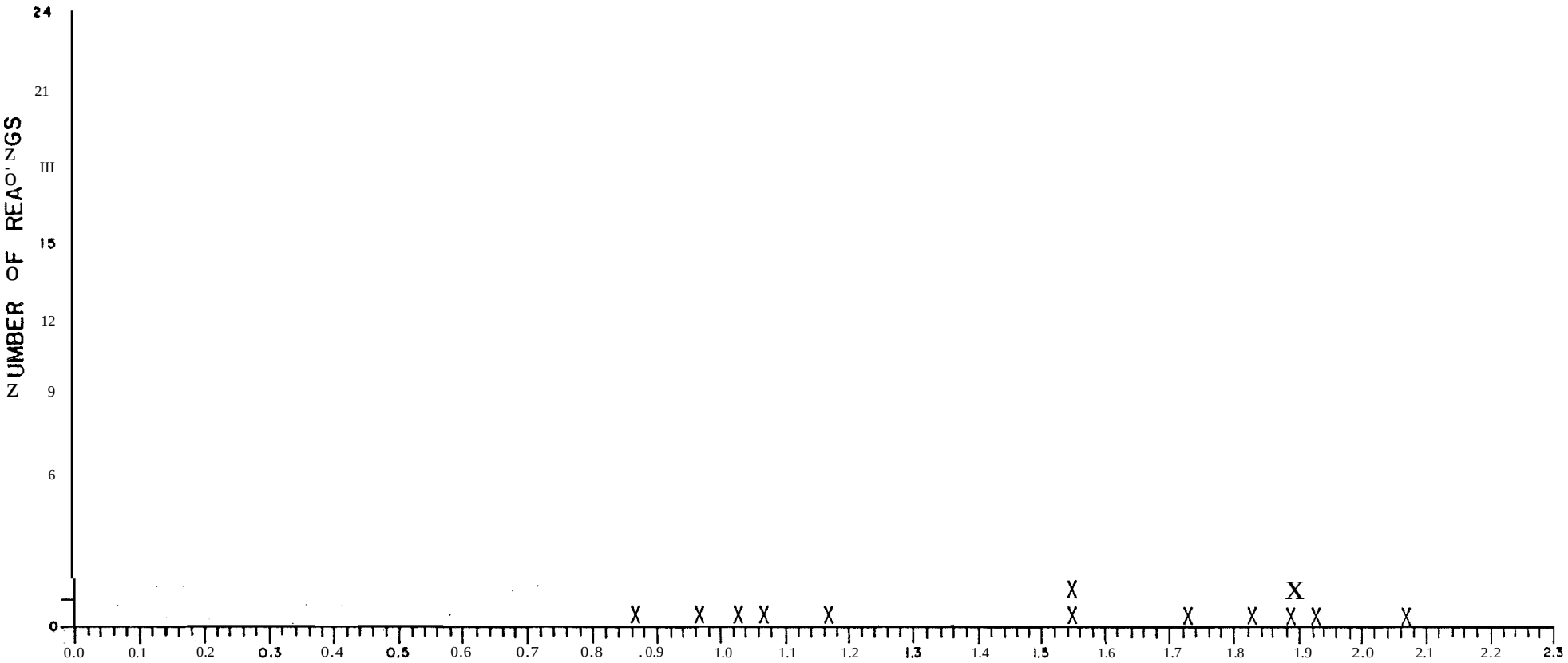
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-026 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 4971.6

CLIENT'S NAME MONSANTO WELL NAME EGS P - PA #1

(NO. OF READINGS = 13) 0.87 0.96 1.02 1.07 1.16 1.54 1.55 1.73 1.83 1.88 1.88 1.93 2.06

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	5	0.87	1.16	1.02	0.110	
(2)	2	1.54	1.55	1.55		
(3)	6	1.73	2.06	1.89	0.109	



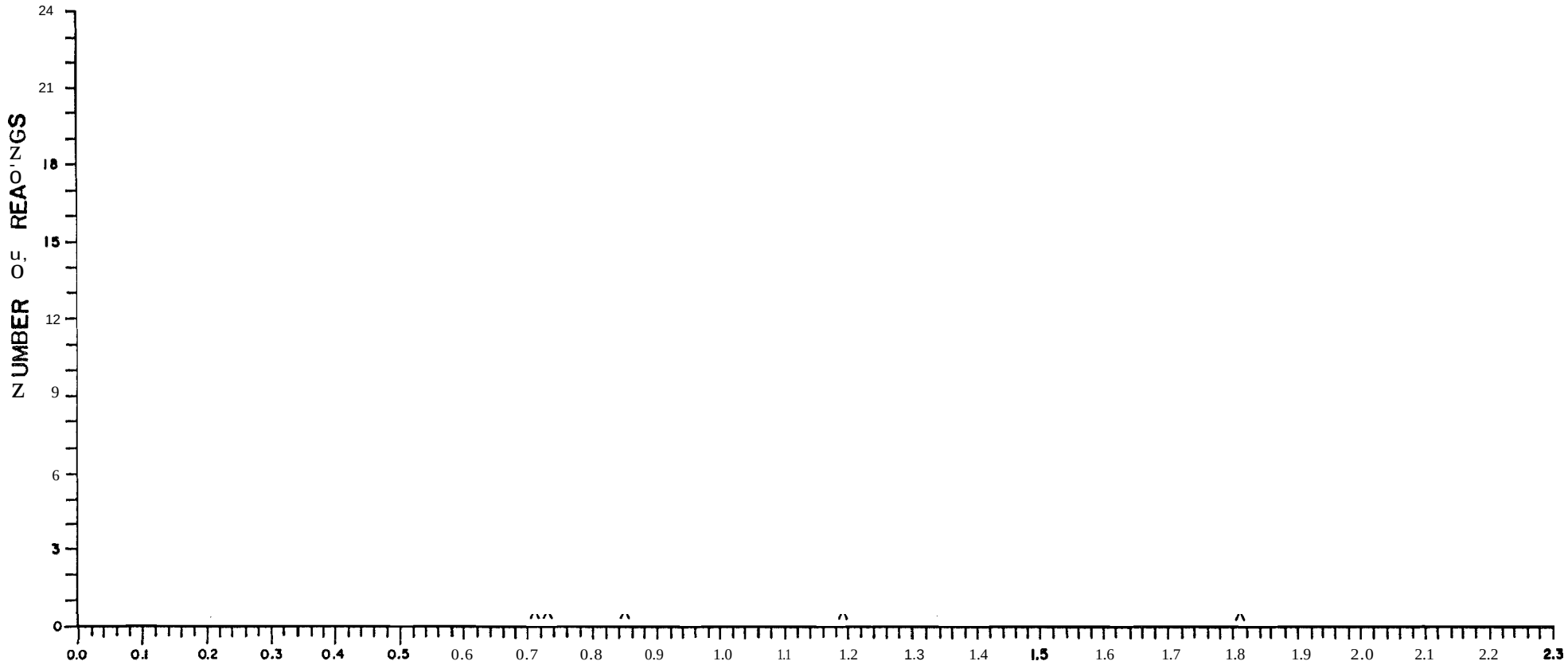
VITRINITE REFLECTANCE HISTOGRAM

R518-032 CORE

CLIENT'S NAME MONSANTO WEII NAME

(NO. OF READINGS = 5) 0.70 0.73 0.84 1.18 1.81

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro(%)	STD. DEV. (%)	REMARKS
(1)	3	0.70	0.84	0.76	0.074	
(2)	1	1.18	1.18	1.18		
(3)	1	1.81	1.81	1.81		



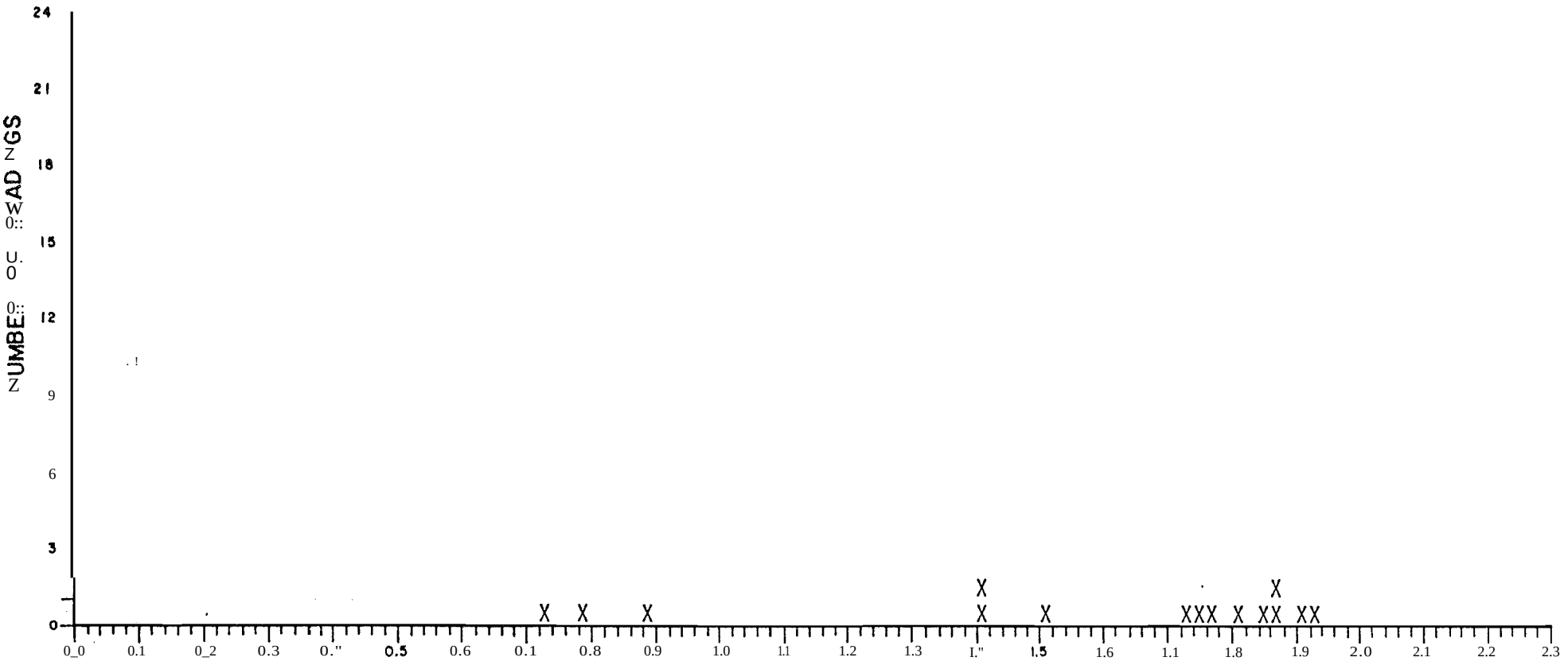
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-033 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 5109.8

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 15) 0.72 0.78 0.88 1.40 1.41 1.51 1.73 1.75 -1.77 1.81 1.85 1.86 1.86 1.90 1.93

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	3	0.72	0.88	0.79	0.081	
(2)	3	1.40	1.51	1.44	0.061	
(3)	9	1.73	1.93	1.83	0.068	



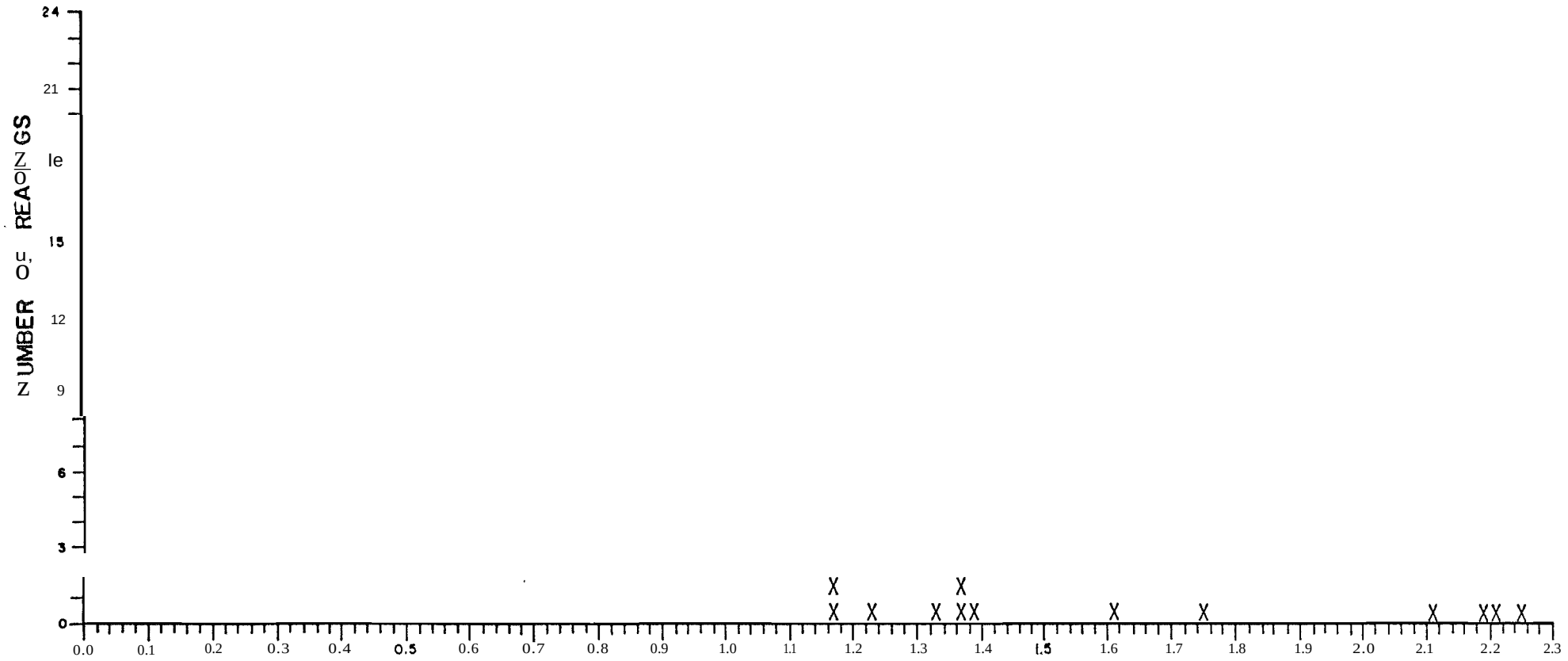
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-034 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 5149.6

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 13) 1.16 1.16 1.23 1.32 1.36 1.36 1.38 1.61 1.75 2.10 2.19 2.21 2.25

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%).	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	7	1.16	1.38	1.28	0.096	
(2)	2	1.61	1.75	1.68		
(3)	4	2.10	2.25	2.19	0.063	



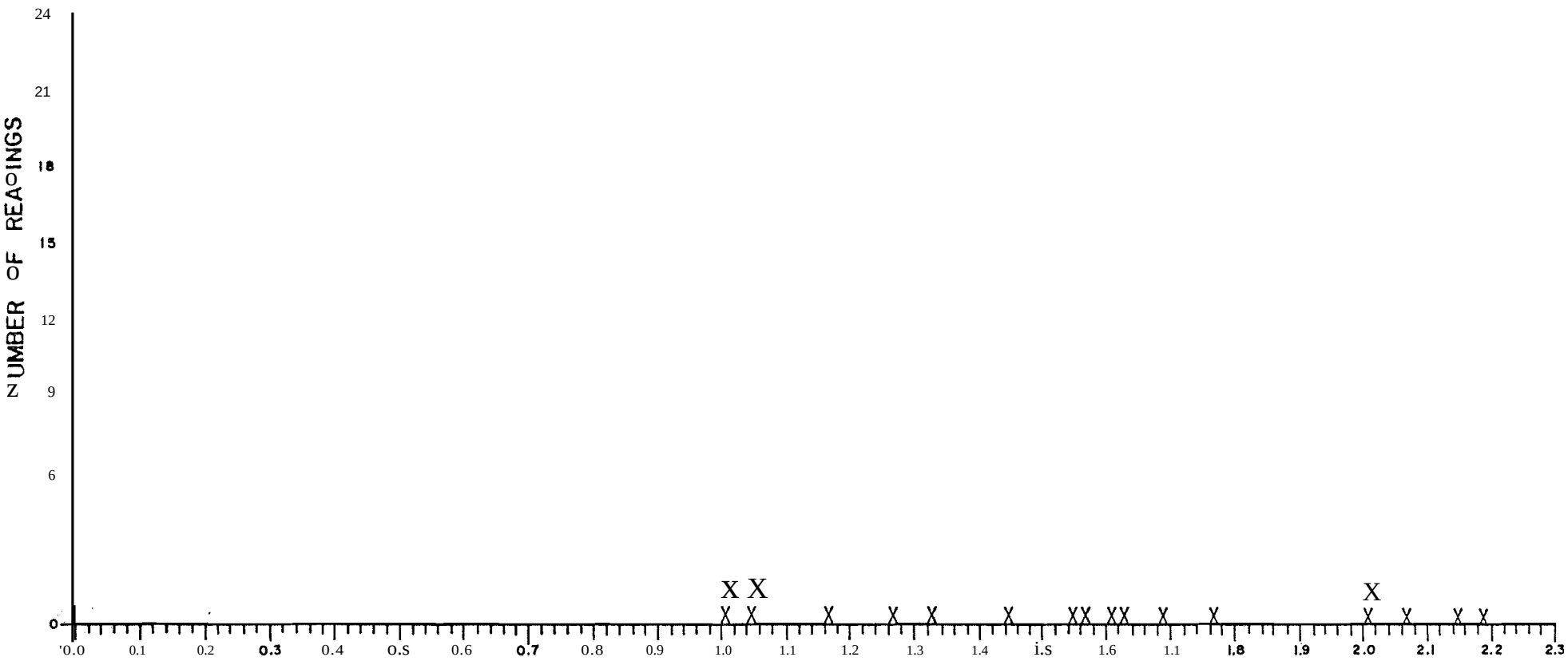
VITRINITE REFLECTANCE HISTOGRAM

GEOCHEM NO. R518-035 TYPE OF SAMPLE: CORE DEPTH / SAMPLE NO. 5169.8

CLIENT'S NAME MONSANTO WELL NAME EGSP - PA #1

(NO. OF READINGS = 19) 1.00 1.01 1.04 1.05 1.17 1.26 1.33 1.44 1.54 1.56 1.61 1.62 1.69 1.76 2.01 2.01 2.06 2.14 2.18

POPULATION	NO. OF READINGS	MIN. Ro (%)	MAX. Ro (%)	MEAN Ro (%)	STD. DEV. (%)	REMARKS
(1)	7	1.00	1.33	1.12	0.132	
(2)	7	1.44	1.76	1.60	0.104	
(3)	5	2.01	2.18	2.08	0.077	



VITRINITE REFLECTANCE HISTOGRAM

TABLE VIII

Sununary of C15+ Extraction, Deaspha1tening
and Liquid Chromatography

A. Weights of Extracts and Chromatographic Fractions

GeoChem Sample Number	Weight of Rock Extd. (grams)	Total Extract (grams)	Precipitated Aspha1tenes (grams)	N-C5 Soluble (grams)	Paraffins-Naphthenes (grams)	Aromatics (grams)	Eluted NSO's (grams)	None1uted NSO's (grams)
RS18-001	92.8	0.0335	0.0079	0,0256	0,0176	0.0050	0,0006	0.0024
003	99.5	0.0484	0.0056	0.0428	0.0317	0.0045	0.0009	0.0054
005	99.2	0.0788	0.0050	0.0738	0.0500	0.0086	0.0003	0.0150
007	87.9	0.0766	0.0058	0.0708	0.0508	0.0068	0.0008	0.0124
009	94.2	0.0397	0.0044	0.0353	0.0213	0.0045	0.0004	0.0091
011	96.8	0.0517	0.0046	0.0471	0.0345	0.0037	0.0002	0.0087
013	94.9.	0.0745	0.0039	0.0706	0.0532	0.0063	0.0018	0.0093
015	86.8	0.0793	0.0068	0.0725	0.0488	0.0077	O.OCll	0.0149
017	98.0	0.0587	0.0035	0.0552	0.0388	0.0027	0.0004	0.0133
020	95.7	0.0132	0.0042	0.0090				
022	76.8	0.0183	0.0048'	0.0135	0.0042	0.0017	0.0005	0.0071
·024	98.5	0.0370	0.0052	0.0318	0.0193	0.0031	0.0013;	0.0081
026	97.7	0.1129	0.0067	0.1062	0.0785	0.0055	0.0026	0.0196
028	97'.1	0.0059	0.0037	0.0022				
030	94.2	0.0647	0.0037	0.0610	0.0542	0.0037	0.0023	0.0008
032	100.9	0.1217	0.0058	0.1159	0.0745	0.0068	0.0000	0.0346
RS18-034	81.0	0.0203	O.: 024	0.0179	0.0108	0.0042	0.0002	0.0027

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)
R518-001	361	190	54	244	85	6	26	
003	486	319	45	354	56	9	54	119
005	794	503	86	589	50	3	151	204
007	871	578	77	655	66	9	14	89
009	421	226	48	274	47	4	97	148
011	534	356	38	384	48	2	90	140
013	785	561	66	394	41	19	98	148
015	914	562	89	651	78	13	172	263
017	599	396	28	624	36	4	136	176
020	138				44			
022	238	55	22	77	63	7	92	162
024	376	196	31	227	53	13	82	148
026	1258	803	56	859	69	27	201	294
028	60				38			
030	687	575	39	614	39	24	8	71
032	1206	738	67	805	57	a	343	400
R518-034	251	133	52	185	30	2	33	65

C. Composition of Extracts

GeoChem Sample Number	Hydrocarbons			Nonhydrocarbons					
	Paraffin-Naphthene X	Aromatic %	PN/Arom	Eluted NSO's %	Noneluted NSO's %	Precipitd. Asphaltene %	Asph/NSO	HC's %	He/Non HC
R518-001	52.5	14.9	3.52	1.8	7.2	22.3	2.49	67.4	2.16
003	65.5	9.3	7.04	1.9	11.2	11.6	0.89	74.8	3.04
005	63.5	10.9	5.83	0	19.0	6.3	0.33	74.4	2.94
007	66.3	8.9	7.45	1.0	16.2	7.6	0.44	75.2	3.03
009	53.7	11.3	4.75	1.0	22.9	11:1	0.46	65.0	1.86
011	66.7	7.2	9.26	a	16.8	8.9	0.53	73.9	2.88
013	71.4	8.5	8.40	2.4	12.5	5.2	0.35	79.9	3.98
015	61.5	9.7	6.34	1.4	18.8	8.6	2.35	71.2	2.47
017	66.1	4.6	14.37	0.1	22.7	6.0	0.26	70.7	2.45
020						31. 8			
022	23.0	9.3	2.47	2.7	38.8	26.2	0.63	32.3	0.48
024	52.2	8.4	6.21	3.5	21. 9	14.1	0.56	60.6	1.53
026	69.5	4.9	14.18	2.3	17.4	5.9	0.30	74.4	2.91
028						62.7			
030	83.8	.5.7	14.70	3.6	1.2	5.7	1.19	89.7	8.54
032	61. 2	5.6	10.93	a	28.4	4.8	0.17	66.8	2.01
R518-034	53.2	20.7	2.57	0.1	13.3	11.8	0.88	73.9	2.93

TABLE IX
Saturate Hydrocarbon Analyses

GeoChem Sample Number	R518-001	003	005	007	009	011
% Distribution						
nC_{15}	8.1	1.6	11.8	12.1	7.5	7.8
nC_{16}	12.4	5.0	12.5	13.2	10.8	11.1
nC_{17}	13.2	9.6	11.9	12.6	11.8	12.0
nC_{18}	11.8	11.5	10.6	11.1	11.5	11.1
nC_{19}	10.7	12.7	10.2	10.1	10.9	10.9
nC_{2D}	8.6	12.4	8.7	8.1	9.4	8.9
nC_{21}	7.3	11.4	7.3	7.0	7.8	8.3
nC_{22}	5.7	9.2	5.8	5.2	6.5	6.4
nC_{23}	3.8	6.3	4.2	3.9	4.5	4.6
nC_{24}	2.7	4.6	3.1	2.8	3.2	3.4
nC_{25}	2.2	3.3	2.2	2.1	2.4	2.4
nC_{26}	1.4	2.0	1.5	1.4	: 1.7	1.5
nC_{27}	0.8	1.3	0.9	0.8	1.0	0.9
nC_{28}	0.5	0.7	0.5	0.5	0.5	0.6
nC_{29}	0.4	0.4	0.3	D.3	0.4	0.3
nC_{3D}	0.1	0.3	0.2	0.1	0.3	0.3
nC_{31}	0.1	0.1	0.1	0.1	0.1	0.1
nC_{32}	0	0.1	0	0	0	0
iC_{18}	3.1	2.0	3.0	3.1	3.4	3.1
iC_{19}	4.8	3.1	3.5	3.5	4.1	4.0
iC_{20}	2.2	2.3	1.9	1.9	2.3	2.3
% Isoprenoid	10.1	7.4	8.4	8.5	9.9	9.4
CPI A	1.09	1.07	1.05	1.09	1.04	1.08
cpr B	1.30	1.16	1.13	1.28	1.12	1.15
Naphthene Ratio	3.59	2.07	2.61	2.58	1.85	2.26

Saturate Hydrocarbon Analyses

GeoChem Sample Number	RS18-0l3	015	017	022*	024	026
% Distribution						
nC_{15}	9.5	14.8	12.8	3.2	11.8	13.0
nC_{16}	11.6	14.1	12.3	9.9	12.7	12.4
nC_{17}	11.3	12.5	12.2	13.1	12.3	12.2
nC_{18}	10.4	11.1	10.6	13.9	11.3	10.9
nC_{19}	10.4	9.9	10.1	13.4	10.7	10.1
nC_{20}	9.0	8.2	8.7	11.2	9.1	8.6
nC_{2l}	7.8	6.7	7.3	9.3	7.7	7.5
nC_{n}	6.2	5.2	5.8	6.5	6.0	5.9
nC_{Z3}	4.4	3.7	4.1	4.6	4.2	4.2
nC_{24}	3.4	2.6	3.2	3.1	3.0	3.5
nC_{Z5}	2.4	1.8	2.3	2.3	2.1	2.3
nC_{26}	1.8	1.2	1.5	1.5	1.4	1.6
nC_{27}	1.0	0.7	1.0	0.8	0.8	1.1
nC_{28}	0.6	0.4	0.6	0.4	0.5	0.6
nC_{29}	0.4	0.4	0.3	0.4	0.3	0.3
nC_{30}	0.3	0.1	0.2	0.2	0.2	0.3
nC_{31}	0.1	0	0.1	0.1	0.1	0.1
nC_{32}	0	0	0	0	0	0
iC_{18}	3.3	2.6	2.4	2.0	2.2	1.8
iC_{19}	3.9	2.3	2.9	2.3	2.0	2.1
iC_{ZO}	2.3	1.6	1.7	1.9	1.7	1.4
% Isoprenoid	9.7	6.5	7.0	6.2	5.9	5.3
CPI A	1.03	1.06	1.05	1.12	1.06	0.99
cpr B	1.04	1.19	1.14	1.20	1.11	1.54
Naphthene Ratio	2.39	3.10	2.30	2.38	3.04	2.87

* The chromatogram of aromatic hydrocarbons is not available.

Saturate Hydrocarbon Analyses

GeoChem Sample Number	RS18-030	032	034
% Distribution			
nClS	10.9	15.0	8.9
nC_{16}	11.8	13.5	11.6
nC_{17}	11.8	12.8	13.2
nC_{1S}	11.0	11.0	12.3
nC_{19}	10.6	10.0	10.9
nC_{ZO}	9.4	7.9	8.8
nCZl	8.0	6.8	7.4
nC_{Z2}	6.5	5.1	5.8
nC_{Z3}	4.7	3.7	4.1
nC_{Z4}	3.4	2.8	2.8
nC_{2S}	2.7	1.9	2.1
nC_{26}	1.8	1.4	1.4
nC_{27}	1.2	1.1	0.8
nC_{28}	0.7	0.5	0.4
nC_{29}	0.4	0.4	0.3
nC_{30}	0.3	0.1	0.1
nC_{31}	0.1	0.1	0.1
nC_{32}	0	0	0
iC_{18}	1.6	2.3	3.4
iC_{19}	1.6	1.9	3.0
iC_{ZO}	1.5	1.8	2.4
% Isoprenoid	4.7	6.0	8.8
CPI A	1.07	1.08	1.08
CPI B	1.14	1.24	1.22
Naphthene Ratio	2.25	2.78	3.01

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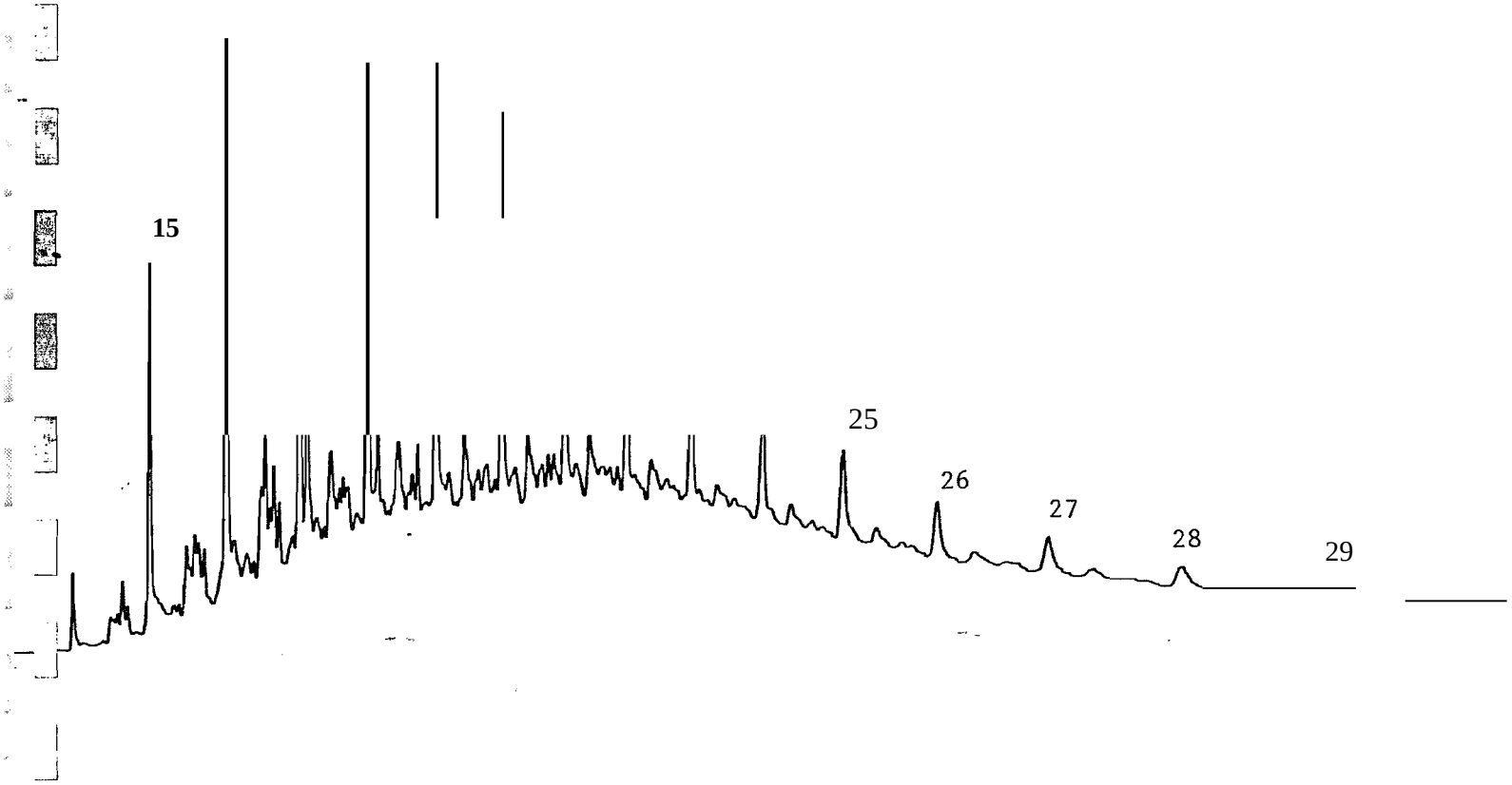

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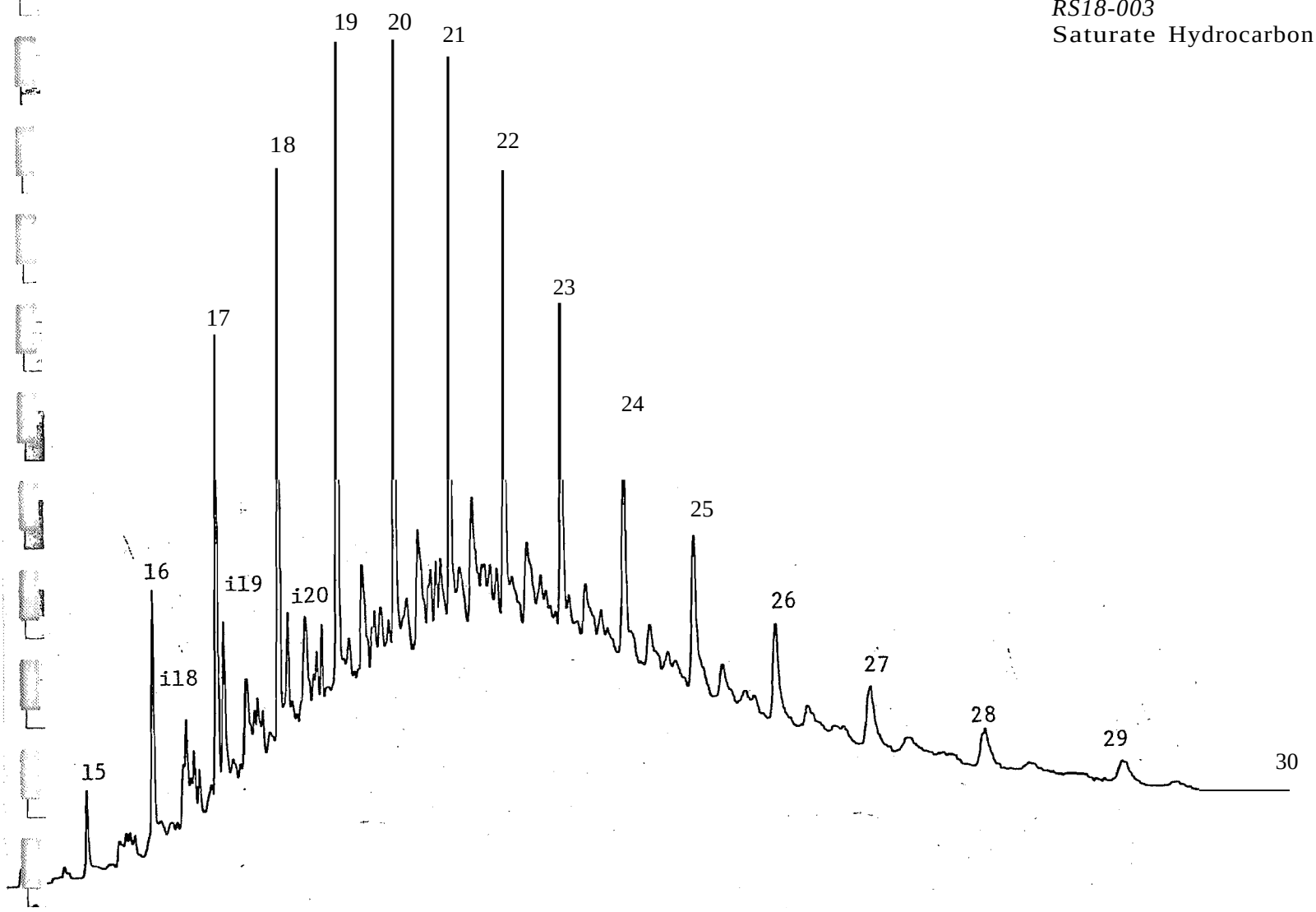

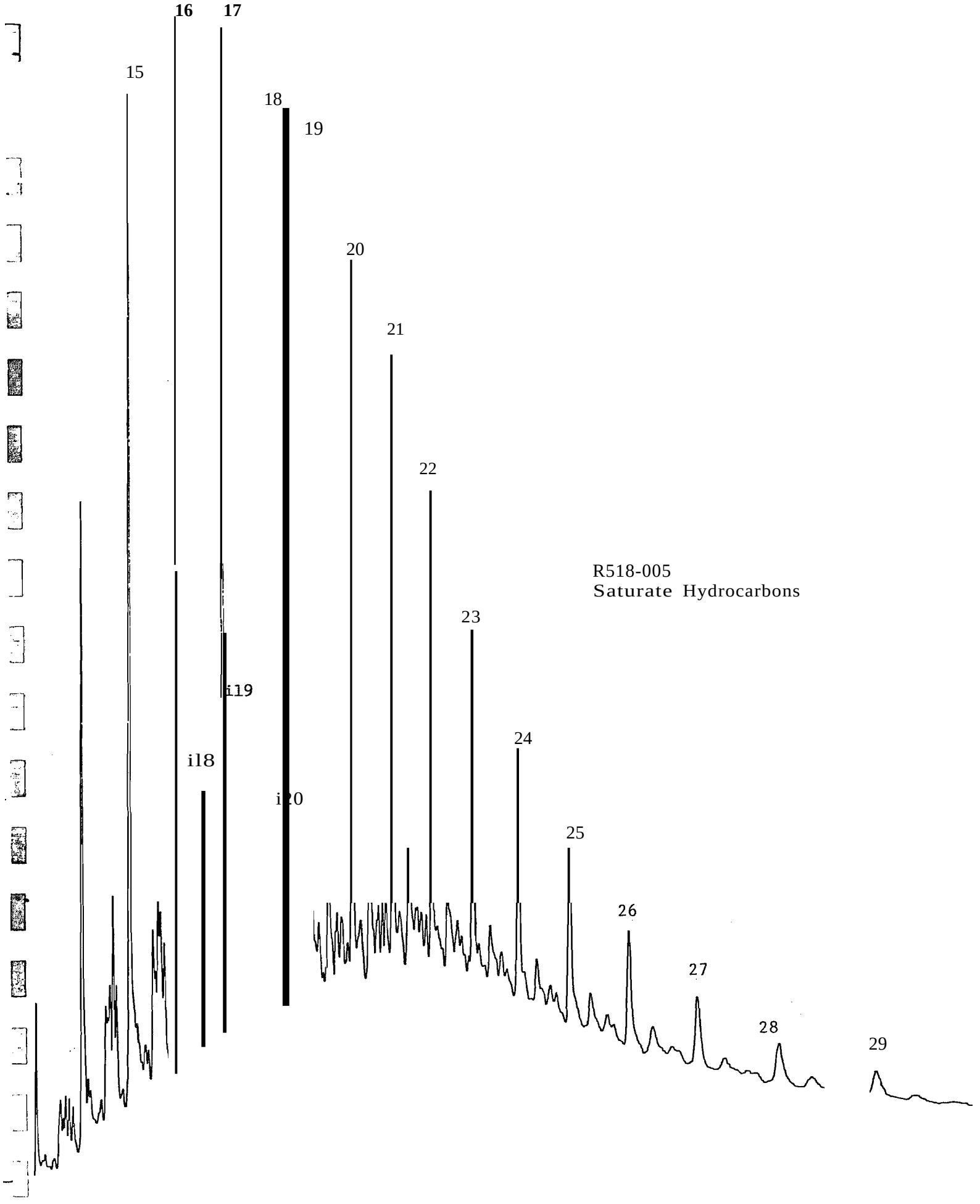
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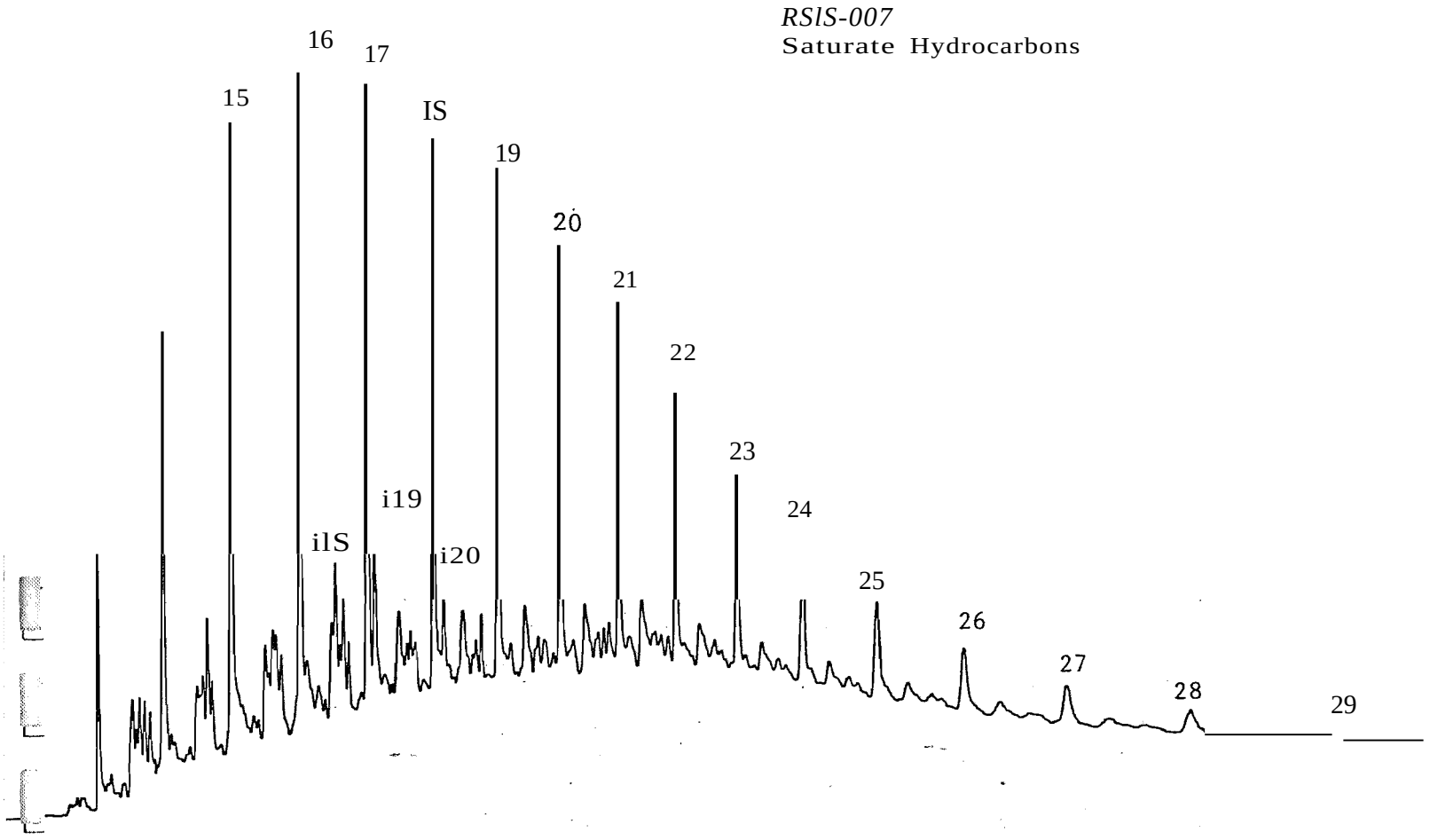
Saturate Hydrocarbons

J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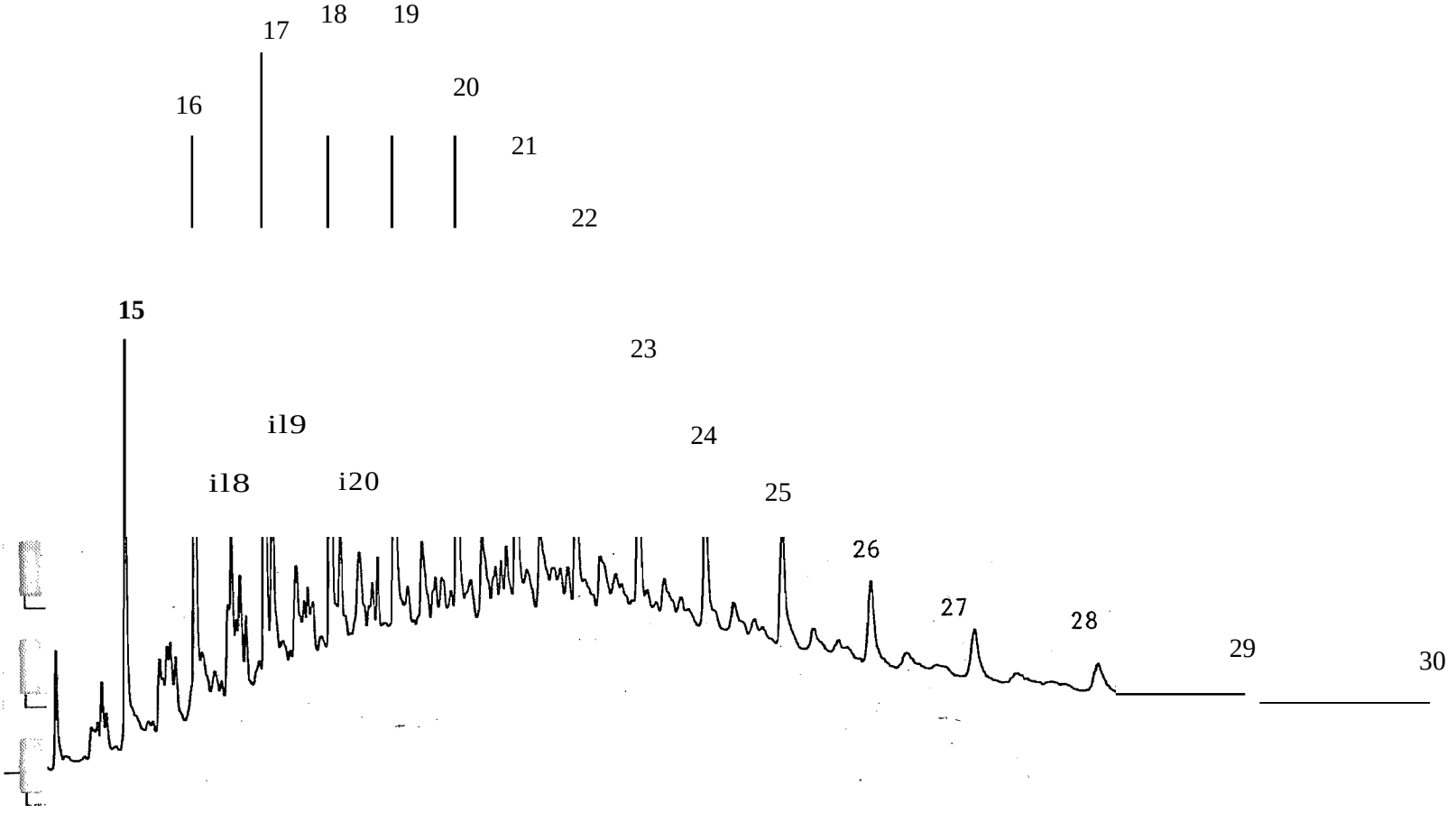

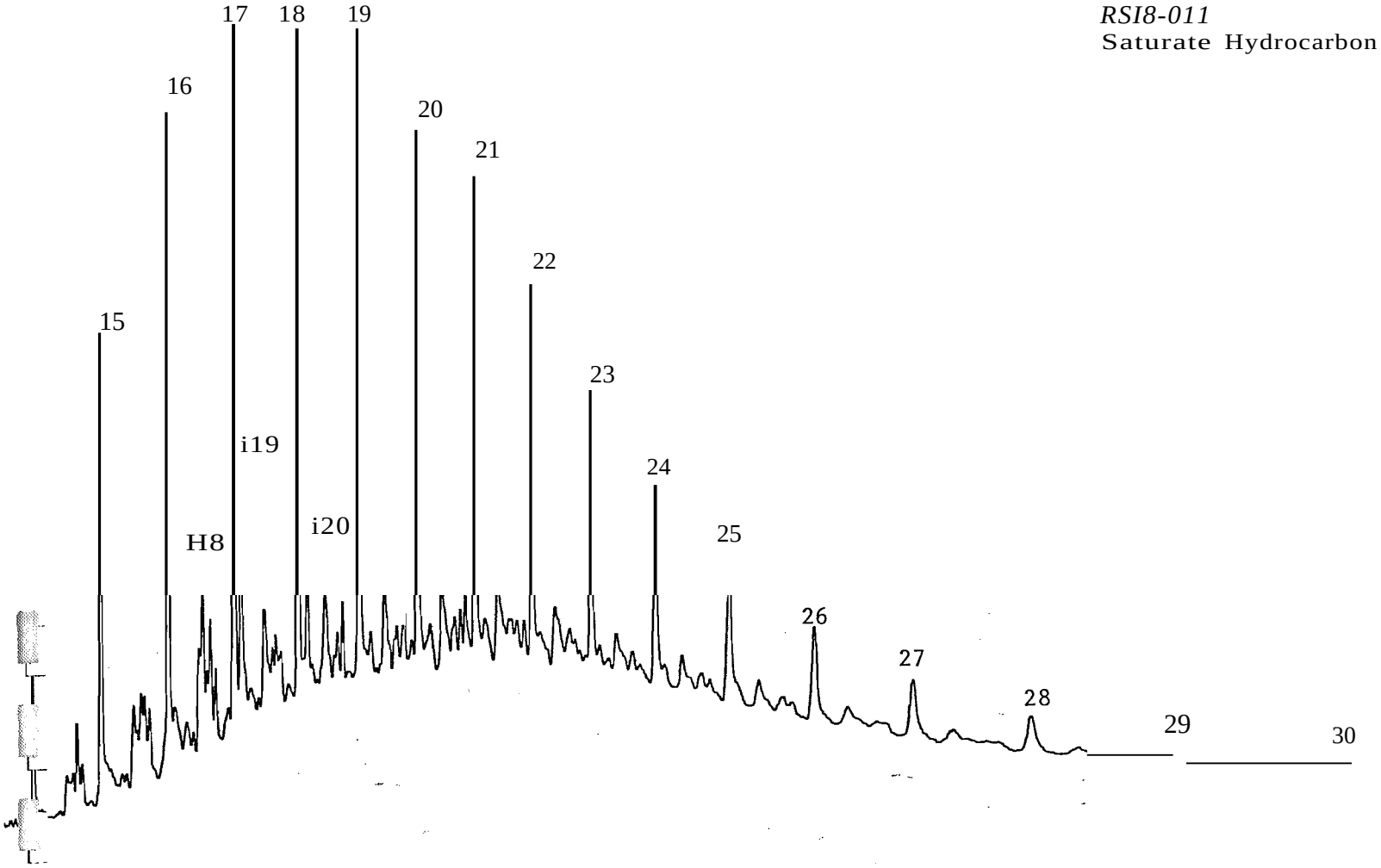
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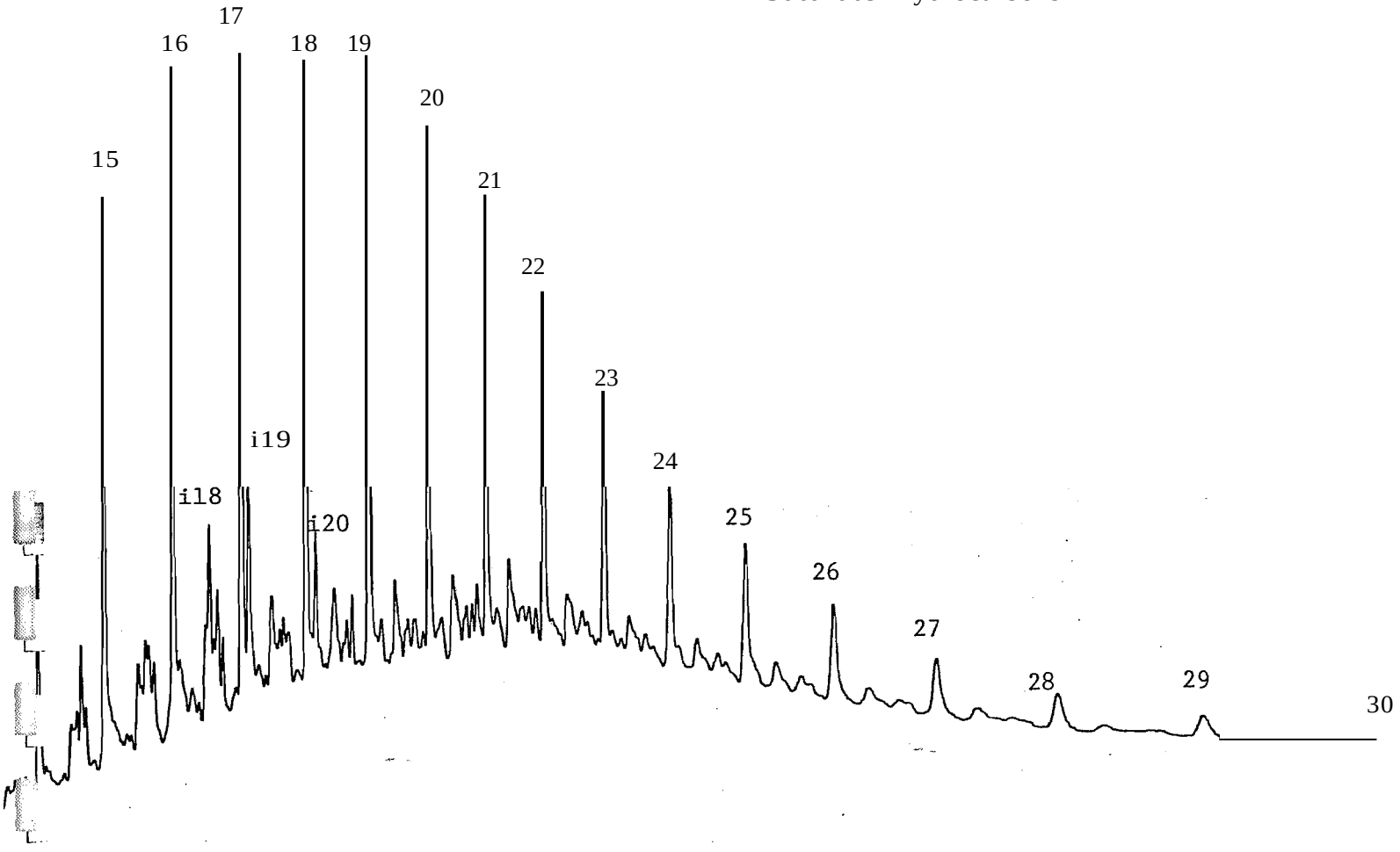
Saturate Hydrocarbons



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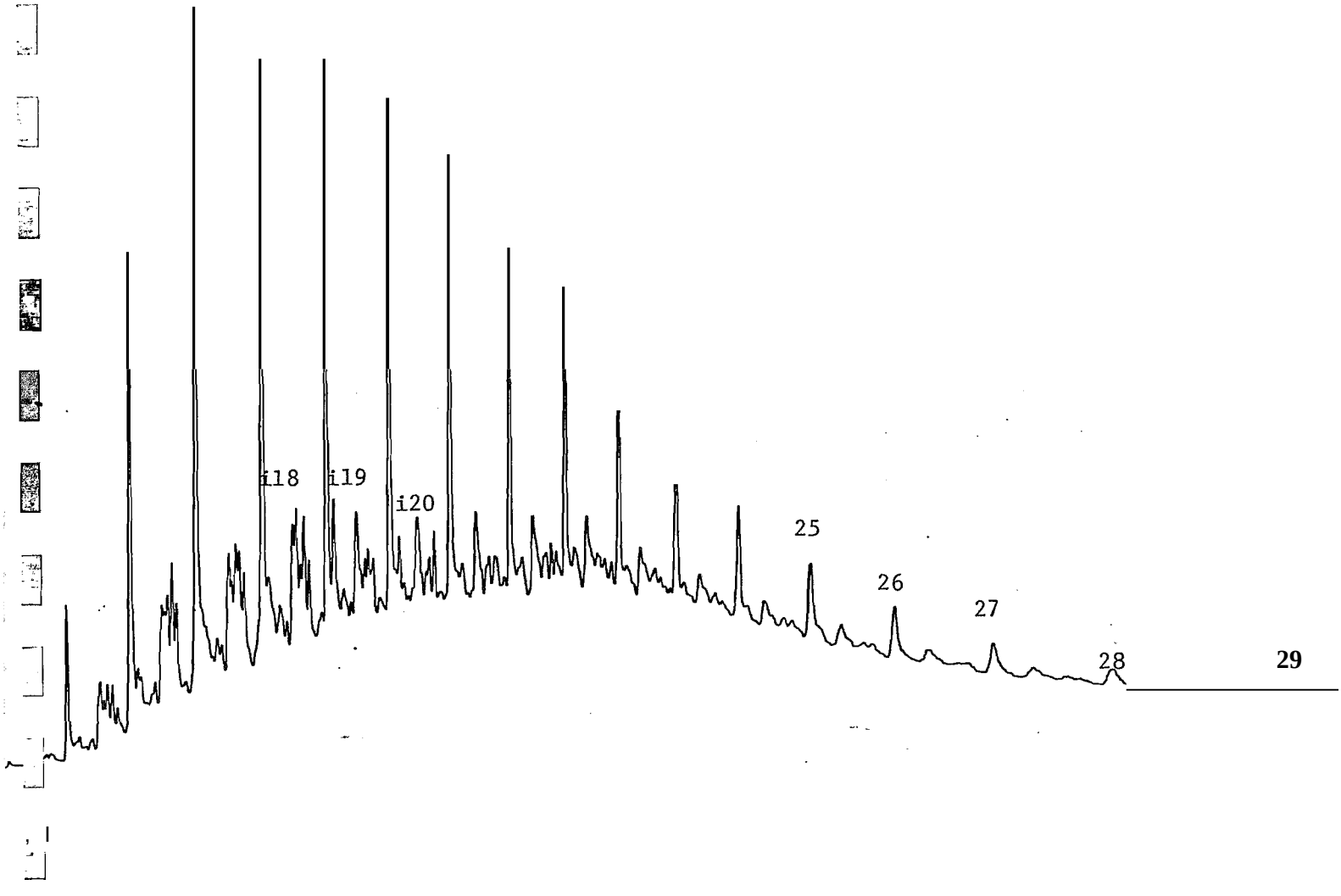

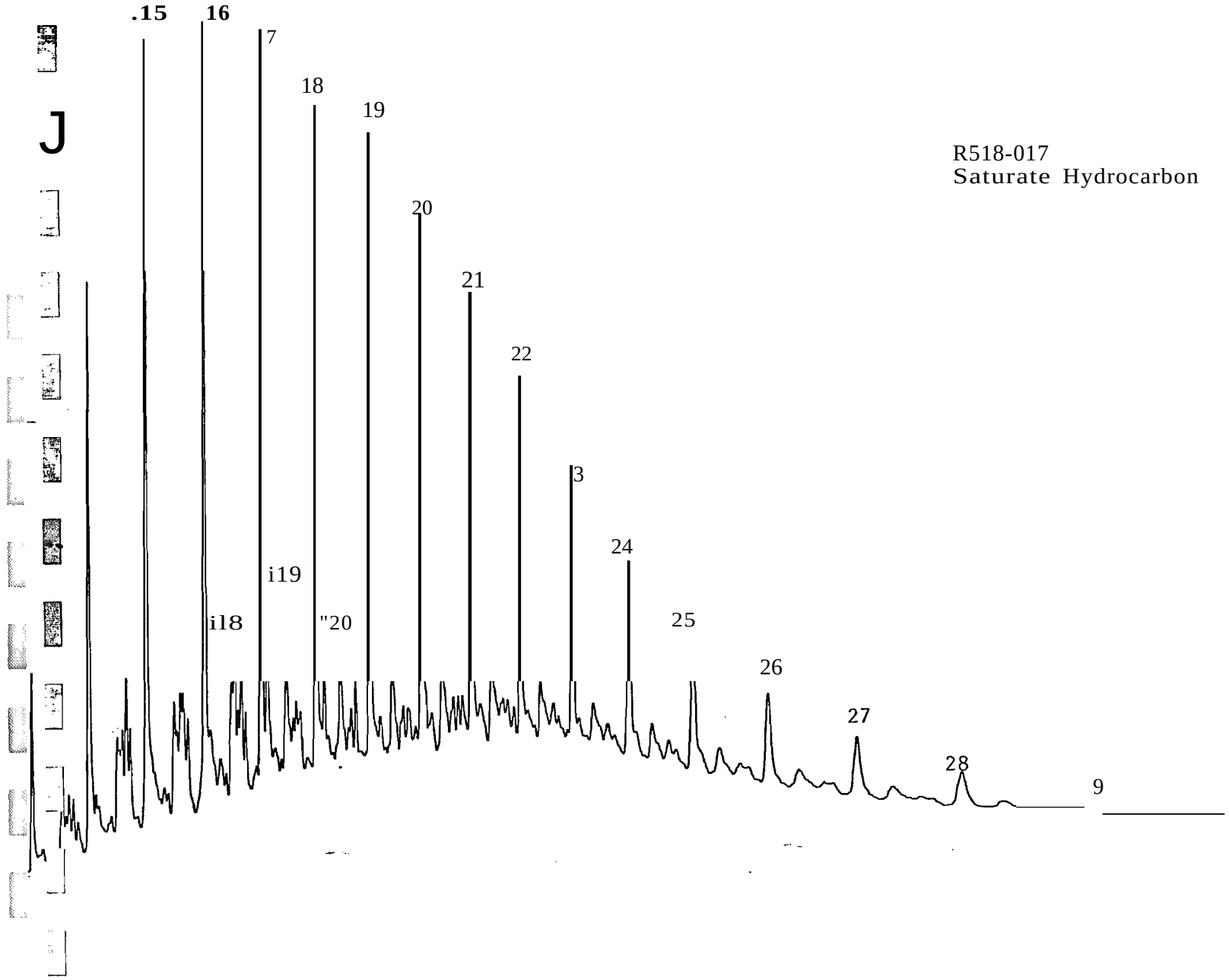

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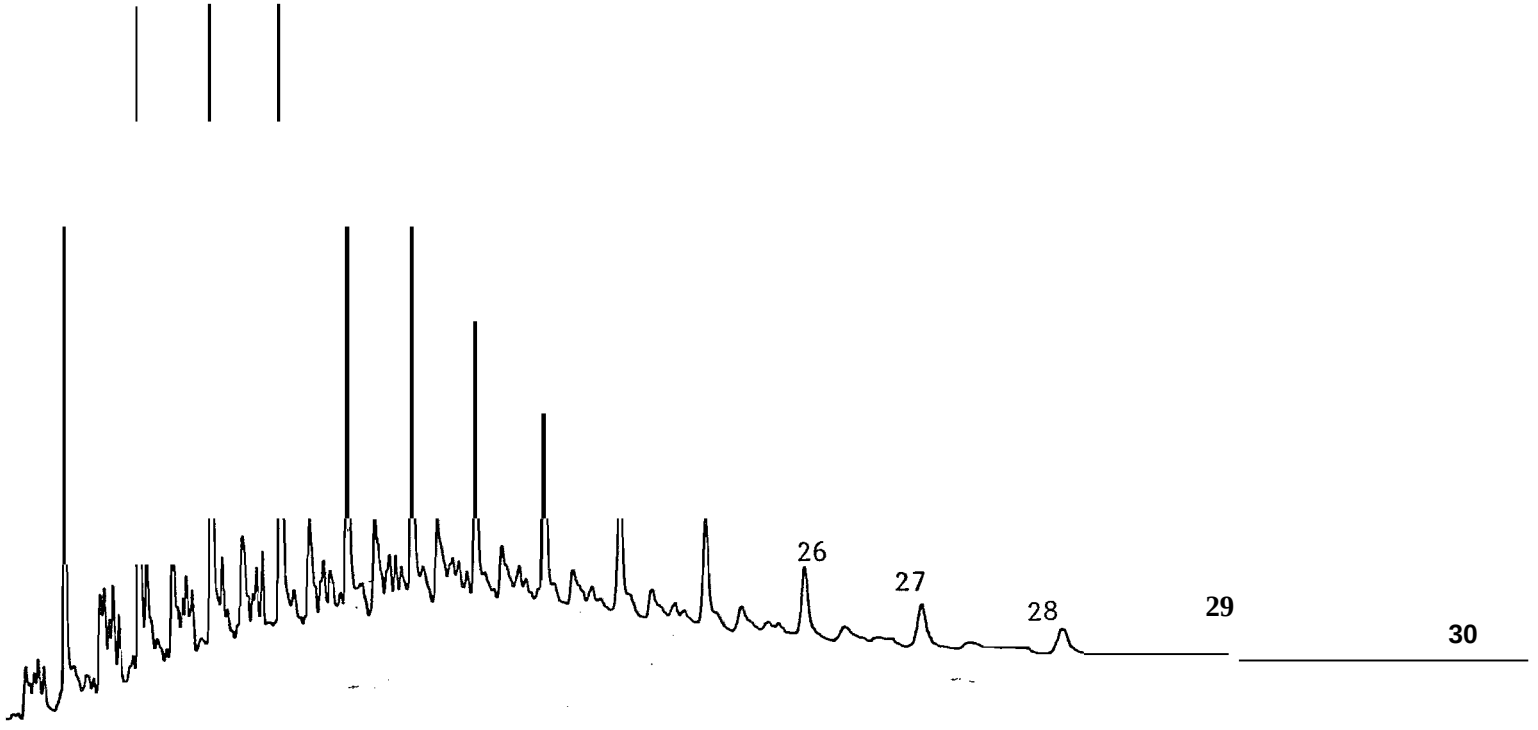

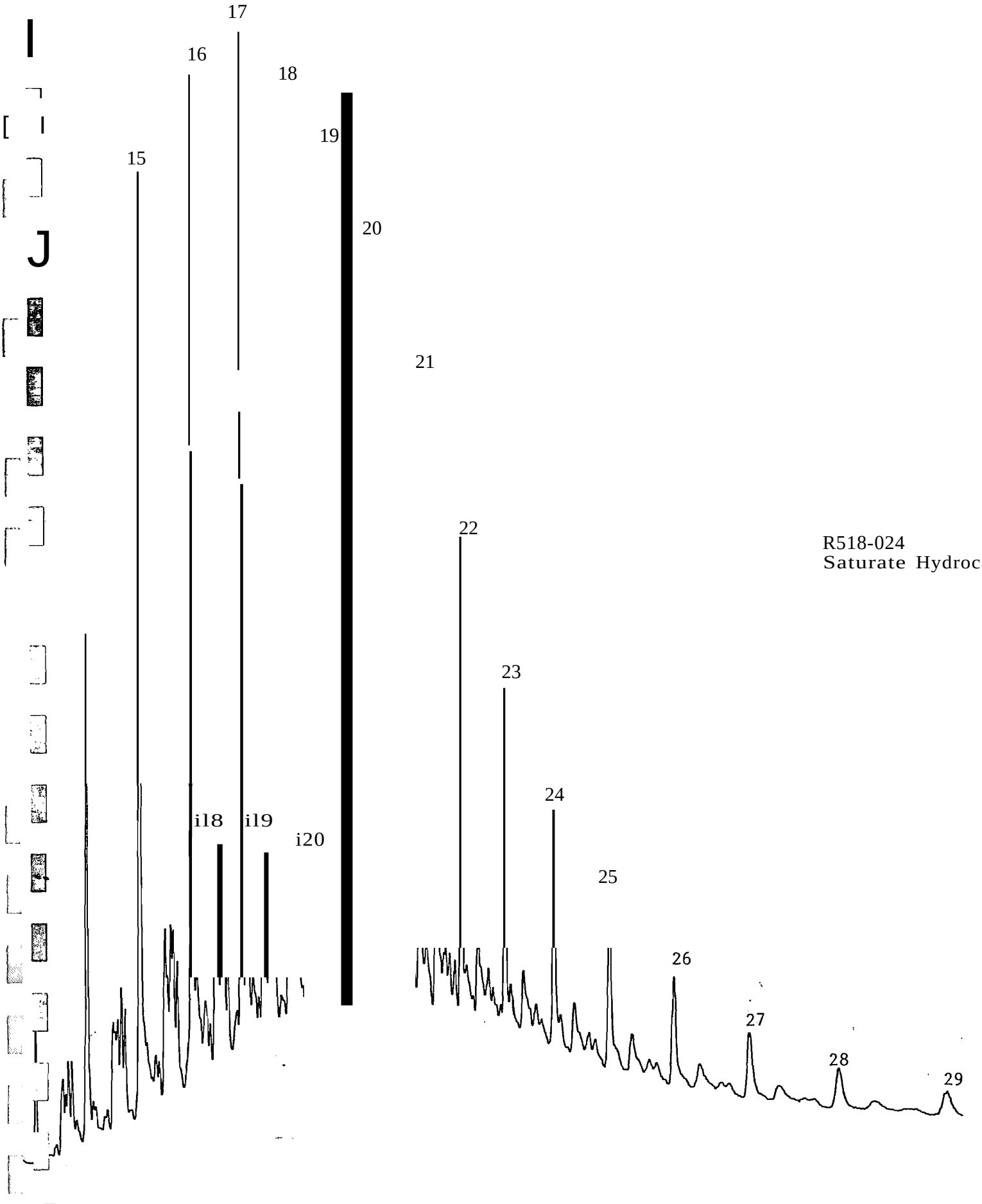

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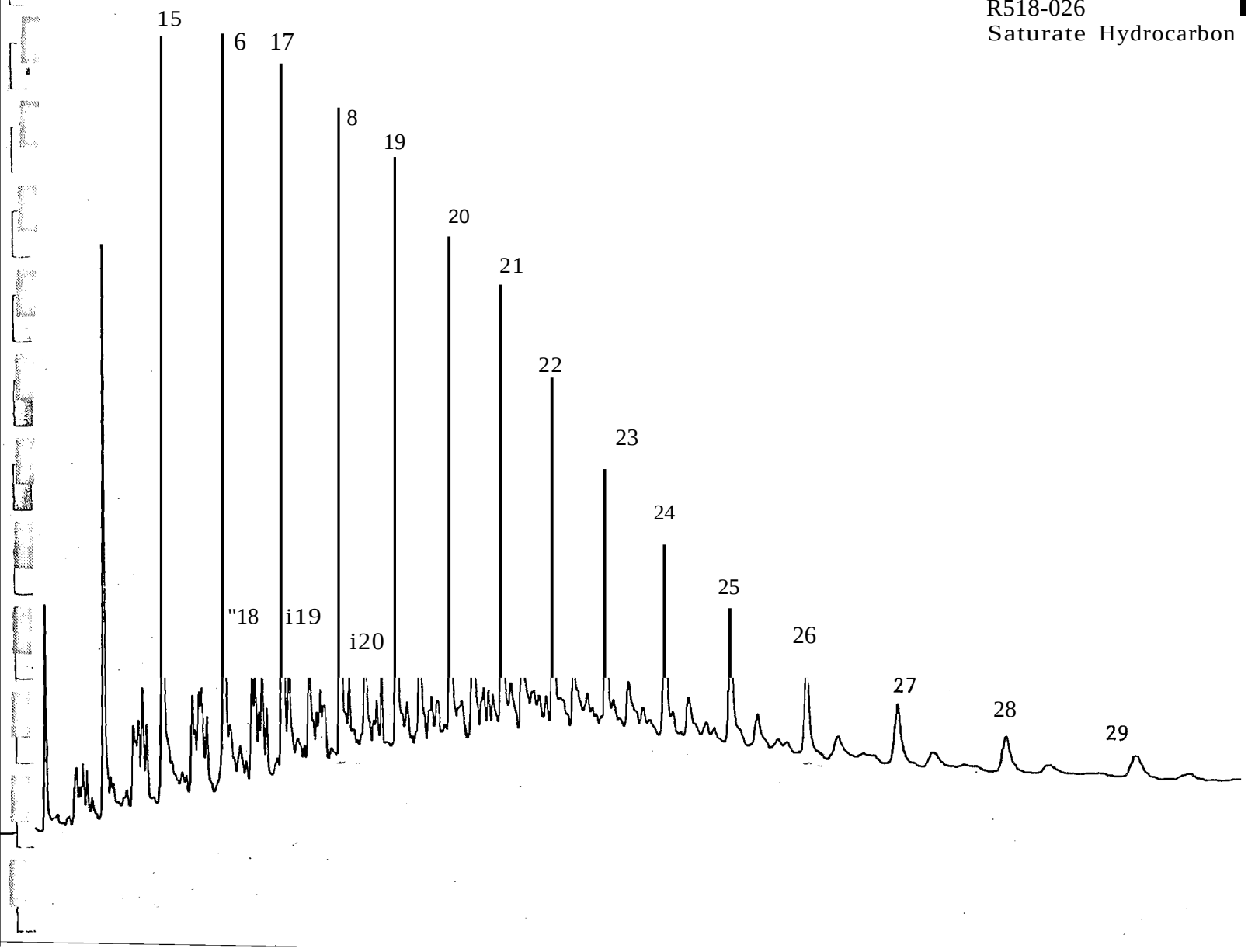

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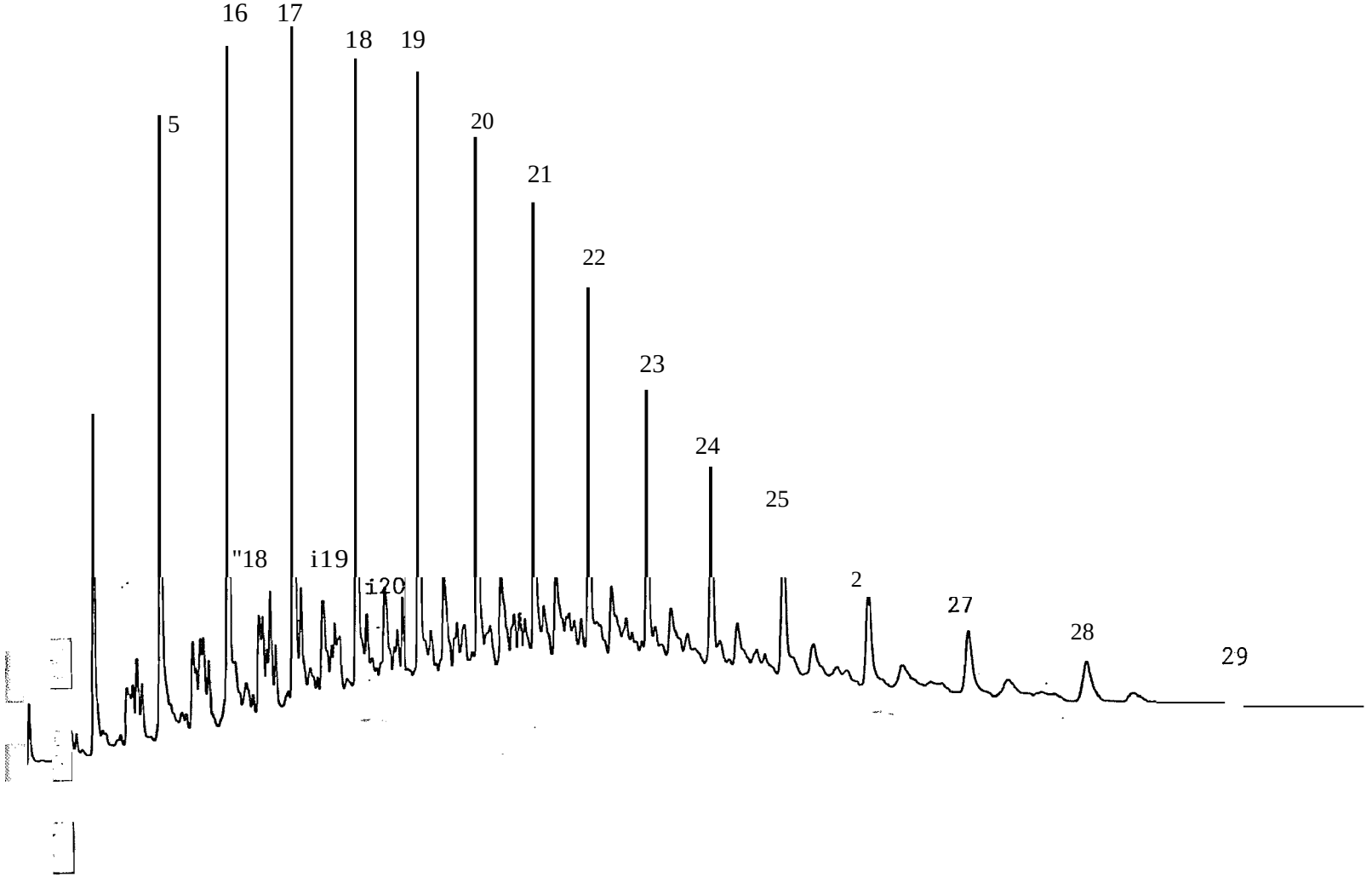

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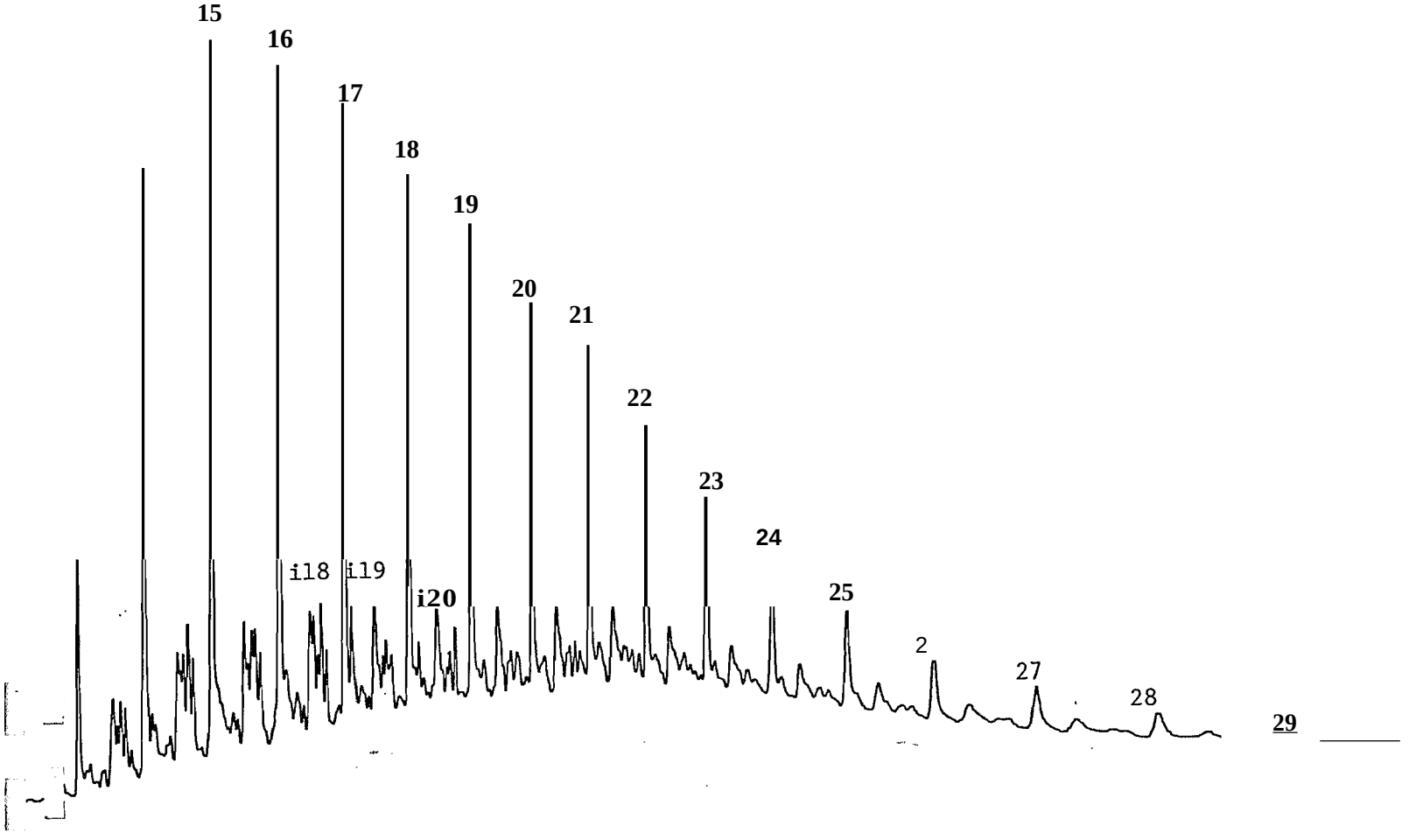

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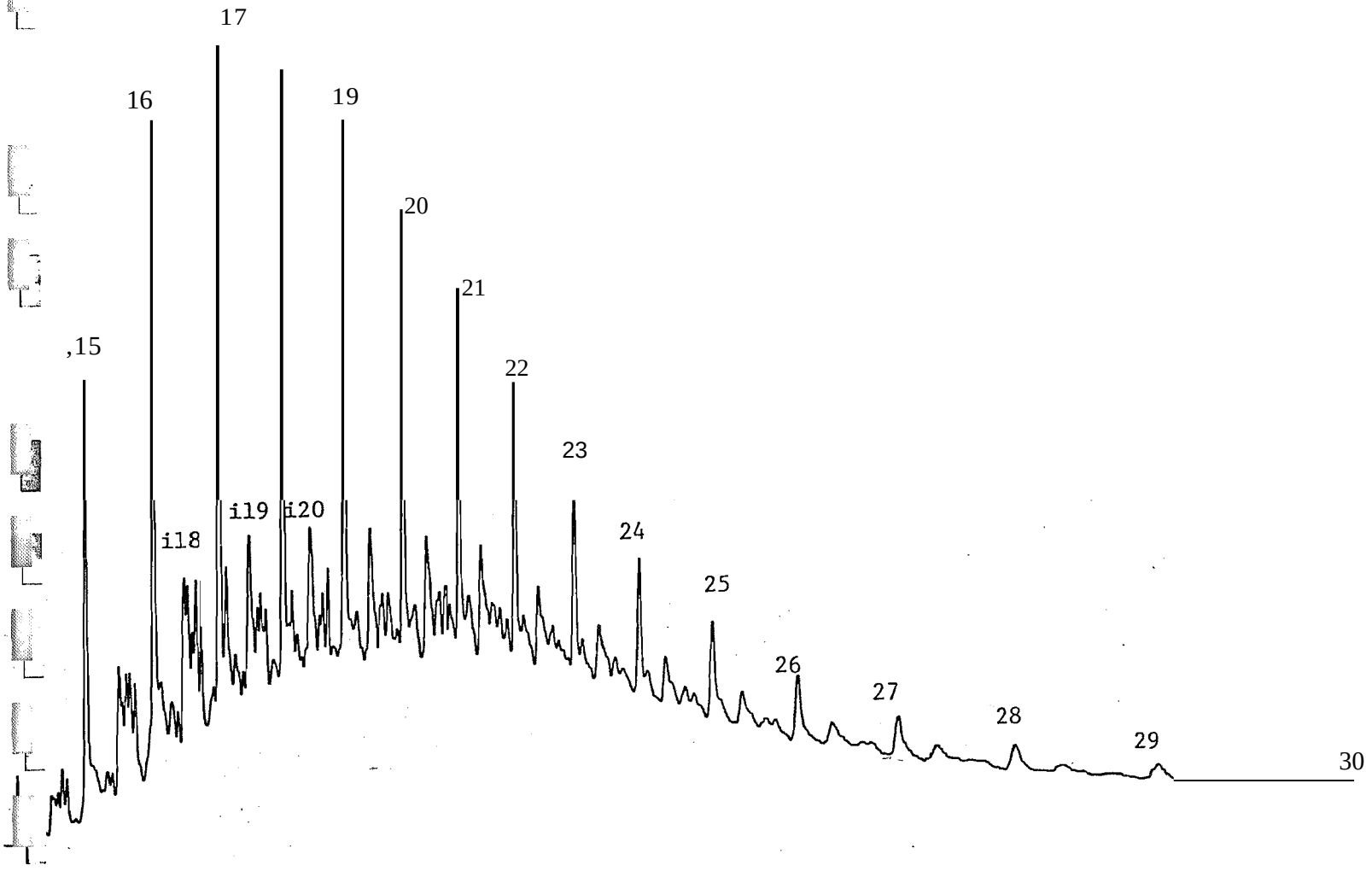

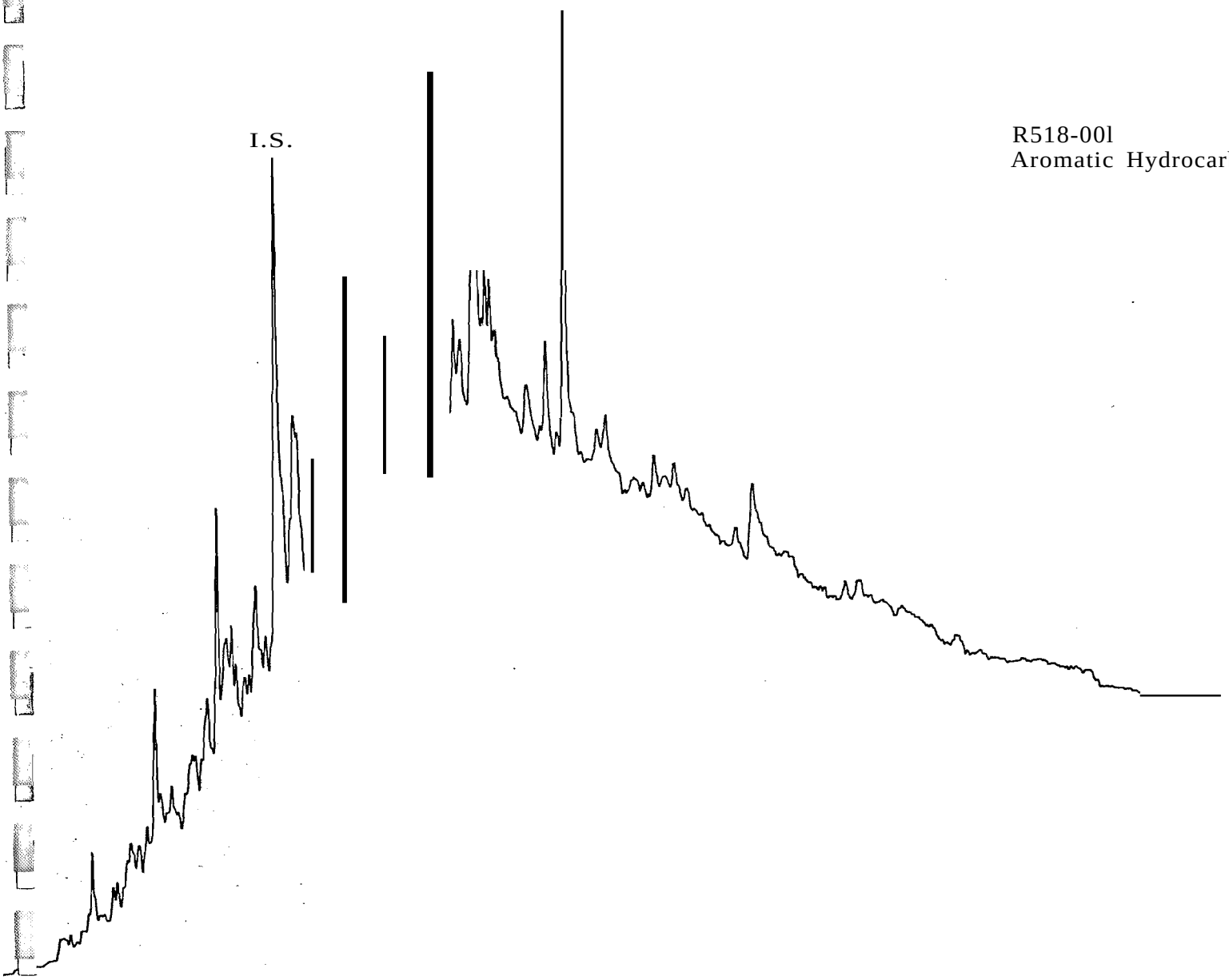

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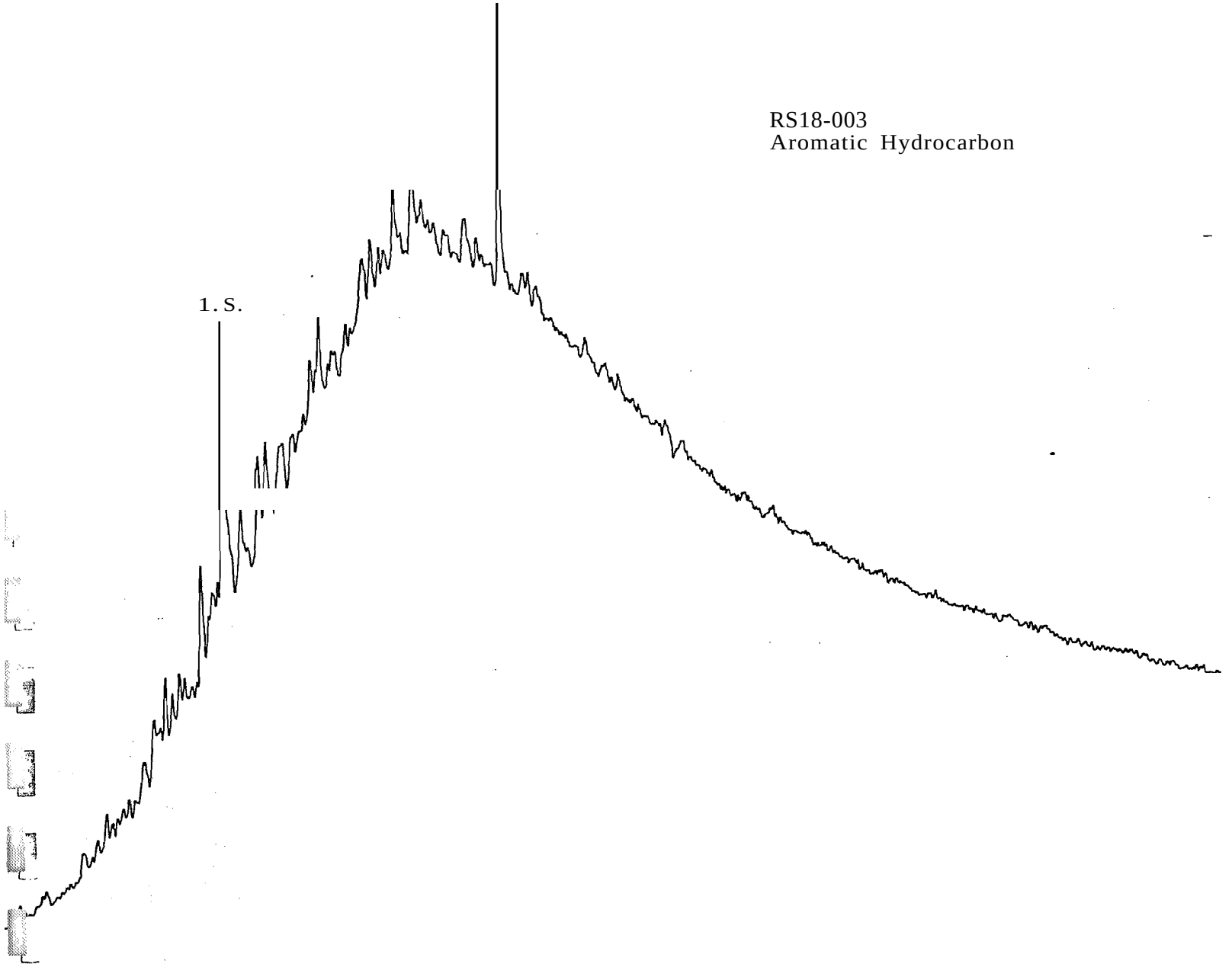
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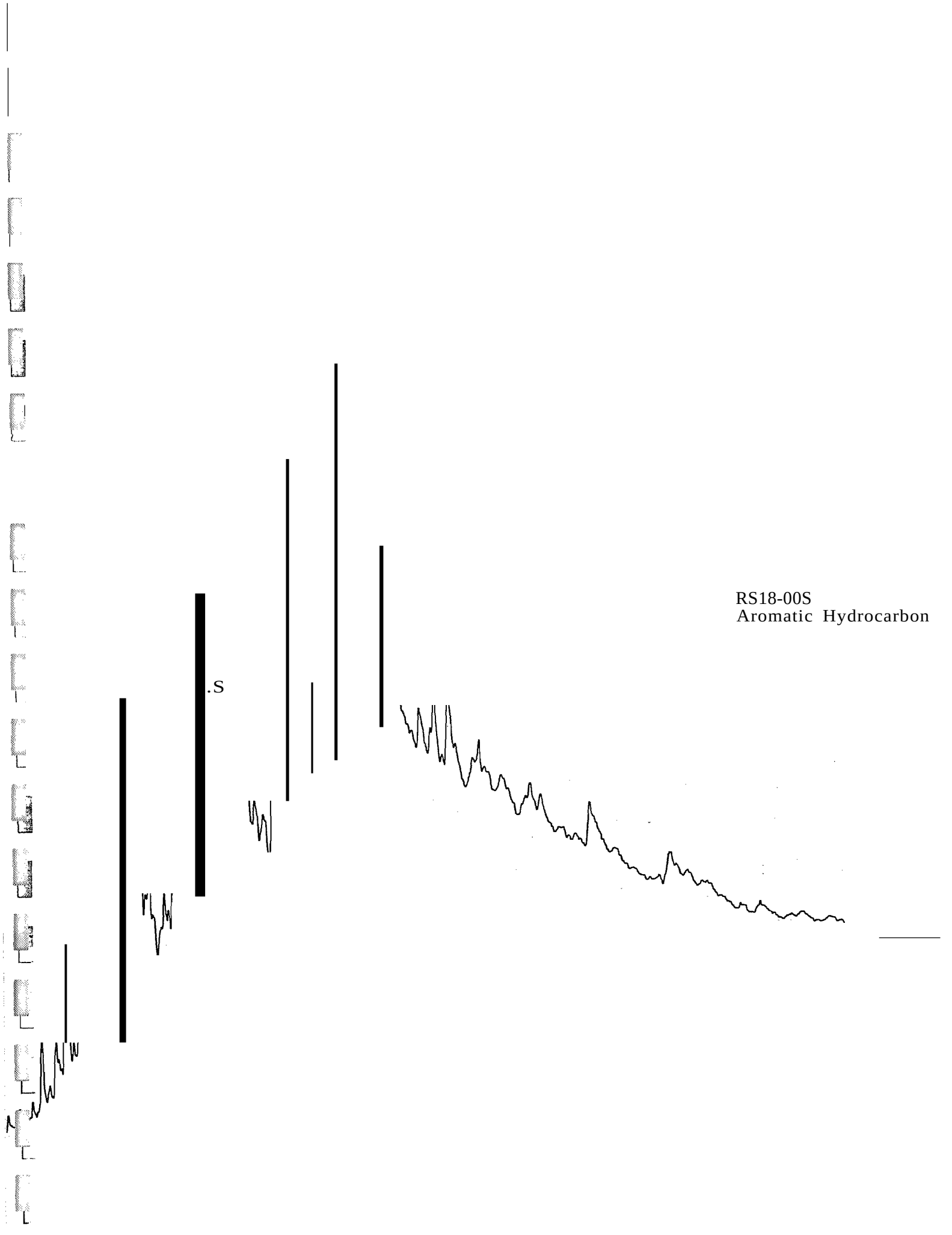
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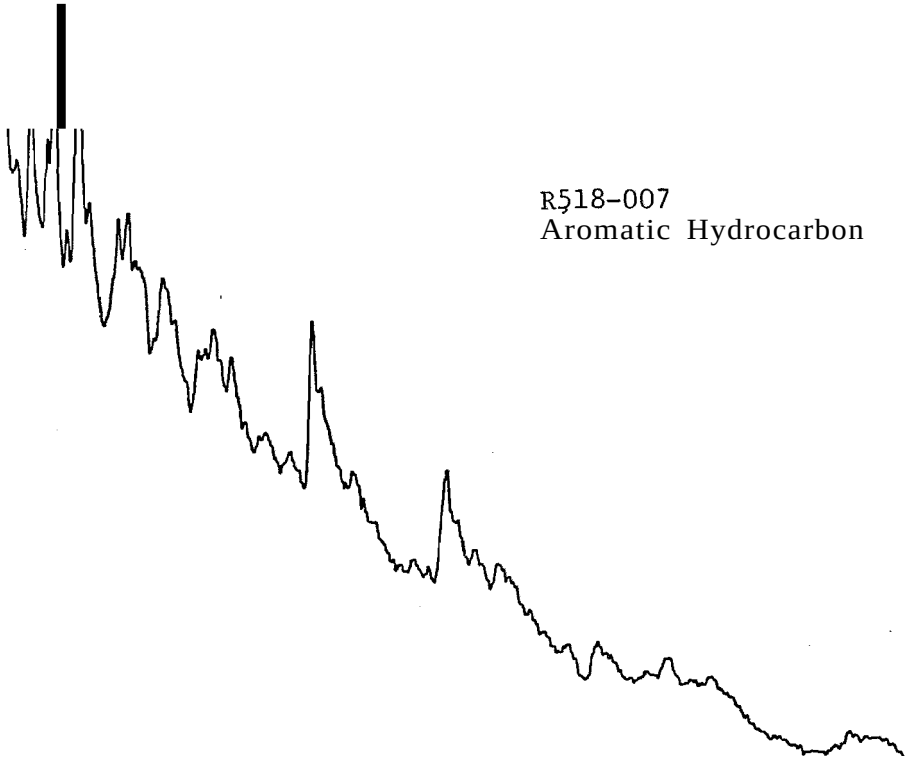

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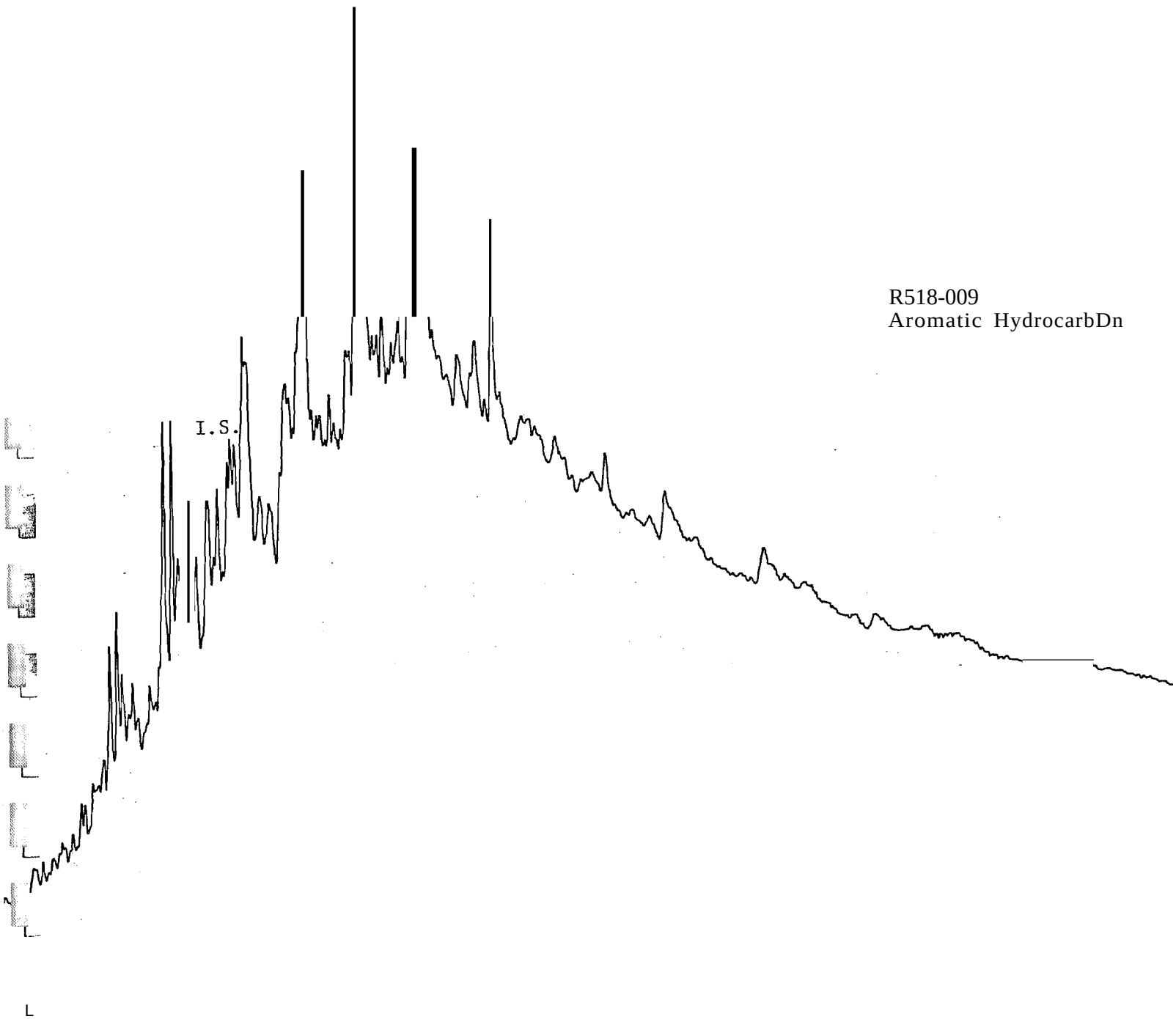
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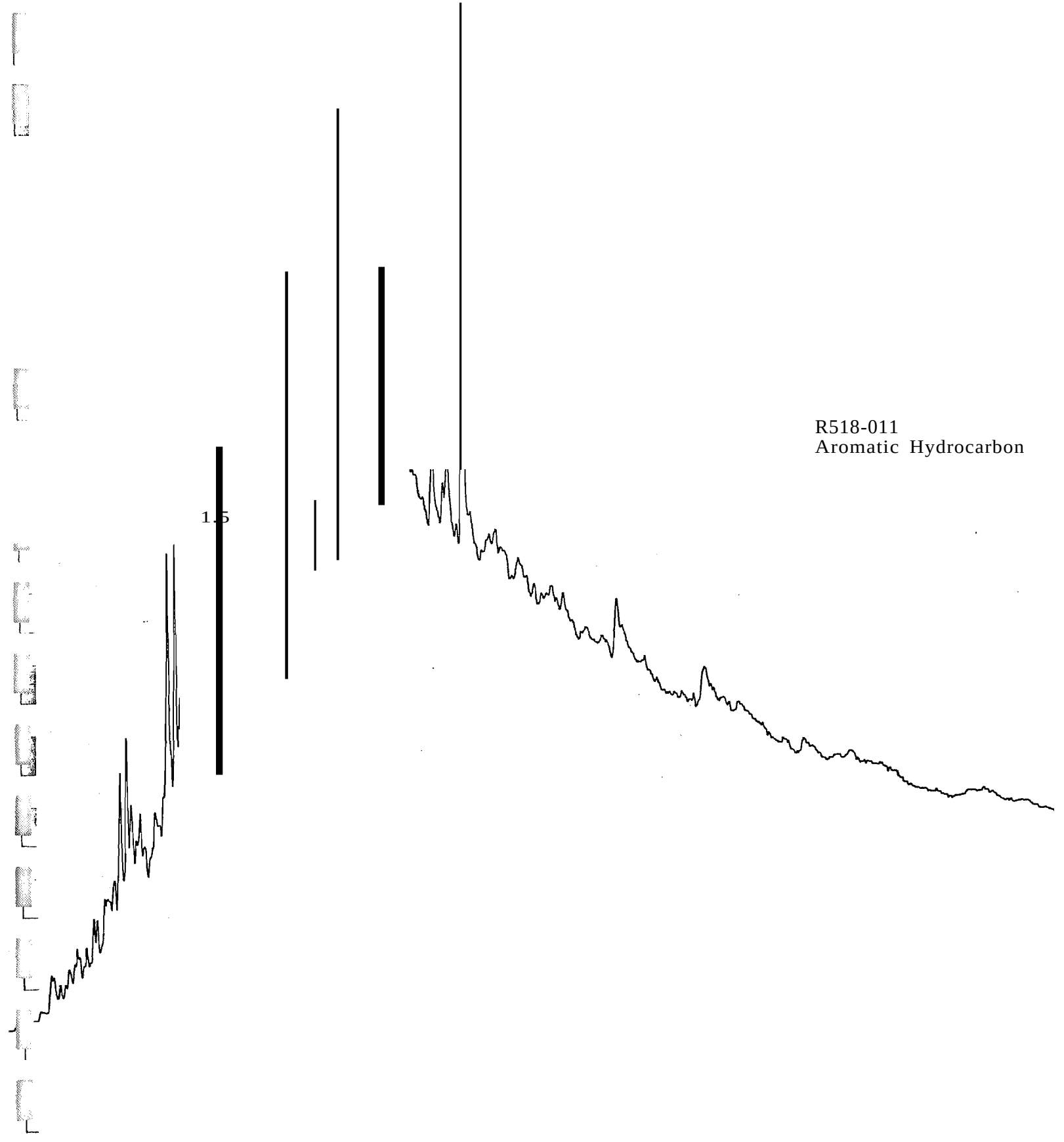
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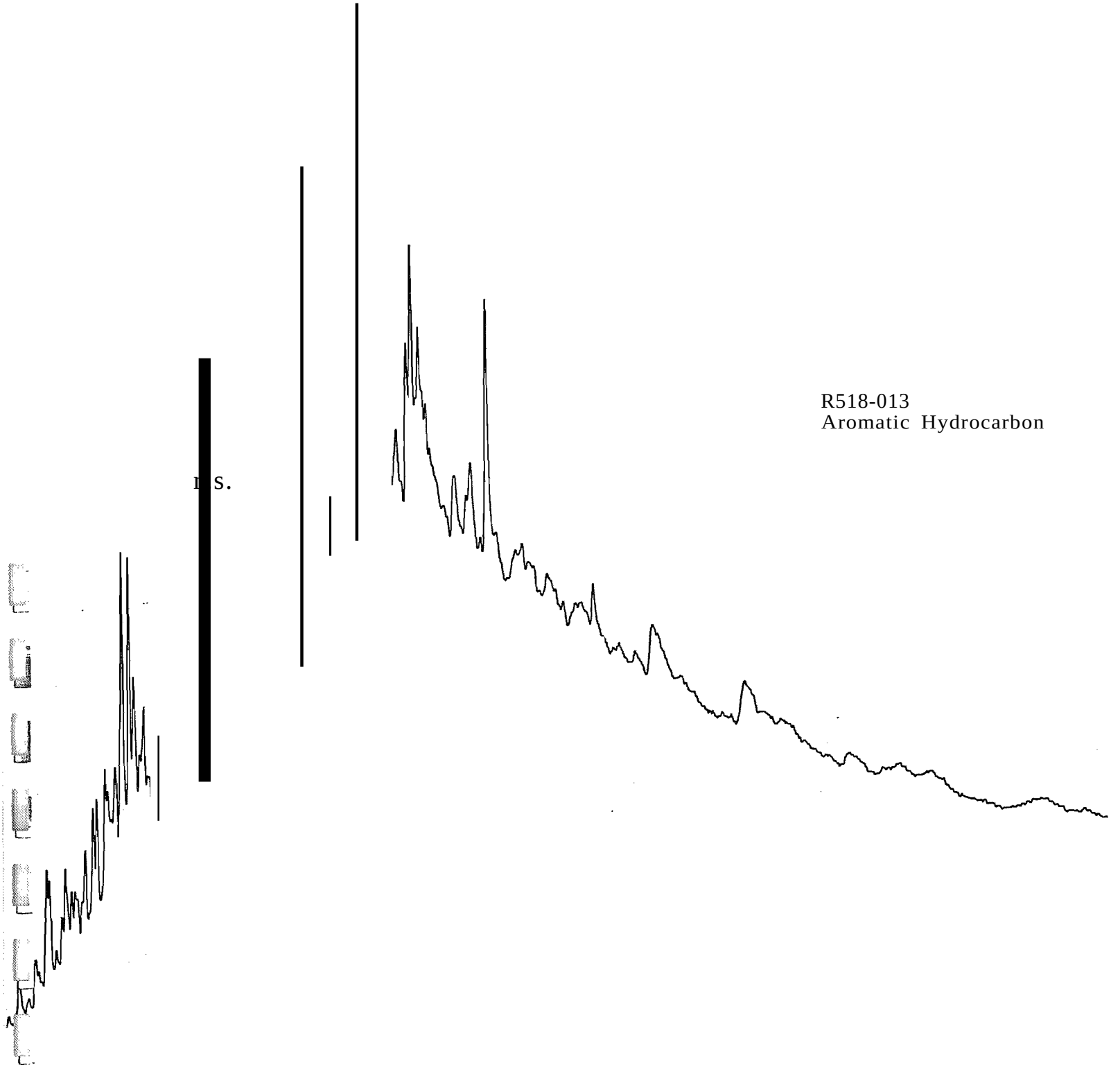
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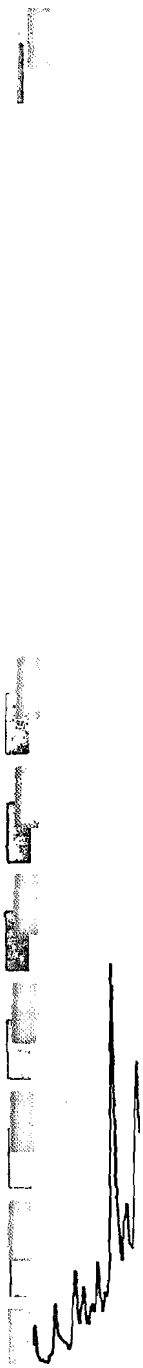

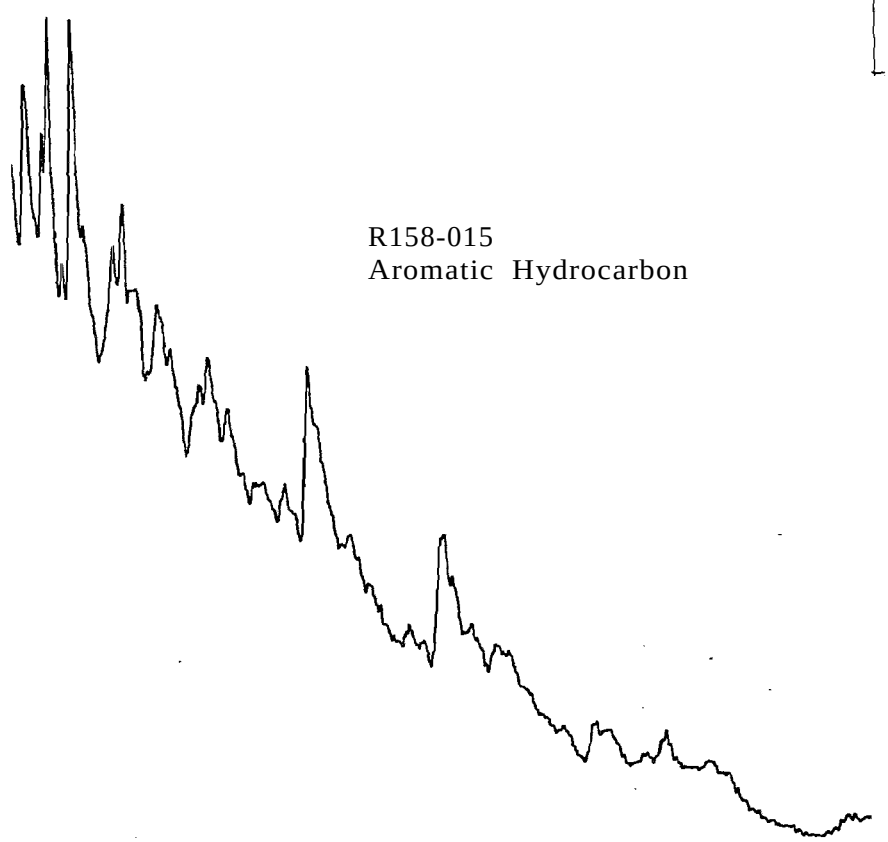

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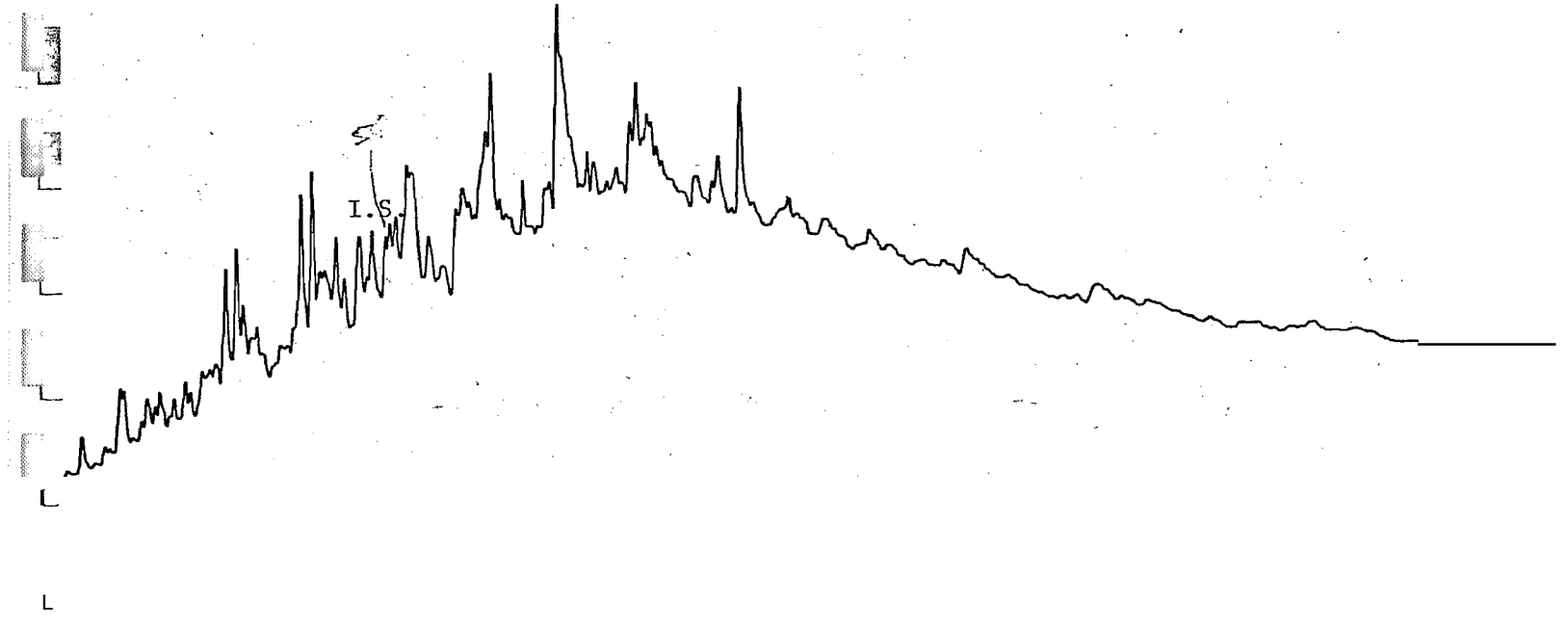

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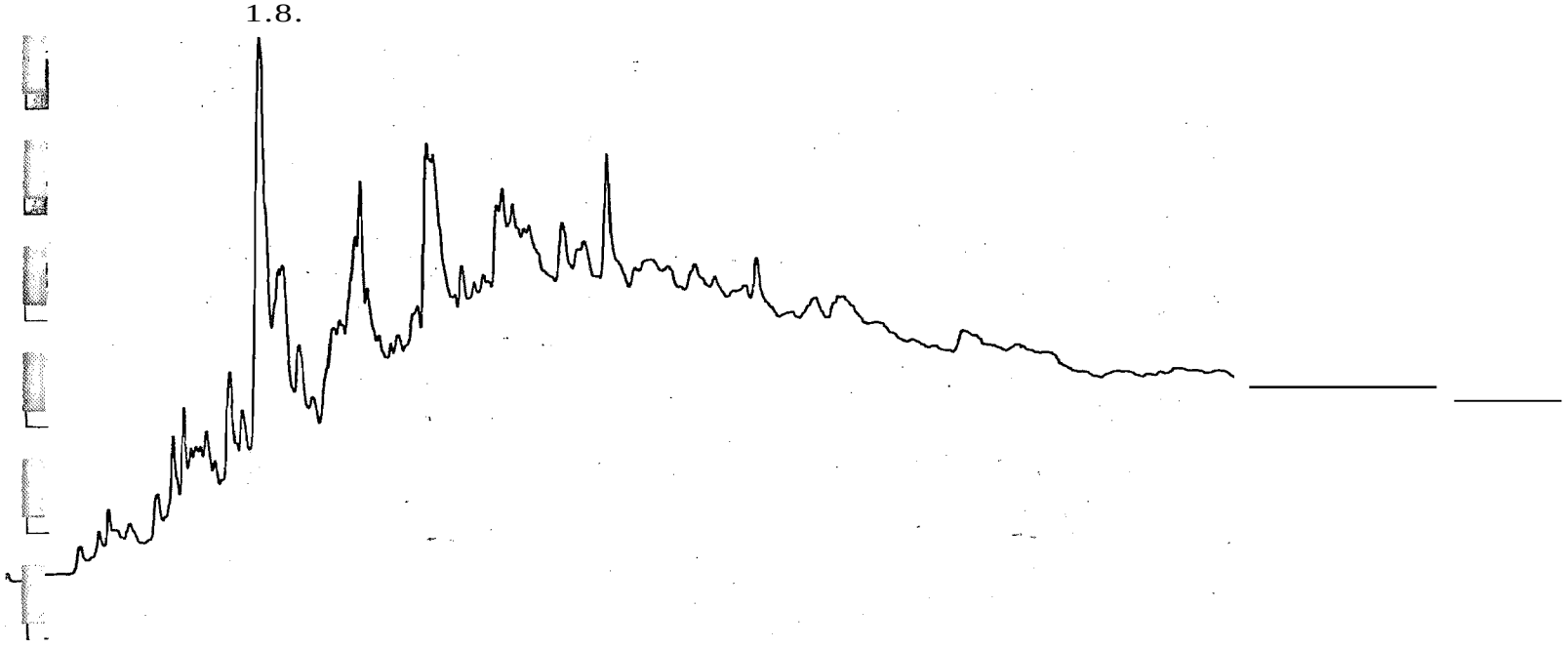

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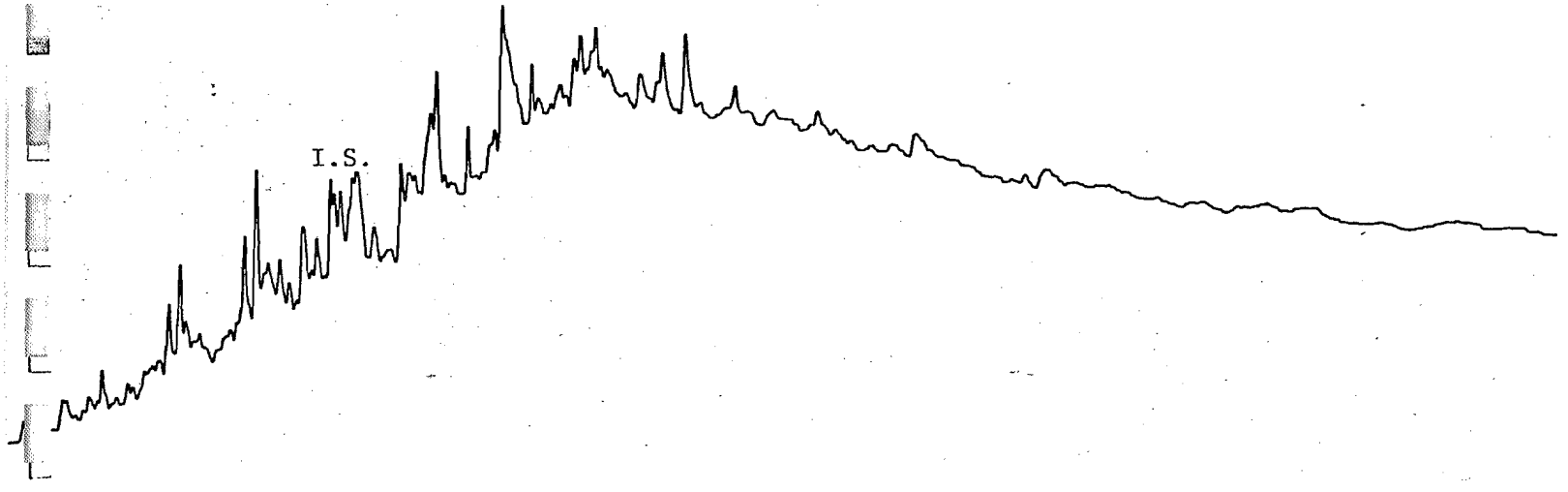

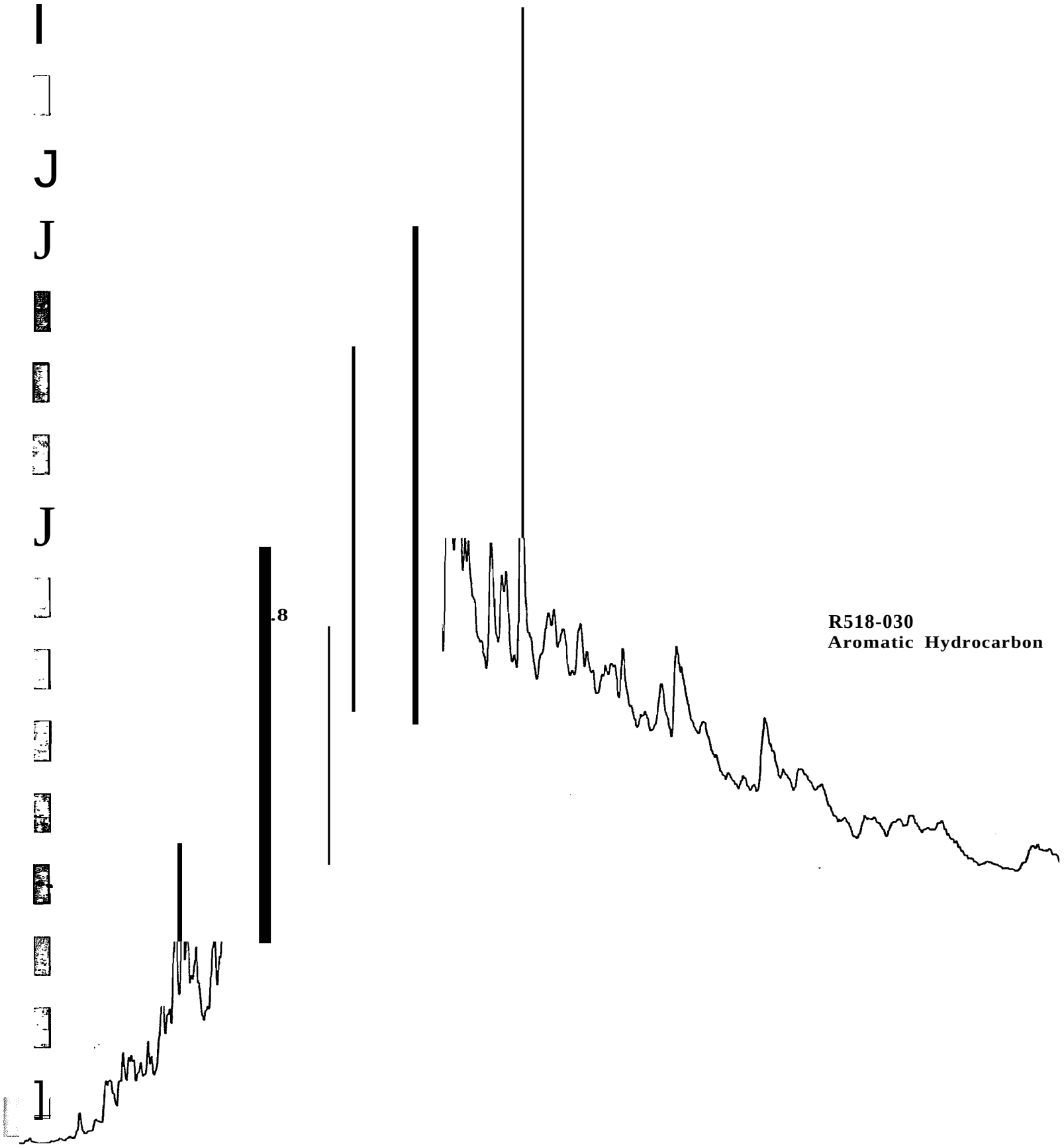
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R518-030
Aromatic Hydrocarbon

R518-032
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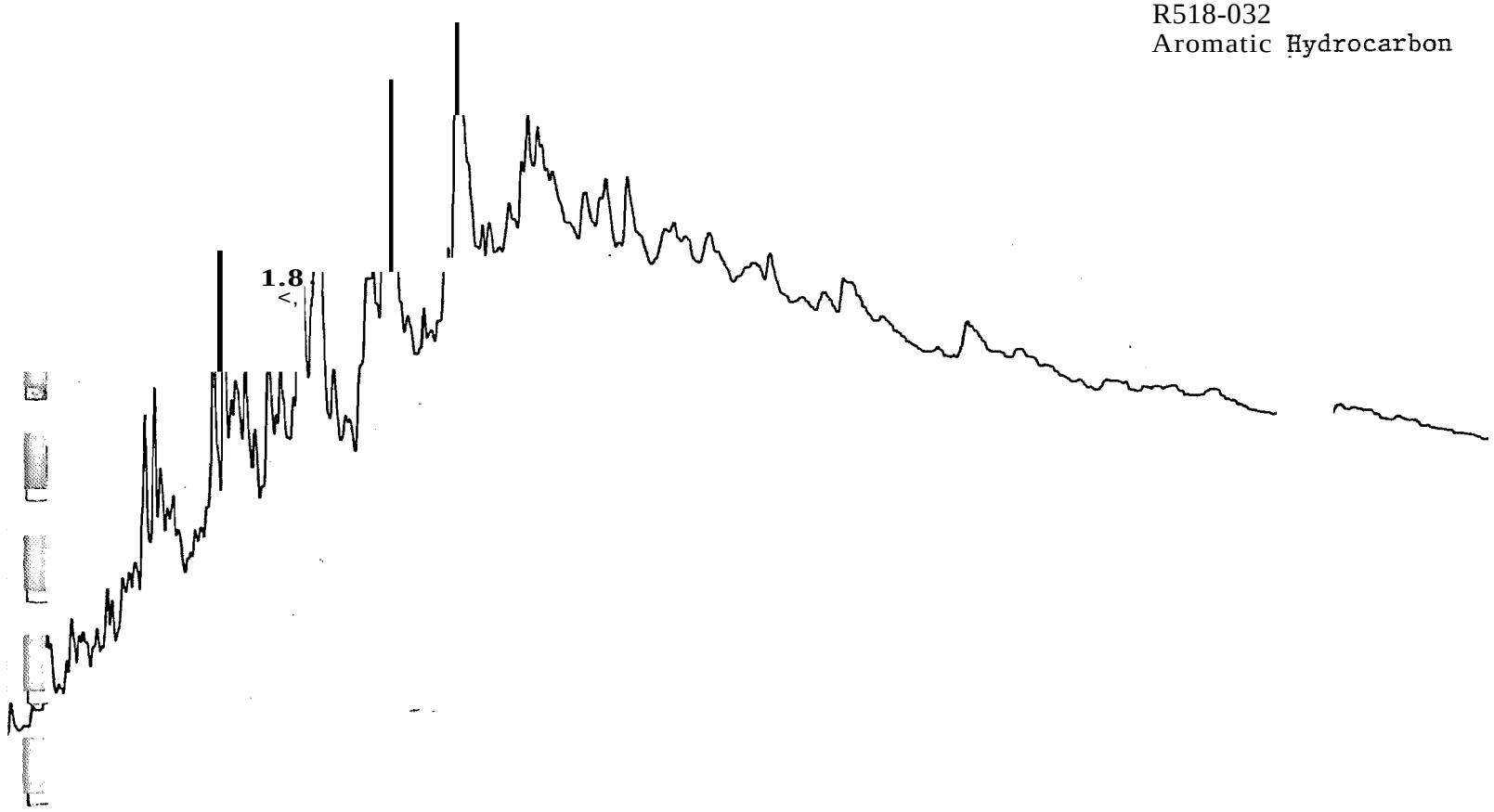

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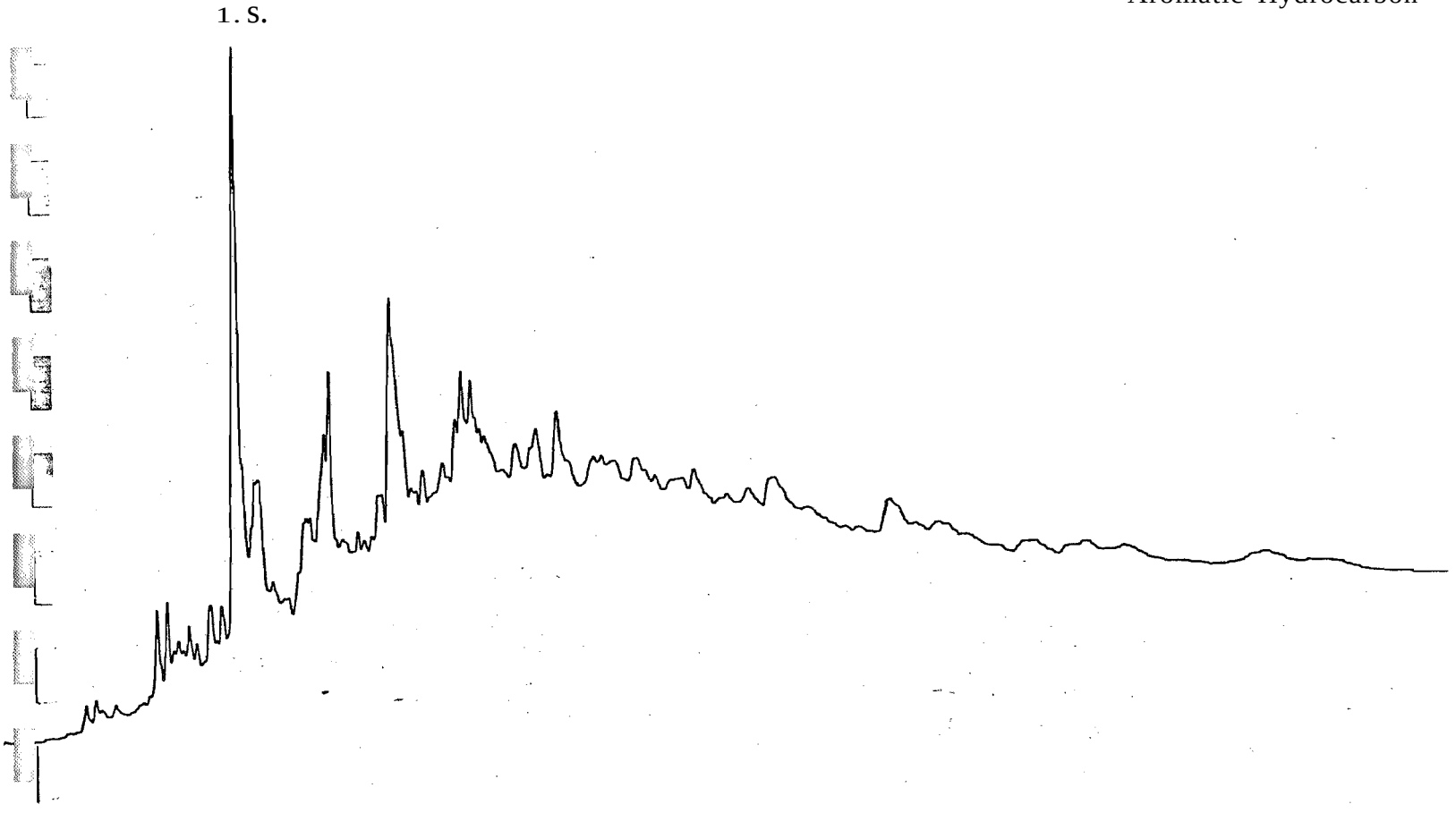


BIOSTRATIGRAPHY

PA -1 WELL

McKEAN COUNTY, PENNSYLVANIA.

Thirty-five (35) samples of core chips were studied by standard palynologic methods. The samples range in age from upper Middle Devonian (Givetian) to upper Upper Devonian (Famennian) over the 1687' interval represented by these samples.

In terms of palynofacies, this well represents an area in which near shore, normal marine sedimentatton was replaced three separate times ty the Tasmanites-rich restricted marine facies.

AGE

These samples contain moderately well preserved acritarchs and Chitinozoans. Tasmanites and spores are poorly preserved, and the spores can be identified only by their basic body symmetry and by occassional views of the spore wall ornamentation. Because of the poor preservation of the spores, age determinations of these samples were based on the acritarchs and chitinozoans.

The upper sample (001-3482') is presumed to be upper Devonian because of its stratigraphic location, although it lacks diagnostic palynomorphs. Sample 002 (3502') is uppermost Upper Devonian based on the presence of the acritarchs Micrhystridium flexible and Gorgonisphaeridium absitum. Samples 003 through 016 (3522' to 4775') are Upper Devonian and may be either Frasnian or Famennian. The chitinozoans Hoegispaeras and the Gorgonisphaeridium spp, are not distinctive.

Sample 017 (4795') is lower Upper Devonian (Frasnian) in age based on a diverse acritarch assemblage and a limited chitinozoan faunule, and sample 018 (4815') is also Frasnian based on the Ancyrochitina and Hoegisphaere chitinozoans.

The interval from 4835' to 4933' (samples 019 to 023) may be either lowermost Upper Devonian or upper Middle Devonian. Either a Frasnian or Givetian age could be assigned to this strata based on the presence of acritarchs and chitinozoans that are found to range through both those ages.

Samples 024 to 035 are all Givetian, Middle Devonian in age. The strata from 4933' to the base of this section 5169' contain acritarchs and chitinozoans of Givetian age and correlate well with Canadian strata as well as with europe an sections.

ENvrnONMENTS AND KEROGEN FACIES ACCUl\WLATION

The oldest sediments represented in this core were deposited inma.rme conditions which favored large accumulations of the green algae Tasmanites. The basal sample (5169') contains an assortment of acritarchs and chitinozoans mixed in with the Tasmanitea, but the overlying three samples contain only Tasmanites with only very small quantities of normal marine palynomorphs. In this phase, there was at least one interruption with terrestrially-derived kerogen deposited and for displacing the Tasmanites deposition at 5069 feet. At 5050' the Tasmanites had become re-established.

The first episode of Tasmanites-rich deposits was succeeded by a thick sequence of marine shales with varying amounts of terrestrial debris. In the interval from 5030' (sample 029) to 4775' (sample 017) there are very small quantities of Tasmanites but fairly abundant leiospheres and sphaeromorphs. Chitinozoan debris is common, but intact (and taxonomically identifiable) chitinozoans are scarce. Acritarchs are rare. The volume of woody material varies from sample to sample as does spore density. The variation in quantities of land plant-derived debris may mirror changes in distances from shore lines.

This was followed by Tasmanites-deposition (015 to 012, 4757' to 4697') which was, perhaps typically, interrupted at least once (at 4717') by deposition of terrestrial-derived material.

This was succeeded by terrestrial debris (4677' to 4620').

A short section (4600' to 4582'). represents mixture of terrestrial debris and Tasmanites. This mixture implies Tasmanites accumulation near to shore line, whereas the two older tongues of Tasmanites-rich material may have been deposited farther offshore if their small quantity of terrestrial debris is an accurate reflection. of distance from shore line. An alternate explanation is that this upper Tasmanites accumulation was not as major abtologtc event as were those in the underlying strata and that the influence of this one was buffered out by a large influx of terrestrial debris. In other words, if x amount of terrestrial debris was supplied to the basin in an interval of y years, the underlying Tasmanites intervals, the quantity of Tasmanites accumulating in y years may have been 40 x, but in this upper interval the amount of Tasmanites debris may have been x or 2 x in y time.

This Tasmanites inverval was succeeded by an accumulation of terrestrial-kerogen in a marine environment.

AGE

PA-l WELL, McKEAN COUNTY, PENNSYLVANIA

GEOCHEM No.	DEPTH	FIRST CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE	SECOND CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE
R518-001	3482'	D	U	I	Stratigraphic location				
R518-002	3502'	D	U	Fa	Acritarchs. Micrhystridium flexilile, Gorgonisphaeridium absitum				
R518-003 -009	3522' 4640'	D	U	Fa Fr	Stratigraphic location				
R518-010 -011	4657' 4677'	D	U	Fa Fr	Acrttarchs- Gorgonisphaeridium spp,				
R518-012 -015	4697' 4757'	D	U	Fa					
R518-016	4775'	D	U	Fa Fr	Chitinozians: Hoeglsphaer-s sp.				
R518-017	4795	D	U	Fr	Acrttarchs, Navifusa bacillum, Duvernoysphaera angelae, Du, krauselt, Chitinozoans: of, Anayrochitina sp,				

KEY

D	Devonian	Fr	F'rasntan
U	Upper	M	Middle
Fa	Famennian	Gi	Givetian
		I	Indeterminate

GEOCHEM No.	DEPTH		FIRST CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE	SECOND CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE
R518-018	4815'	D	U		Fr	Chitinozoans: Ancyrochitina spp and Hoegisphaera sp.				
R518-019 -021	4835' 4875'	D	U M		Fr Gi	stratigraphic location				
R518-022	4893	D	U M		Fr Gi	Acritarchs: Du, angelae Chitinozoans: Hoegrsphaera glabra				
R518-023	4913'	D	U M		Fr Gi	Chitinozoan: Hoegrsphaera glabra				
R518-024	4933'	D	M		Gi	Acritarch: Palacan thus of, P. ledanoish Polyedryxium spp,				
R518-025 -028	4951' 5010'	D	M		Gi	stratigraphic location				
R518-029	5030'	D	M		Gi	Chitinozoans: Sphaerochitina of', S rockglenensis Ancyrockina d. A cornizera				

KEY

GEOCHEM No.	DEPTH	FIRST CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE	SECOND CYCLE PALYNOMORPHS SYSTEM	SERIES	STAGE	RATIONALE
R518-030	5050'	0	M	Gi	Chitinozoans: Acritarohs, Duvernaysphaera angelae, Du tesselata, Du, spp.				
R518-031 -034	5069' 5149'	0	M	Gi	Stratigraphic location				
R518-035	5169'	D	M	Gi	Chitinozoans: Hoegisphaera spp, Acritarchs: Du angela.e, Du. tesselata				

KEY

DEPOSITIONAL ENVIRONMENT AND DISTRIBUTION OF PALYNOMORPHS

PA - 1 WELL

McKEAN COUNTY, PENNSYLVANIA

			FIRST CYCLE PALYNOMORPHS															SECOND CYCLE PALYNOMORPHS		
			NONMARINE								RESTRICTED MARINE	MARINE								
GEOCHEM No.	DEPTH	NUMBER OF COUNTS	VASCULAR PLANT DEBRIS	MEGASPORES	SPORES WITH APHEL PROCESSES	SACCATE & ZONATE POLLEN & SPORES	SPORES IN TETRADS	OTHER POLLEN AND SPORES	TASMANITES	LEIOSPHERES & SPHAEROMORPHS	ACRITARCHS	CHITINOZOANS	SCOLECODONTS	POLLEN AND SPORES	SMANITES	ACRITARCHS, CHITINOZOANS, SCOLECODONTS	
R518-001	3482	300	39					31	6	14							
R518-002	3502	300	85			I		12		1	1						
R518-003	·3522	300	87					3	t	10							
R518-004	4542	300	·75					13	5	7							
R518-005	4562	300	92					6	t	2							
R518-006	4582	300	33					23	41	3							
R518-007	4600	300	20					16	49	13			t				
R518-008	4620	300	37					55	3	4	1		t				
R518-009	4640	300	69			t		21	t	9							
R51S-01	4657	300	74			1		17		8	1						
R51S-011	4677	300	80					1		19	t						
R518-012	4697	300	5						94*	1							
R51S-013	4717	300	82					1		17	t						
R518-014	4737	300	3					3	93*	1							
R51S-015	4757	300	t						99*	t							
R51S-016	4775	300	83					6		11		t**					
R518-017	4795	300	77					8	t	13	1	1**					

*Badly degraded

** Fragme

DEPOSITIONAL ENVIRONMENT AND DISTRIBUTION OF PALYNOMORPHS

PA - 1 WELL

McKEAN COUNTY. PENNSYLVANIA

				FIRST CYCLE PALYNOMORPHS													SECOND CYCLE PALYNOMORPHS		
				NONMARINE							RESTRICTED MARINE	MARINE							
GEOCHEM No.	DEPTH	NUMBER OF COUNTS	VASCULAR PLANT DEBRIS	MEGASPORES	SPORES WITH GRAPHEL 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
R518-018	4815	300	80					8		12			t			
R518-019	4835	300	71					21	3*	5		t**				
R518-020	4855	300	90					2	1*	7						
R518-021	4875	300	82					3		14	t	1**				
R518-022	4893	300	85			t		3		10		2**				
R518-023	4913	300	22					71	t*	5		2**				
R518-024	4933	300	73					22	t*	12	t	2**				
R518-025	4951	300	62					t		38		t**				
R518-P26	4971	300	75					5		19						
R518-'027	4991	300	100					t		t		t**				
R518-028	5010	300	95					1		4						
R518-029	5030	300	59					22	2*	9	t	8**				
R518-030	5050	300	20					t	72*	6		2**				
R518-031	5069-	300	80					4		14	t	2**				
R518-032	5089	300	1						96*	3						
R518-033	5109	300	4					2	91*	4						
R518-034	5149	300	2					3	95*			t**				
R518-035	5169	300	2					3	89*	5		1**				

FINE PARTICLE SIZE ANALYSIS OF KEROGEN

FROM THE

PA -1 WELL

MCKEAN COUNTY, PENNSYLVANIA

Histograms produced by measurements of kerogen particles using the 200 um aperture tube of a Coulter Counter TA II were made on kerogen recovered from core chips of fourteen (14) samples from the PA-1 Well, McKean County, Pennsylvania.

Samples were processed according to standard procedures (Appendix B) to avoid reducing the size of the kerogen particles in processtng, The mature kerogen in . this sample may, however, have fragmented as a result of biochemical changes in the form of the kerogen particles.

Initial studies of other wells in this area indicated there are at least twenty-eight different kinds of kerogen. Some of these types are more mature' equivalents of less mature, better preserved kerogen types. In the PA-1 well the more mature kerogen types are seen; their less mature equivalents are included in the kerogen type summary in Appendix A. The numerical kerogen types and the distribution of the different "types" were plotted on the histograms produced by the TA II after detailed examination of kerogen strew slides of the same material. The distributions and types relative to size are summarized on the grid sheet.

Samples were chosen in this well to outline the following questions:

1) In similar sa.mples of mixed Tasma.nites/terrestrial kerogen, was there a change in kerogen distribution over a thirty-eight foot interval?

2) In a sequence going from normal marine kerogen to Tasmanites to normal marine, can a transition zone be identified with the size frequency histogram?

3) What natural shifts in kerogen histogram patterns may be seen for increased maturity of known kerogen types?

In answer to the third question, the kerogen types in this well are very like those seen elsewhere, but the kerogen is less well preserved. Fragments of wood seem to be the least altered by increasing maturity. Spore preservation is dependent on the combined factors of total thermal maturity and the corrosive effect of secondary crystal growth within and into the spores at some time in the geologic past. When there has been little secondary crystal growth, the spores retain their original form

with little alteration, but when there was extensive growth of crystals (for example, pyrite) the spore walls were damaged and there is a reduction in spore size due to the spores breaking apart along weak areas in the spores' wall. Fine amorphous material (type 09) and "morphous" mater-ial seem to be little altered. Most acritarchs are still identifiable to species level, although very fine details may have been destroyed (for example the thin near-transparent membrane around the Duvernayspaeras). Chitinozoans are also well preserved; although they tend to fragment, there is no major degration of processes nor of the body wall.

Tasmanites, however, are poorly preserved. Their walls have a corroded appearance and most are fragmented.

With reference to changes in histogram form with increasing thermal maturity, there are changes only for those samples rich in Tasmanites. The Tasmanites histogram remains one that is relatively flat with no peaks. In samples 012, 013, 014, and 015 there is reduced accumulation in the larger channels (due to the Tasmanites breaking apart into smaller parts), and there is a misleading "normal" distribution for samples 013 and 014 due to the large amount of kerogen type 08 in those samples.

Elsewhere in the basin, samples with large quantities of amorphous (type 09) mater-Ial produced histograms with major accumulations in the fine size channels. In these samples, 005, 011, 016, 017, and 018 have the dominant ace umulations in the fine channels. Although the histograms do have accumulations in the coarser channels, such coarser accumulations can be explained by increased quantities of terrestrial material due to proximity to the Devonian delta front.

Those samples with mixtures of kerogen types strongly resemble those elsewhere with peaks emphasizing the major kerogen types within the mixtures.

In conclusion, the only shift in kerogenpatterns occurs in Tasmanites-rich samples. The shift to finer channels corresponds to a decrease in Tasmanites size due to degradation of the Tasmanites.

To answer question two, samples 011 to 016 document a change from normal marine kerogen to Tasmanltes-crfch kerogen and a return to normal marine kerogen as seen at intervals twenty stratigraphic feet apart. The change in histogram form clearly indicates the Tasmanites-rich samples without reference to the kerogen types within the histograms. There are not enough elements from the normal marme kerogen 'present in the Tasmanites-rich kerogen to trace multiple trends, but the woody material (type 017 or 027) was deposited in small quantities in approximately the same size ranges. This would imply a constant but continued source of that debris and changing environmental factors somehow favoring Tasmanites proliferation.

In conclusion, although the changes in histogram silouettes do mir-ror the changes in kerogen types, here the histograms do not reflect any transitional zones and do not produce any positive evidence about the nature of Tasmanite-rich kerogen.

And finally, to answer question one, three similar kerogen samples 005, 006, and -007 all represent a mixture of Tasmanites and terrestrial-derived kerogen, but they do have different histograms which reflect differences in kerogen composition. Such differences are hard to distinguish in mature sequences, but the histograms here do distinguish size and type. It appears that 006 and 007 are alike and 005 represents a change from the underlying kerogen accumulation patterns. The change was to more terrestrial (woody and spores) kerogen with fine amorphous with a reduction in Tasmanites accumulation.

To conclude, although the samples examined here are more mature than those in many of the other wells studied, fine particle size analyses are applicable to these samples. Results are comparable to those from less mature samples when allow-ances are made for some size-reductions related to thermal alteration.

TABLE XI

GeoChem Laboratories, Inc. COULTER COUNTER® Model T & T_A Worksheet

1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

Geo Chem # R518-001 Sample 1.0

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

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Apar, Oia.	Sar, No.	CALIBRATION DATA	Pa.t. Oia.	W	rIA	A
50	11007	LATEX	2 02	6	6	17q
200	2400	MICROSPHERES	10.11	7	3.2	170

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

rIA	1.613.2	
CALIe. A	174.21169.3	
APERTURE DIA.	50 200	

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

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ 2lWz'W') Fo.ModelT$_A$

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI				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	?								
.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				6.7			
94.78	67.02	5.04	10	4				9.8			
189.6	134.0	6.35	11	5				12.6			
379.1	268.1	8.00	12	6				12 2			
758.3	536.2	10.08	13	7				10.1			
1516.	1072.	12.7	14	8				8.9			
3033.	2145.	16.0	15	q				8.2			
6066.	4289.	20.2	16	10				7.5			
12.13×10^3	8579.	25.4		11				7.1			
24.27×10^3	17.16×10^3	32.0		12				5 7			
48.54×10^3	34.31×10^3	40.3		13				4 1			
97.18×10^3	68.63×10^3	50.8		14				3 3			
194.4×10^3	137.3×10^3	64.0		15				2.4			
388.7×10^3	274.5×10^3	80.6		Hi				1 3			
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

COULTER COUNTER® Model Ts T_A Worksheet

Geochem Laboratories, Inc.
,14a-e BRITTMORE ROAD
HOUSTON, TEXAS 77043

Geo Chem # R518-005 Sample I.D

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

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Ap.,. Dia.	S8'. No.	CALIBRATION DATA	Part.. Dia.	W	±IA	A
50	11007	LATFX	2.02	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	1.6	3.2
CALIB. A	174.2	1169.3
APERTURE DIA.	50	200

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3 2^{(W2 - W1)}$ fo, Model T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3 2^{(W2 - W1)}$ fo, Model TA

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel W)				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	?				--			
47.39	33.51	4.00	9	3				16.0			
94.78	67.02	5.04	10	4				18.8			
189.6	134.0	6.35	11	5				16.3			
379.1	268.1	8.00	12	6				14.0			
758.3	536.2	10.08	13	7				114			
1516.	1072.	12.7	14	8				8.8			
3033.	2145.	16.0	15	9				5.5			
6066.	4289.	20.2	16	11				3.6			
12.13×10^3	8579.	25.4		1				2.6			
24.27×10^3	17.16×10^3	32.0		12				1.3			
48.54×10^3	34.31×10^3	40.3		13				0.9			
97.18×10^3	68.63×10^3	50.8		14				0.6			
194.4×10^3	137.3×10^3	64.0 -		15				0.3			
388.7×10^3	274.5×10^3	80.6		16				0.0			
777.4)(10^3	549.0×10^3	101.6									
1.555×10^6	$1.09B \times 10^6$	128.							-		
3.109×10^6	2.196×10^6	161.									
6.219×10^6	$4.39T \times 10^6$	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.									

COULTER COUNTER® Model T & T_A Worksheet

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

Seo Chem # R518-006 Sample 1.0

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

EOUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Dia.	Sar. No.	CALIBRATION DATA	Part. Dia.	W	± IA	A
50	11007	LATEX	? O?	6	1 6	17q
200	2400	M1CROSPHERES	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^z · W.) ForModelT

$\frac{A_z}{A_1} = \left(\frac{d_1}{d_z}\right)^3$ 21Wz'W') F_{or} M_0 d_eIT$_A$

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI				50	200			
.00575	.004091	.198	50	?00							
.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				6.6			
94.78	67.02	5.04	10	4				8.7			
189.6	134.0	6.35	11	5				9.1			
379.1	268.1	8.00	12	6				9.9			
758.3	536.2	10.08	13	7				10.1			
1516.	1072.	12.7	14	8				10.2			
3033.	2145.	16.0	15	q				9.4			
6066.	4289.	20.2	16	10				9.5			
12.13 x 10^3	8579.	25.4		11				8.7			
24.27 x 10^3	17.16 x 10^3	32.0		12				7.3			
48.54 x 10^3	34.31 x 10^3	40.3		13				5.4			
97.18x10^3	68.63 x 103	50.8		14				3 2			
194.4 x 10^3	137.3 x 10^3	64.0		15				1.6			
388.7 x 10^3	274.5 x 10^3	80.6		16				0.4			
777.4 x 10^3	549.0 x 10^3	101.6									
1.555 x 10^6	1.098 x 10^6	128.									
3.109 x 10^6	2.196 x 10^6	161.									
6.219 x 10^6	4.392 x 10^6	203.									
12.44 x 10^6	8.784 x 10^6	256.									
24.88 x 10^6	17.57 x 10^6	322.									
49.75 x 10^6	35.14 x 10^6	406.									
99.50 x 10^6	70.27 x 10^6	512.									
199.0 x 10^6	140.6 x 10^6	- 645.									
398.0 x 10^6	281.1x10^6	812.									
796.0 x 10^6	562.2 x 10^6	1024.									

COULTER COUNTER® Model T & T_A Worksheef

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

Geo Chem #R518-007 Sample 1.0

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

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Ojll.	5er. No.	CALIBRATION DATA	Part: Dill.	W	±IA	A
50	11007	LATFX	2 o?	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	
CALIB. A	174.21169.3	
APERTURE DIA.	50 200	

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^{3}$ 2 (W² • WI) For Model T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^{3}$ 2(W² ' W¹) ForModelT A

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI				50	200			
.00575	.004091	.198	50	?On							
.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				7.9			
94.78	67.02	5.04	10	4				9.6			
189.6	134.0	6.35	11	5				8.6			
379.1	268.1	8.00	12	6				7 9			
758.3	536.2	10.08	13	7				7.7			
1516.	1072.	12.7	14	8				8.9			
3033.	2145.	16.0	15	Q				9 n			
6066.	4289.	20.2	16	10				10.2			
12.13×10^3	8579.	25.4		11				9.2			
24.27×10^3	17.16×10^3	32.0		12				9.1			
48.54×10^3	34.31×10^3	40.3		13				6 3			
97.18×10^3	68.63×10^3	50.8		14				3.1			
194,4 " 10^3	137.3×10^3	64.0		15				1 6			
388.7×10^3	274.5×10^3	80.6		16				0 6			
777.4×10^3	549.0×10^3	101.6									
1,555 $\times 10^6$	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.									

COULTER COUNTER® Model T & T_A Worksheet

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

Ceo Chern # R518-011 Sample 1.0

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	Part. Dia.	W	± IA	A
50	11007	LATFX	? 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

±IA	1.613.2	
CALIS. A	174.21 169.3	
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

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ 2IWz·Wt) For Model T_A

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (Wl				50	200			
.00575	.004091	.198	50	znn							
.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				15.8			
94.78	67.02	5.04	10	4				19.7			
189.6	134.0	6.35	11	5				16 7			
379.1	268.1	8.00	12	6				12.8			
758.3	536.2	10.08	13	7				9 9			
1516.	1072.	12.7	14	8				8.4			
3033:	2145.	16.0	15	q				6.7			
6066.	4289.	20.2	16	10				5.2			
12.13×10^3	8579.	25.4		11				3.:1			
24.27 it 10^3	17.16 it 10^3	32.0		12				1.4			
48.54×10^3	34.31×10^3	40.3		13				0.5			
97.18×10^3	68.63×10^3	50.8		14				0.0			
194.4×10^3	'137.3×10^3	64.0		15				0.0			
388.7×10^3	274.5×10^3	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	4.392×10^6	203.									
12.44×10^6	8.784×10^6	256.									
24.88×10^6	17.57 it 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.									

COULTER COUNTER® ModeJ T & T_A Worksheet

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

Geo Chem # R518-013 Sample I.D

ELECTROLYTE 4% {Na PO2)6 DISPERSANT

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Oia.	Ser. No.	CALIBRATION DATA	Part., Oia,	W	±IA	A
50	11007	LATEX	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

±IA	1.613.2	
CALIB. A	174.21169.3	
APERTURE DIA.	50 200	

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

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

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel(W)				50	200			
.00575	.004091	.198	50	?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	6								
l'.B5	8.378	2.52	7	1				--			
23.70	16.76	3.17	8	?				--			
47.39	33.51	4.00	9	3				6.4·			
94.78	67.02	5.04	10	4				10.0			
189.6	134.0	6.35	11	5				11.7			
379.1	268.1	8.00	12	6				13.3			
758.3	536.2	10.08	13	7				13.3			
1516.	1072.	12.7	14	8				13.2			
3033.	2145.	16.0	15	Q				10 8			
6066.	4289.	20.2	16	10				9. 0			
12.13×10^3	8579.	25.4		11				6.0			
24.27×10^3	17.16×10^3	32.0		12				3.7			
48.54×10^3	34.31×10^3	40.3		13				2.1			
97.18×10^3	68.63×10^3	50.8		14				0.5			
194.4×10^3	137.3×10^3	64.0		15				0.0			
388.7×10^3	274.5×10^3	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	4.392×10^6	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.									

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

COULTER COUNTER® Model T & T_A Worksheet

SeD Chem # B518-014 Sample I.D

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

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Oi".	Stir. No.	CALIBRATION DATA	Part.- Dia.	W	±IA	A
50	11007	LATFX	2 02	6	1 6	170
200	2400	MICROSPHERES	10. 11	7	3.2	170, B

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

FOR MODEL T

±IA	1.6	3.2
CALIS. A	174. Z	i169.3
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...

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	Channel (WI		50	200
.00575	.004091	'.198	50	?nn		
.0115	.OOB181	.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		4.4
94.78	67.02	5.04	10	4		5.9
189.6	134.0	6.35	11	5		6 8
379.1	268.1	8.00	12	6		9.2
758.3	536.2	10.08	13	7		11.6
1516.	1072.	12.7	14	8		13.1
3033.	2145.	16.0	15			11.5
6066.	4289.	20.2	16	11		11.3
12.13×10^3	8579.	25.4		1		8.1
24.27×10^3	17.16×10^3	.32.0		12		6.7
48.54×10^3	34.31×10^3	40.3		13		4 q
97.18×10^3	68.63×10^3	50.8		14		3.6
194.4×10^3	137.3×10^3	64.0		15		1.9
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	1.09B)(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.				
99.50×10^5	70.27×10^5	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.				

COULTER COUNTER® Model T & T_A Worksheet

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

Geo Chem # R518-016 Sample 1.0

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

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. ou.	5er. No.	CALIBRATION DATA	Part•.' Oia.	W	± jA	A
50	11007	LATFX	2 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

± I A	1.61 3.2	
CAIIS. A	174.21169.3	
APERTURE OIA.	50 200	

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3 2^{(W_2 \cdot W,1}$ For Model T

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

SAMPLE DATA

Geometric Mean μ^3	Volume μ^3	Diameter μ	ChannellW)				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	?				--			
47.39	33.51	4.00	9	3				14.2			
94.78	67.02	5.04	10	4				17.8			
189.6	134.0	6.35	11	5				15 9			
379.1	26B.1	B.OO	12	6				13.7			
758.3	536.2	10.08	13	7				12 2			
1516.	1072.	12.7	14	8				10.6			
3033.	2145.	16.0	15	9				7.7			
6066.	4289.	20.2	16	10				4 9			
12.13×10^3	8579.	25.4		11				2.4			
24.27×10^3	$17.16,,10^3$	32.0		12				0.1			
48.54×10^3	34.31×10^3	40.3		13				0.3			
97.18×10^3	68.63×10^3	50.8		14				0 0			
194.4×10^3	137.3×10^3	64.0		15				0.0			
388.7×10^3	274.5×10^3	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	4.392×10^6	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.									

COULTER COUNTER® Model T& T_A Worksheet

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

Geo Chem # R518-015 Sample 1.0

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

EQUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Die.	Ser. No.	CALIBRATION DATA	Pert: Die.	W	± 1A	A
50	11007	LATEX	2 O?	6	1 6	17Q
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	

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

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3 2^{(W_2 - W_1)}$ For ModelT 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				3.0			
94.78	67.02	5.04	10	4				4 4			
189.6	134.0	6.35	11	5				5.3			
379.1	268.1	8.00	12	6				6.5			
758.3	536.2	10.08	13	7				7.5			
1516.	1072.	12.7	14	8				7.6			
3033.	2145.	16.0	15	q				8. 4			
6066.	4289.	20.2	16	10				10.8			
12.13×10^3	8579.	25,4		11				9.8			
24.27×10^3	17.16×10^3	32.0		12				10.3			
48.54×10^3	34.31×10^3	40.3		13				9. 3			
97.18 x 103-	68.63×10^3	50.8		14				7. 8			
194.4×10^3	137.3×10^3	64.0		15				6 1			
388.7×10^3	274.5×10^3	80.6		16				4.0			
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.									

COULTER COUNTER® Model T & TA Worksheet

BECKMAN INSTRUMENTS, INC.
1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

Ceo Chem # R518-017 Sample 1.0

ELECTROLYTE 4% $(Na\ PO_3)_6$ 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	LATFX	2.02	6	1 6	170
200	2400	MICROSPHERES	10.11	7	3.2	170.

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

FOR MODEL T

± I A	1.6	3.2
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 (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	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	?				1--			
47.39	33.51	4.00	9	3				14.7			
94.78	67.02	5.04	10	4				115 9			
189.6	134.0	6.35	11	5				14.2			
379.1	268.1	8.00	12	6				13 4			
758.3	536.2	10.08	13	7				10.9			
1516.	1072.	12.7	14	8				8.2			
3033.	2145.	16.0-	15	q				5.1			
6066.	4289.-	20.2	16	10				3.8			
12.13×10^3	8579.	25.4		11				3 0			
24.27×10^3	17.16×10^3	32.0		1?				3.7			
48.54×10^3	34.31×10^3	40.3		13				2.8			
97."8 $\times 10^3$	'68.63 $\times 10^3$-	50.8		14				2 1			
194.4×10^3	137.3×10^3	64.0		15				1.4			
388.7×10^3	274.5×10^3	80.6		16				0.9			
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.									
$49,75 \times 10^6$	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.									

GeoChem Laboratories, Inc. COULTER COUNTER® Model T & T_A Worksheef

1143-C BRITTMORE ROAD
HOUSTON, TEXAS 77043

: Geo Chem # R518-018 Sample I.D

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

EQUIPMENT TA II SERIAL 1652	Apar. Oia.	Sar. No.	CALIBRATION DATA	Part. Oia.	W	± IA	A
ORGANIZATION	50	11007	I ATFX	? n?	6	1 6	17Q
OPERATOR D.N.R. DATE	200	2400	MICROSPHERES	10.11	7	3.2	170

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

FOR MODEL T

± I A	1.61 3.2	
CALIS. A	174.21169.3	
APERTURE DIA.	50 200	

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

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

SAMPLE DATA

Geometric Mean μ3	Volume μ³	Diameter μ	Channel (W)		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	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		16.5
94.78	67.02	5.04	10	4		17 1
189.6	134.0	6.35	11	5		12 6
379.1	268.1	8.00	12	6		112
758.3	536.2	10.08	13	7		10.9
1516.	1072.	12.7	14	8		10.2
3033.	2145.	16.0	15	9		8.2
6066.	4289.	20.2	16	1)		6.0
12.13 x 10³	8579.	25.4		1		3.6
24.27 x 10³	1'.16xlQ3	32.0		12		1.6
48.54 x 10³	34.31 x 10³	40.3		13		1.1
97.18 x 10³	68.63 x 10³	50.8		14		0.6
194.4 x 10³	137.3 x 10³	64.0		15		0.3
388.7 x 10³	274.5 x 10³	80.6		16		0.0
777.4 x 10³	549.0 x 10³	101.6				
-1.555 x 10⁶	1.098 x 10⁶	128.				
3.109 x 10⁶	2.196 x 10⁶	161.				
6.219 x 10⁶	4.392 x 10⁶	203.				
12.44 x 10⁶	8.784 x 10⁶	256.				
24.88 x 10⁶	17.57 x 10⁶	322.				
49.75 x 10⁶	35.14 x 10⁶	406.				
99.50 x 10⁶	70.27 x 10⁶	512.				
199.0 x 10⁶	140.6 x 10⁶	645.				
398.0 x 10⁶	281.1x10⁶	812.				
796.0 x 10⁶	562.2 x 10⁶	1024.				

COULTER COUNTER® Model T & T_A Worksheet

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

Geo Chem # R518-024 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. No.	CALISRAnON DATA	Pert. Dia.	W	±IA	A
50	11007	I ATFX	2.02	6	, 6	179
200	2400	MICROSPHERES	10.11	7	3.2	170

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

FOR MODEL T

±IA	1.613.2		
CALIS. A	174.2 i169.3		
APERTURE DIA.	50	200	

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ 2(W z'WIJ For ModelT

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ 2(W z ' WI) For Model T_A

SAMPLE DATA

Geometric Mean μ3	Volume μ3	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	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				10.3			
94.78	67.02	5.04	10	4				11.5			
189.6	134.0	6.35	11	5				10.9			
379.1	268.1	8.00	12	6				12.2			
758.3	536.2	10.08	13	7				12.9			
1516.	1072.	12.7	14	8				'2. 9			
3033.	2145.	16.0	15					10.8			
6066.	4289.	20.2	16	1				8.5			
12.131'10³	8579.	25.4		1				5.2			
24.27 1'10³	17.16 1'10³	32.0		12				3 4			
48.54 x 10³	34.31 1'10³	40.3		13				0 9			
97.18 1'10³	68.63 1'10³	50.8		14				0 5			
194.4 x 10³	137.3 x 10³	64.0		15				0 2			
388.7 1'10³	274.5 1'10³	80.6		16				0.0			
777.4 1'10³	549.0 1'10³	101.6									
1.555 x 10⁶	1.098 x 10⁶	128.									
3.109 x 10⁶	2.196 x 10⁶	161.									
6.219 1'10⁶	4.392 x 10⁶	203.									
12.44 x 10⁶	8.784 x 10⁶	256.									
24.88 1'10⁶	17.57 1'10⁶	322.									
49.75 x 10⁶	35.14 x 10⁶	406.									
99.50 x 10⁶	70.27 x 10⁶	512.									
199.0 x 10⁶	140.6 x 10⁶	645.									
398.0 x 10⁶	281.1 x 10⁶	812.									
796.0 x 10⁶	562.2 1'10⁶	1024.									

COULTER COUNTER® Model T & T_A Worksheef

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

Geo Chem # :R518-034 Sample 1.0

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

EOUIPMENT TA II SERIAL 1652

ORGANIZATION

OPERATOR D.N.R. DATE

Aper. Dia.	Ser. No.	CAlI BRATION DATA	Part. Dia.	W	±IA	A
50	11007	LATEX	2.02	6	1 6	170
200	2400	MICROSPHERES	10.11	7	3.2	170

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

±IA	1.6 3.2	
CALIS. A	174.21169.3	
APERTURE DIA.	50 200	

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ 2\W2·W·J For M_0 d_eIT

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ 2 (W2 · W,) For Model T_A

SAMPLE DATA

Geometric Mean μ³	Volume μ³	Diameter μ	Channel WI				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	2				- -			
47.39	33.51	4.00	9	3				4.5			
94.78	67.02	5.04	10	4				7.2			
189.6	134.0	6.35	11	5				8.9			
379.1	268.1	8.00	12	6				10.9			
758.3	536.2	10.08	13	7				10.8			
1516.	1072.	12.7	14	8				3			
3033.	2145.	16.0	15	9				9 6			
6066.	4289.	20.2	16	1)				9.4			
12.13 x 10³	8579.	25.4		11				7.9			
24.27 x 10³	17.16 x 10³	32.0		12				6 3			
48.54 x 10³	34.31 x 10³	40.3		13				4 8			
97.18 x10³	68.63 x 10³	50.8		14				3.8			
194.4 x 10³	137.3 x 10³	64.0		15				2 7			
388.7 x 10³	274.5 x 10'3	80.6		16				1.7			
777.4 x 10³	549.0" 10³	101.6									
1.555 x 10⁶	1.098 x 10⁶	128.									
3.109 x 10⁶	2.196 x 10⁶	161.									
6.219 x 10⁶	4.392 x 10⁶	203.									
12.44 x 10⁶	8.784 x 10⁶	256.									
24.88 x 10⁶	17.57 x 10⁶	322.									
49.75 x 10⁶	35.14 x10⁶	406.									
99.50 x 10⁶	70.27 x 10⁶	512.									
199.0 x 10⁶	140.6 x 10⁶	645.									
398.0 x 10⁶	281.1 x 10⁶	812.									
796.0 x 10⁶	562.2 x 10⁶	1024.									

4221008

SAMPLE No. R518-001 DATE 7-23-79 OPERATOR ABR

COMMENTS:

TYPE VISUAL — SIZE RANGE

	.794	LOO	1.26	L59	2.00	2.52	3.17	".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	1111
01																			1	1				
02																								
03																								
04																								
05																								
06																								
07																								
08								3	5	5	3	1	1											
09							5	3	1															
10								2	3	1														
11																								
12																								
13													1	2	2	2	1							
14																								
15																								
16											2	5	3	4	3	2	1	1						
17																								
18								1	4	6	5	3	3	2	2	2	2	2	1					
19																								
20																								
21																								
22																								
23																								
24																								
25							2	11																
26																								
27																								
28																								
TOTAL PERCENTAGE							7	10	13	12	10	9	8	8	7	6	4	3	1					
PERCENTAGE FROM COULTER							7	10	13	12	10	9	8	8	7	6	4	3	2	1				

^MPLE No. B518-005 DATE 7-23-79 OPERATOR ABR

MMENTS:

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	110.6	101.6	128	161
01																								
02																								
03																								
04																								
05																								
06																								
07																								
08								7	14	11	6	2												
09								9	5	2														
10																								
11																								
12																								
13															2	1	1	1	1	t				
14																								
15																								
16										3	7	7	7	4	2	2								
17											1	2	2	2	i									
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26																								
27																								
28																								
CENTAGE								16	19	16	14	11	9	6	4	3	1	1	I'	t				
CENTAGE COULTER								16	19	16	14	11	9	6	4	3	1	1	1	t				

SAMPLE No. R518-007 DATE 7-23-79 OPERATOR ABR

MMENTS:

TYPE VISUAL	.794	1.00	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	1008	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	e0.6	101.6	128	1111
01																								
02																								
03																								
04																								
05															1	2	3	3	3	2	1			
06																								
07																								
08								2	6	9	8	6	8	8	6	3	2	2						
09								5	3															
10																								
11																								
12																								
13															2	3	3							
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25								1	1															
26																								
27												1	1	1	1	1	1	1						
28																								
TOTAL PERCENTAGE								8	10	9	8	7	9	9	10	9	9	6	3	2	1			
Pfo,CENTAGE FROM COULTER								8	'10	9	8	7	9	9	10	9	9	6	3	2	1			

SIZE RANGE

J

SAMPLE No. R518-011 DATE 7-23-79 OPERATOR ABR

COMMENTS:

TYPE

VISUAL SIZE RANGE

	.794	LOO	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	11.00	10.08	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	1211	161
01																								
02																								
03																								
04																								
05																								
06																								
07																								
08									2	9	11	10	6	4	2	2	t							
09								12	16	8	2													
10																								
11																								
12																								
13														2	3									
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																1	1	t						
22																								
23																								
24								4	2															
25																								
26																								
27													2	1										
28																								
TOTAL PERCENTAGE								16	20	17	13	10	8	7	5	3	1	t						
PERCENTAGE FROM COULTER								16	20	17	13	10	8	7	5	3	1	t						

SAMPLE No. R518-012 DATE 7-23-79 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	10.01	12.7	15.9	20.2	25.4	32.0	40.3	50.8	64.0	110.6	101.5	128	16
01																								
02																								
03																								
04																								
05															1	1	4	6	6	5	4			
06																								
07																								
08									1	3	6	8	7	7	8	9	7	3						
09								3	3	2														
10																								
11																								
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25								1	1															
26																								
27													2	2	1	1								
28																								
TOTAL PERCENTAGE								14	5	5	6	8	9	9	10	11	11	9	6	5	4			
PERCENTAGE FROM COULTER								4	5	5	6	8	9	9	10	11	11	9	6	5	4			

SAMPLE No. R518-013 DATE 7-23-79 OPERATOR A BR

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	10.011	12.7	111.0	20.2	25.4	32.0	40.3	110.11	64.0	80.6	101.6	128	16
01																								
02																								
03																								
04																								
05															1	3	4	2	1					
06																								
07																								
08									3	9	13	10	11	10	8	3								
09								3	3	1														
10									2	2														
11																								
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25								3	2															
26																								
27												3	2	1										
28																								
TOTAL PERCENTAGE								6	10	12	13	13	13	11	9	6	4	2	1					
PERCENTAGE FROM COULTER								6	10	12	13	13	13	11	9	6	4	2	1					

MPLE No. B518-014 DATE 7-23-79 OPERATOR ABR

M ENTS:

TYPE

VISUAL — SIZE RANGE

	.194	1.00	1.26	1.59	2.00	2.52	317	400	5.04	6.35	8.00	10.11	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																								
05																2	3	7	5	4	2	1		
06																								
07																								
08								1	4	7	9	12	13	12	8	3								
09																								
10																								
11																								
12																								
13																								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25								3	2															
26																								
27															1	2								
28																								
TAL								4	6	7	9	12	13	12	1	8	7	5	4	2	1			
PERCENTAGE																								
PERCENTAGE FROM COULTER								4	6	7	9	12	13	12	1	8	7	5	4	2	1			

SAMPLE No. R518-015 DATE 7-23-79 OPERATOR ABR

MMENTS:

TYPE
ViSUAL

SIZE RANGE

	.794	too	1.26	1.59	2.00	2.52	3.17	.. 00	5.04	II 35	800	1008	12.7	16.0	20.2	25.4	32.0	40.3	so.e	64.0	80.11	101.6	128	1111
0/																								
02																								
03																								
04																								
05															1	3	5	7	8	6	4			
-rlOS																								
07																								
1 08								1	3	5	7	8	8	8	10'	7	5	2						
09								2	1															
.10																								
I 1																								
/2																								
13																								
14																								
/5																								
/S																								
17																								
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25																								
26																								
1 27																								
28																								
-AL !CENTAGE								3	4	5	7	8	8	8	11	10	10	9	8	6	4			
PERCENTAGE OM COULTER								3	4	5	7	8	8	8	11	10	10	9	8	6	4			

SAMPLE No. R518-016 DATE 7-23-79 OPERATOR ABR

COMMENTS:

TYPE VISUAL — SIZE RANGE

	.794	teo	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8DO	10 01	12.7	16.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.5	128	161
01																								
02																								
03																								
04																								
05																								
06																								
07																								
08										4	8	12	10	5										
09								10	13	11	6													
10									3	1														
11																								
12																								
13														2	4	1								
14																								
15																								
16																								
17																								
18																								
19																								
20																								
21																								
22																								
3																								
24																								
25								4	2															
26																								
27													1	1	1	1	1	.t						
28																								
TOTAL PERCENTAGE								14	18	16	14	12	11	8	5	2	1	t						
PERCENTAGE FROM COULTER								14	18	16	14	12	11	8	5	2	1	t						

SAMPLE No. ,R518-017 DATE 7-23-79 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																								
06																								
07																								
08										2	6	8	6	3	1									
09								11	13	9	6	3												
10									1	3	1													
11																								
12																								
13														1	1	3	3	1						
14																								
15																								
16																								
17													2	1	2									
18																								
19																								
20																								
21																								
22																								
23																								
24																								
25								4	2															
26																		1	1					
27																	1	1	1	1	1			
28																								
TOTAL PERCENTAGE								15	16	14	13	11	8	5	4	3	4	3	2	1	1			
PERCENTAGE FROM COULTER								15	16	14	13	11	8	5	4	3	4	3	2	1	1			

SAMPLE No. E51S-01B DATE -7-23-79 OPERATOR ABE

COMMENTS:

TYPE VISUAL --11

SIZE RANGE

	.794	loo	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	10.08	12.7	111.0	20.2	25.4	32.0	40.3	50.8	64.0	80.6	101.6	128	Itli
01																								
02																								
03																								
04																								
05																								
06																								
07																								
08									2	5	10		'8	6	5	3								
09								13	12	5														
10									1	3														
11																								
12																								
13																								
14																								
115																								
16																								
17																								
18																								
19																								
20																								
21																								
22															1	1	2	1	1	t				
23																								
"1 24																								
25								4	2															
26																								
27											1	3'	2	2										
28																								
TOTAL PERCENTAGE								17	17	13	11	11	10	8	6	4	2	1	1	t				
PERCENTAGE FROM COULTER								17	17	13	1	11	10	8	6	4	2	1	1	t				

;AMPLE No. R518-024 DATE 7-23-79 OPERATOR ABR

C IMENTS:

TYPE
'/ISUAL

SIZE RANGE

	.794	1.00	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	10.0	27	18.0	20.2	25.4	32.0	40.3	50.8	6-.0	'0.6	101.6	IZ8	161
01																								
)2																								
03																								
)4																								
05																								
)6																								
07																								
)8									2	.6	10	11	11	9	6	1								
09								7	7	2														
10									1	3	2													
11																								
12																								
13																								
14																								
15																								
IS												2	2	2	3	3	.2	1	1	t				
17																								
8																								
9																								
20																								
1																								
2																11	1							
3																								
24																								
5								3	2															
26																								
7																								
28																								
'O" IL 'E :ENTAGE																								
>ERCENTAGE 'ROM COULTER								10	11.2	11	12	13	13	11	9	5	3	1	1	·t				

SAMPLE No. R 518-034 DATE 7-23-79 OPERATOR ABR

COMMENTS:

TYPE VISUAL	.794	100	1.26	1.59	2.00	2.52	3.17	4.00	5.04	6.35	8.00	10.01	12.7	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													2	5	5	4	3	2	2	1				
06																								
07																								
08																								
09																								
10																								
11																								
12																								
13																								
14																								
15																								
16											4	4	6	2										
17																								
18																								
19																								
20																								
21																								
22																	1	1						
23																								
24																								
25																								
26																								
27										3	3	3	3	3	4	4	2	2	2	2	2			
28									4	6	4	4												
TOTAL PERCENTAGE																								
PERCENTAGE FROM COULTER								5	7	9	11	11	11	10	9	8	6	5	4	3	2			

COULTER **COUNTER®** Model T & TA

PARTICLE SIZE ANALYSIS

.15 .. 200 μm
X PERCENT

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

ORGANIZATION

OPERATOR

EQUIPMENT

SAMPLE | ELECTROLYTE | DISPERSANT

R518-001

T-332367

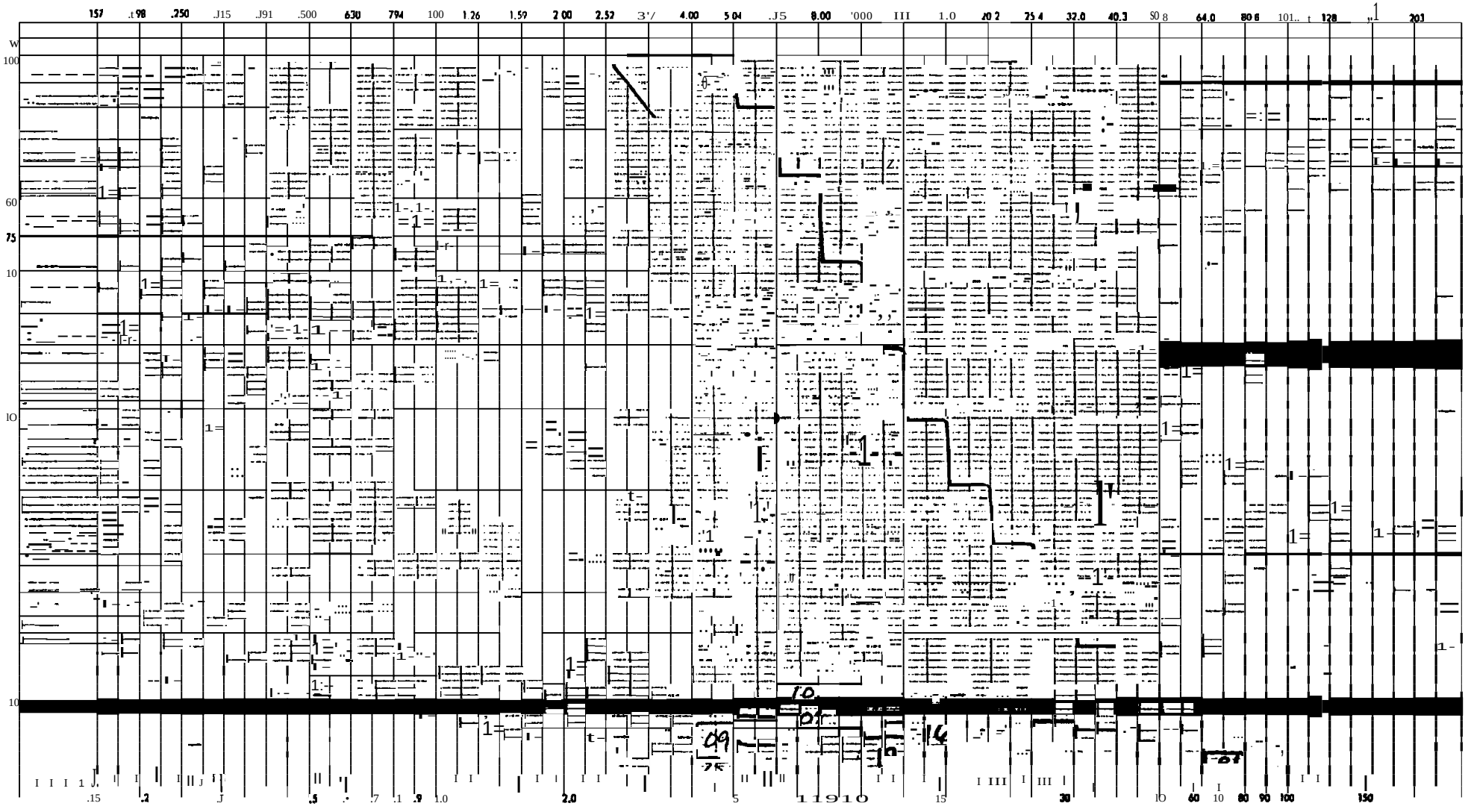
ITC-237.3

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

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

APER. SIZE	SER'AL	PART DIA.	W	±TA	A	SAMPLE SETTINGS DIA.	W	±TA	A
200									



4221010

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

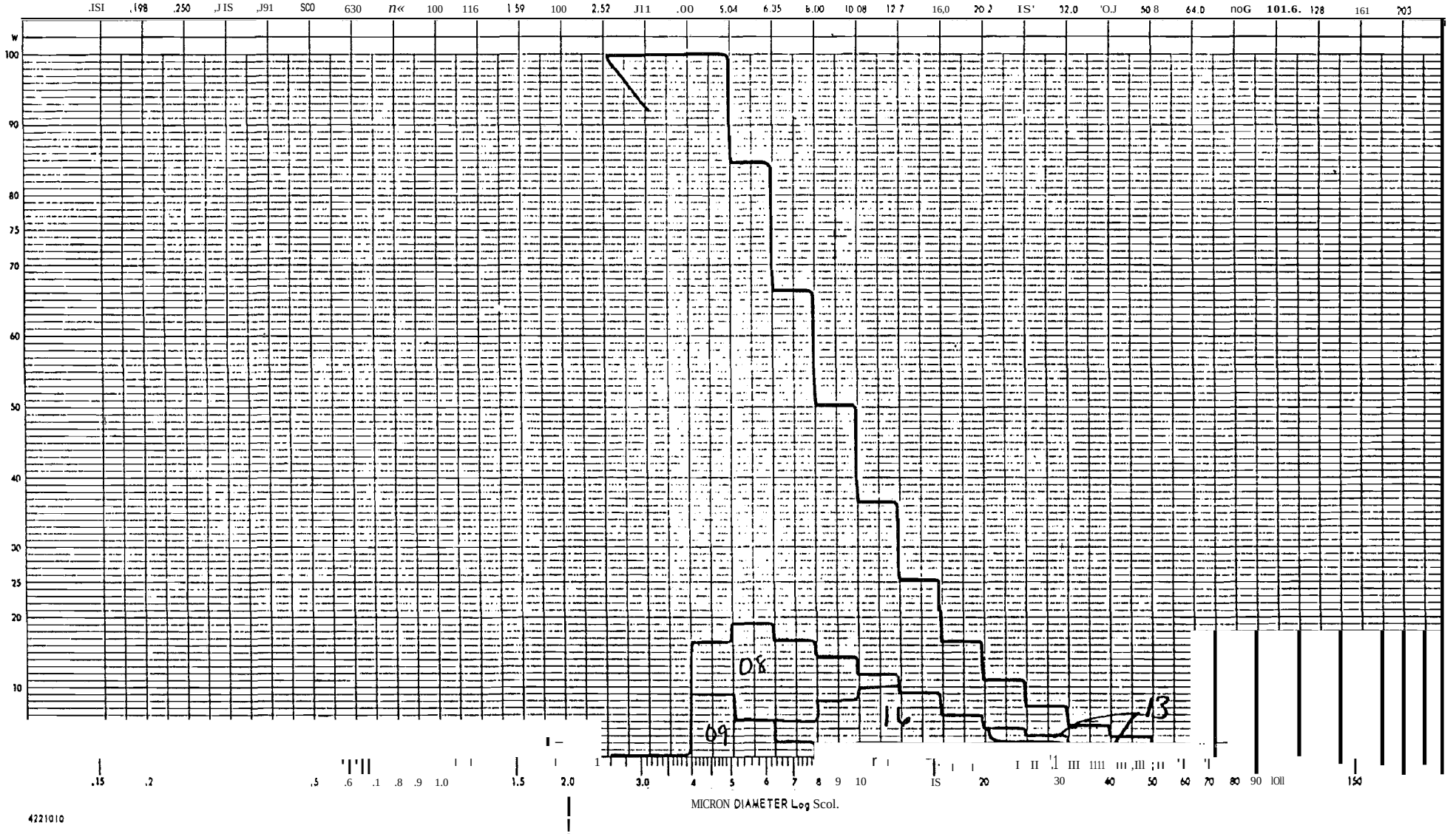
ORGANIZATION

OPERATOR

EQUIPMENT

$k = d\sqrt[b]{\lambda^{\alpha}}$ $\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$ $\frac{S_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$

	SAMPLE	ELECTROLYTE	DISPERSANT	FOR MODEL 1 APER. SIZE	SERIAL		FOR MODEL TA PART DIA.	W	±IA	A	SAMPLE SETTINGS DIA.	W	±IA	A
	R518-005			200										
	T-296.2													
	,TC-585645													



4221010

COULTER COUNTER® Model T & TA

PARTICLE SIZE ANALYSIS

.15 - 200 µm
1 PERCENT

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

ORGANIZATION

OPERATOR

EQUIPMENT

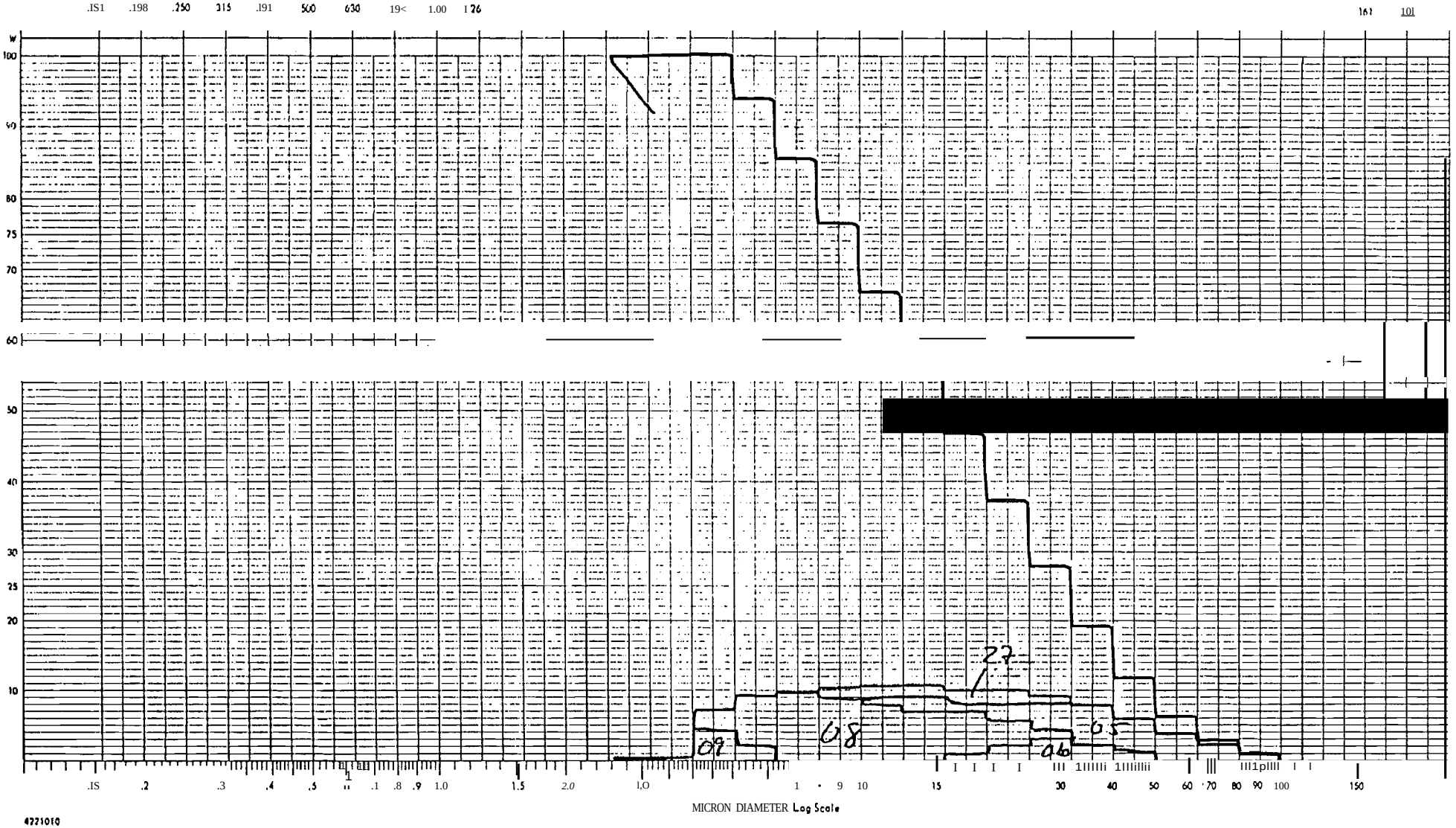
$k = d\sqrt[3]{2w}$ FOR MODEL T

$\frac{A2}{A1} = \left(\frac{d2}{d1}\right)^1$ when W2 = W1

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

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	± 1A	A	01A.	W	± 1A	A
R518-006			200										
T-208.0													
TC-299948													

SAMPLE SETTINGS



4221010

COULTER COUNTER® Model T&TA

PARTICLE SIZE ANALYSIS

.15 - 200 μ
X PERCENT

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

ORGANIZATION

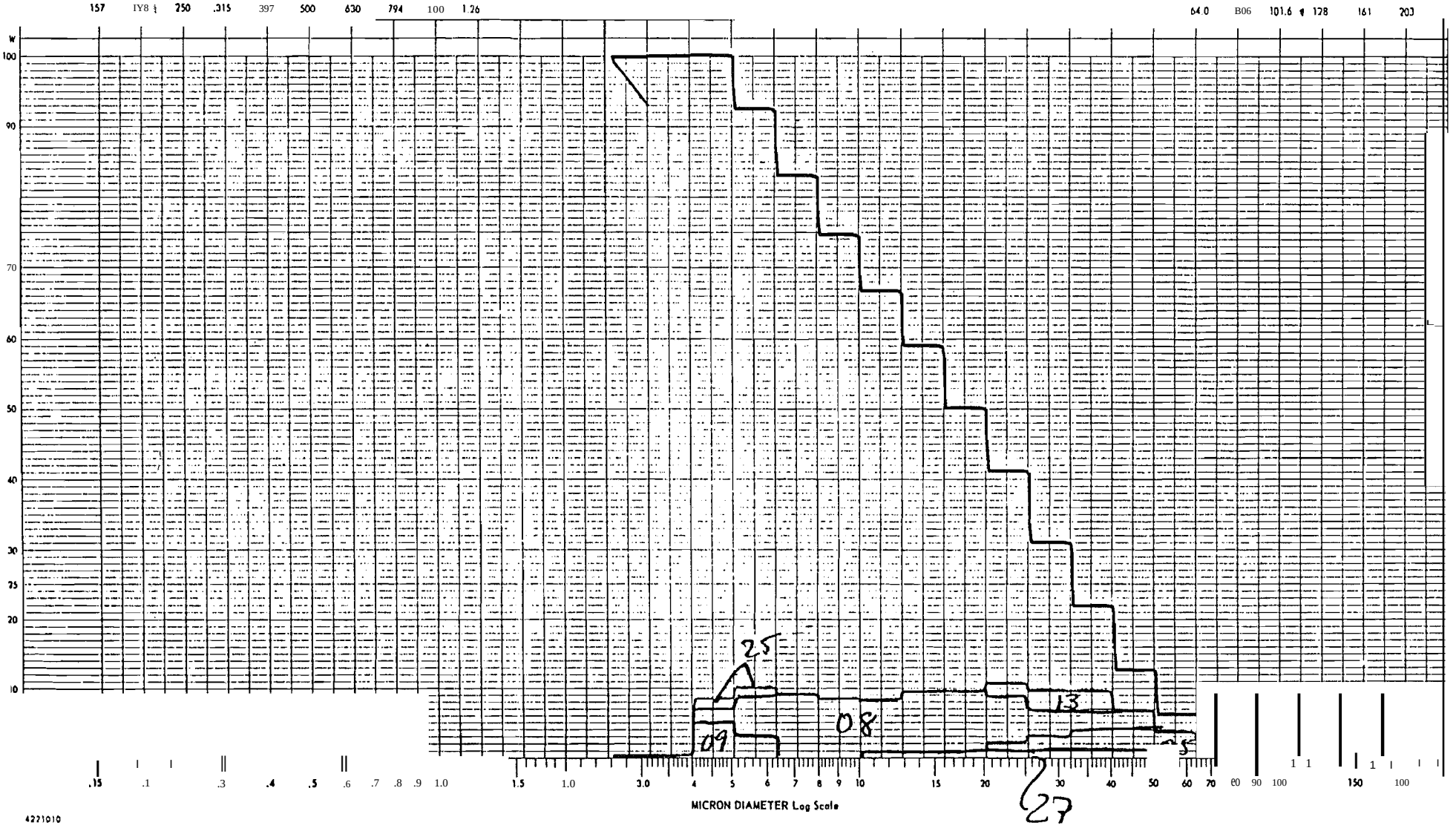
OPERATOR

EQUIPMENT

$k = d\sqrt[3]{2^W}$ $\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$ $\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$

FOR MODEL 1 FOR MODEL 1A

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL	PART DIA.	●	±IA	●	SAMPLE SETTINGS OIA	●	±I	●
R518-007			200									
T-184.1												
TC-333239												



4221010

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

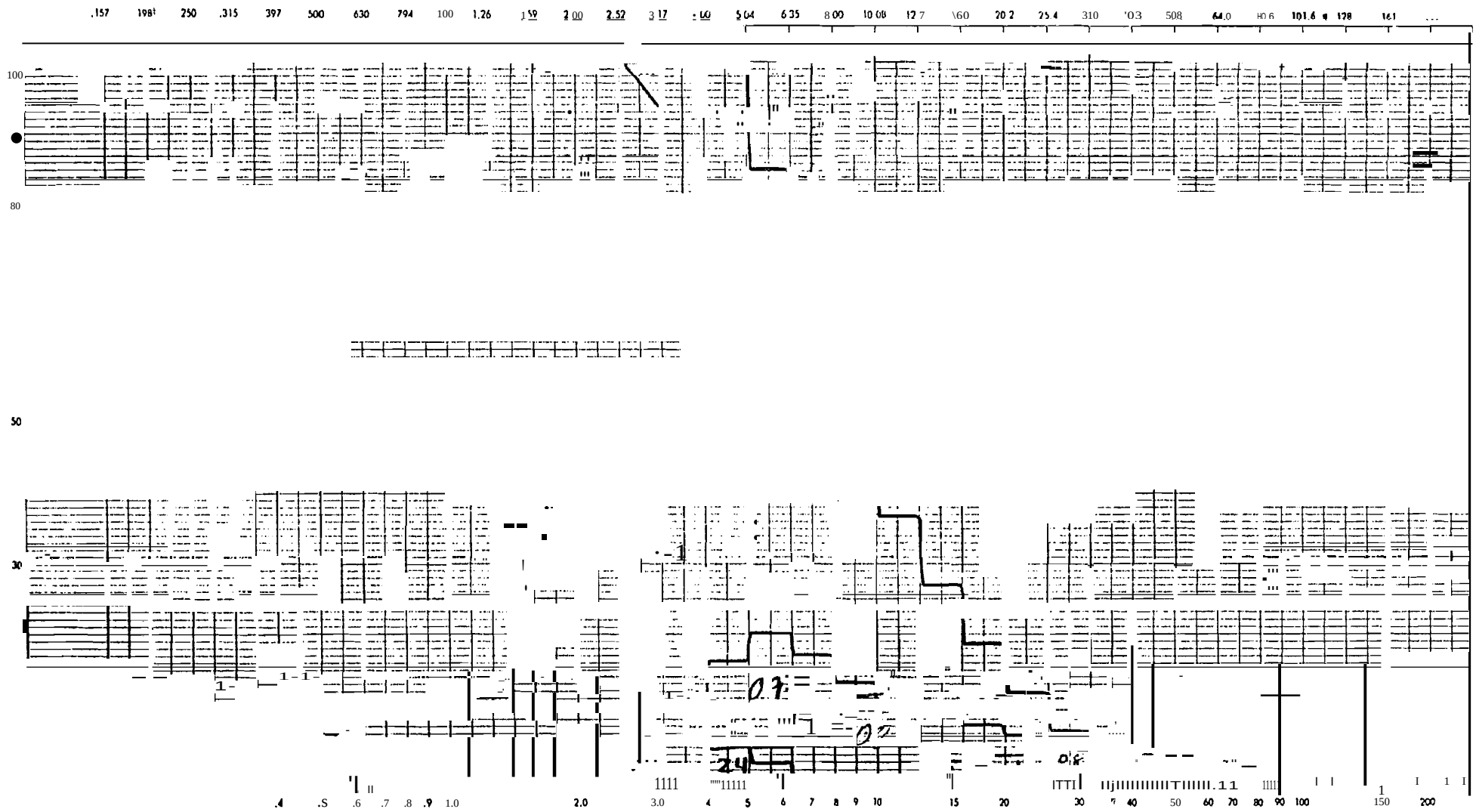
EQUIPMENT

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

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL	PART DIA.	W	±IA	A	SAMPLE SETTINGS DIA.	W	±IA	●
R518-011			200									
T-360.7												
TC-599997												



4221010

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

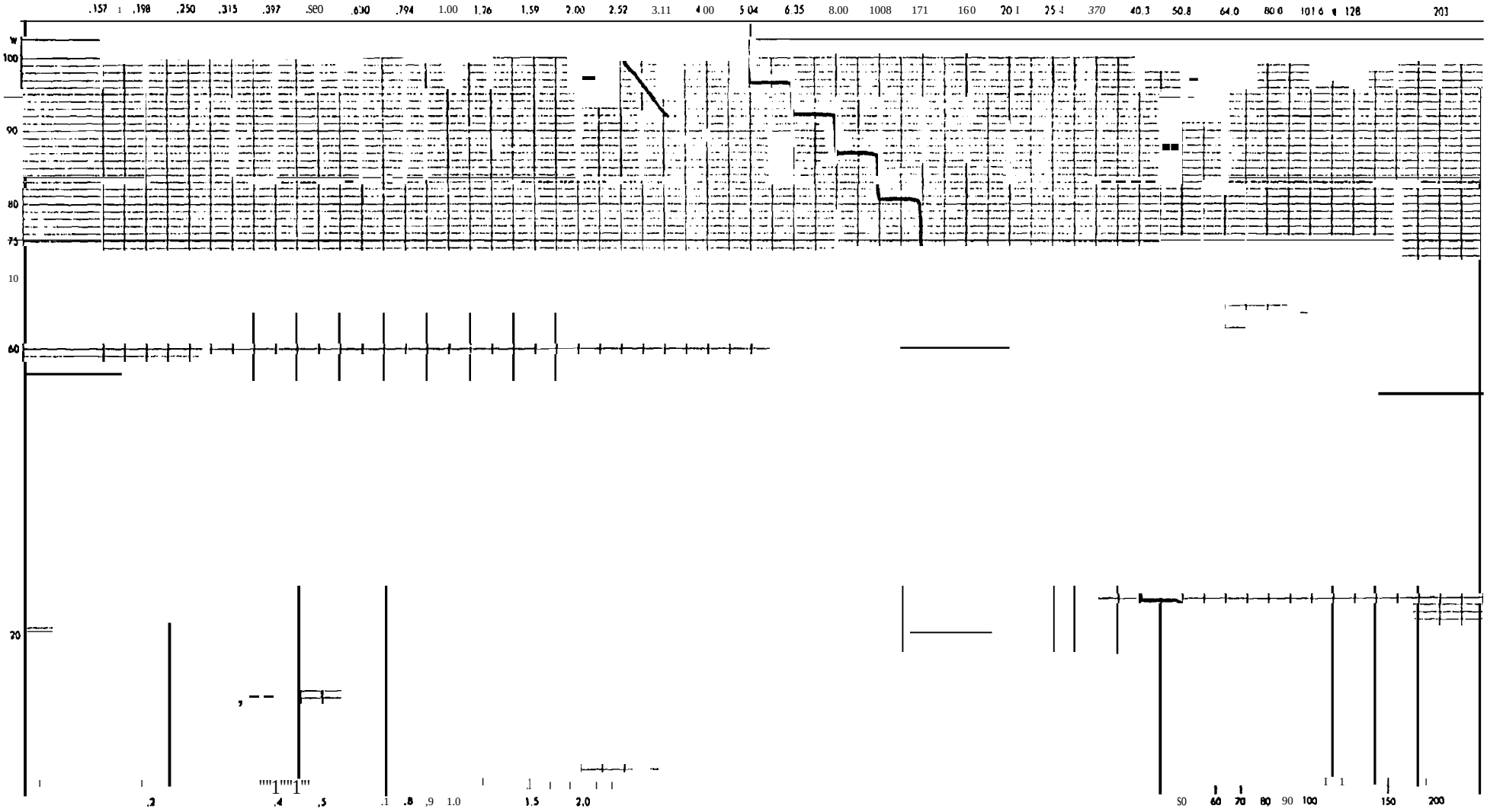
EQUIPMENT

$k = d\sqrt[3]{2w}$ FOA MODEL -J

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_1 = W_1$

$\frac{0_1}{0} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	●	±'0	A	SAMPLE SETTINGS DIA.	■	±TA	A
R518-012			200										
T-132.0													
TC-164295													



MICRON DIAMETER Log Seal.

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

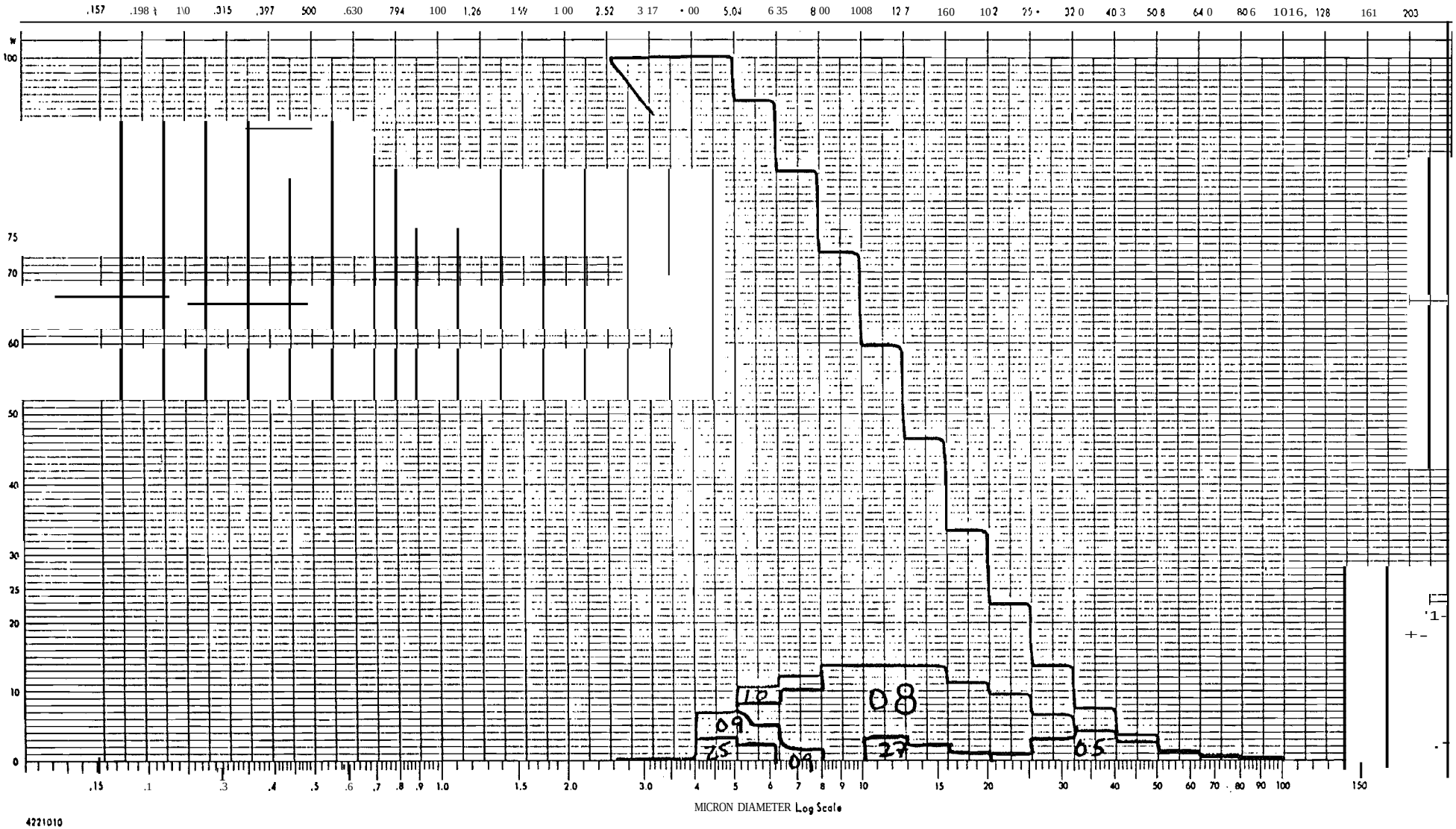
EQUIPMENT

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

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART O'A.	W	±IA	A	SAMPLE SETTINGS DIA.	W	±IA	A
R518-013			200										
T-222.2													
TC-337580													



4221010

CaULTER COUNTER® Model T&TA

PARTICLE SIZE ANALYSIS

.15 .. 200μ
X PERCE'T

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

ORGANIZATION

OPERATOR

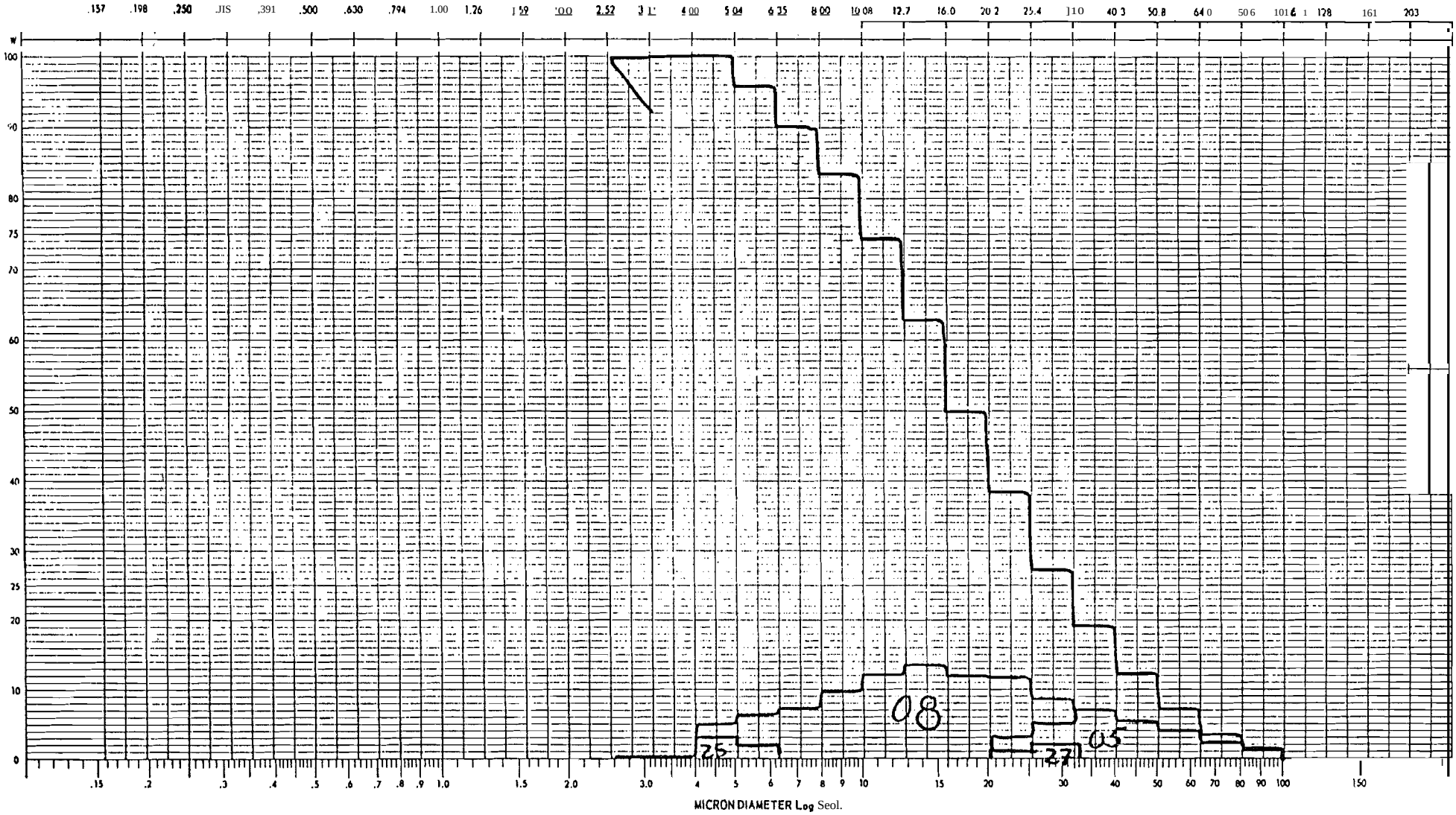
$k \cdot d \sqrt[3]{2W}$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 \cdot W_1$

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 \cdot W_1$ Fon MODEL TA

SAMPLE SETTINGS

SA..PLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL	PART DIA.	W	± IA	A	OIA.	●	± IA	A
R518-014			200									
T-173.9												
TC-240058												



MICRON DIAMETER Log Seol.

CaULTER COUNTER® Model T&TA

PARTICLE SIZE ANALYSIS

.15 ... 200μ
X PERCENT

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

ORGANIZATION

OPERATOR

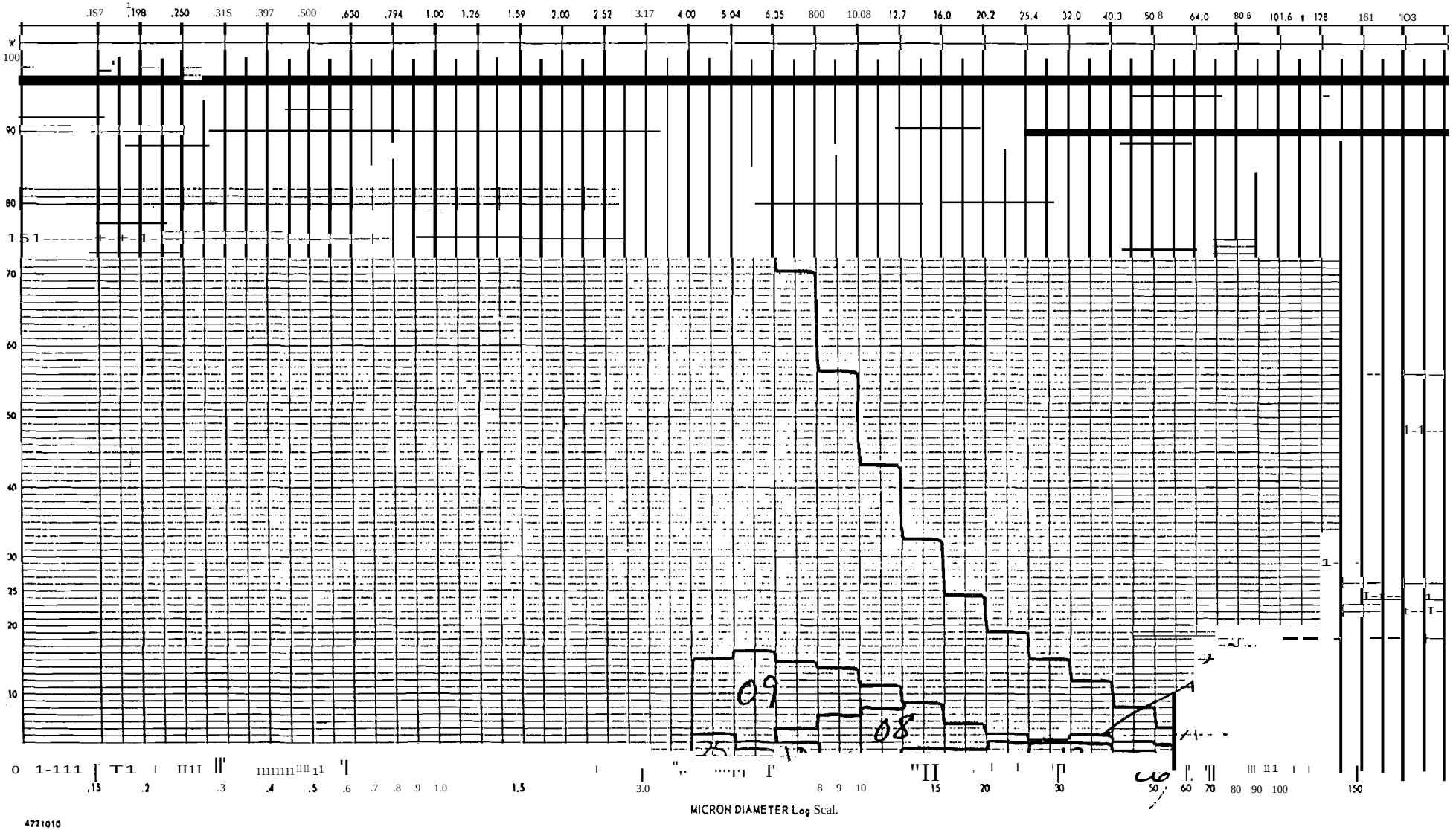
EQUIPMENT

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

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	±IA	A	SAMPLE SETTINGS DIA.	W	±IA	A
			200										
R518-017													
T-272.3													
TC-500000													



4221010

COULTER COUNTER® Model T & TA

PARTICLE SIZE ANALYSIS

.15 - 200....
X PERCEHT

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

ORGANIZATION

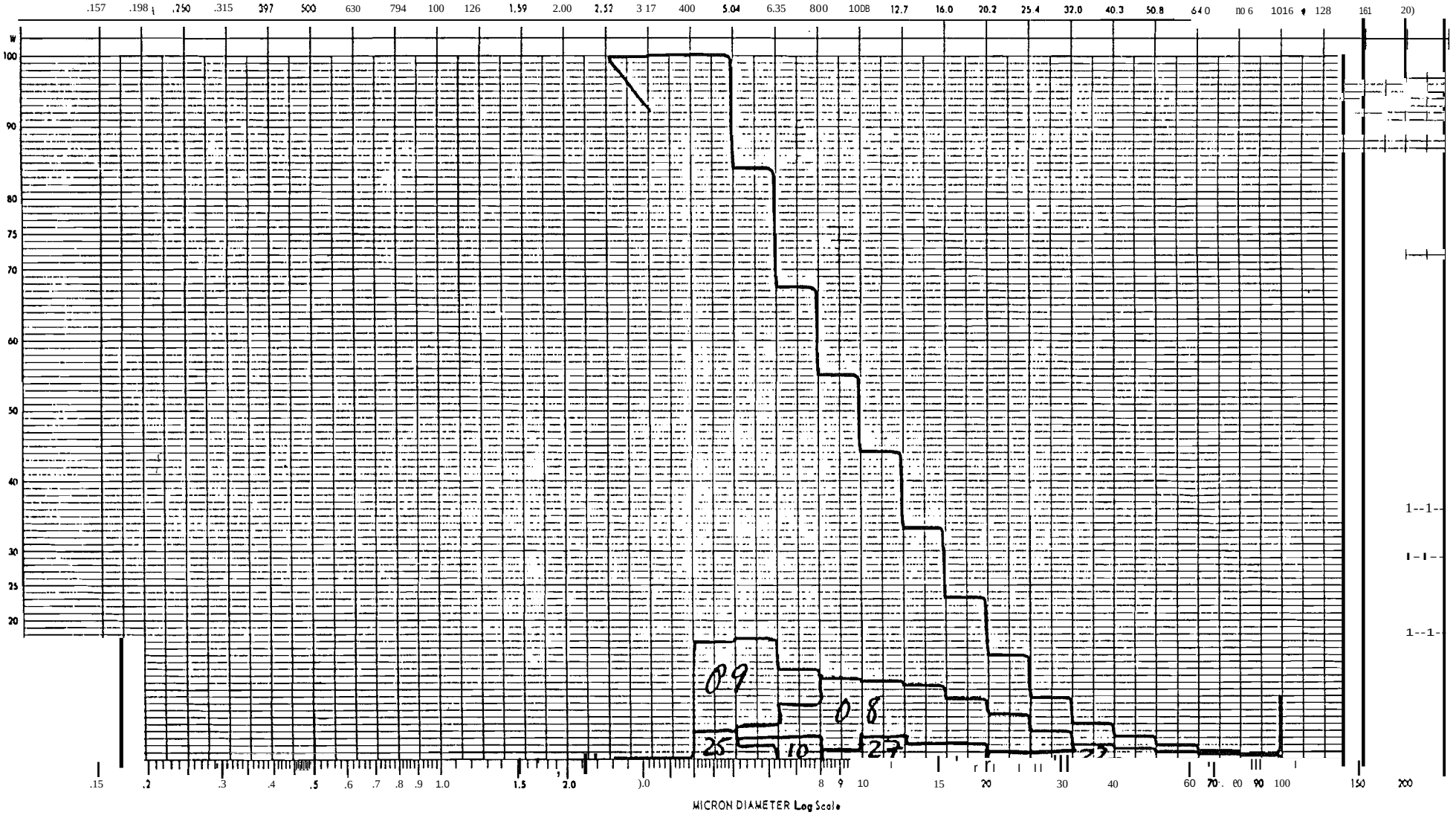
OPERATOR

EQUIPMENT

$x = d\sqrt[3]{2\pi}$ $\frac{A2}{A1} = \left(\frac{d2}{d1}\right)^3$ when W2 = W1 $\frac{A2}{A1} = \left(\frac{d1}{d2}\right)^3$ when W2 = W1

fOR MODEL T fOR MODEL TA

	SAMPLE	ELECTRDLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	± IA	A	SAMPLE SETTINGS DIA.	W	± LA	A
				200										
	R518-018													
	T-317.9													
	TC-565744													



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

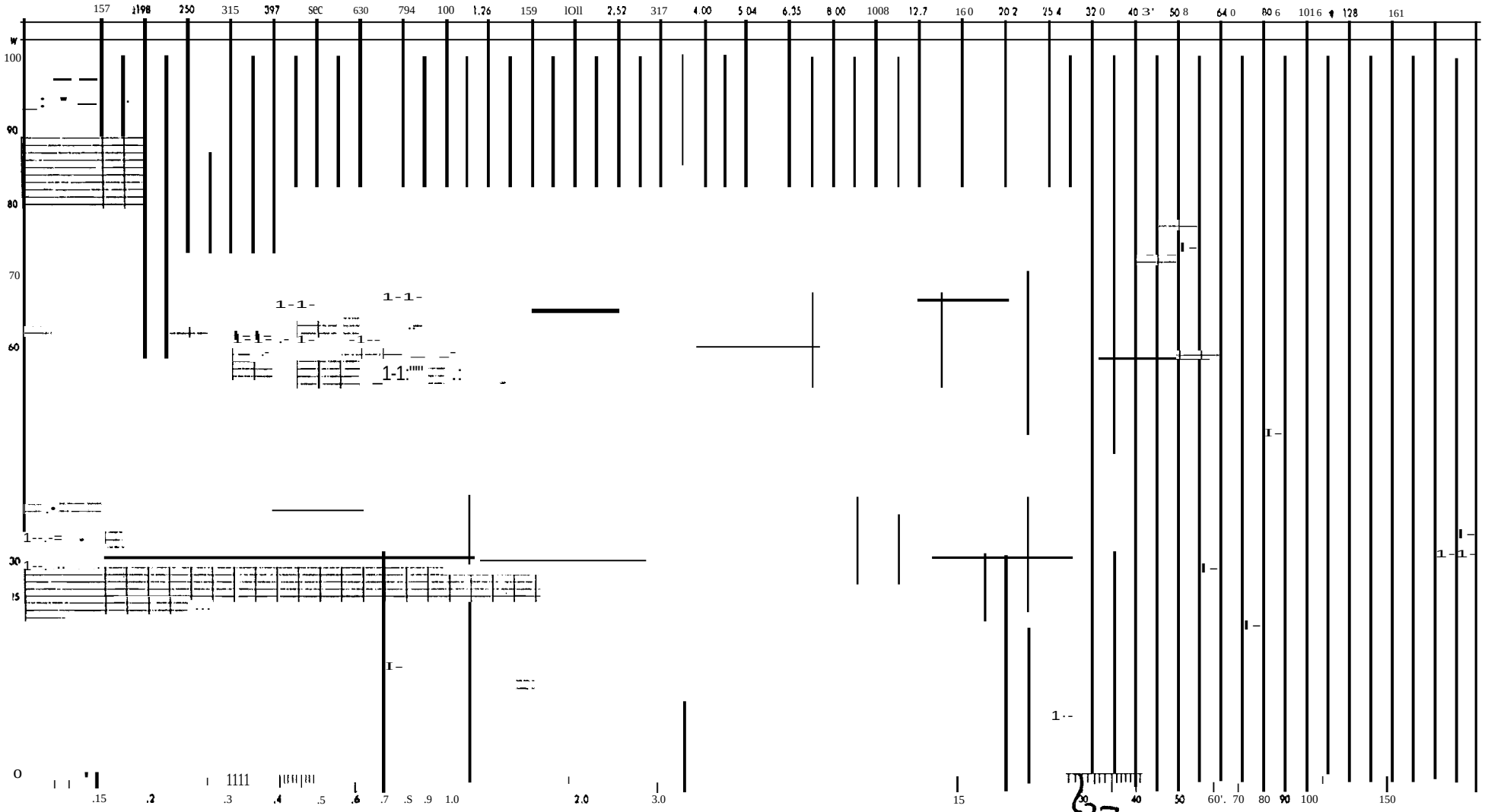
EQUIPMENT

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

$\frac{A_2}{A_1} = \left(\frac{d_2}{d_1}\right)^3$ when $W_2 = W_1$ FOR MODEL T

$\frac{A_2}{A_1} = \left(\frac{d_1}{d_2}\right)^3$ when $W_2 = W_1$ FOR MODEL TA

	SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIAL		PART DIA.	W	± 'A	A	SAMPLE SETTINGS DIA.	W	± 'A	A
				200										
	R518-024													
	T-288.6													
	TC-400000													



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4221010

COULTER COUNTER® Model T & TA

PARTICLE SIZE ANALYSIS

.15 - 200μ
X PERCENT

GEOCHEM LABORATORIES. INC.
1143-C BAITTMORE AOAD
HOUSTON. TEXAS 77043 • 713/467-7011

ORGANIZATION

OPERATOR

EQUIPMENT

$k = d\sqrt[3]{2w}$ FOil MOOEL T

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

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

	SAMPLE	ELECTROLYTE	DISPERSANT	APER. SIZE	SERIA"		PART OIA.	W	± IA	A	SAMPLE SETTINCS OIA.	W	± IA	A
				200										
	R518-034													
	T-177.4													
	TC-250174													

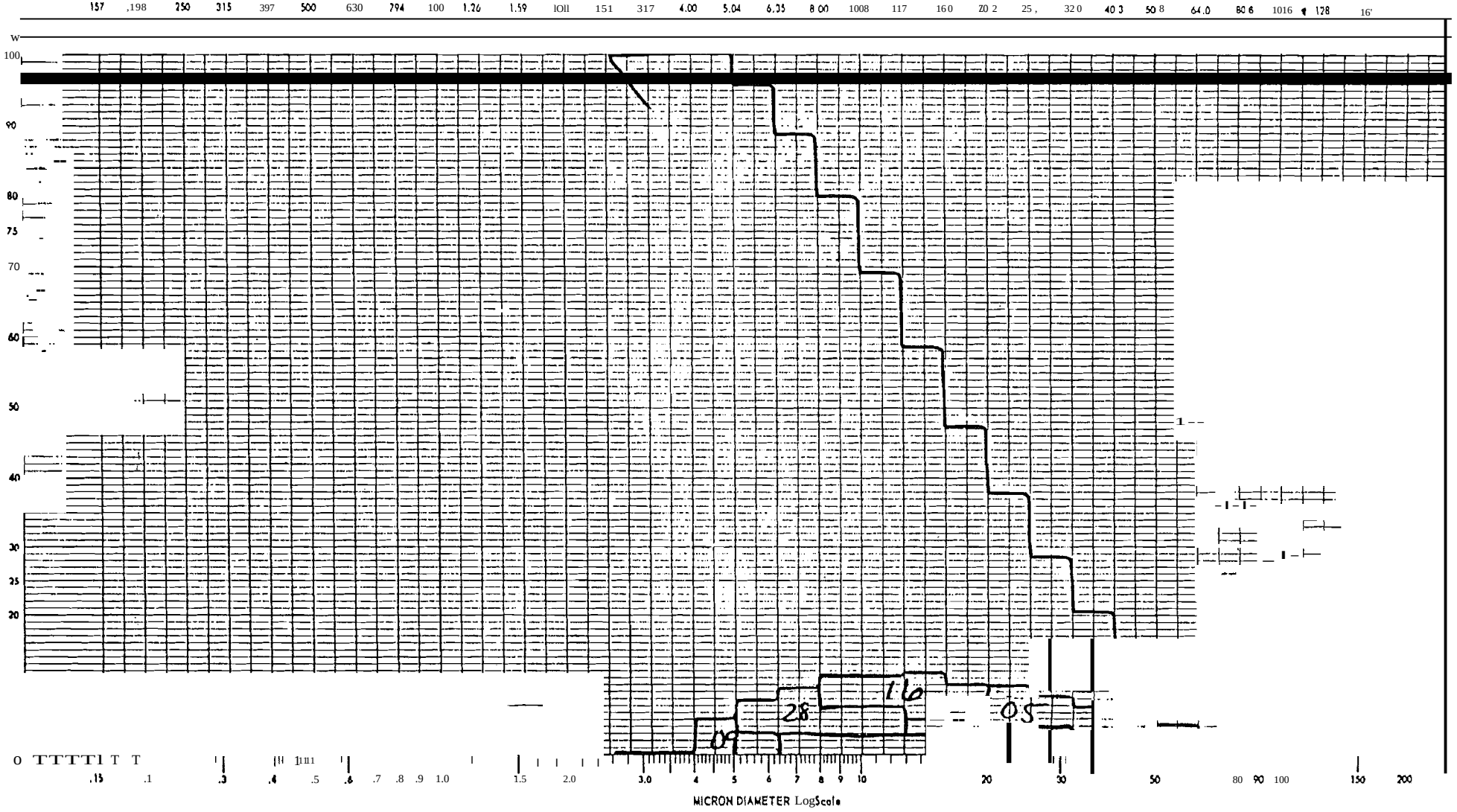


TABLE XII
KEROGEN COHPOSITION

GeoChem Sample Number	\\Jeight Percent (Ash Free) C	H	N	0	Weight Percent Ash	Atomic *H/c*	Atomic *Ole*
RS18-006	66.61	3.49	1.08	28.82	16.16	0,62	0.32
-014	81.15	3.08	0.54	15.23	29.29	0.45	0.,14
R518-015	88.04	.4.31	1.69	5.96	24.00	0.58	0,05

TABLE XIII

Whole Rock Composition

GRI Sample Number	Weight Percent Carbon	Hydrogen	Nitrogen	Ash
R518-001	0.37	0.52	0.11	93.06
002	0.18	0.49	0.06	93.29
003	0.05	0.16	6.04	98.00
004	2.75	0.60	0.19	92.35
005	2.16	0.51	0.16	92.98
006	2.28	0.42	0.15	90.11
007	3.62	0.77	0.25	94.67
008	0.65	0.43	0.11	94.68
009	1.22	0.41	0.15	94.18
010	1.20	0.45	0.13	93.63
011	1.58	0.40	0.12	93.25
012	3.96	0.44	0.19	89.52
013	5.78	0.31	0.19	82.33
014	5.00	0.70	0.28	89.88
015	10.98	0.86	0.46	81.58
016	3.40	0.48	0.18	88.47
017	4.20	0.42	0.16	84.93
018	1.61	0.51	0.15	92.58
019	9.03	0.08	0.17	67.67
020	1.81	0.45	0.12	91.32
021	3.94	0.37	0.14	84.42
022	1.80	0.48	0.13	91.48
023	3.09	0.44	0.14	87.76
024	1.57	0.46	0.13	92.02
025	3.40	0.34	0.12	86.68
026	5.81	0.40	0.18	82.67
027	2.47	0.42	0.12	88.58
028	3.30	0.39	0.12	85.84
029	6.60	0.22	0.17	75.76
030	2.67	0.50	0.16	90.96
031	4.62	0.37	0.15	83.59
032	5.06	0.58	0.25	88.55
033	4.45	0.44	0.18	86.06
034	5.56	0.36	0.20	81.61
R518-035	5.26	0.67	0.32	88.73

TABLE XIV

SAMPLE #	% SULFUR CONTENT
R518-001	3.564 %
-002	0.4064 %
-003	0.2209 %
-004	1.217 %
-005	1.600 %
-006	1.422 %
-007	0.9815 %
-008	0.9139 %
-009	1.175 %
-010	1.126 %
-011	0.8757 %
-012	0.8989 %
-013	2.105 %
-014	1.497 %
-015	2.228 %
-016	1.381 %
-017	0.6253 %
-018	0.8483 %
-019	0.4326 %
-020	0.8123 %
-021	0.6721 %
-022	0.6960 %
-023	0.5222 %
-024	0.7667 %
-025	0.4984 %
-026	0.7572 %
-027	0.3745 %
-028	0.4271 %
-029	0.4097 %
-030	1.016 %
-031	0.7464 %
-032	1.074 %
-033	1.076 %
-034	0.8186 %
R518-035	3.002 %

TABLE XV
Clay Mineralogy

GeoChem Sample Number	Illite (%)	Mixed-Layer (%)	Chlorite (%)	Other Minerals	Crystallini Index
R5l8-006	56	31	13		1.3
R5l8-022	64	14	22	Calcite	2.0
R5l8-027	64	15	21	Calcite, Sodium Feldspar	2.0

J

J

Major Elements in Whole Core

GeoChem Sample Number	Al_2O_3 (%)	Fe_2O_3 (%)	CaO(%)	HgO(%)	TiO_2(%)	MnO(%)	NaZO(%)	KZO(%)	$8iO_Z$(%)	P_2O_5(%)
R518-001	19.8	8.61	.305	2.09	1.12	.·0355	.954	4.67	41. 6	0.05
002	19.0	6.75	.560	2.22	1. 08	.0654	1.19	4.36	60.6	0.14
003	7.70	3.05	.656	.943	.704	.0453	1.33	1.21	82.8	0.09
004	17.9	5.28	1.15	2.12	.911	.0327	.925	4.23	62.0	0.04
005	16.3	5.42	1. 25	2.11	.842	.0376	1.01·	3.77	65.3	0.04
006	17.0	5.05	.545	2.01	.920	.0298	1.01	3.96	66.3	0.03
007	16.1	3.89	.259	1. 57	.791	.0214	.955	3.82	72.4	0.03
008	17.8	5.02	.977	2.39	1. 06	.·0442-	1.23	4.10	69.1	0·03
009	15.6	4.78	1.77	1.81	1.10	.0408	1.15	3.34	68.1	0.04
010	17.3	5.24	2.62'	2.27	1. 06	.0452	1.01	3.88	65.3	0.03
011	14.8	4.35	4.21	2.19	1.·04	.0460	1.06	3.16	68.6	0.04
012	13.0	3.76	7.93 -	1. 96	.873	.·0426	•935	2.89.	63.4	0.04
013	11.0	5.16	22.5	2.30	.636	.0830	.472	2.90	40.7	0.04
014	17.3	5.18	1.21	2.21	1.00	.0298	1. 06	4.11	61.5	0.08
015	12.9	5.05	7.94	2.21	.670	.0396	.689	3.17	62.0	0.11
016	17.1	4.96	10.4	2.21	.722	.-0559	.938	4.19	52.0	0.04
017	15.1	3.64	17.1	2.30	.662	.0563	.769	3.72	53.5	0.04
018	19.8	5.71	4.35	2.50	.871	.0437	1.03	4.50	61.0	0.03
019	3.98	2.33	41. 7	2.02	.310	.150	.213	1.19	19.0	0.02
020	13.6	4.57	19.7	2.19	.645	.0785	.680	3.17	54.9	0.05
021	16.4	5.74	7.21	2.84	.959	.0795	.776	3.64	44.5	0.09
022	18.1	5.64	6.22	2.72	.821	.0563	.834	4.22	57.7	0.03
023	'16.2	5.04	10.7	2.52	.753	.0728	.775	3.72	54.9	0.04
024	17.2	5.64	5.21	2.52	.·921	.0542'	.859	3.90	62.5	0.08
025	13.3	3.95	15.2	2.19	.605	.0648	.714	3.11	56.8	0.03
026	11.0	3.60	17.8	1.77	.521	.0716	.561	2.66	48.8	0.03
027	16.6	5.49	9.05	2.79	.933	.0824.	.732	3.72	54.1	0.09
028	14.2	5.12	15.1	2.72	.651	.0810	.767	3.23	41.4	0.06
029	8.10	3.06	31. 2	1.71	.362	.108	.265	2.09	33.2	0.05
030	16.6	5.14	5.26	2.27'	.754	.0447	.639	3.82	57.8	0.03
031	12.6	3.80	18.5	2.09	.569	.0633	.504	3.16	42.3	0.03
032	12.1	4.30	5.56	1.36	.415	.0313	.642	2.83	76.3	0.07
033	11.7	3.47	10.5	1.33	.476	.0368	.550	2.75	72.9	0.09
034	11.0	3.05	22.5	1.81	.588	.0613	.414	2.77	43.1	0.06
R5l8-035	17.2	6.01	5.95	1.71	.763	.0284	.750	4.07	52.6	0.02

N.D. = Not Detected

TABLE XVI

U, V, Ni and Th Composition of Whole Core

GeoChem Sample Number	Total Uranium (ppm)	Thorium (ppm)	Vanadium (ppm)	Nickel (ppm)
R518-001	7.4	14	60	66
002	3.0	14	100	62
003	1.7	8	30	23
004	12.0	8	140	105
005	4.6	10	195	88
006	8.2	10	135	80
007	5.4	8	160	70
008	5.4	11	85	42
009	3.6	11	65	48
010	2.6	11	70	56
011	3.0	10	65	49
012	5.0	9	115	89
013	8.2	8	65	67
014	9.8	10	145	140
015	26.0	7	285	240
016	4.0	8	110	95
017	5.2	9	100	71
018	34.0	8	95	90
019	1.4	4	25	34
020	2.4	10	80	65
021	2.6	7	85	75
022	2.6	7	100	66
023	1.7	7	130	69
024	2.6	9	145	77
025	4.0	6	125	55
026	3.2	5	110	81
027	1.6	9	135	63
028	22.0	7	100	54
029	1.3	4	85	57
030	3.4	8	185	87
031	2.2	6	100	59
032	5.6	6	215	120
033	3.0	7	130	85
034	3.0	7	100	65
R518-035	14.0	8	180	129

TABLE XVII

$\delta^{13}C$ of CH_4

	$\delta^{13}C$ of CH_4 (PDB)
R518-003	-40.6
005	-35.4
009	-37.2
011	-39.4
021	-35.3
023	-36.6
025	-40.9
027	-34.8
R518-029	-39.3

TABLE XVIII
ORGANIC CARBON ISOTOPE RATIO

GeoChem Sample No.	$\delta^{13}C$ of Organic Carbon (PDB)
R518-001	-30.1
003	-29.8
005	-28.8
009	-29.5
011	-29.0
013	-28.4
015	-29.8
021	-28.3
022	-28.8
023	-28.6
025	-29.8
026	-29.1
027	-27.3
028	-27.9
029	-28.7
030	-29.0
R518-034	-29.1

TABLE XIX

Pyrolysis - GC Analysis

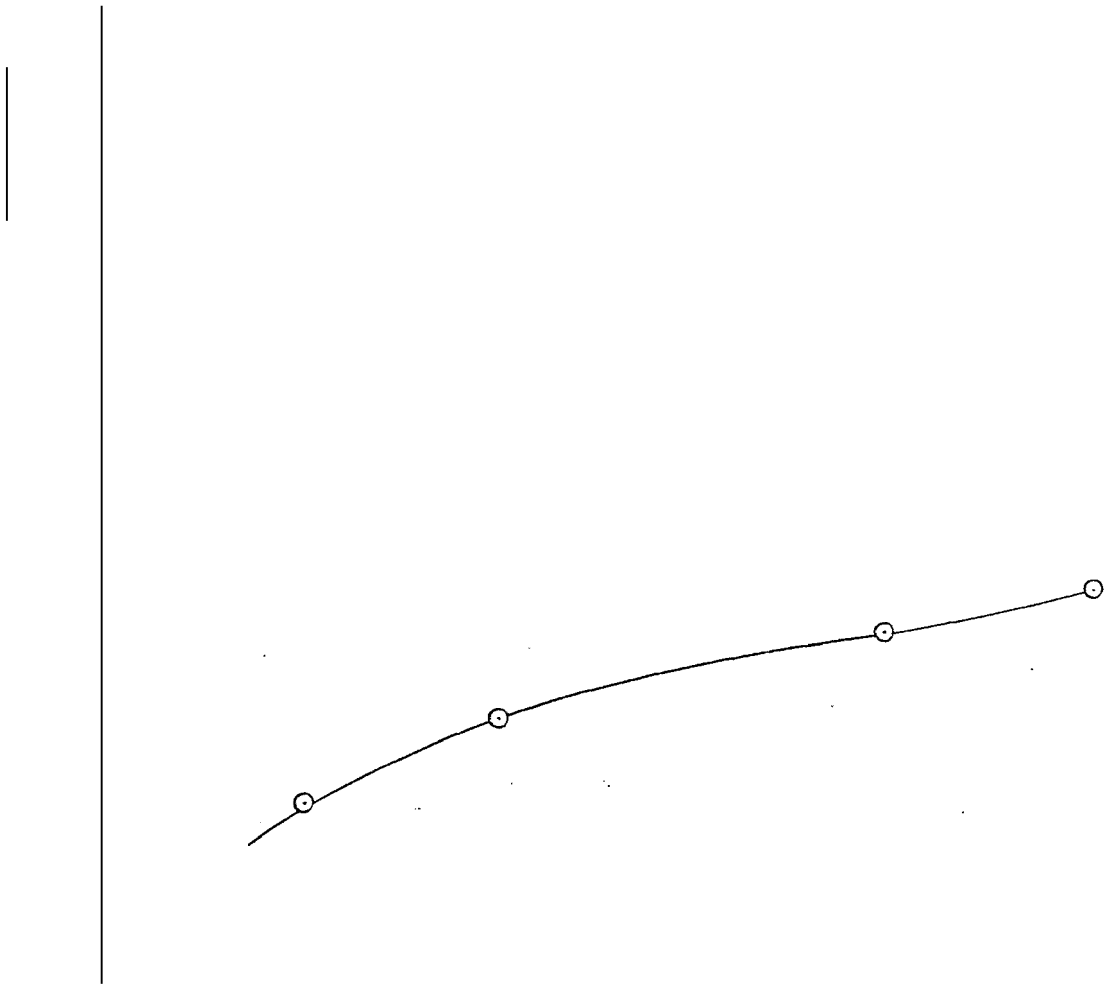
GRI Sample Number	Total Hydrocarbon Yield (Wt.%)	Volatile Hydrocarbon Content (PPM)	HaxLmum Temperature (OC)
R518-001	0.05	176	454
002	0.01	44	428
003	0.03	160	446
004	0.41	1845	487
005	0.27	1421	478
006	0.38	1844	487
007	0.44	1988	496
008	0.06	251	439
009	0.15	780	464
010	0.12	536	458
011	0.12	594	461
012	0.40	1854	493
013	0.23	1086	477
014	0.64	3037	485
015	1.30	5337	483
016	0.19	999	471
017	0.17	848	469
018	0.11	613	445
019	0.01	25	455
020	0.03	128	446
021	0.04	138	453
022	0.06	267	452
023	0.07	379	462
024	0.06	260	439
025	0.06	350	448
026	0.33	1701	483
027	0.03	105	453
028	0.02	77	455
029	0.06	261	448
030	0.27	1302	470
031	0.18	820	415
032	0.54	2467	485
033	0.23	983	465
034	0.12	629	476
R518-035	0.34	1745	490

TABLE XX

METHANE ADSORPTION ISOTHERMS
EASTERN GAS SHALES

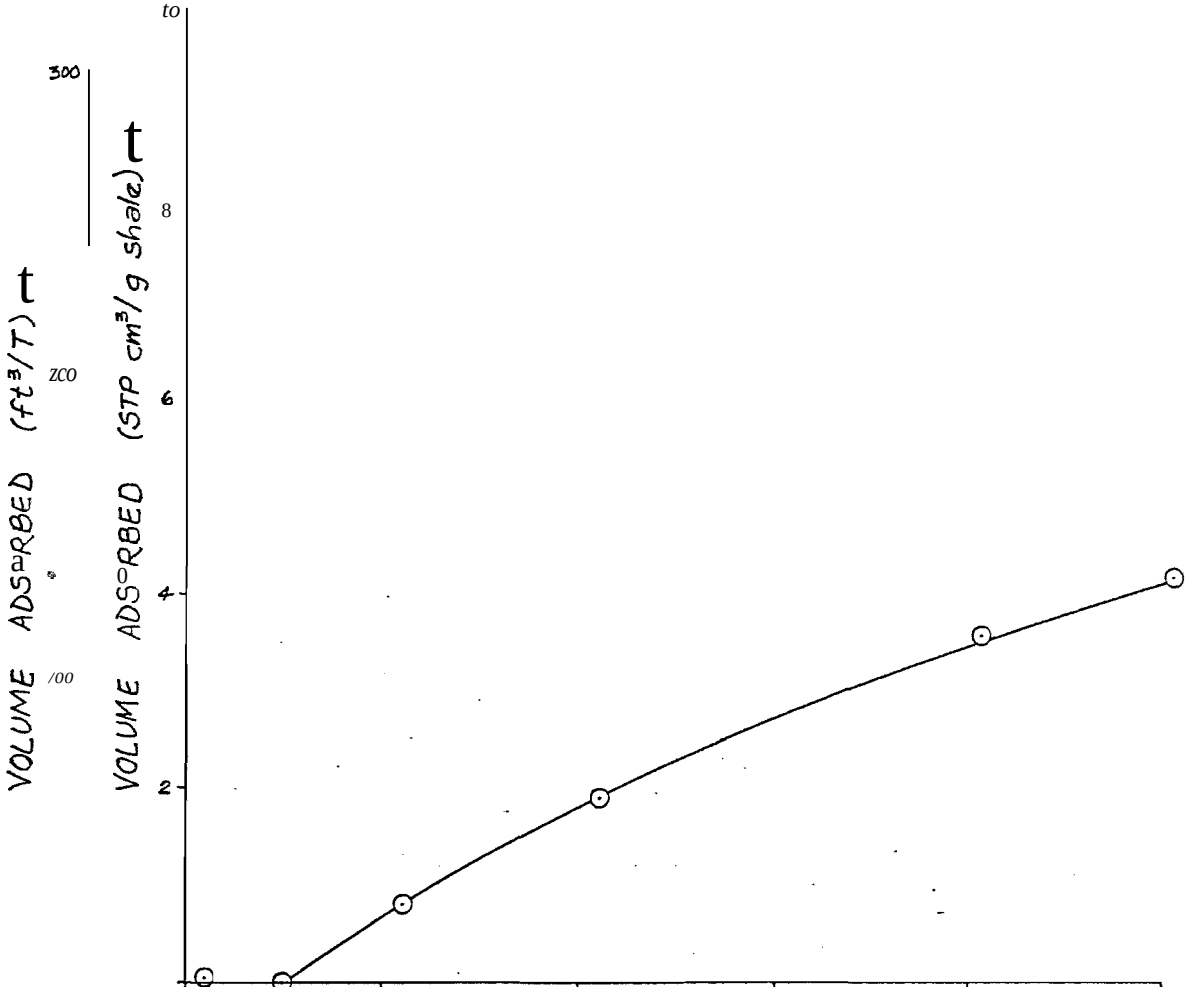
PARTICLE SIZE: 4 x 8 mesh (ASTM)
ISOTHERM TEMPERATURE: 20°C.

SAMPLE NUMBER	ABSOLUTE PRESSURE (atm)	VOLUME METHANE ADSORBED (STP cm^3/g shale)
RS18-013	1.0	0.01
	4.2	0.81
	10.5	1.8
	20.3	2.7
	40.2	3.6
	50.9	4.0
RS18-020	1.0	0.05
	5.3	0.00
	11.1	0.81
	21.1	1.9
	40.7	3.5
	50.6	4.2
RS18-032	1.0	0.07
	4.8	0.43
	17.8	1.3
	21.0	2.5
	40.8	4.0
	49.0	5.4



SAMPLE NO.. R518-013
ISOTHERM TEMPERATURE: 20°C.

① 8/31/79



SAMPLE NO. R518-020
ISOTHERM TEMPERATURE:

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