Technical Service Report

Exxon Production Research Company

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STATOIL 34/10-2, NORWAY: HYDROCARBON SOURCE PATTERNS

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SUMMARY AND CONCLUSIONS

Canned cuttings from the interval 2030 - 3725 meters were analyzed routinely for hydrocarbon source characteristics. One core chip from 3036.3 meters was included in the study.

Results of the analyses are given in Tables 1 through 6 and in Figs. 1 through 12.

This service work was authorized in Esso Norway's TSJA No. 1119 of March 13, 1979 by J. Barrier. It is a part of a more general geochemical study of the 34/10 Block area, which will be discussed shortly in a separate report.

The analytical data are summarized graphically in Fig. 1 and can be interpreted as follows:

Approximate Interval (m)	Unit	Maturity	Richness	Indigenous Hydrocarbon Expected
2030 - 2250	U. Cret.(?)	Immature	Poor	Lean
2250 - 2866	U. Cret.	Immature	Marginal to fair	Minor gas shows
2866 - 2889	U. Cret. & Malm	Immature	Fair (?)	Minor gas shows
2889 - 3130	Brent (+Doggersh.)	Transitional(?)	Shales good to rich	Gas, liquids
3130 - 3324	Dunlin	Transitional	Good	Minor gas, liquids
3324 - 3527	Statfjord	Transitional	Shales good	Minor gas
3527 - 3725	Triassic	Transitional	Poor (shales fair to good)	Lean

The maturation state of the various units in the section at 34/10-2 is not clear. A quick glance at Fig. 1 and the corresponding tables would lead one to conclude that the section from 2250 meters on down is mature. The cuttings gas in that section is both plentiful and fairly rich in C_2-C_4 components. Also, light gasolines (C_4-C_7) are present in appreciable amounts. However, the kerogen alteration values are only "2-" at total depth, suggesting a section that is no more than transitional between immature and mature.

Vitrinite reflectance values (Table 6) support the kerogen alteration values, with R_o average values of less than 0.70% suggesting a section that is transitional in maturity, or at least at no more than a "very early maturity" stage. Unfortunately the coal grains used for vitrinite reflectance measurements were not clearly indigenous to the indicated depths. They may all be recycled chips from a single interval, particularly in the case of the four deeper samples which are nearly identical in reflectance values.

Heavy (C_{15+}) saturate hydrocarbon patterns shown in the gas chromatograms of Figs. 2-12 are suggestive of an early maturity or transitional stage of maturation. The normal paraffin peaks still show a definite odd-carbon-number preference in the sample from 3260 - 3275 meters (Fig. 10) and there is still a definite but slight odd-carbon-number preference in the deepest two "Triassic" samples (Figs. 11 and 12) even through these latter two were so lean in hydrocarbons that their patterns may not be reliable. (Also, there is a high probability that the apparent source characteristics detected in the "Triassic" samples came from cavings rather than indigenous chips.)

The high yields of gases and gasolines in the 34/10-2 samples may therefore be migrated rather than indigenous hydrocarbons. Their quantities and compositions are inconsistent with the organic matter in these rocks.

PROCEDURES

Compositions and concentrations of hydrocarbon gases in the air spaces above the cuttings in the sample cans were determined by gas chromatography. Similar data were obtained on gases released from standard mixtures of cuttings and tap water after two minutes of agitation in a Waring blender. Combined results on the air space gas plus the cuttings gas were calculated for each sample. The data were plotted graphically to show vertical variations in total gas (C_1-C_4) and a graphical plot was also made of the percent "wet gas" in total gas (Figure 1). Detailed results of the gas analyses are listed in Table 1.

Twenty-eight cuttings samples while still wet were selected for further analyses on the basis of their gas yields, depths and general appearance (Table 2). We attempted to pick chips of reasonably uniform fine-grained lithologies from the heterogeneous mixtures of cuttings in the original samples. Our routine gas chromatographic procedures were used for determining their light gasoline (C_4-C_7) content, and the total organic carbon was determined with a commercial Leco analyzer after carbonate was first removed from the samples by use of HCl. These results are given in Tables 2, 3, and 4, and they are plotted graphically in Figure 1.

Visual kerogen characteristics were determined on 27 of the samples (Table 3). Determinations were made with a standard palynological microscope utilizing transmitted light through dispersed organic matter on standard slide mounts. The organic matter was separated from the samples by removing rock matrix materials with HF and HCl. The descriptions were based on the so-called "Staplin" nomenclature. In Table 2 many of the kerogens contain high percentages of "indeterminate fines". Chemical and lithologic data were used as the basis of our "Best guesses" as to what the fines probably included.

Ten of the gross cuttings samples and one core sample were sent to GeoChem Laboratories of Houston for heavy (C_{15+}) soluble organic matter analysis (Table 5). This consisted of extraction of organic matter with a methylene chloride-methanol mixture, and analysis of the extracts (after deasphaltening) by means of liquid column chromatography. Gas chromatograms were run on the heavy saturate fractions (Figs. 2-12).

Sand-sized coal chips from five of the samples were sent to Geo-Strat Inc. for vitrinite reflectance measurements (Table 6). The histograms summarizing data for individual samples are shown in Figs. 13-17. The coals may not be indigenous to the indicated sample depths. The four "deeper" samples listed in Table 6 do appear to be essentially identical, and the coals were present only in trace amounts in these samples.

TABLE 1A

C1-C4 HYDROCARBON ANALYSES - AIR SPACE AT TOP OF CANS

SPL NO	R	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M	E	P	IB	NB	WET GAS E	P	IB	NB	
			GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)									
69783A	4	2030	6567.34	626.05	669.13	237.39	511.80	2044.37	8611.71	23.7394	76.	7.	8.	3.	6.	31.	32.	12.	25.	
69783B	4	2060	9849.60	835.20	1013.47	402.80	862.34	3113.81	12963.41	24.0200	76.	6.	8.	3.	7.	27.	32.	13.	28.	
69783C	4	2090	5529.60	502.69	576.65	225.13	488.13	1792.60	7322.20	24.4817	75.	7.	8.	3.	7.	28.	32.	13.	27.	
69783D	4	2110	4365.42	449.44	594.80	257.62	543.38	1845.24	6210.66	29.7108	70.	7.	10.	4.	9.	24.	33.	14.	29.	
69783E	4	2125	464.26	81.89	137.48	73.48	161.69	454.54	918.80	49.4710	50.	9.	15.	8.	18.	18.	30.	16.	36.	
69783F	4	2155	2890.47	510.80	338.74	144.58	293.25	1287.37	4177.84	30.8142	70.	12.	8.	3.	7.	40.	26.	11.	23.	
69783G	4	2185	8985.60	610.13	918.53	486.44	998.12	3015.22	12000.82	25.1251	75.	5.	8.	4.	8.	20.	30.	16.	34.	
69783H	4	2215	8764.28	865.78	1099.74	496.89	972.28	3434.69	11698.96	29.3589	72.	7.	9.	4.	8.	25.	33.	14.	28.	
69783I	4	2255	9907.20	1958.40	8147.52	2168.14	3942.14	16216.19	26123.39	62.0754	39.	7.	31.	8.	15.	12.	51.	13.	24.	
69783J	4	2285	27417.60	3673.60	4884.10	2212.34	4088.15	14858.18	42275.77	35.1458	64.	9.	12.	5.	10.	25.	32.	15.	28.	
69783K	4	2315	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.	0.	0.	0.	0.	0.	0.	0.	0.	C*
69783L	4	2345	13824.00	1774.93	275.56	119.35	221.53	2391.37	16215.37	14.7475	85.	11.	2.	1.	1.	74.	12.	5.	9.	
69783M	4	2375	7236.92	1971.20	4622.53	2927.58	4920.42	14441.72	21678.64	66.6173	33.	9.	21.	14.	23.	14.	32.	20.	34.	
69783N	4	2405	7517.09	1529.79	3494.26	1673.67	2742.75	9440.47	16957.56	55.6712	44.	9.	21.	10.	16.	16.	37.	18.	29.	
69783O	4	2435	678.40	264.53	1024.51	663.04	1283.84	3235.92	3914.32	82.6688	17.	7.	26.	17.	33.	8.	32.	20.	40.	
69783P	4	2440	1510.40	460.80	1324.80	651.99	1334.19	3771.78	5282.18	71.4057	29.	9.	25.	12.	25.	12.	35.	17.	36.	
69783Q	4	2475	5152.58	1382.40	3013.32	1139.22	2131.72	7666.66	12819.23	59.8059	39.	11.	24.	9.	17.	18.	39.	15.	28.	
69783R	4	2490	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.	0.	0.	0.	0.	0.	0.	0.	0.	C*
69783S	4	2520	4608.00	896.69	1306.18	430.08	612.32	3245.27	7853.27	41.3238	59.	11.	17.	5.	8.	28.	40.	13.	19.	
69783T	4	2550	4553.14	819.20	1650.32	629.89	917.03	4016.44	8569.58	46.8686	53.	10.	19.	7.	11.	20.	41.	16.	23.	
69784A	4	2610	8064.00	2205.54	6106.31	3284.60	5286.40	16882.84	24946.84	67.6753	33.	9.	24.	13.	21.	13.	37.	19.	31.	
69784B	4	2640	1240.62	575.51	1070.03	437.35	706.55	2789.44	4030.06	69.2158	30.	14.	27.	11.	18.	21.	38.	16.	25.	
69784C	4	2670	5152.00	725.33	936.19	375.72	497.17	2534.41	7686.41	32.9726	68.	9.	12.	5.	6.	29.	36.	15.	20.	
69784D	4	2700	4608.00	1024.00	2437.63	1326.08	1938.35	6726.06	11334.06	59.3438	40.	9.	22.	12.	17.	15.	36.	20.	29.	
69784E	4	2730	5847.77	2186.97	6692.13	3848.00	6802.19	19529.29	25377.05	76.9565	23.	9.	26.	15.	27.	11.	34.	20.	35.	
69784F	4	2765	4044.80	1194.67	4310.02	2475.35	3977.39	11957.43	16002.23	74.7235	25.	7.	28.	15.	25.	10.	36.	21.	33.	
69784G	4	2795	4608.00	1228.80	3338.50	1889.66	3209.60	9666.56	14274.56	67.7188	33.	9.	23.	13.	22.	13.	34.	20.	33.	
69784H	4	2825	4300.80	882.22	2625.14	1606.60	2724.53	7838.49	12139.29	64.5712	36.	7.	22.	13.	22.	11.	33.	20.	36.	
69784I	4	2855	4346.04	1041.53	2606.77	1348.79	2430.09	7427.18	11773.22	63.0854	37.	9.	22.	11.	21.	14.	35.	18.	33.	
69784J	4	2885	10503.88	3032.62	5592.69	1999.32	4147.79	14772.41	25276.29	58.4437	42.	12.	22.	8.	16.	21.	37.	14.	28.	
69784K	4	2915	12547.60	5520.95	6233.65	1245.77	2406.00	15406.37	27953.96	55.1133	45.	20.	22.	4.	9.	36.	40.	8.	16.	
69784L	4	2945	18432.00	5632.00	5166.72	994.56	1699.20	13492.48	31924.48	42.2637	58.	18.	16.	3.	5.	42.	38.	7.	13.	
69784M	4	2975	91075.31	32768.00	14713.07	1716.10	2558.79	51755.94	142831.25	36.2357	64.	23.	10.	1.	2.	64.	28.	3.	5.	
69784N	4	3005	57343.98	19114.67	7065.60	795.65	1157.97	28133.86	85477.84	32.9136	68.	22.	8.	1.	1.	68.	25.	3.	4.	
69784O	4	3035	15360.00	5802.67	4592.64	839.85	1736.96	12972.11	28332.11	45.7859	55.	20.	16.	3.	6.	46.	35.	6.	13.	
69784P	4	3065	23778.46	6134.15	3138.76	499.83	864.12	10636.85	34415.30	30.9073	69.	18.	9.	1.	3.	57.	30.	5.	8.	
69784Q	4	3095	29376.00	18201.60	18123.26	3580.42	7986.24	47891.48	77267.48	61.9814	38.	24.	23.	5.	10.	38.	38.	7.	17.	
69784R	4	3125	30831.48	7531.35	5683.82	1239.46	2140.75	16595.36	47426.84	34.9915	64.	16.	12.	3.	5.	46.	34.	7.	13.	
69784S	4	3155	10828.80	3686.40	2994.05	497.28	1113.92	8291.64	19120.44	43.3653	56.	19.	16.	3.	6.	45.	36.	6.	13.	
69784T	4	3185	15974.40	4403.20	3921.41	696.19	1510.40	10531.19	26505.59	39.7320	59.	17.	15.	3.	6.	42.	37.	7.	14.	
69785A	4	3215	5632.00	1962.67	1713.41	340.36	714.92	4731.36	10363.36	45.6547	54.	19.	17.	3.	7.	42.	36.	7.	15.	
69785B	4	3245	10654.25	3584.00	3945.50	759.48	1826.21	10115.18	20769.43	48.7023	51.	17.	19.	4.	9.	35.	39.	8.	18.	
69785C	4	3275	7007.34	1890.87	1227.95	192.05	423.82	3734.69	10742.03	34.7671	65.	18.	11.	2.	4.	51.	33.	5.	11.	
69785D	4	3305	3960.69	1389.71	1522.26	284.95	649.11	3846.03	7806.72	49.2656	51.	18.	19.	4.	8.	36.	40.	7.	17.	
69785E	4	3335	31171.76	5888.00	3333.82	515.81	1047.28	10784.89	41956.65	25.7048	75.	14.	8.	1.	2.	54.	31.	5.	10.	
69785F	4	3365	15131.73	6530.84	5371.33	830.64	1849.19	14581.99	29713.72	49.0749	51.	22.	18.	3.	6.	44.	37.	6.	13.	
69785G	4	3395	39244.79	8960.00	6862.46	1160.32	4691.68	21674.45	60919.23	35.5790	64.	15.	11.	2.	8.	41.	32.	5.	22.	
69785H	4	3425	3984.00	672.00	649.15	74.59	136.88	1532.62	5516.62	27.7819	73.	12.	12.	1.	2.	44.	42.	5.	9.	
69785I	4	3455	5856.00	1408.00	728.64	116.03	245.44	2498.11	8354.11	29.9027	70.	17.	9.	1.	3.	56.	29.	5.	10.	
69785J	4	3485	2944.00	580.27	521.09	123.77	266.84	1491.97	4435.97	33.6334	66.	13.	12.	3.	6.	39.	35.	8.	18.	
69785K	4	3515	2188.80	450.56	408.04	92.83	211.46	1162.89	3351.69	34.6956	66.	13.	12.	3.	6.	39.	35.	8.	18.	
69785L	4	3545	1376.44	436.97	422.11	92.43	169.01	1120.52	2496.96	44.8753	54.	18.	17.	4.	7.	39.	38.	8.	15.	
69785M	4	3575	417.50	110.41	98.80	20.85	42.41	272.47	689.97	39.4901	61.	16.	14.	3.	6.	40.	36.	8.	16.	
69785N	4	3605	1034.24	133.12	91.85	19.61	43.11	287.69	1321.93	21.7628	79.	10.	7.	1.	3.	46.	32.	7.	15.	
69785O	4	3635	796.80	179.20	241.11	54.70	103.84	578.85	1375.65	42.0783	57.	13.	18.	4.	8.	31.	42.	9.	18.	
69785P	4	3665	1216.00	409.60	569.66	127.08	276.91	1383.25	2599.25	53.2173	46.	16.	22.	5.	11.	30.	41.	9.	20.	
69785Q	4	3695	532.87	144.41	143.49	31.79	65.50	385.19	918.06	41.9569	58.	16.	16.	3.	7.	37.	38.	8.	17.	
69785R	4	3725	516.75	74.61	65.86	14.21	27.51	182.19	698.94	26.0666	74.	11.	9.	2.	4.	41.	36.	8.	15.	

B = CUTTINGS NOT ANALYZED *C* = AIR SPACE GAS NOT RUN *BC* = NO ANALYSES RUN

TABLE 1B

C1-C4 HYDROCARBON ANALYSES - CUTTINGS ONLY

SPL. NO	R	DEPTH	GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS) METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	GAS COMPOSITION (PERCENT) TOTAL GAS M	E	P	IB	NB	WET GAS E	P	IB	NB	
69783A	4	2030	547.20	52.80	74.52	31.08	92.92	251.32	798.52	31.4732	68.	7.	9.	4.	12.	21.	30.	12.	37.	
69783B	4	2060	561.60	64.80	83.21	38.07	95.58	281.66	843.26	33.4013	66.	8.	10.	5.	11.	23.	30.	14.	33.	
69783C	4	2090	403.20	25.80	31.05	13.99	46.02	116.86	520.06	22.4705	77.	5.	6.	3.	9.	22.	27.	12.	39.	
69783D	4	2110	363.60	14.40	21.11	13.21	42.48	91.20	454.80	20.0527	80.	3.	5.	3.	9.	16.	23.	14.	47.	
69783E	4	2125	230.40	9.60	18.63	11.65	38.05	77.93	308.33	25.2748	75.	3.	6.	4.	12.	12.	24.	15.	49.	
69783F	4	2155	284.40	28.50	47.20	40.79	113.28	229.77	514.17	44.6875	55.	6.	9.	8.	22.	12.	21.	18.	49.	
69783G	4	2185	327.60	18.00	36.02	31.86	104.43	190.31	517.91	36.7458	64.	3.	7.	6.	20.	9.	19.	17.	55.	
69783H	4	2215	356.40	26.40	60.24	60.61	168.15	315.40	671.80	46.9485	53.	4.	9.	9.	25.	8.	19.	19.	54.	
69783I	4	2255	572.40	98.40	347.76	385.39	948.72	1780.27	2352.67	75.6702	24.	4.	15.	16.	41.	6.	20.	22.	52.	
69783J	4	2285	1173.60	117.60	283.18	245.53	598.26	1244.57	2418.17	51.4674	48.	5.	12.	10.	25.	9.	23.	20.	48.	
69783K	4	2315	212.40	3.60	18.63	50.50	123.90	196.63	409.03	48.0723	52.	1.	5.	12.	30.	2.	9.	26.	63.	C*
69783L	4	2345	1195.20	196.80	387.50	220.67	598.26	1403.23	2598.43	54.0030	46.	8.	15.	8.	23.	14.	28.	16.	42.	
69783M	4	2375	784.80	201.60	571.32	360.53	1012.44	2145.89	2930.69	73.2213	27.	7.	19.	12.	35.	9.	27.	17.	47.	
69783N	4	2405	885.60	211.20	645.84	453.77	1076.16	2386.97	3272.57	72.9387	27.	6.	20.	14.	33.	9.	27.	19.	45.	
69783O	4	2435	432.00	115.20	576.29	559.44	1331.04	2581.97	3013.97	85.6667	14.	4.	19.	19.	44.	4.	22.	22.	52.	
69783P	4	2440	309.60	88.80	452.09	407.15	991.20	1939.24	2248.84	86.2329	14.	4.	20.	18.	44.	5.	23.	21.	51.	
69783Q	4	2475	446.40	139.20	576.29	391.61	1033.68	2140.78	2587.18	82.7457	17.	5.	22.	15.	41.	7.	27.	18.	48.	
69783R	4	2490	153.00	2.40	2.10	4.37	14.93	23.80	176.80	13.4615	88.	1.	1.	2.	8.	10.	9.	18.	63.	C*
69783S	4	2520	3196.80	979.20	2026.94	826.73	2039.04	5871.91	9068.71	64.7491	36.	11.	22.	9.	22.	17.	35.	14.	34.	
69783T	4	2550	1339.20	326.40	1579.82	341.88	906.24	3154.34	4493.54	70.1972	30.	7.	35.	8.	20.	10.	50.	11.	29.	
69784A	4	2610	712.80	256.80	1122.77	839.16	2308.08	4526.81	5239.61	86.3959	14.	5.	21.	16.	44.	6.	25.	19.	50.	
69784B	4	2640	192.60	52.80	203.69	116.55	339.84	712.88	905.48	78.7295	21.	6.	22.	13.	38.	7.	29.	16.	48.	
69784C	4	2670	55.80	14.40	36.33	13.21	37.17	101.11	156.91	64.4382	36.	9.	23.	8.	24.	14.	36.	13.	37.	
69784D	4	2700	374.40	97.20	290.63	133.64	410.64	932.11	1306.51	71.3435	29.	7.	22.	10.	32.	10.	31.	14.	45.	
69784E	4	2730	187.20	36.00	154.01	108.78	325.68	624.47	811.67	76.9364	23.	4.	19.	13.	41.	6.	25.	17.	52.	
69784F	4	2765	241.20	96.00	437.18	313.91	807.12	1654.21	1895.41	87.2745	13.	5.	23.	17.	42.	6.	26.	19.	49.	
69784G	4	2795	180.00	51.60	198.72	155.40	410.64	816.36	996.36	81.9342	18.	5.	20.	16.	41.	6.	24.	19.	51.	
69784H	4	2825	108.00	34.80	155.25	152.29	329.22	671.56	779.56	86.1460	14.	4.	20.	20.	42.	5.	23.	23.	49.	
69784I	4	2855	381.60	153.60	635.90	410.26	948.72	2148.48	2530.08	84.9175	15.	6.	25.	16.	38.	7.	30.	19.	44.	
69784J	4	2885	1137.60	595.20	2265.41	1442.11	4729.44	9032.16	10169.76	88.8139	11.	6.	22.	14.	47.	7.	25.	16.	52.	
69784K	4	2915	2793.60	2534.40	5723.14	1591.30	5437.44	15286.28	18079.87	84.5486	15.	14.	32.	9.	30.	17.	37.	10.	36.	
69784L	4	2945	6796.80	4032.00	6756.48	1641.02	5210.88	17640.37	24437.18	72.1866	28.	16.	28.	7.	21.	23.	38.	9.	30.	
69784M	4	2975	43199.98	22272.00	15500.16	1989.12	5380.80	45142.06	88342.05	51.0992	49.	25.	18.	2.	6.	50.	34.	4.	12.	
69784N	4	3005	20160.00	13824.00	9538.56	1118.88	3540.00	28021.43	48181.43	58.1581	42.	29.	20.	2.	7.	49.	34.	4.	13.	
69784O	4	3035	2880.00	3408.00	5683.39	1491.84	3738.24	14321.46	17201.46	83.2572	17.	20.	32.	9.	22.	24.	40.	10.	26.	
69784P	4	3065	9100.80	4608.00	3815.42	547.01	1670.88	10641.31	19742.11	53.9016	47.	23.	19.	3.	8.	43.	36.	5.	16.	
69784Q	4	3095	806.40	350.40	1440.72	609.17	1869.12	4269.41	5075.81	84.1129	16.	7.	28.	12.	37.	8.	34.	14.	44.	
69784R	4	3125	7718.40	3494.40	4610.30	1392.38	3398.40	12895.47	20613.87	62.5573	38.	17.	22.	7.	16.	27.	36.	11.	26.	
69784S	4	3155	1396.80	1488.00	2424.38	497.28	1727.52	6137.18	7533.98	81.4600	19.	20.	31.	7.	23.	24.	40.	8.	28.	
69784T	4	3185	1411.20	1180.80	1877.90	459.98	1430.16	4948.84	6360.04	77.8114	22.	19.	30.	7.	22.	24.	38.	9.	29.	
69785A	4	3215	2678.40	1689.60	3100.03	745.92	2548.80	8084.35	10762.75	75.1142	25.	16.	28.	7.	24.	21.	38.	9.	32.	
69785B	4	3245	777.60	787.20	1887.84	484.85	1840.80	5000.69	5778.29	86.5427	13.	14.	33.	8.	32.	16.	37.	10.	37.	
69785C	4	3275	1670.40	960.00	1271.81	248.64	835.44	3315.89	4986.29	66.5001	33.	19.	26.	5.	17.	29.	39.	7.	25.	
69785D	4	3305	345.60	223.20	526.61	124.32	431.88	1306.01	1651.61	79.0750	21.	14.	31.	8.	26.	17.	40.	10.	33.	
69785E	4	3335	2318.40	1430.40	1500.34	323.23	863.76	4117.73	6436.13	63.9783	37.	22.	23.	5.	13.	35.	36.	8.	21.	
69785F	4	3365	691.20	345.60	894.24	186.48	651.36	2077.68	2768.88	75.0368	25.	12.	32.	7.	24.	17.	43.	9.	31.	
69785G	4	3395	950.40	681.60	1609.63	360.53	1231.92	3883.68	4834.08	80.3396	20.	14.	34.	7.	25.	18.	41.	9.	32.	
69785H	4	3425	1800.00	432.00	347.76	99.46	230.10	1109.32	2909.32	38.1299	62.	15.	12.	3.	8.	39.	31.	9.	21.	
69785I	4	3455	1159.20	388.80	357.70	85.47	226.56	1058.53	2217.73	47.7303	52.	18.	16.	4.	10.	37.	34.	8.	21.	
69785J	4	3485	388.80	112.80	231.01	80.81	223.02	647.64	1036.44	62.4870	37.	11.	22.	8.	22.	17.	37.	12.	34.	
69785K	4	3515	64.80	9.90	22.36	8.94	23.45	64.65	129.45	49.9420	50.	8.	17.	7.	18.	15.	35.	14.	36.	
69785L	4	3545	370.80	103.20	163.94	48.17	138.06	453.37	824.17	55.0093	44.	13.	20.	6.	17.	23.	36.	11.	30.	
69785M	4	3575	142.20	21.60	45.33	15.54	40.71	123.18	265.38	46.4164	54.	8.	17.	6.	15.	18.	36.	13.	33.	
69785N	4	3605	338.40	36.00	43.47	11.65	30.97	122.09	460.49	26.5130	73.	8.	9.	3.	7.	29.	36.	10.	25.	
69785O	4	3635	370.80	69.60	130.41	37.30	86.73	324.04	694.84	46.6352	54.	10.	19.	5.	12.	21.	40.	12.	27.	
69785P	4	3665	50.40	6.60	20.49	6.99	17.70	51.78	102.18	50.6753	50.	6.	20.	7.	17.	13.	40.	13.	34.	
69785Q	4	3695	381.60	76.80	101.84	32.63	84.96	296.23	677.83	43.7027	56.	11.	15.	5.	13.	26.	34.	11.	29.	
69785R	4	3725	540.00	108.00	183.82	60.61	180.54	532.97	1072.97	49.6724	50.	10.	17.	6.	17.	20.	34.	11.	35.	

B = CUTTINGS NOT ANALYZED *C* = AIR SPACE GAS NOT RUN *BC* = NO ANALYSES RUN

TABLE 1C

C1-C4 HYDROCARBON ANALYSES - CUTTINGS AND AIR SPACE

SPL NO	R	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M	E	P	IB	NB	WET GAS E	P	IB	NB	
			GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)									
69783A	4	2030	7114.54	678.85	743.65	268.47	604.72	2295.69	9410.23	24.3957	76.	7.	8.	3.	6.	30.	32.	12.	26.	
69783B	4	2060	10411.20	900.00	1096.68	440.87	957.92	3395.47	13806.67	24.5929	75.	7.	8.	3.	7.	27.	32.	13.	28.	
69783C	4	2090	5932.80	528.49	607.70	239.12	534.15	1909.46	7842.26	24.3483	75.	7.	8.	3.	7.	28.	31.	13.	28.	
69783D	4	2110	4729.02	463.84	615.91	270.83	585.86	1936.44	6665.46	29.0518	71.	7.	9.	4.	9.	24.	32.	14.	30.	
69783E	4	2125	694.66	91.49	156.11	85.13	199.74	532.47	1227.13	43.3915	57.	7.	13.	7.	16.	17.	29.	16.	38.	
69783F	4	2155	3174.87	539.30	385.94	185.37	406.53	1517.14	4692.01	32.3345	68.	11.	8.	4.	9.	36.	25.	12.	27.	
69783G	4	2185	9313.20	628.13	954.55	520.30	1102.55	3205.53	12518.72	25.6059	74.	5.	8.	4.	9.	20.	30.	16.	34.	
69783H	4	2215	8620.68	892.18	1159.98	557.50	1140.43	3750.08	12370.76	30.3141	70.	7.	9.	5.	9.	24.	31.	15.	30.	
69783I	4	2255	10479.60	2056.80	8495.28	2553.53	4890.86	17996.46	28476.06	63.1986	37.	7.	30.	9.	17.	11.	48.	14.	27.	
69783J	4	2285	28591.20	3791.20	5167.28	2457.87	4686.41	16102.74	44693.94	36.0289	65.	8.	12.	5.	10.	24.	32.	15.	29.	
69783K	4	2315	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.	0.	0.	0.	0.	0.	0.	0.	0.	C*
69783L	4	2345	15019.20	1971.73	663.06	340.02	819.79	3794.60	18813.79	20.1692	80.	10.	4.	2.	4.	52.	17.	9.	22.	
69783M	4	2375	8021.72	2172.80	5193.85	3288.11	5932.86	16587.61	24609.33	67.4037	33.	9.	21.	13.	24.	13.	31.	20.	36.	
69783N	4	2405	8401.69	1740.99	4140.10	2127.44	3818.91	11827.44	20230.12	58.4645	42.	9.	20.	11.	19.	15.	35.	18.	32.	
69783O	4	2435	1110.40	379.73	1600.80	1222.48	2614.88	5817.89	6928.29	83.9729	16.	5.	23.	18.	38.	7.	28.	21.	44.	
69783P	4	2440	1820.00	549.60	1776.89	1059.14	2325.39	5711.02	7531.02	75.8333	24.	7.	24.	14.	31.	10.	31.	19.	40.	
69783Q	4	2475	5598.98	1521.60	3589.61	1530.83	3165.40	9807.43	15406.41	63.6581	36.	10.	23.	10.	21.	16.	36.	16.	32.	
69783R	4	2490	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.	0.	0.	0.	0.	0.	0.	0.	0.	C*
69783S	4	2520	7804.80	1875.89	3333.12	1256.81	2651.36	9117.17	16921.97	53.8777	46.	11.	20.	7.	16.	21.	36.	14.	29.	
69783T	4	2550	5892.34	1145.60	3230.14	971.77	1823.27	7170.78	13063.12	54.8933	45.	9.	25.	7.	14.	16.	45.	14.	25.	
69784A	4	2610	8776.80	2462.34	7229.08	4123.76	7594.48	21409.65	30186.45	70.9247	29.	8.	24.	14.	25.	12.	34.	19.	35.	
69784B	4	2640	1433.22	628.31	1273.72	553.90	1046.39	3502.32	4935.54	70.9612	29.	13.	26.	11.	21.	18.	36.	16.	30.	
69784C	4	2670	5207.80	739.73	972.52	388.93	534.34	2635.52	7843.32	33.6021	67.	9.	12.	5.	7.	28.	37.	15.	20.	
69784D	4	2700	4981.40	1121.20	2728.26	1459.72	2348.99	7658.17	12640.57	60.5841	39.	9.	22.	12.	19.	15.	35.	19.	31.	
69784E	4	2730	6035.97	2222.97	6846.14	3956.78	7127.87	20153.75	26188.72	76.9558	23.	8.	26.	15.	27.	11.	34.	20.	35.	
69784F	4	2765	4285.00	1290.67	4747.20	2789.26	4784.51	13611.63	17897.63	76.0527	24.	7.	27.	16.	27.	9.	35.	20.	36.	
69784G	4	2795	4789.00	1280.40	3537.22	2045.06	3620.24	10482.92	15270.92	68.6463	31.	8.	23.	13.	24.	12.	34.	20.	34.	
69784H	4	2825	4407.80	917.02	2780.39	1758.89	3053.75	8510.05	12918.85	65.8731	34.	7.	22.	14.	24.	11.	33.	21.	35.	
69784I	4	2855	4727.64	1195.13	3242.67	1759.05	3378.81	9575.66	14303.29	66.9472	33.	8.	23.	12.	24.	12.	34.	18.	36.	
69784J	4	2885	11641.48	3627.82	7858.10	3441.43	8877.23	23804.57	35446.05	67.1572	33.	10.	22.	10.	25.	15.	33.	14.	38.	
69784K	4	2915	15342.20	8055.35	11956.79	2837.07	7843.44	30692.64	46033.84	66.6741	33.	17.	26.	6.	17.	26.	39.	9.	26.	
69784L	4	2945	25228.80	9664.00	11923.20	2635.58	6910.08	31132.85	56361.65	55.2376	45.	17.	21.	5.	12.	31.	39.	8.	22.	
69784M	4	2975	134275.28	55040.00	30213.23	3705.22	7939.59	96898.00	231173.28	41.9157	58.	24.	13.	2.	3.	57.	31.	4.	8.	
69784N	4	3005	77503.98	32938.66	16604.16	1914.53	4697.97	56155.29	133659.25	42.0138	58.	25.	12.	1.	4.	59.	30.	3.	8.	
69784O	4	3035	18240.00	9210.67	10276.03	2331.69	5475.20	27293.57	45533.57	59.9417	40.	20.	23.	5.	12.	34.	37.	9.	20.	
69784P	4	3065	32879.25	10742.15	6954.18	1046.84	2535.00	21278.15	54157.41	39.2895	60.	20.	13.	2.	5.	50.	33.	5.	12.	
69784Q	4	3095	30181.40	18552.00	19563.98	4189.59	9855.36	52160.89	82343.28	63.3456	37.	23.	24.	5.	12.	36.	37.	8.	19.	
69784R	4	3125	38549.87	11025.75	10294.12	2631.84	5539.15	29490.83	68040.70	43.3429	57.	16.	15.	4.	8.	37.	35.	9.	19.	
69784S	4	3155	12225.60	5174.40	5418.43	994.56	2841.44	14428.82	26654.42	54.1329	46.	19.	20.	4.	11.	36.	37.	7.	20.	
69784T	4	3185	17385.60	5584.00	5799.31	1156.17	2940.56	15480.03	32865.62	47.1010	52.	17.	18.	4.	9.	36.	38.	7.	19.	
69785A	4	3215	8311.40	3652.27	4813.44	1086.28	3263.72	12815.70	21126.10	60.6629	39.	17.	23.	5.	15.	28.	39.	8.	25.	
69785B	4	3245	11431.85	4371.20	5833.34	1244.33	3667.01	15115.87	26547.72	56.9385	43.	16.	22.	5.	14.	29.	39.	8.	24.	
69785C	4	3275	8677.74	2850.87	2499.76	440.69	1259.26	7050.57	15728.31	44.8273	55.	18.	16.	3.	8.	41.	35.	6.	18.	
69785D	4	3305	4306.29	1612.91	2048.87	409.27	1080.99	5152.04	9458.33	54.4709	46.	17.	22.	4.	11.	31.	40.	8.	21.	
69785E	4	3335	33490.16	7318.40	4834.16	839.04	1911.04	14902.62	48392.77	30.7951	69.	15.	10.	2.	4.	49.	32.	6.	13.	
69785F	4	3365	15822.93	6876.44	6265.57	1017.12	2500.55	16659.67	32482.60	51.2880	49.	21.	19.	3.	8.	41.	38.	6.	15.	
69785G	4	3395	40195.19	9641.60	8472.09	1520.85	5923.60	25558.12	65753.31	38.8697	61.	15.	13.	2.	9.	38.	33.	6.	23.	
69785H	4	3425	5784.00	1104.00	996.91	174.05	366.98	2641.94	8425.94	31.3548	69.	13.	12.	2.	4.	41.	38.	7.	14.	
69785I	4	3455	7015.20	1796.80	1086.34	201.50	472.00	3556.64	10571.84	33.6426	67.	17.	10.	2.	4.	50.	31.	6.	13.	
69785J	4	3485	3332.80	693.07	752.10	204.58	489.86	2139.61	5472.41	39.0981	60.	13.	14.	4.	9.	32.	35.	10.	23.	
69785K	4	3515	2253.60	460.46	430.40	101.77	234.91	1227.54	3481.14	35.2626	65.	13.	12.	3.	7.	38.	35.	8.	19.	
69785L	4	3545	1747.24	540.17	586.05	140.60	307.07	1573.89	3321.13	47.3902	53.	16.	18.	4.	9.	34.	37.	9.	20.	
69785M	4	3575	559.70	132.01	144.13	36.39	83.12	395.65	955.35	41.4141	58.	14.	15.	4.	9.	33.	37.	9.	21.	
69785N	4	3605	1372.64	169.12	135.32	31.26	74.08	409.78	1782.42	22.9901	77.	9.	8.	2.	4.	41.	33.	8.	18.	
69785O	4	3635	1167.60	248.80	371.52	92.00	190.57	902.89	2070.49	43.6075	57.	12.	18.	4.	9.	28.	41.	10.	21.	
69785P	4	3665	1266.40	416.20	590.15	134.07	294.61	1435.03	2701.43	53.1211	47.	15.	22.	5.	11.	29.	41.	9.	21.	
69785Q	4	3695	914.47	221.21	245.33	64.42	150.46	681.42	1595.89	42.6984	58.	14.	15.	4.	9.	32.	37.	9.	22.	
69785R	4	3725	1056.75	182.61	249.68	74.82	208.05	715.16	1771.91	40.3609	60.	10.	14.	4.	12.	26.	35.	10.	29.	

B = CUTTINGS NOT ANALYZED *C* = AIR SPACE GAS NOT RUN *BC* = NO ANALYSES RUN

Table 2 Descriptions of "Picked" Samples, and Total Organic Carbon

(Lithology by Hahn; TOC by Adams)

Depth (meters)	EPR No.	Unit (EEPN)	Gross Lithology	GSA Color Code	Total Organic Carbon (%)
2060 - 2090	69783-C	Tertiary?	Shale, olive gray to med. gy., some calc., tr. pyrite	5Y4/1-N5	.30
2140 - 55	69783-F	"	Shale, med. gray, some silty, some calc.	N5	.40
2240 - 55	69783-I	U. Cret.?	Shale, med. gray to greenish gray	N5-5GY6/1	.34
2270 - 85	69783-J	"	Shale, med. dk. gray to med. greenish gray	N4-5GY5/1	.42
2330 - 45	69783-L	U. Cret.	Shale, dk. greenish gray, some calc.	5GY4/1	.47
2360 - 75	69783-M	"	Shale, med. dk. to med. gray	N4 - N5	.53
2435 - 50	69783-P	"	Shale, med. gray to dk. gray, some calc.	N5 - N3	.55
2505 - 20	69783-S	"	Shale, med. dk. gray to dk. greenish gray, some silty, some calc.	N4 - 5GY4/1	.65
2595 - 610	69784-A	"	Shale, med. dk. gray, some silty, traces of coal	N4	1.42
2625 - 40	69784-B	"	Shale, med. dk. gray, plus med. lt. gray limestone	N4; N6	.76
2715 - 30	69784-E	"	Shale, med. gray to med. lt. gray, some mod. calc., traces limestone	N4 - N6	.77
2810 - 25	69783-H	"	Shale and siltstone, med. dk. gray to lt. olive gray, traces coal, drilling mud	N4 - 5Y6/1	.96(?)
2870 - 85	69783-J	L. Cret.	Shale, med. dk. gray to olive gray, some calc., some silty	N4 - 5Y4/1	.72
2900 - 15	69783-K	Dogger sh.	Shale, olive black to lt. olvie gray, some silty, tr. pyrite	5Y1/1 - 6/1	2.38
2960 - 75	69783-M	Brent	Shale, med. gray to olive black, some calc., tr. of coal; pipe dope present	N5 - 5Y2/1	2.46
2990 - 3005	69784-N	"	Shale, lt. brownish gray to brownish black, some calc., pipe dope present	5YR6/1 - 2/1	3.88
3020 - 35	69784-O	"	Shale, med. dk. gray to olive black, some calc., coal laminae, traces limestone; pipe dope	N4-5Y2/1	3.04
3036.3 - 36.4	69799	"	Shale, olive black, micaceous, sl. silty	5Y2/1	2.50
3110 - 25	69784-R	Dunlin	Shale, med. gray to olive black, some calc., some silty; abundant pipe dope	N5 - 5Y2/1	2.55
3170 - 85	69784-T	"	Silty shale, brownish to olive black, abundant pipe dope	5YR2/1 - 5Y2/1	1.96
3230 - 45	69785-B	"	Shale, olive black, some silty		1.47
3260 - 75	69785-C	"	Shale, some silty, olive gray to olive black, traces pipe dope and coal	5Y4/1 - 2/1	2.15
3320 - 35	69785-E	"	Shale, some silty, med. olive gray to olive black, some calc., traces coal and pipe dope	5Y5/1 - 2/1	1.44
3380 - 95	69785-G	Statfjord	As above	5Y5/1 - 2/1	1.91
3440 - 55	69785-I	"	Shale, some silty, lt. olive gray to olive black, some calc., trace of pipe dope	5Y6/1 - 2/1	1.08
3530 - 45	69785-L	Triassic	As above (cavings?)	5Y5/1 - 2/1	.91
3620 - 35	69785-O	"	Shale, some silty, olive gray to olive black, trace of pipe dope	5Y4/1 - 2/1	.93
3680 - 95	69785-Q	"	Shale, some silty, olive gray to med. greenish gray to brownish black	5Y4/1-5GY5/1-5YR2/1	2.27
3710 - 25	69785-R	"	As above, plus v. dk. red to grayish brown siltstone	a.a plus 10R2/4-5YR3/2	1.05

Table 3 Visual Kerogen Descriptions and Organic Carbon, 34/10-2

(Kerogen by Morgan, TOC by Adams)

Max. Depth (meters)	EPR No.	Unit (EEPN)	Total Organic Carbon (%)	Kerogen Alteration	Types of Kerogen (% of Total)*					Kerogen Source Rating		
					H	W	C	IF	Other	Maturity	Richness	Type when Mature
2090	69783-C	Tert.	.30	1+	-	40	tr	40(H,C)	10A	Immature	Poor	Lean
2155	69783-F	Tert.	.40	1+	-	30	10	60(H,C)		"	Poor	Lean
2255	69783-I	U.K.(?)	.34	1+	10	40	20	30(H,W)		"	Poor	Lean
2285	69783-J	U.K.(?)	.42	1+	-	40	10	50(H,C)		"	Marginal	Gas
2345	69783-L	U.K.	.47	1+	-	30	10	60(H,W)		"	Marginal	Gas, Liquids
2375	69783-M	"	.53	2-	-	40	20	40(H,W)		"	Marginal	Gas
2450	69783-P	"	.55	2-	-	30	30	40(H,W)		"	Fair	Gas
2520	69783-S	"	.65	2-	-	30	20	50(H,W,C)		"	Fair	Gas
2610	69784-A	"	1.42	2-	-	30	20	50(H,W,C)		"	Good	Gas
2640	69784-B	"	.76	2	-	20	20	60(H,W,C)		"	Fair	Gas, Liquids
2730	69784-E	"	.77	2+	-	60	30	10(H)		"	Fair	Gas
2885	69784-J	L.K.	.72	2+	-	30	20	50(W,H)		"	Fair	Gas
2915	69784-K	Dogger	2.38	1+	10	10	10	50(H,W)	10A,10Al	"	Good	Oil, Gas
2975	69784-M	Brent	2.46	2-	10	40	20	30(W,H)		"	Good	Gas, Liquids
3005	69784-N	"	3.88	2-	-	30	10	20(H,Al)	40Al?	"	Rich	Oil, Gas
3035	69784-O	"	3.04	2-	10	20	20	50(W,H)		"	Rich	Gas, Liquids
3125	69784-R	Dunlin	2.55	2-	-	30	20	30(W,H)	20Al	"	Good	Gas, Liquids
3185	69784-T	"	1.96	2-	10	40	20	30(H,W)		"	Good	Gas, Liquids
3245	69785-B	"	1.47	2-	20	40	20	20(H,W,Al)		"	Good	Gas, Liquids
3275	69785-C	"	2.15	2-	-	40	20	40(H,Al)		"	Good	Gas, Liquids
3335	69785-E	"	1.44	2-	tr	30	20	40(H,Al)	trAl	"	Good	Gas, Liquids
3395	69785-G	Statfjord	1.91	2-	10	40	20	30(H,W)		"	Good	Gas, Liquids
3455	69785-I	"	1.08	2-	-	40	20	30(H,Al)	trN	"	Fair	Gas
3545	69785-L	Trias.	.91	2-	-	30	30	40(C,H)	trA	"	Fair	Gas
3635	69785-O	"	.93	2	-	30	20	50(W,H)		"	Fair	Gas
3695	69785-Q	"	2.27	2	-	50	10	40(H,Al)		"	Good	Gas, Liquids
3725	69785-R	"	1.05	2-	-	50	20	30(H)		"	Fair	Gas

*A - Amorphous
Al - Algal
H - Herbaceous
W - Woody
C - Coaly
N - Nonfilamentous Algal
IF - Indeterminate Fines
(H) - Best guess at identity of IF

Table 4 Light Gasolines (C_4-C_7) and Total Organic Carbon, 34/10-2

(Analyses by Adams)

Depth (meters)	EPR No.	Unit (EEPN)	Total Organic Carbon (%)	Total C_4-C_7 (ppm)	Correlation Ratios			
					C_1/C_2	A/D_2	C_1/D_2	CH/MCP
2090	69783-C	Tert.?	.30	1.4	3.87	4.84	4.68	1.05
2155	69783-F	"	.40	3.4	4.59	5.19	4.86	1.26
2255	69783-I	U. Cret.?	.34	42.2	3.43	5.33	6.13	1.53
2285	69783-J	"	.42	20.5	3.68	4.78	5.42	2.23
2345	69783-L	U. Cret.	.47	13.5	3.35	5.60	5.86	1.47
2375	69783-M		.53	15.5	3.46	5.25	5.13	1.42
2450	69783-P	"	.55	13.8	.40	2.13	1.93	1.40
2520	69783-S	"	.65	78.0	3.15	5.03	7.02	1.62
2610	69784-A	"	1.42	52.5	2.80	5.49	6.80	1.55
2640	69784-B	"	.76	11.5	2.94	4.82	6.88	1.40
2730	69784-E	"	.77	23.0	2.99	5.55	7.02	1.51
2825	69784-H	"	.96	87.7	3.81	4.71	4.71	1.68
2885	69784-J	L. Cret.	.72	37.3	2.73	6.34	5.38	1.43
2915	69784-K	Dogger sh.	2.38	141.6	1.85	6.03	10.51	1.41
2975	69784-M	Brent	2.46	126.4	2.61	6.36	12.06	1.76
3005	69784-N	"	3.88	78.5	2.43	5.88	11.16	1.63
3035	69784-O	"	3.04	97.1	2.14	5.33	9.39	1.59
3125	69784-R	Dunlin	2.55	23.6	2.48	5.66	7.11	1.47
3185	69784-T	"	1.96	43.2	2.32	5.12	8.29	1.44
3245	69785-B	"	1.47	41.7	2.21	5.77	9.13	1.37
3275	69785-C	"	2.15	57.4	2.14	6.19	10.96	1.48
3335	69785-E	"	1.44	61.4	2.14	6.10	8.91	1.36
3395	69785-G	Statfjord	1.91	65.7	2.30	5.96	11.91	1.64
3455	69785-I	"	1.08	25.2	2.96	4.77	10.64	1.81
3545	69785-L	Triassic	.91	22.4	2.51	5.82	8.25	1.47
3635	69785-O	"	.93	13.9	2.16	6.89	10.32	1.30
3695	69785-Q	"	2.27	18.6	2.54	5.59	7.19	1.40
3725	69785-R	"	1.05	24.8	2.76	4.96	5.59	1.28

Table 5 Heavy (C_{15+}) Soluble Organic Matter, 34/10-2

(C_{15+} by GeoChem)

Depth (meters)	EPR No.	Unit (EEPN)	Total Organic* Carbon (%)	Soluble Organic Matter ppm	Composition of Soluble O.M. (%)						Hydrocarbons			C_{15+} Source Rating	
					Sats.**	Aroms.	Eluted NSO's	Noneluted NSO's	Asphaltenes	Sulfur	ppm of rock	% of TOC	Sats./Aroms	Richness	Type
2240-85	69783-(I+J)	L. Cret.	.38	645	11.9	11.5	9.8	12.9	51.5	2.5	151	4.0	1.0	Marginal	Oil, Gas
2330-75	69783-(L+M)	"	.50	322	23.3	27.6	17.1	7.8	20.8	3.4	164	3.3	.8	Marginal	Oil
2685-2700	69784-D	"	.80(?)	499	21.8	29.0	15.8	7.8	19.3	6.3	254	3.2(?)	.8	Fair	Oil
2960-3005	69784-(M+N)	Dogger(Brent)	3.17	2264	13.1	27.4	13.7	16.7	26.2	2.9	917	2.9	.5	Good	Oil, Gas
3020-35	69784-O	"	3.04	1534	7.7	14.3	11.1	37.2	25.5	4.3	337	1.1	.5	Good	Gas, Liquids
3036.3+	69799†	"	2.50	1223	14.3	24.9	10.1	12.3	32.7	5.7	479	1.9	.6	Good	Oil, Gas
3110-25	69784-R	"	2.55	1746	5.1	10.4	8.0	36.1	33.8	6.7	270	1.1	.5	Good	Oil, Gas
3170-85	69784-T	Lias(Dunlin)	1.96	1647	18.0	21.5	12.4	13.4	24.2	10.5	651	3.3	.8	Good	Oil, Gas
3260-75	69785-C	"	2.15	1356	17.0	27.1	12.8	13.2	24.6	5.3	598	2.8	.6	Good	Oil, Gas
3530-45	69785-L	Trias.	.91	211	9.4	21.2	20.2	1.0	44.8	3.4	65	.7	.4	Fair	Gas
3620-35	69785-O	"	.93	133	4.6	0.0	0.0	48.9	46.6	-	6	.06	.0	Poor	Nonsource (Gas?)

†Core Sample; others are all cuttings

* Average values from Table 1
** See Figs. 2-12 for gas chromatograms of heavy saturates

Table 6 Vitrinite Reflectivity Values*
(Geo-Strat)

Depth (meters)	EPR No.	No. of Observations	R_o Min. (%)	R_o Max. (%)	R_o Avg. (%)
2450	69783-P	65	.26	.82	.45
a. Population 1			.26	.43	.35
b. Population 2			.46	.82	.64
2975	69784-M	55	.53	.83	.68
3005	69784-N	50	.57	.77	.66
3035	69784-O	55	.51	.76	.67
3335	69785-E	55	.53	.70	.63

* All samples were coal chips, which may not have been indigenous to designated sample intervals.

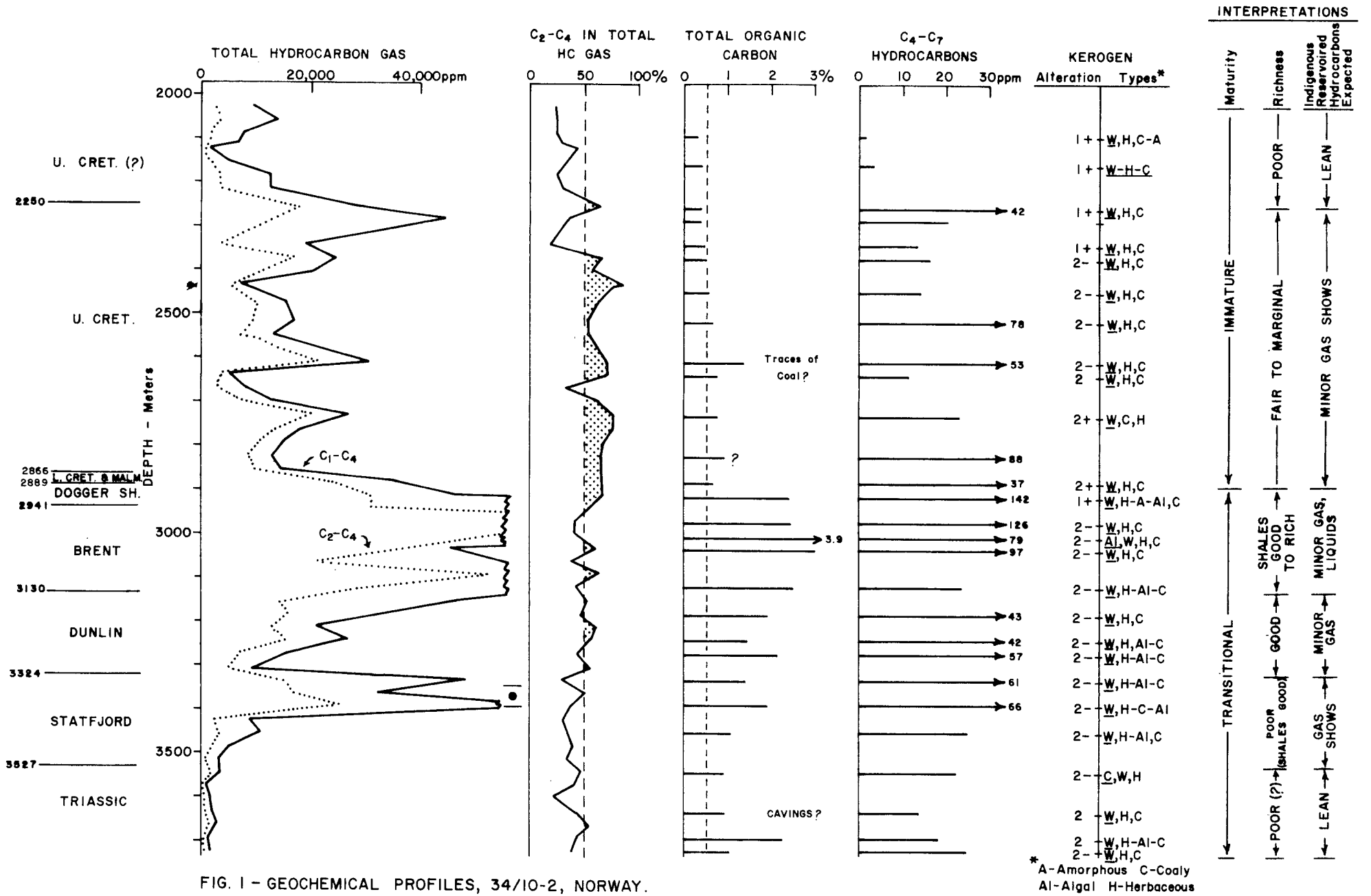

FIG. 1 - GEOCHEMICAL PROFILES, 34/10-2, NORWAY.

C_{15+} Paraffin-Naphthene Hydrocarbon

GeoChem No. E308-001

Exxon No. 69783-J

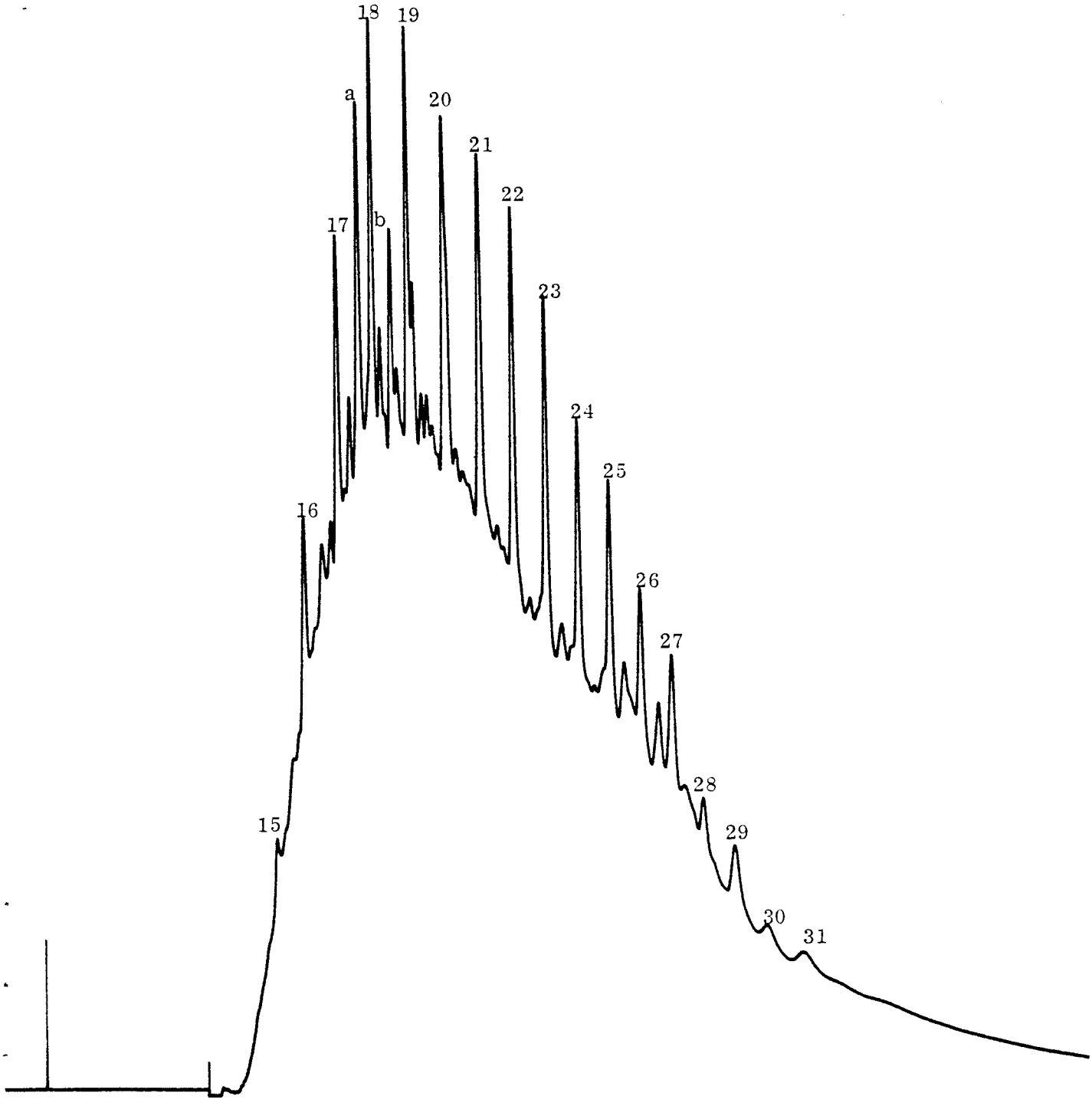

Fig. 2 Cuttings Extract, 2240 - 2285 meters

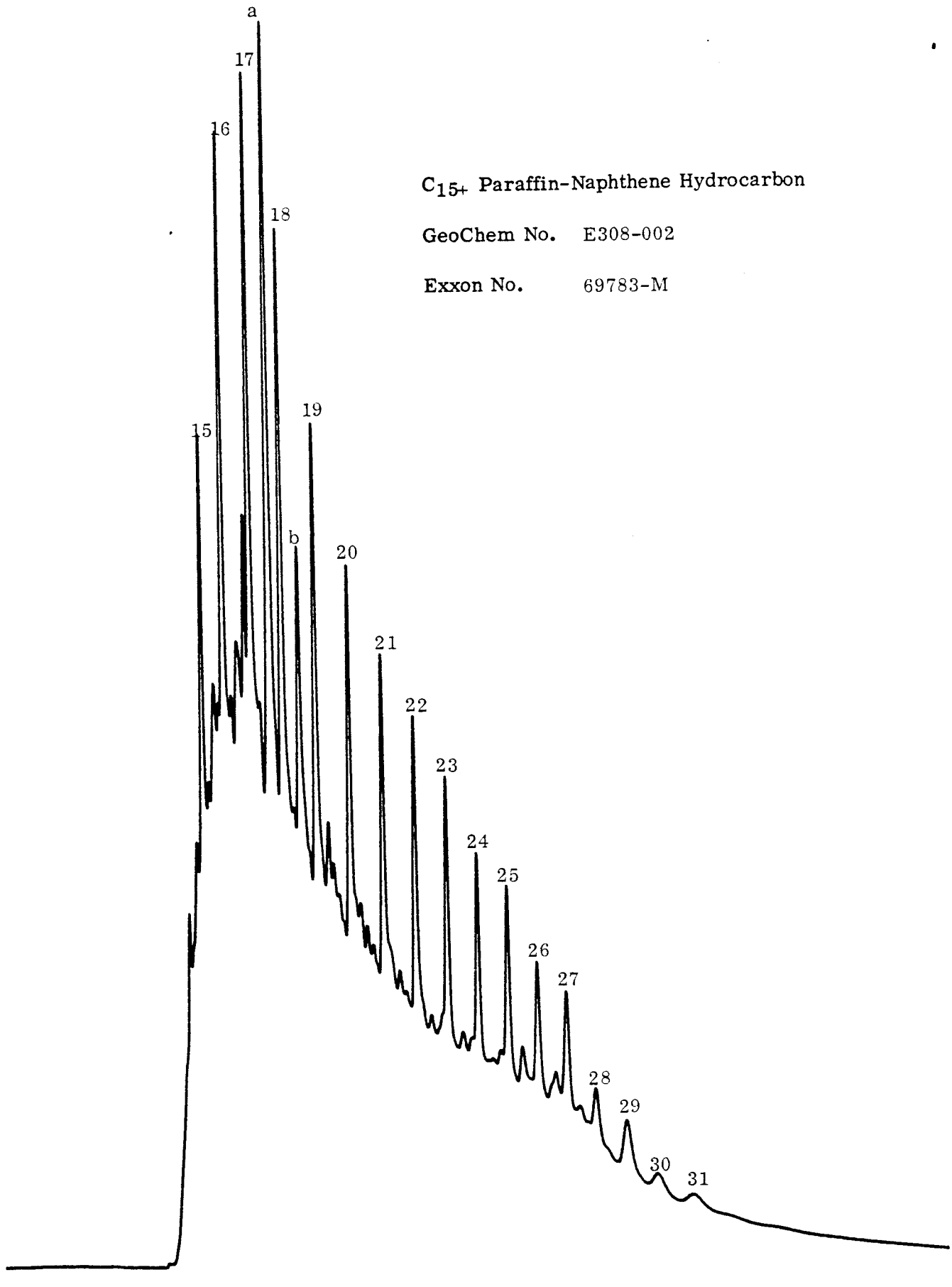

Fig. 3 Cuttings Extract, 2330 - 2375 meters

C_{15+} Paraffin-Naphthene Hydrocarbon

GeoChem No. E308-003

Exxon No. 69784-D

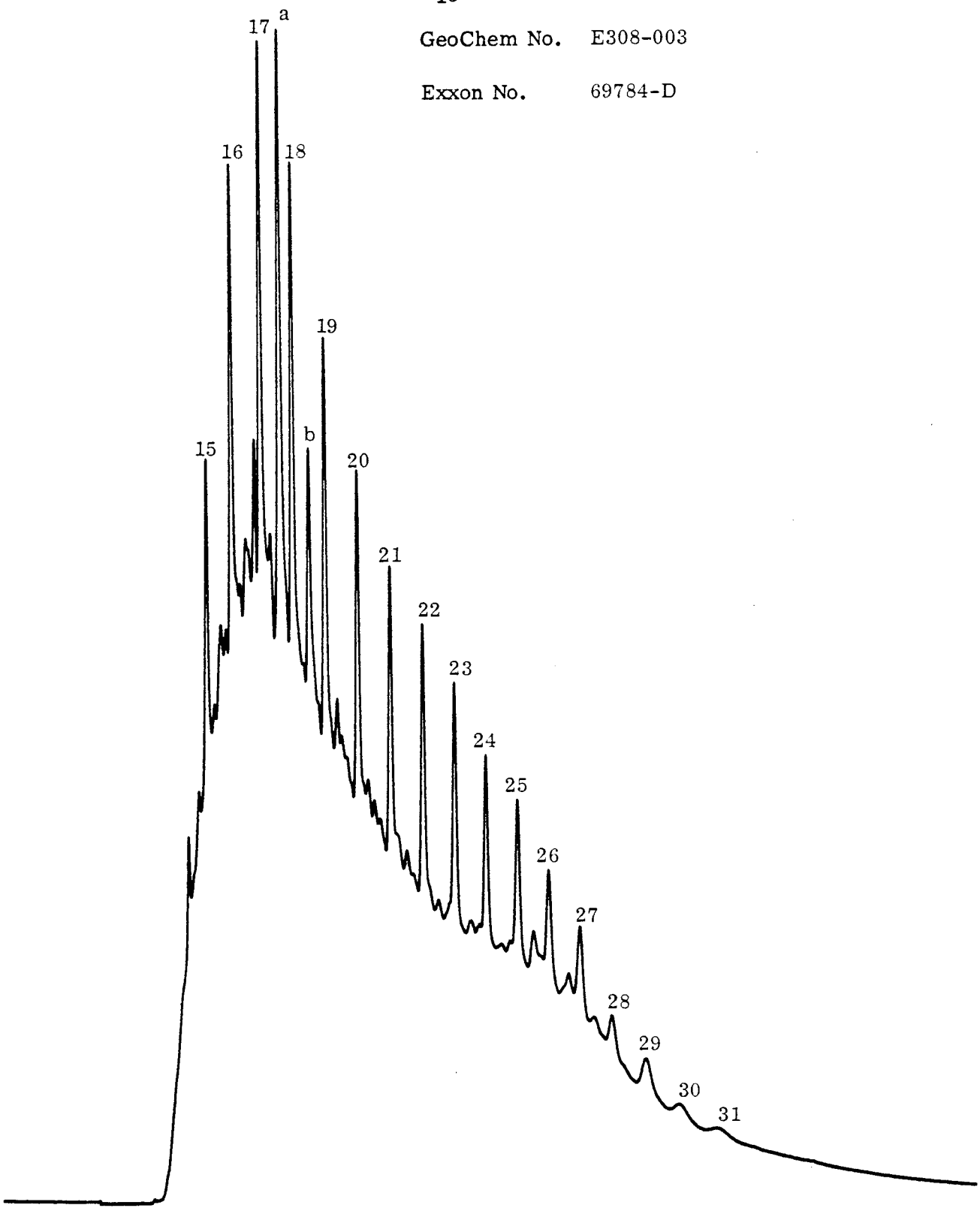

Fig. 4 Cuttings Extract, 2685 - 2700 meters

C_{15+} Paraffin-Naphthene Hydrocarbon

GeoChem No. E308-004

Exxon No. 69784-N

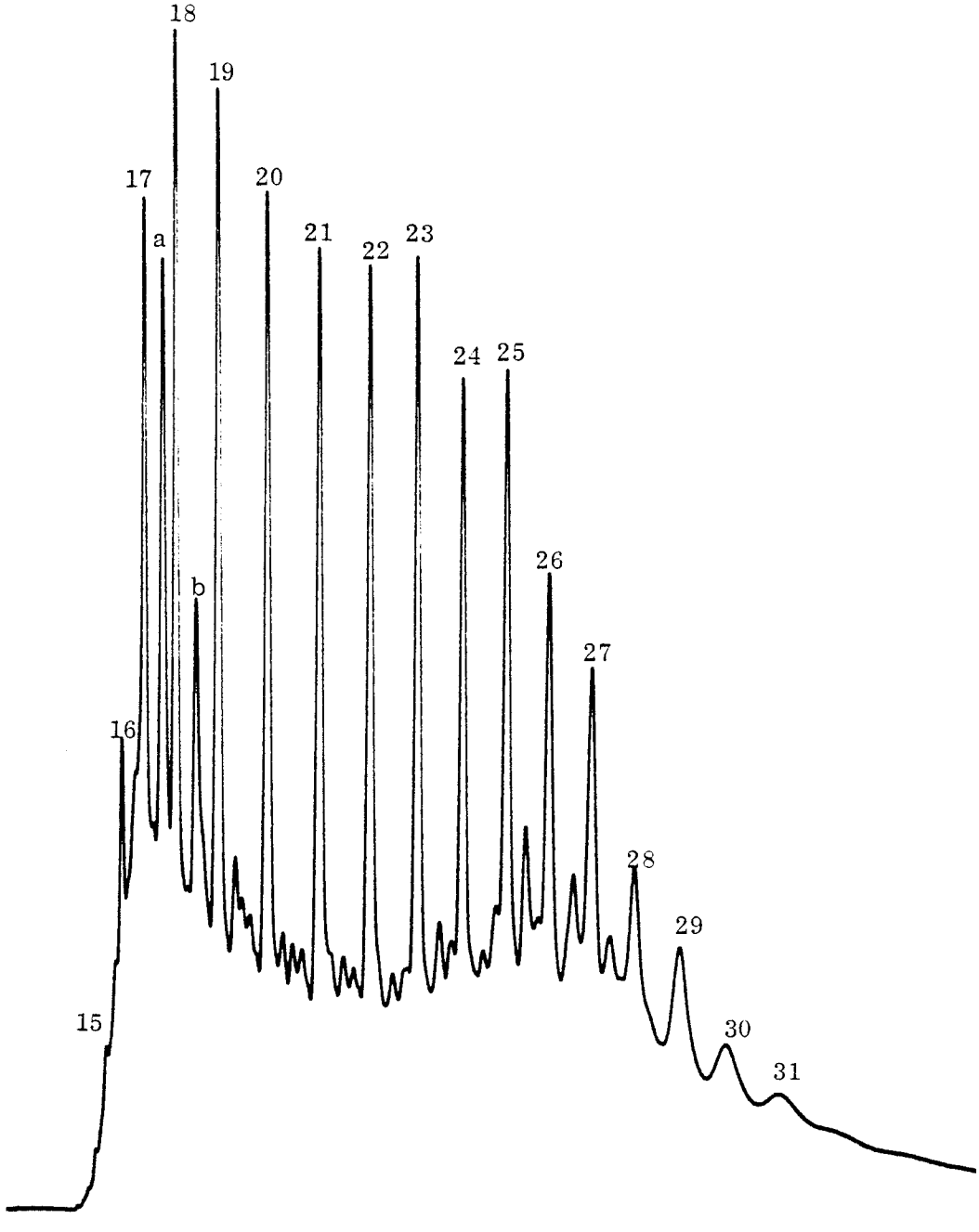

Fig. 5 Cuttings Extract, 2960-3005 meters

C_{15+} Paraffin-Naphthene Hydrocarbon

GeoChem No. E308-005

Exxon No. 69784-O

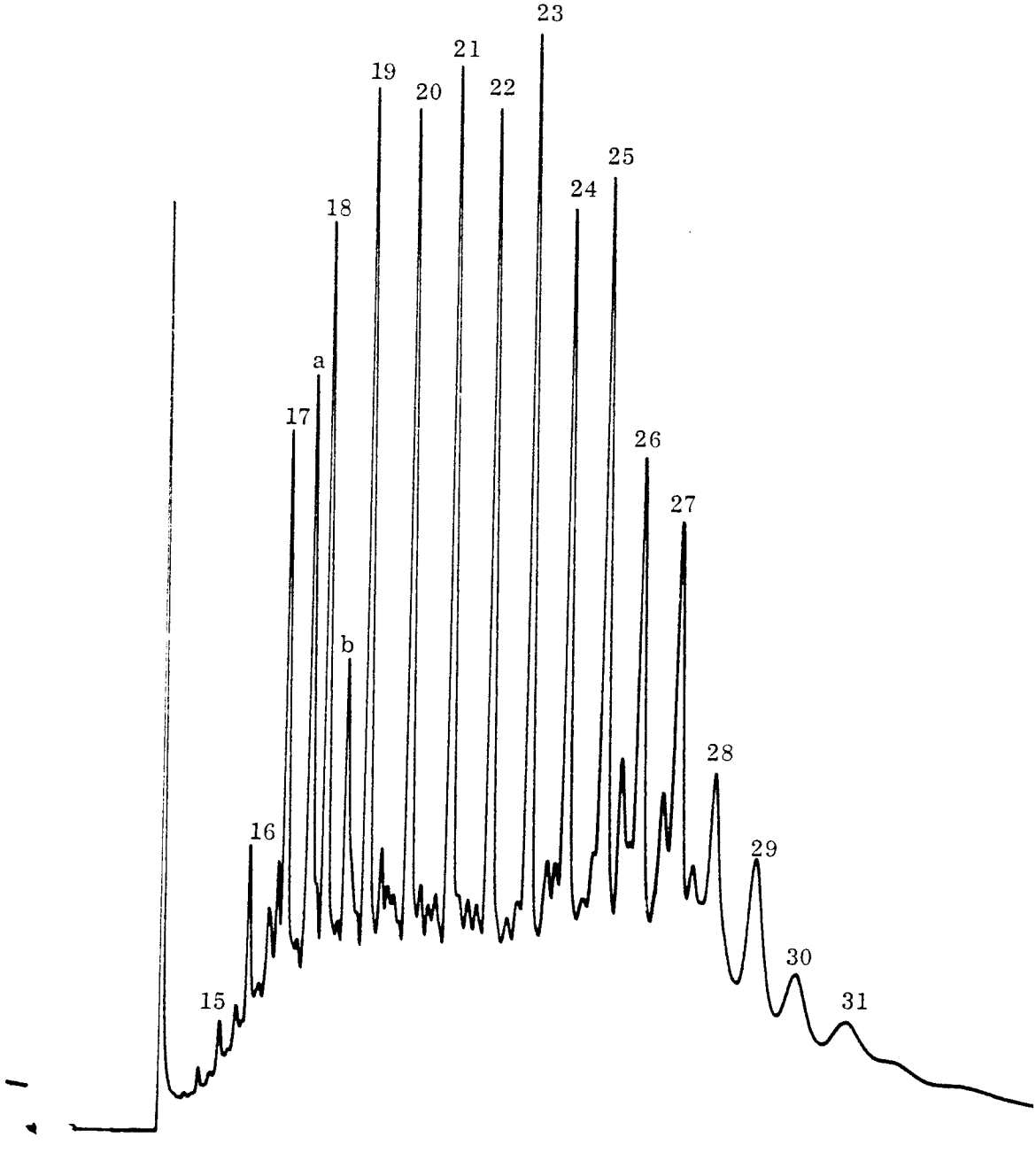

Fig. 6 Cuttings Extract, 3020 - 3025 meters

C_{15+} Paraffin-Naphthene Hydrocarbon

GeoChem No. E299-004

Exxon No. 69799

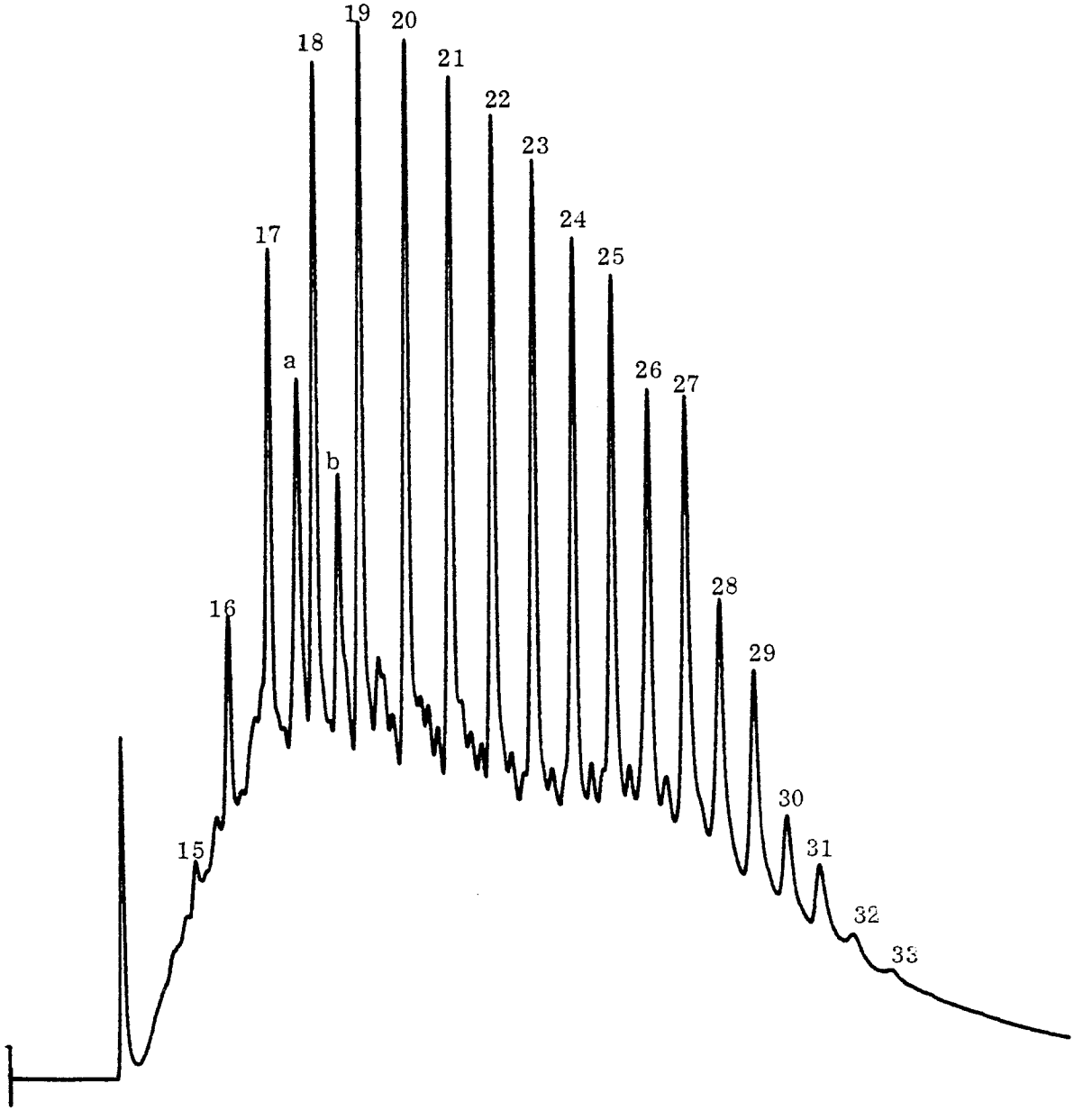

Fig. 7 Core Extract, 3036.3+ meters

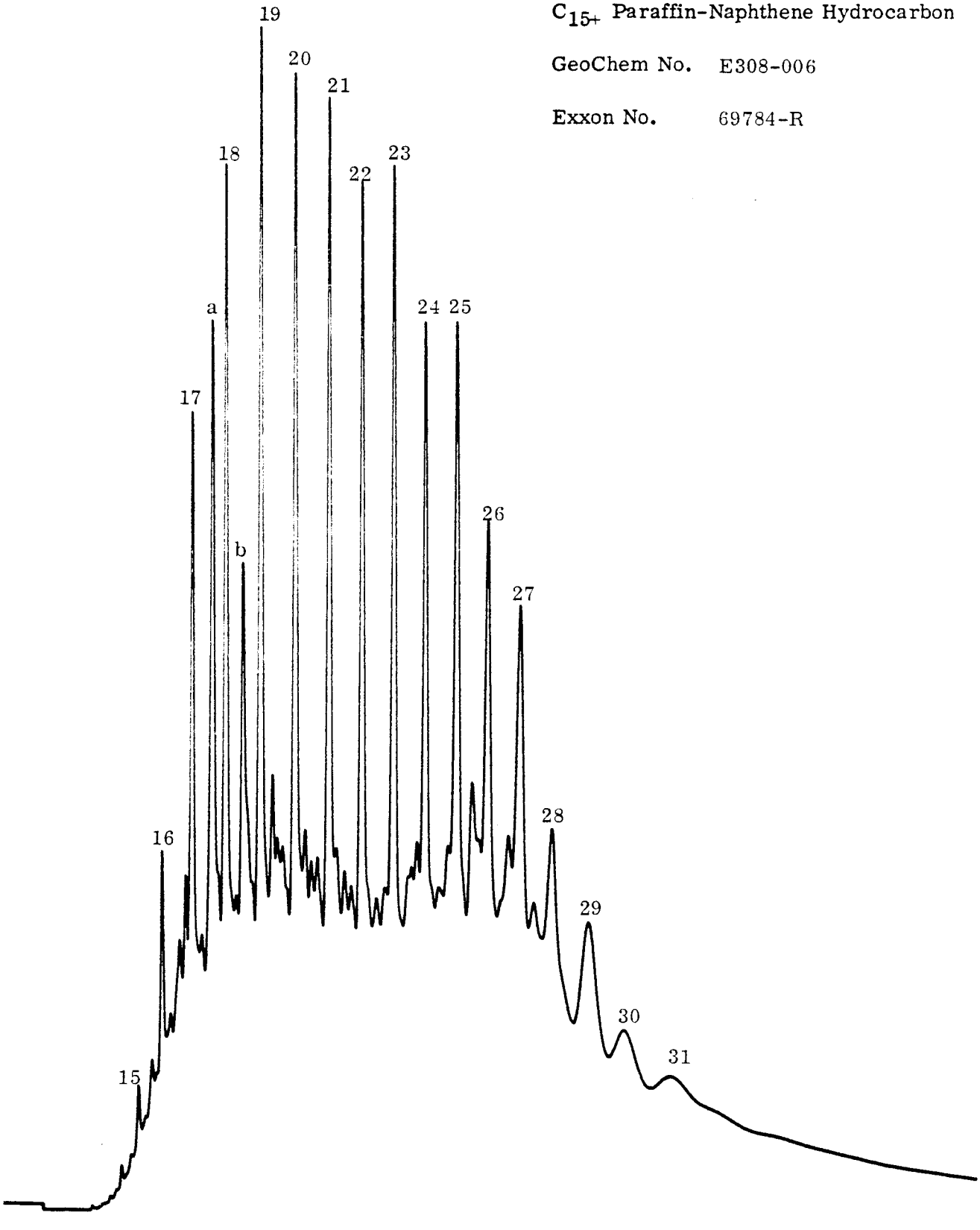

Fig. 8 Cuttings Extract, 3110 - 3125 meters

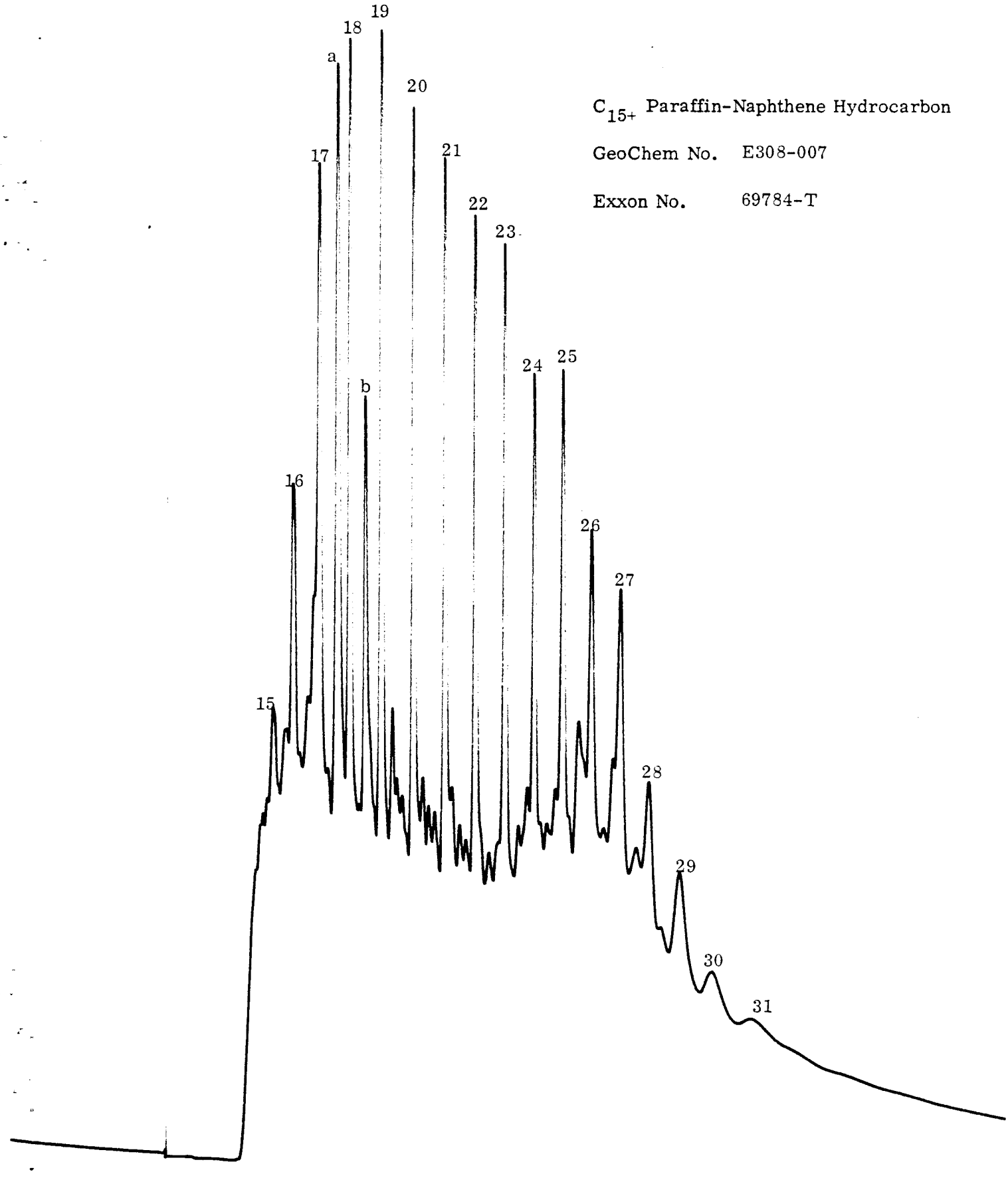

Fig. 9 Cuttings Extract, 3170 - 3185 meters

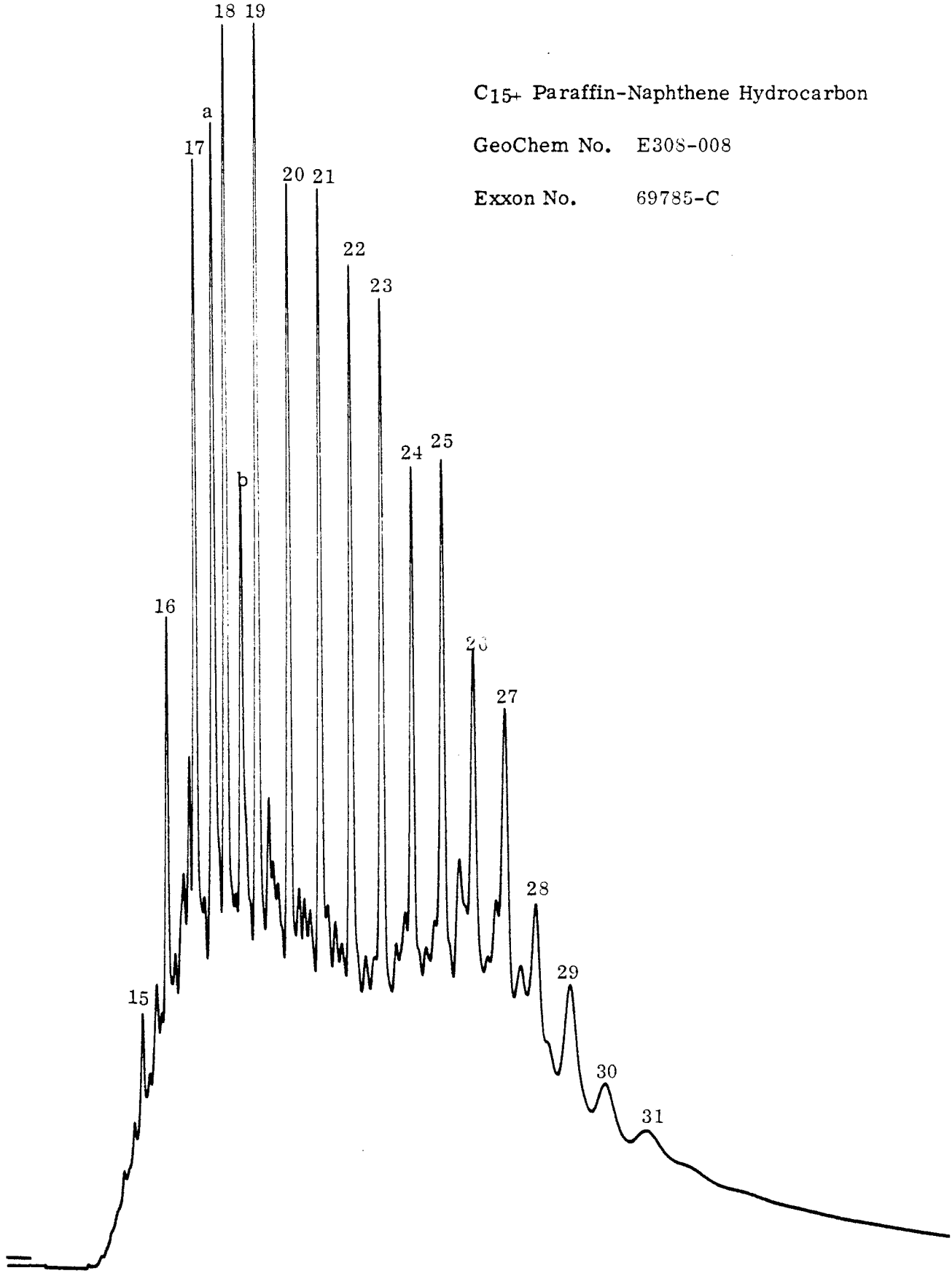

Fig. 10 Cuttings Extract, 3260 - 3275

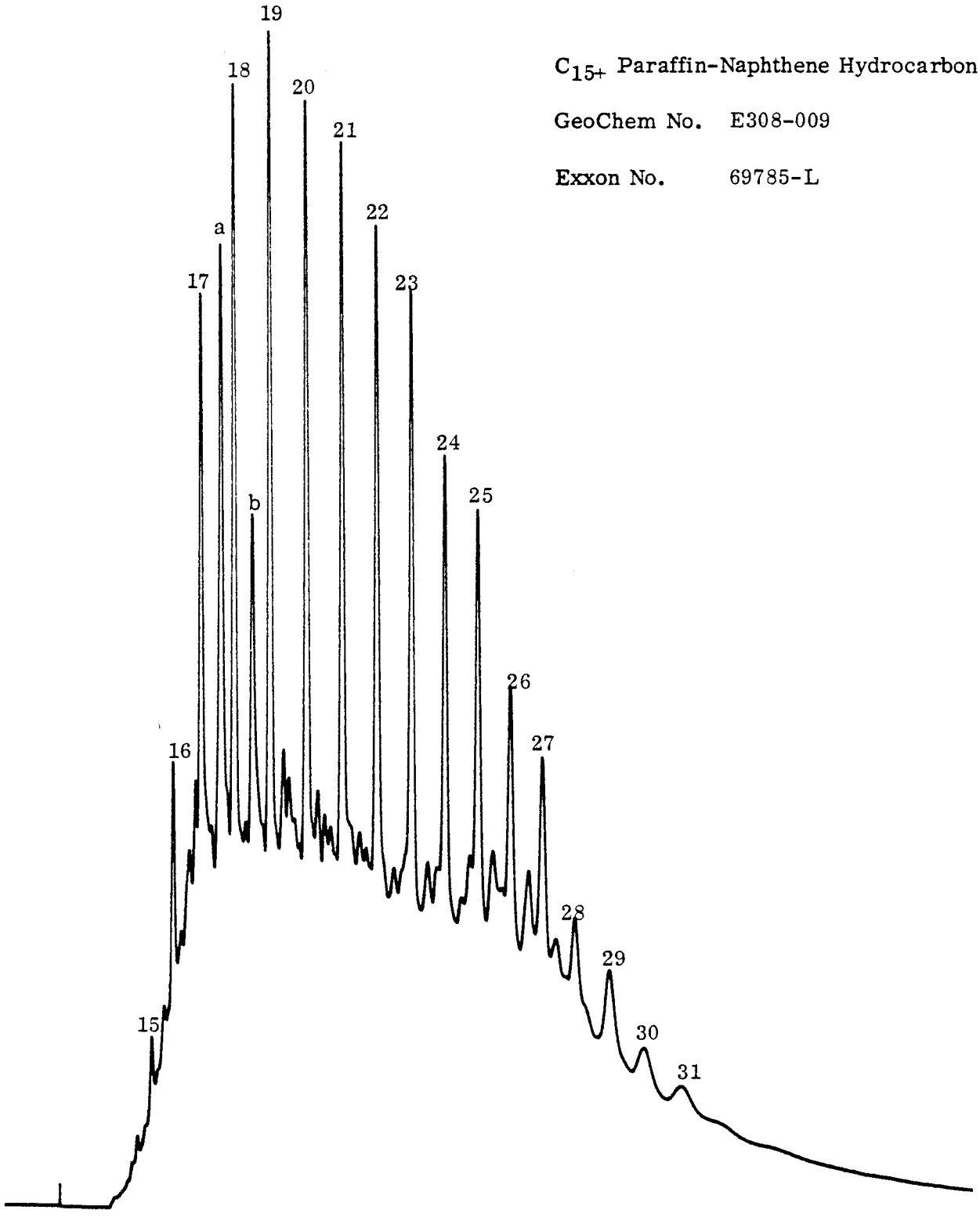

Fig. 11 Cuttings Extract, 3530 - 3545 meters

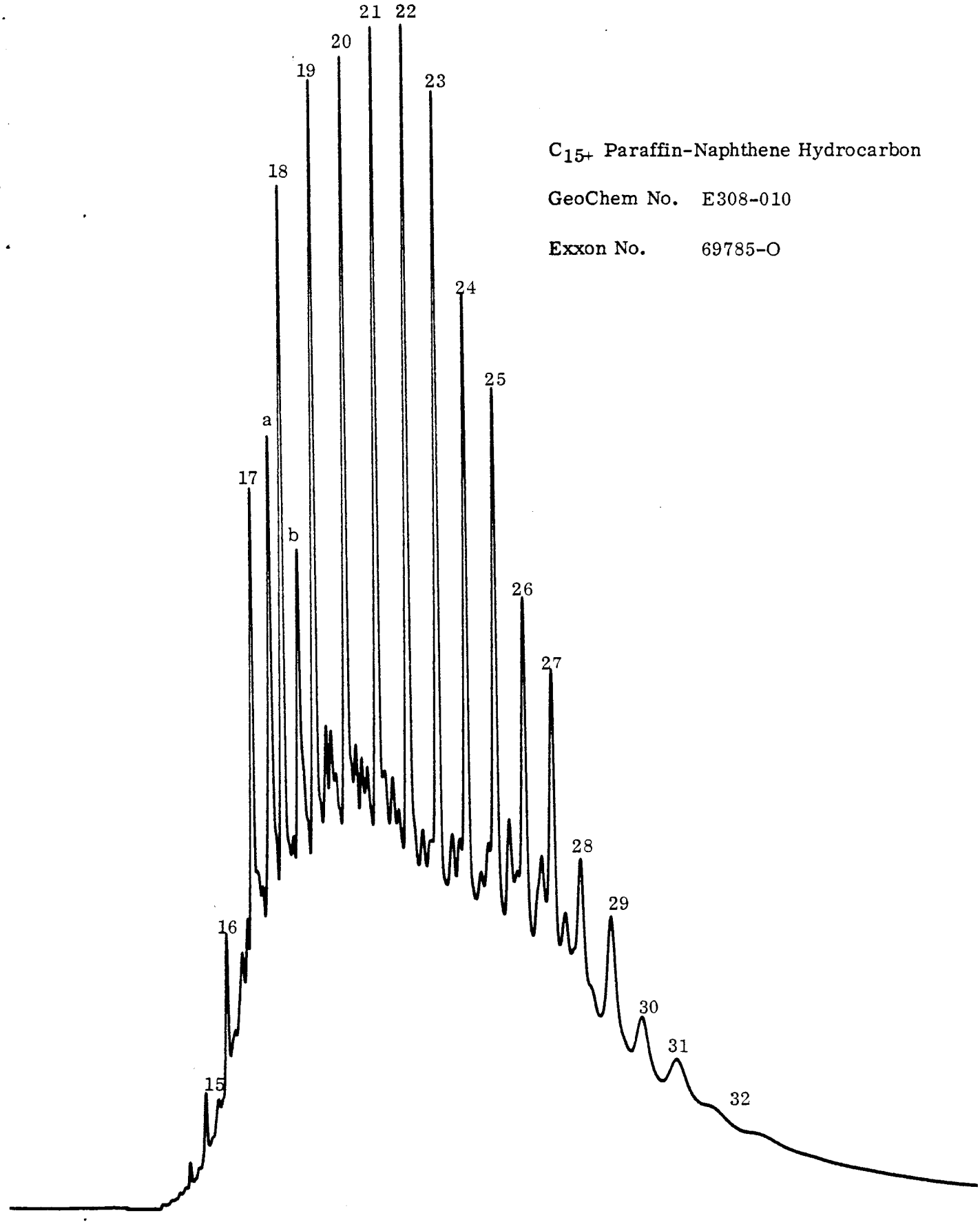

Fig. 12 Cuttings Extract, 3620 - 3625 meters

COMPANY EXXON GEO-STRAT NO. E-218-001 NUMBER OF OBSERVATIONS 65

TYPE OF SAMPLE Ctg. LOCATION DEPTH OR SAMPLE NO. 69783 P

STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 5-1-79

MIN. REFLECTANCE 0.26 (%Ro) MAX. REFLECTANCE 0.82 (%Ro) AVG. REFLECTANCE 0.45 (%Ro)

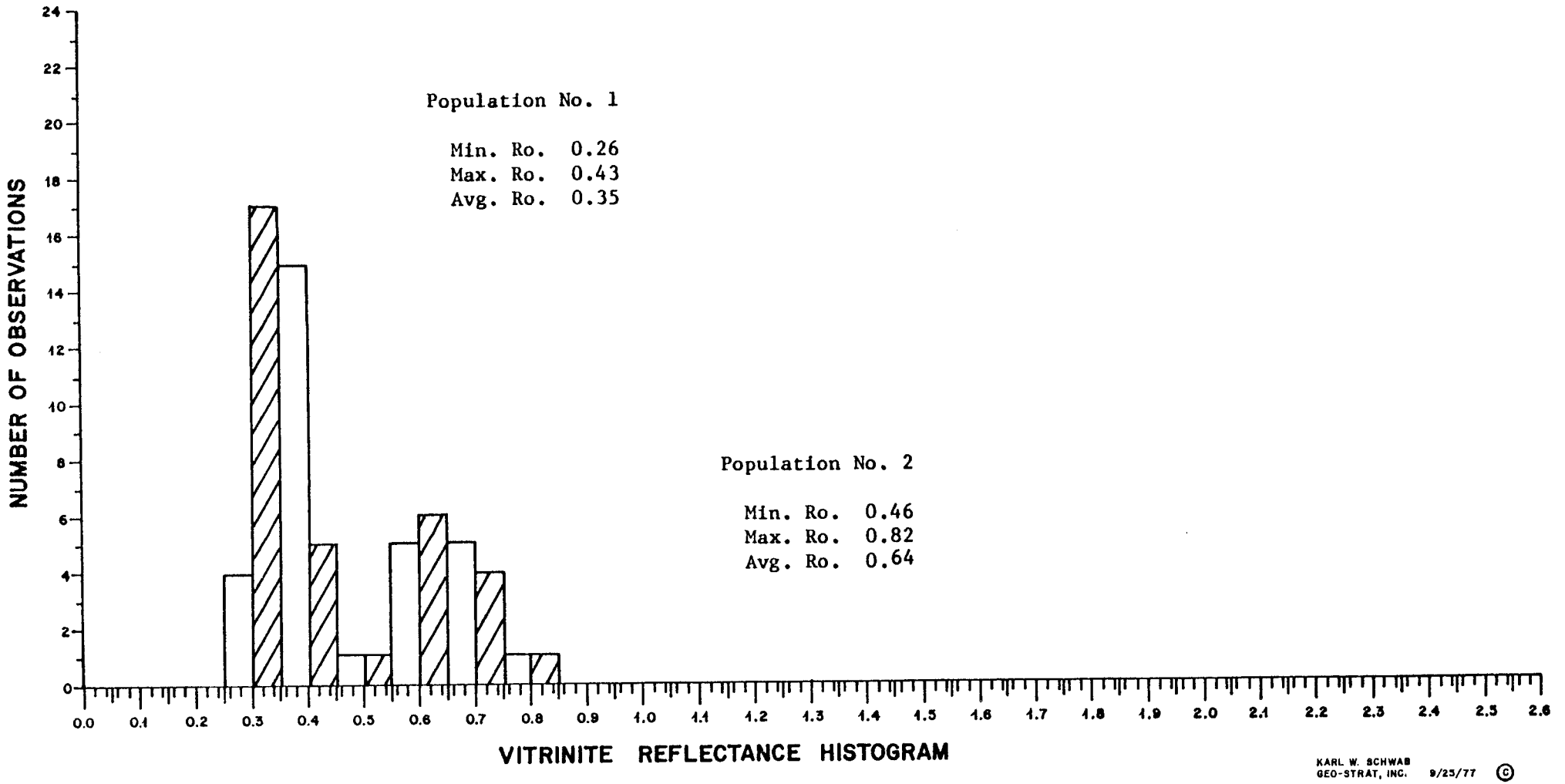

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Fig. 13 2480 meters

COMPANY EXXON GEO-STRAT NO. E-218-002 NUMBER OF OBSERVATIONS 55

TYPE OF SAMPLE Ctg. LOCATION DEPTH OR SAMPLE NO. 69784 M

STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 5-1-79

MIN. REFLECTANCE 0.53 (%Ro) MAX. REFLECTANCE 0.83 (%Ro) AVG. REFLECTANCE 0.68 (%Ro)

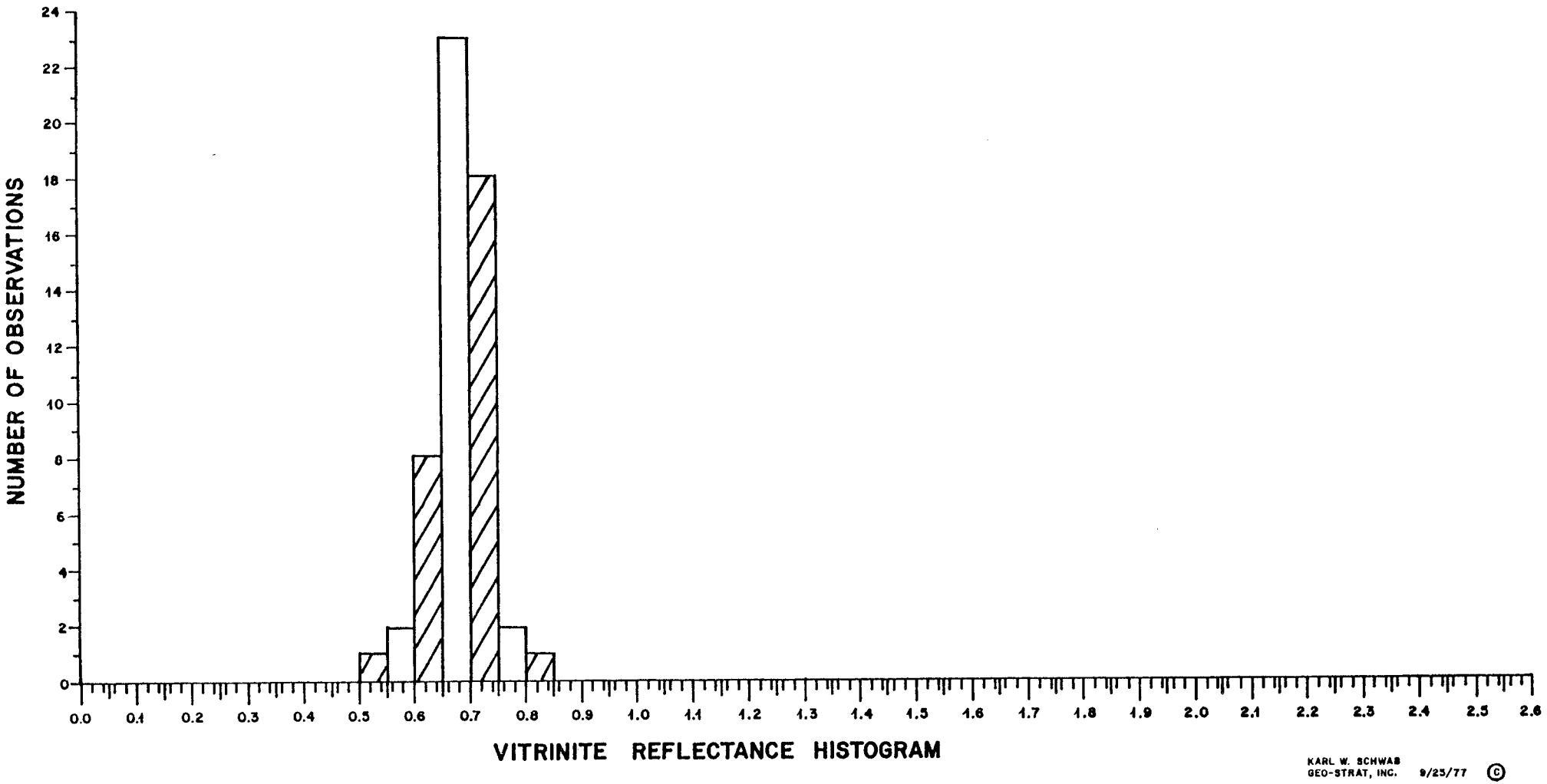

Fig. 14 2975 meters

COMPANY EXXON GEO-STRAT NO. E-218-003 NUMBER OF OBSERVATIONS 50

TYPE OF SAMPLE Ctg. LOCATION DEPTH OR SAMPLE NO. 69784 N

STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 5-1-79

MIN. REFLECTANCE 0.57 (%Ro) MAX. REFLECTANCE 0.77 (%Ro) AVG. REFLECTANCE 0.66 (%Ro)

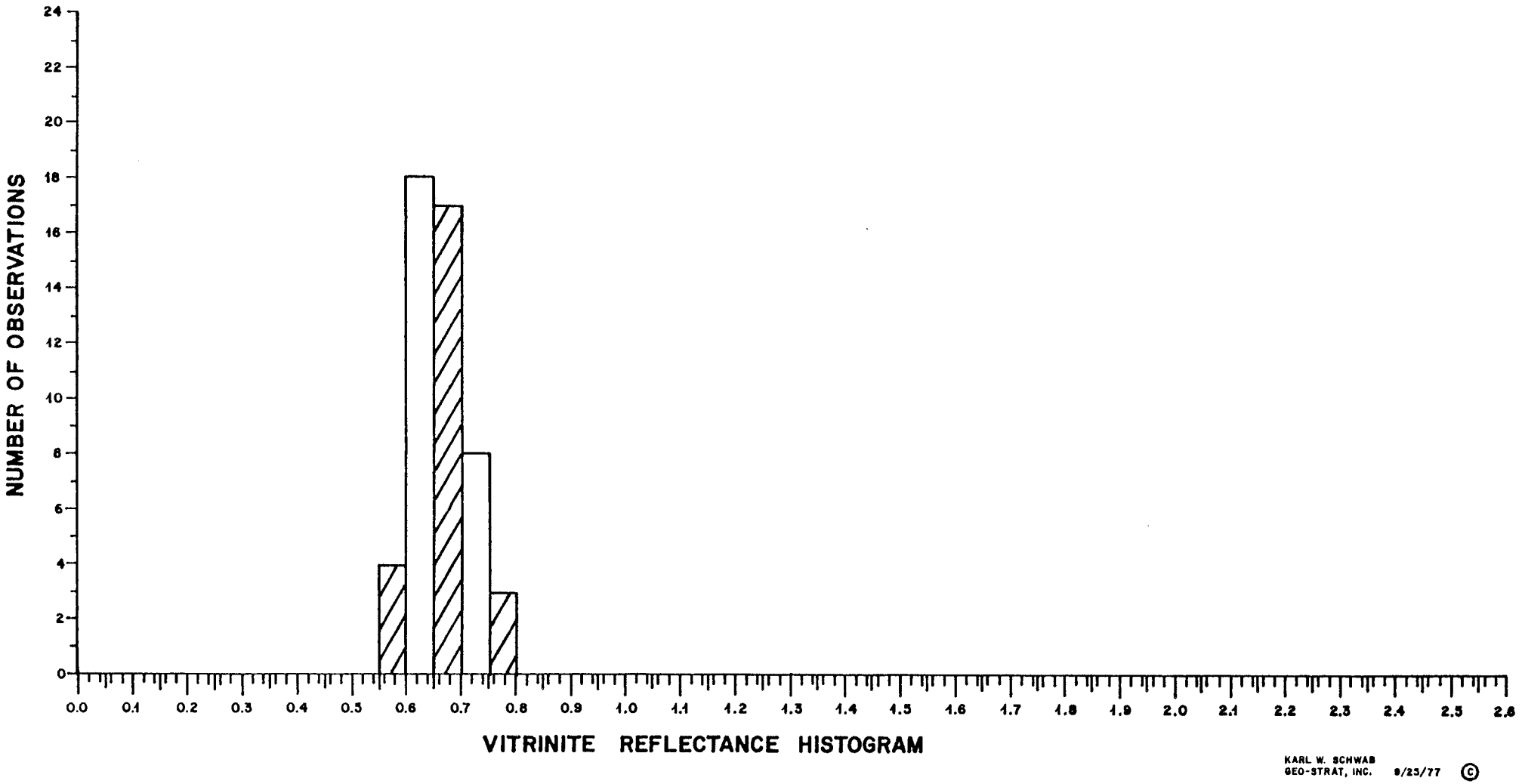

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Fig. 15 3005 meters

COMPANY EXXON GEO-STRAT NO. E-218-004 NUMBER OF OBSERVATIONS 55

TYPE OF SAMPLE Ctg. LOCATION DEPTH OR SAMPLE NO. 69784 O

STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 5-1-79

MIN. REFLECTANCE 0.51 (%Ro) MAX. REFLECTANCE 0.76 (%Ro) AVG. REFLECTANCE 0.67 (%Ro)

Fig. 16 3035 meters

COMPANY EXXON GEO-STRAT NO. E-218-005 NUMBER OF OBSERVATIONS 55

TYPE OF SAMPLE Ctg. LOCATION DEPTH OR SAMPLE NO. 69785 E

STANDARD %Ro : START 1.83 FINISH 1.83 OPERATOR K. W. Schwab DATE 5-1-79

MIN. REFLECTANCE 0.53 (%Ro) MAX. REFLECTANCE 0.70 (%Ro) AVG. REFLECTANCE 0.63 (%Ro)

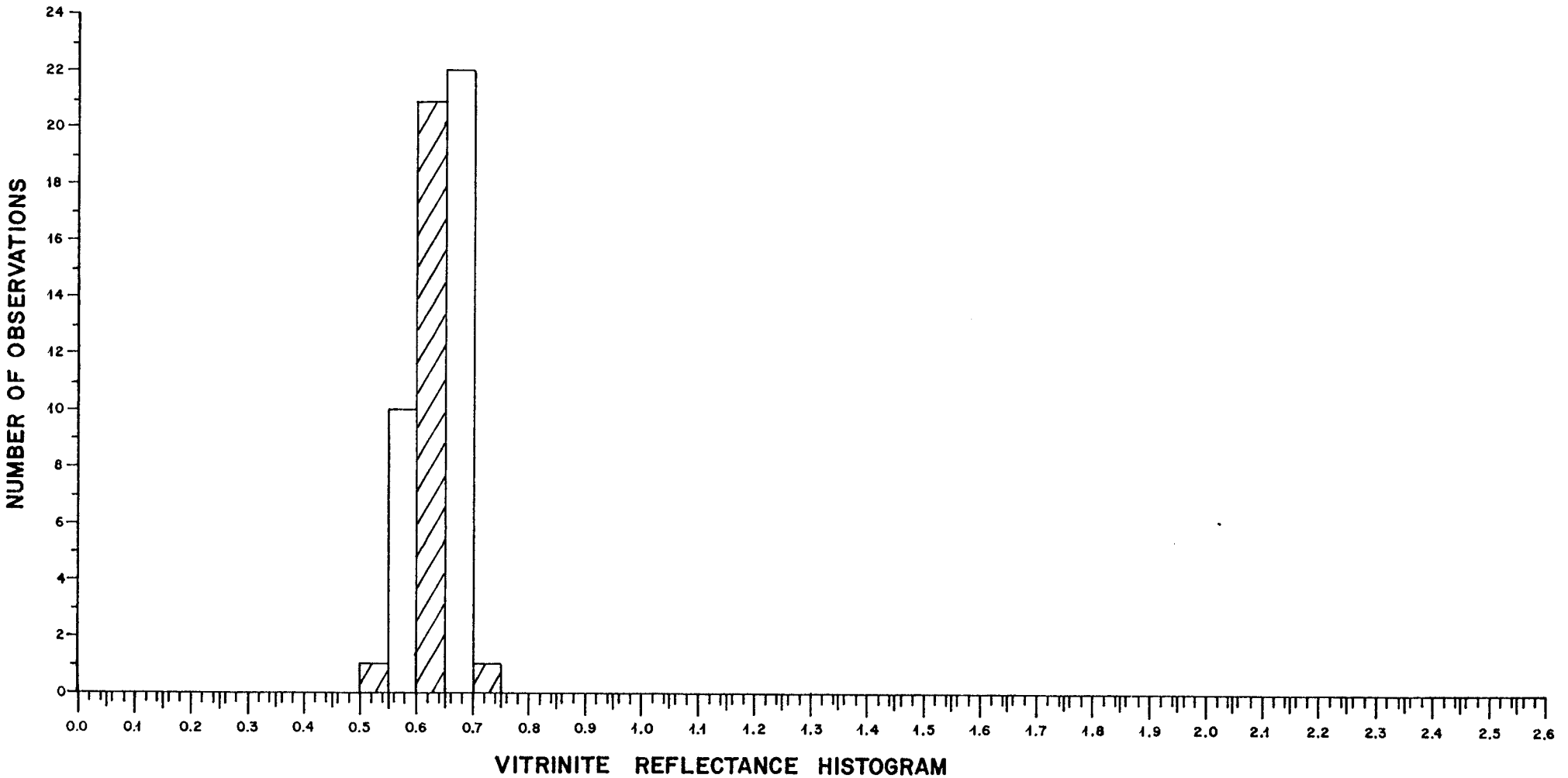

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Fig. 17 3335 meters