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GEOCHEMICAL SERVICE REPORT

Prepared for

MOBIL EXPLORATION NORWAY, INC.

Geochemical Evaluation

for

Hydrocarbon Source Potential

Well: Mobil Norwegian Wildcat 33/9-6

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CORE LABORATORIES, INC.

Source-Bed
Evaluation Services

January 6, 1977

Mobil Exploration Norway, Inc.
Borehaugen 1
P. O. Box 510
4001 Stavenger, Norway

Attention: C. W. Brown

Subject: Geochemical Evaluation
Well: Norwegian Wildcat 33/9-6
Our File Number: SBE/76105

Gentlemen:

This report presents the results of a geochemical study of the section between 495 meters and 3354 meters in the Mobil Norwegian Wildcat 33/9-6. The samples were submitted by C. W. Brown, Exploration Manager, Mobil Exploration Norway, Inc. Correspondence submitted with the samples instructed that the analyses be carried out according to Mobil standard procedures, and that consultation with the Mobil Field Research Laboratory (FRL) be made if necessary. A. J. Miller was the individual consulted at FRL.

A total of eighty-six cuttings samples were received for analysis. The samples were wet and packaged in air tight plastic bags and each sample generally covered a ten to thirty meters interval. The uppermost sample was at 495 meters, and the lowermost sample at 3354 meters.

No analytical work was carried out on any of the samples from the interval 495 meters to 2020 meters. This was due to the fact that the samples from the interval 495-1960 meters consisted entirely of soft clay and mud and could not be washed to a degree suitable for reliable geochemical analysis. Also, there were no samples present with legible depth figures for the interval 1960-2020 meters.

The condition of the samples ranged from fair to very poor. Virtually, all of the samples were badly contaminated with hydrocarbon based mud additives; contamination from Protecto Magic and diesel oil were particularly bad. The samples were however, shipped wet and sealed in air tight bags. Had this not been done, a comprehensive evaluation could not have been carried out. After receipt in our laboratory, extensive cleaning of all the samples was carried out with each being thoroughly cleaned with water, toluene, and methanol. Examination of the total data and in particular the gas chromatograms indicates that the sample cleaning procedures were successful, and that the effect of the initial contamination can be considered minimal. Caving was also a major problem throughout all of the well and in particular the lower 300 meters. A composite well log would have aided greatly in assessing the extent of the cave problem and would have enabled detailed handpicking of the samples in order to minimize the effect of the cave. Since such a log was not available, the analytical work had to be carried out primarily on the samples as received and any evaluation of the data should take the cave problem into account.

Total organic carbon (TOC) determinations were used for the initial screening. Samples for extraction work were then selected on the basis of the TOC screening data and conversations with A. J. Miller of Mobil FRL in Dallas, Texas. The vitrinite reflectance work and the kerogen analyses were carried out after review of the Carbon Preference Index (CPI) data indicated the possibility of extensive cave in the well.

The results of all analyses are tabulated in the attached Tables. A discussion of the results is also attached.

Thank you for the opportunity to be of service to Mobil Exploration Norway, Inc. Should you have any questions regarding these data, or if we may be of further service in any way, please feel free to call upon us.

Very truly yours,

Core Laboratories, Inc.

G. W. Ruth
Source-Bed Evaluation Services

GWR:tl

In the case of the 33/9-6 well, the TOC contents of the samples from the interval 2020 m. to 2920 m. ranges from 0.22% to 0.71% and hence are of below average richness. The visual descriptions show that the kerogens present consist primarily of woody material. The H/C data is limited due to the scarcity of organic material, but the data that are available indicate a hydrogen-poor kerogen. This predominance of woody material along with the low H/C values indicate a gas-prone kerogen type. There is evidence that the majority of the components making up the structured kerogen fraction are stratigraphically recycled items. A large amount of pyrite was present, often being imbeded in the kerogen. Evidence of considerable down-hole cave was also present.

Within the interval 2920 m. to 3037 m., the TOC values must be qualified in terms of the proportion of siltstone in the gross sample. In most of the samples from this interval, the siltstone is mixed with about equal proportions of limestone and/or sandstone. For this reason, the TOC content of the total sample was determined as was the TOC content of the siltstone. Both values are reported in Table 1. The TOC contents of samples from this interval (2920 m. to 3037 m.) ranged from 0.97% to 1.42% while the siltstones from this interval ranged from 0.81% to 2.31% and hence are of about average organic richness. Structured kerogens dominate the kerogen content of the samples from this interval and consist primarily of woody material. H/C values are again low although there is a slight increase within the interval 2920-2980. These H/C values are, however, still low and this fact along with the predominance of woody material indicate a gas-prone or gas-with-minor-oil kerogen type. Pyrite, down-hole cave and stratigraphically recycled items were also present.

The TOC contents of the analyzed samples from the remaining lower section indicate an organic richness of slightly less than average to about average. Most of the samples were of mixed lithologies and contained substantial amounts of limestone and sandstone. The kerogen descriptions and limited H/C data again indicate a gas-prone kerogen type present in the samples from 3037 m. to about 3200 m. The kerogen present in the samples from the interval 3199 m. to 3316 m. consists of less of the woody material and more of the exinitic kerogens. This fact along with the slightly higher H/C values indicate a kerogen type still gas-prone but with a potential for minor oil generation.

Level of Thermal Maturation

The interpretation of the vitrinite reflectance (R_o) data was difficult because of the scarcity of vitrinite, the presence of pyrite and stratigraphically recycled material, and the fact that all samples exhibited evidence of down-hole cave. There were only two samples (3172-3181 m. and 3307-16 m.) in which reflectance determinations could be made on the desired minimum of forty points.

For interpretative purposes, it is suggested that the following criteria be used:

R_o Value(s)	State of hydrocarbon generation and/or preservation
0.6	Transistion from IMMATURE to MATURE
0.7-1.0	Peak oil generation
1.0-1.3	Peak wet gas generation
1.3	Transition from MATURE to DRY GAS
1.5	Wet gas floor
1.3-3.0	Dry gas generation
>3.0	Dry gas degraded. Graphite final carbon product.

Based on these criteria, the reflectance data indicate that the section becomes thermally mature at approximately 2900 meters. Gradient projections (assuming a continuation of the same gradient at depth) give a projected depth of from 4310 to 4583 meters for the 1.3 R_o level (transition from MATURE to DRY GAS level of maturation).

Soluble Organic Matter and Associated Hydrocarbons

A total of twenty-seven samples were selected for Extractable Organic Matter (EOM) determinations. The EOM values obtained ranged from 18 ppm to 676 ppm and are all tabulated in Table 3. The following general criteria are suggested for interpreting the EOM data as it pertains to hydrocarbon source characterization:

EOM (ppm)	Interpretation
0-200	Inadequate
200-500	Marginal
500-1000	Adequate
> 1000	Rich

Based on these criteria and the organic richness (TOC) profile of the well, only one sample (2110-40m.) from the interval 2020-2920m. can be considered to have an EOM concentration above the minimum considered necessary (200 ppm) for source-rock characterization. When examining some of the other data, i.e., the H/C values and the visual kerogen descriptions along with the reflectance and CPI data, it would appear that the higher EOM value for the sample 2110-40 may be due to nonindigenous hydrocarbons. Slight contamination of the sample is suspected. The extractability values (EOM/TOC) for these samples is also low ranging from 0.4 to 3.9 and tend to support the previous data, i.e., poor kerogen

quality and thermal immaturity. The CPI values for this interval also indicate immaturity.

The samples from the interval 2920-3019m. show a marked increase in EOM content along with significant quantities of hydrocarbons. The extractability values are more indicative of mature sediments with the kerogen types found in this stratigraphic interval. These data, along with the mature petroleum-like CPI values support the interpretation of the reflectance data, i.e., thermal maturity beginning at about 2900 meters.

The EOM and EOM/TOC values from the lower 300 meters of section (~3000-3300m) indicate an interval lean in soluble organic matter although the lower ± 60 meters could be considered marginal. The CPI values for the samples from these lower 300 meters appear to be anomalously high when one considers the mature CPI and reflectance values for the samples at 2900 meters, the general decreasing trend of CPI values within the interval 2020-3000m., and the fact that kerogen quality is slightly better in the lower 300 meters of the well. These higher CPI values may be due to the down-hole cave material encountered throughout much of the well.

CONCLUSIONS

Combining the results of the organic carbon profiling, kerogen analysis, vitrinite reflectance analysis, and extractable organic matter analysis, the following integrated evaluation of the Mobil Norwegian Wildcat 33/9-6 Well is obtained:

495 to 2020 meters. Because of poor sample quality and/or illegible depth figures on the sample bags, no reliable analytical work could be carried out on samples from this interval.

2020 to 2920 meters. The interval is of below average organic richness and is thermally immature. Gas-prone kerogens dominate, and if at a sufficiently higher level of maturity, minor gas would be the likely hydrocarbon product.

2920 to 3037 meters. This interval of mixed lithologies (siltstone, limestone, sandstone) is thermally mature. The siltstones from this interval are of about average organic richness and minor to marginal amounts of mature hydrocarbons are present. Because of the kerogen type and quality, it is unlikely the sediments would yield more than minor amounts of liquid hydrocarbons even if more mature.

3037 to 3300 meters. This interval of mixed lithologies is of a maturity suitable for peak liquid hydrocarbon generation but is of slightly less than average organic richness. Soluble hydrocarbons are present but of minor to marginal quantity. Likely hydrocarbon products from the interval would be gas with minor oil.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
2020	ctgs	0.46	95% lt gy fis sltst 5% clr sd
2050-80	ctgs	0.55	90% lt gy fis sltst 10% yel brn clyst
2080-2110	ctgs	0.54	99% lt gy fis sltst 1% yel brn clyst
2110-40	ctgs	0.58	95% lt gy fis sltst 5% yel brn clyst
2140-70	ctgs	0.51	99% lt gy fis sltst 1% dk grn glau
2170-2200	ctgs	0.49	95% lt gy fis sltst 5% yel brn clyst
2200-30	ctgs	0.55	90% lt gy sltst 5% brn dol 5% yel brn clyst
2230-60	ctgs	0.44	Lt gy fis sltst
2260-90	ctgs	0.41	95% lt gy fis sltst 5% yel brn clyst
2290-2320	ctgs	0.38	85% lt gy fis sltst 15% lt gy ss
2320-50	ctgs	0.40	50% lt gy sdy sltst 50% lt gy ss
2350-80	ctgs	0.22	85% lt-md gy ss 15% lt gy sdy sltst
2380-2410	ctgs	0.37	80% lt-md gy ss 20% lt gy sdy sltst (0.68)

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
2410-40	ctgs	0.36	80% lt-md gy ss 20% lt gy sdy sltst (0.86)
2440-70	ctgs	0.31	90% lt-md gy ss 10% lt gy sdy sltst
2470-2500	ctgs	0.29	90% lt-md gy ss 10% lt gy sdy sltst
2500-30	ctgs	0.29	95% lt-md gy ss 5% lt gy sdy sltst
2530-60	ctgs	0.34	85% lt-md gy ss 15% lt gy sdy sltst
2560-90	ctgs	0.47	60% lt-md gy ss 40% lt gy sltst (0.68)
2590-2620	ctgs	0.50	50% lt-md gy ss 50% lt gy sltst (0.58)
2620-2650	ctgs	0.56	60% lt gy sltst 40% lt gy ss
2650-80	ctgs	0.51	80% md gy sltst 20% crm calc ss
2680-2710	ctgs	0.54	80% md gy sltst 20% crm calc ss
2710-40	ctgs	0.50	85% md gy sltst 15% crm calc ss
2740-70	ctgs	0.55	90% md gy sltst 10% crm calc ss
2770-2800	ctgs	0.45	50% md gy sltst (0.62) 40% vcol ls (0.14) 10% lt gy ss

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
2820-50	ctgs	0.54	99% md gy sltst 1% ss & ls
2830	ctgs	0.53	98% md gy sltst 1% wh ss 1% lt yel grn ls
2860-90	ctgs	0.71	80% md gy sltst 20% brn ls
2890-2920	ctgs	0.61	90% md gy brn sltst 10% brn ls
2920-50	ctgs	0.97	60% md gy brn sltst (0.81) 40% wh ls
2950-80	ctgs	1.02	50% md gy brn sltst (0.95) 25% wh ls 25% crm ss
2980-3000	ctgs	1.42	50% md gy brn sltst (1.73) 25% wh ls 25% crm ss
3010-19	ctgs	1.16	60% md gy brn sltst (2.31) 30% lt gy ss 10% wh-yel ls
3028-37	ctgs	1.10	50% md-dk gy brn shy sltst (2.20) 25% wh sd & ss 25% wh ls
3037-46	ctgs		90% wh uncons sd 10% lt-md gy sltst
3046-55	ctgs		90% wh uncons sd 10% vcol sltst

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
3055-64	ctgs		90% wh uncons sd 10% lt-md gy sltst tr pyr
3064-73	ctgs		85% wh uncons sd 15% vcol sltst
3073-82	ctgs		85% wh uncons sd 15% vcol sltst
3082-91	ctgs		90% wh uncons sd 8% lt-md gy sltst 2% pyr & carb mat
3091-3100	ctgs		90% wh uncons sd 8% vcol sltst 2% pyr
3100-09	ctgs		90% wh-crm calc sd & ss 10% md-dk gy sltst tr pyrite
3109-18	ctgs	0.71	50% wh calc ss 50% lt-md gy sltst tr pyrite
3118-27	ctgs	0.60	60% wh v calc ss 35% vcol sltst 5% pyr
3127-36	ctgs	0.56	50% md gy sltst (1.25) 50% wh ss tr pyrite
3136-45	ctgs	0.74	85% lt-md gy sltst 15% wh ss tr% pyr

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
3145-54	ctgs	0.60	70% crm calc ss & sd 30% lt-md gy sltst (1.00) 1% pyr
3154-63	ctgs	0.43	70% clr sd 25% md gy sltst (1.29) 5% pyr
3163-72	ctgs	0.48	60% clr-wh sd & ss 38% lt-md gy sltst (0.98) 2% pyr
3172-81	ctgs	0.69	90% lt-dk gy sltst 10% clr-crm sd & ss with tr pyr
3181-90	ctgs	0.78	70% lt-md gy sltst (1.21) 15% crm sd 15% arg ls
3190-99	ctgs	0.81	80% lt-md gy sltst 10% olv gr arg ls 10% clr sd with tr pyr
3199-32	ctgs	0.79	80% lt-md gy sltst 15% crm sd & ss 5% tn ls with tr pyr
3208-17	ctgs	0.83	55% lt-md gy sltst (1.31) 45% wh-crm calc ss
3217-26	ctgs	0.68	60% wh calc ss & sd 40% md-dk gy sltst (1.51)
3226-35	ctgs	0.71	50% vcol sltst (1.36) 50% wh sl clc ss
3235-44	ctgs	0.78	50% md-dk gy sltst (1.40) 50% wh calc ss with tr brn arg ls

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
3244-53	ctgs	0.78	60% md-dk gy sltst (1.40) 40% crm ss with tr pyr
3253-63	ctgs	0.97	75% md-dk gy brn sdy sltst (1.53) 15% wh ss 10% brn arg ls
3262-71	ctgs	0.98	80% md gy brn sdy sltst 15% brn arg ls 5% clr ss
3271-80	ctgs	0.86	80% md gy grn sltst (1.30) 10% crm ss & sd 10% olv grn arg ls
3280-89	ctgs	0.72	40% brn arg ls 30% brn gy sltst (1.33) 30% crm ss
3289-98	ctgs	0.89	50% md brn gy sltst 50% wh-crm calc ss and sd with tr pyr
3298-3307	ctgs	0.67	60% wh-crm calc ss & sd 40% lt-md gy sltst (1.39)
3307-16	ctgs	0.94	60% vcol sltst (1.24) 20% crm ss & sd 20% brn arg ls, tr coal
3316-25	ctgs	0.42	50% wh ls 40% clr sd 10% md brn-md gy sdy sltst (1.08)
3325-34	ctgs		70% wh sd 25% wh ls 5% md-dk gy sltst

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 1. Total Organic Carbon Results and Gross Lithologic Descriptions

Depth (m)	Sample Type	TOC * (wt %)	Gross Lithologic Description *
3334-53	ctgs		70% wh sd 25% wh ls 5% md-dk gy sltst
3343-54	ctgs		90% wh sd 5% wh ls 5% m-dk gy sltst

* TOC = Total Organic Carbon. Number in parenthesis is TOC value for that particular lithology.

Table 2. Results of Kerogen Analysis

Depth (m)	Sample Type	H/C	Kerogen Description * %Alginite	%Exinite	%Other	TAI	R_o (range)	R_o (mean)	N	NT	Kerogen Quality
2020	ctgs	0.60	10	20	70	1.5	0.33-0.43	0.38	11	11	Poor, recycling
2110-40	ctgs	0.65	0	20	80						
2230-60	ctgs	ND	30	10	60	1.5	0.33-0.38	0.35	2	2	Poor, recycling
2590-2620	ctgs	0.60	10	10	80	1.5	0.38-0.47	0.44	7	7	Poor, recycling
2820-50	ctgs	ND	20	0	80	2.0	0.46-0.58	0.52	4	4	Poor, recycling
2890-2920	ctgs	ND	20	0	80	2.0	0.49-0.60	0.55	12	12	Poor, recycling
2920-50	ctgs	0.82	30	0	70	2.0	ND				Poor, cave material
2950-80	ctgs	0.71	0	30	70						
2980-3000	ctgs	0.65	10	20	70	2.0	ND				Poor, cave material
3010-19	ctgs	0.63	5	20	75						
3109-18	ctgs	ND	20	10	70	2.0	ND				Poor, cave material
3136-45	ctgs	0.69	5	30	65						
3172-3181	ctgs	0.83	10	30	60	2.2	0.60-0.77	0.71	40	40	Good, recycling
3199-3208	ctgs	ND	5	50	45						

H/C = atomic hydrogen to carbon ratio; *Alginite = amorphous + algal, Exinite = cuticle + spore & pollen exines + resins, Other = woody tissue + finely disseminated organic matter; TAI = Thermal Alteration Index; R_o = Vitrinite reflectance; N = number of edited points used to obtain R_o mean; NT = total number of vitrinite particles read; ND = no data (recovery too low, no spores or pollen, bad sample quality, etc.)

Table 2. Results of Kerogen Analysis (con't.)

Depth (m)	Sample Type	H/C	Kerogen Description * %Alginite	%Exinite	%Other	TAI	R_o (range)	R_o (mean)	N	NT	Kerogen Quality
3262-71	ctgs	ND	0	60	40						
3280-89	ctgs	0.88	10	50	40						
3298-3307	ctgs	0.89	0	50	50						
3307-16	ctgs	1.03	20	20	60	2.2	0.61-0.78	0.71	40	40	Good, recycling

H/C = atomic hydrogen to carbon ratio; *Alginite = amorphous + algal; Exinite = cuticle + spore & pollen exines + resins, Other = woody tissue + finely disseminated organic matter; TAI = Thermal Alteration Index; R_o = Vitrinite reflectance; N = number of edited points used to obtain R_o mean; NT = total number of vitrinite particles read; ND = no data (recovery too low, no spores or pollen, bad sample quality, etc.)

Table 3. Results of C_{15+} Extractable Organic Matter (EOM) Analysis

Depth (m)	Sample Type	TOC (wt %)	EOM (ppm)	HC (ppm)	Composition of C_{15+} Extractable Organic Matter (Percent of Organic Extract) F-1	F-2	F - (3 + 4)	CPI
2020	ctgs	0.55	67					
2080-2110	ctgs	0.57	98					2.49
2110-40	ctgs	1.03	398	188	12.6	34.7	52.7	1.17
2140-70	ctgs	0.49	46					
2170-2200	ctgs	0.42	18					
2200-30	ctgs	0.49	73					
2320-50	ctgs	0.41	40					
2590-2620	ctgs	0.44	28					
2620-50	ctgs	0.46	105					1.76
2650-80	ctgs	0.45	90					
2680-2710	ctgs	0.50	119					1.59
2710-40	ctgs	0.50	112					

TOC = Total Organic Carbon; EOM = Extractable Organic Matter (C_{15+}); HC = C_{15+} Hydrocarbons (saturates + aromatics); CPI = Carbon Preference Index (C_{24} - C_{34} carbon number range); F - 1 = saturates; F - 2 = aromatics; F - 3 = asphaltics; F - 4 = noneluted fraction.

Table 3. Results of C_{15+} Extractable Organic Matter (EOM) Analysis (con't.)

Depth (m)	Sample Type	TOC (wt %)	EOM (ppm)	HC (ppm)	Composition of C_{15+} Extractable Organic Matter (Percent of Organic Extract) F-1	F-2	F - (3 + 4)	CPI
2830	ctgs	0.53	98					1.80
2860-90	ctgs	0.58	94					
2890-2920	ctgs	0.52	62					
2920-50	ctgs	0.79	476	174	4.2	32.4	63.4	1.13
2950-80	ctgs	1.00	408	140	2.9	31.4	65.7	1.16
2980-3000	ctgs	1.45	676	296	7.4	36.4	56.2	1.17
3010-19	ctgs	1.14	380	172	7.9	37.4	54.7	1.37
3109-18	ctgs	1.01	134					
3136-45	ctgs	1.19	160					1.43
3172-81	ctgs	1.25	152					
3190-97	ctgs	1.53	189					1.23
3199-3208	ctgs	1.02	189					

TOC = Total Organic Carbon; EOM = Extractable Organic Matter (C_{15+}); HC = C_{15+} Hydrocarbons (saturates + aromatics); CPI = Carbon Preference Index (C_{24} - C_{34} carbon number range); F - 1 = saturates; F - 2 = aromatics; F - 3 = asphaltics; F - 4 = noneluted fraction.

Table 3. Results of C_{15+} Extractable Organic Matter (EOM) Analysis (con't.)

Depth (m)	Sample Type	TOC (wt %)	EOM (ppm)	HC (ppm)	Composition of C_{15+} Extractable Organic Matter (Percent of Organic Extract) F-1	F-2	F - (3 + 4)	CPI
3235-44	ctgs	1.13	238	95	2.1	37.9	60.0	1.55
3262-71	ctgs	1.07	377	182	7.5	40.8	51.7	1.56
3280-89	ctgs	1.17	264	109	2.7	38.4	58.9	1.49
3289-98	ctgs	1.06	265	117	3.4	40.9	55.7	1.56

TOC = Total Organic Carbon; EOM = Extractable Organic Matter (C_{15+}); HC = C_{15+} Hydrocarbons (saturates + aromatics); CPI = Carbon Preference Index (C_{24} - C_{34} carbon number range); F - 1 = saturates; F - 2 = aromatics; F - 3 = asphaltics; F - 4 = noneluted fraction.

Table 4. Significant Ratios

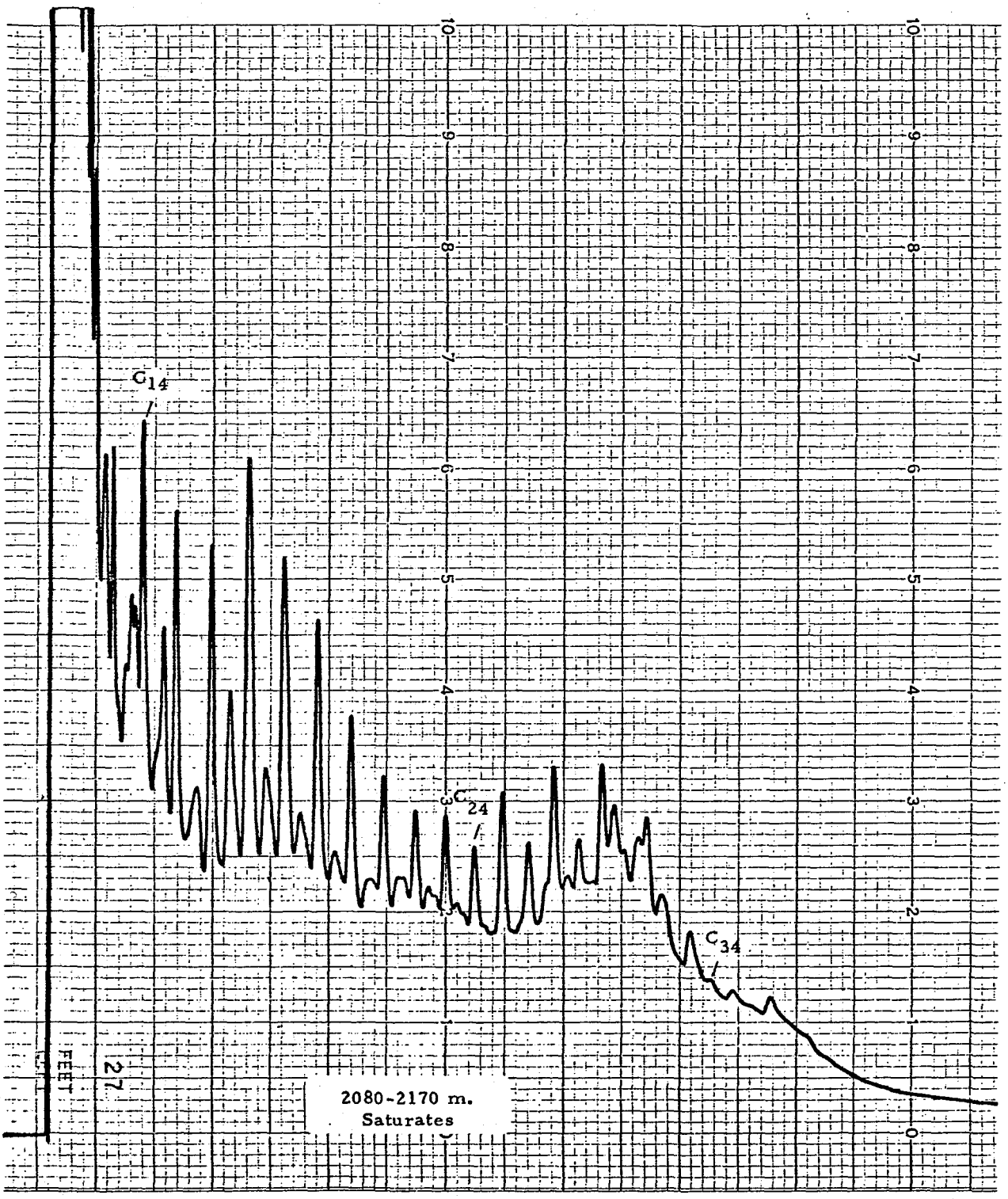
Depth (m)	$\frac{EOM}{TOC} \times 100$	$\frac{HC}{TOC} \times 100$	$\frac{HC}{EOM} \times 100$
2020	1.2		
2080-2110	1.7		
2110-40	3.9	1.8	47.2
2140-70	0.9		
2170-2200	0.4		
2200-30	1.5		
2320-50	1.0		
2590-2620	0.6		
2620-50	2.3		
2650-80	2.0		
2680-2710	2.4		
2710-40	2.2		
2830	1.8		
2860-90	1.6		
2890-2920	1.2		
2920-50	6.0	2.2	36.6
2950-80	4.1	1.4	34.3
2980-3000	4.7	2.0	43.8
3010-19	3.3	1.5	45.3
3109-18	1.3		

TOC = Total Organic Carbon (ppm); EOM = C_{15+} Extractable Organic Matter (ppm); HC = C_{15+} Hydrocarbons (ppm)

Table 4. Significant Ratios (con't.)

Depth (m)	$\frac{EOM}{TOC} \times 100$	$\frac{HC}{TOC} \times 100$	$\frac{HC}{EOM} \times 100$
3136-45	1.3		
3172-81	1.2		
3190-99	1.2		
3199-3208	1.9		
3235-44	2.1	0.8	39.9
3262-71	3.5	1.7	48.3
3280-89	2.3	0.9	41.3
3289-98	2.5	1.1	44.2

TOC = Total Organic Carbon (ppm); EOM = C_{15+} Extractable Organic Matter (ppm); HC = C_{15+} Hydrocarbons (ppm)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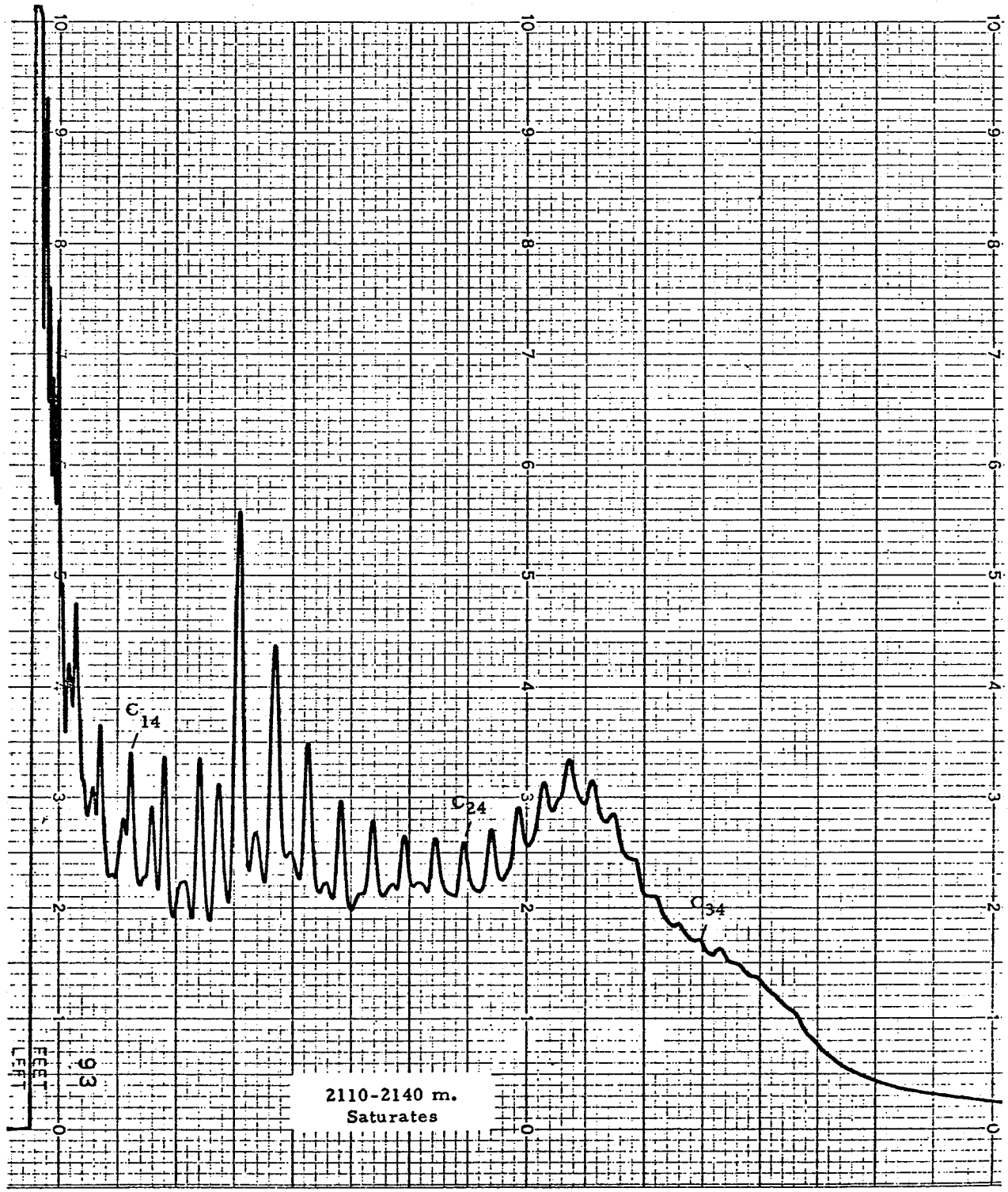
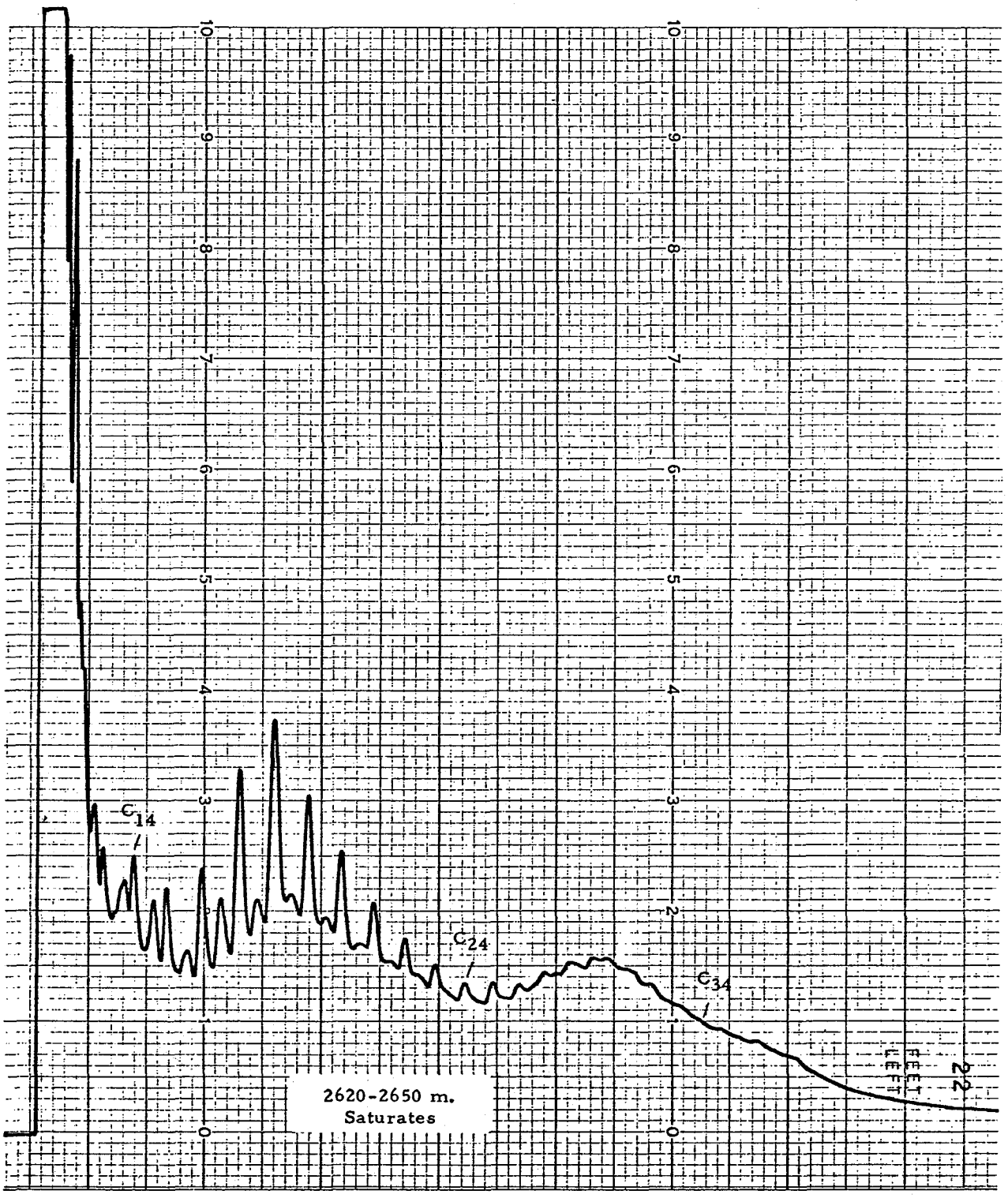
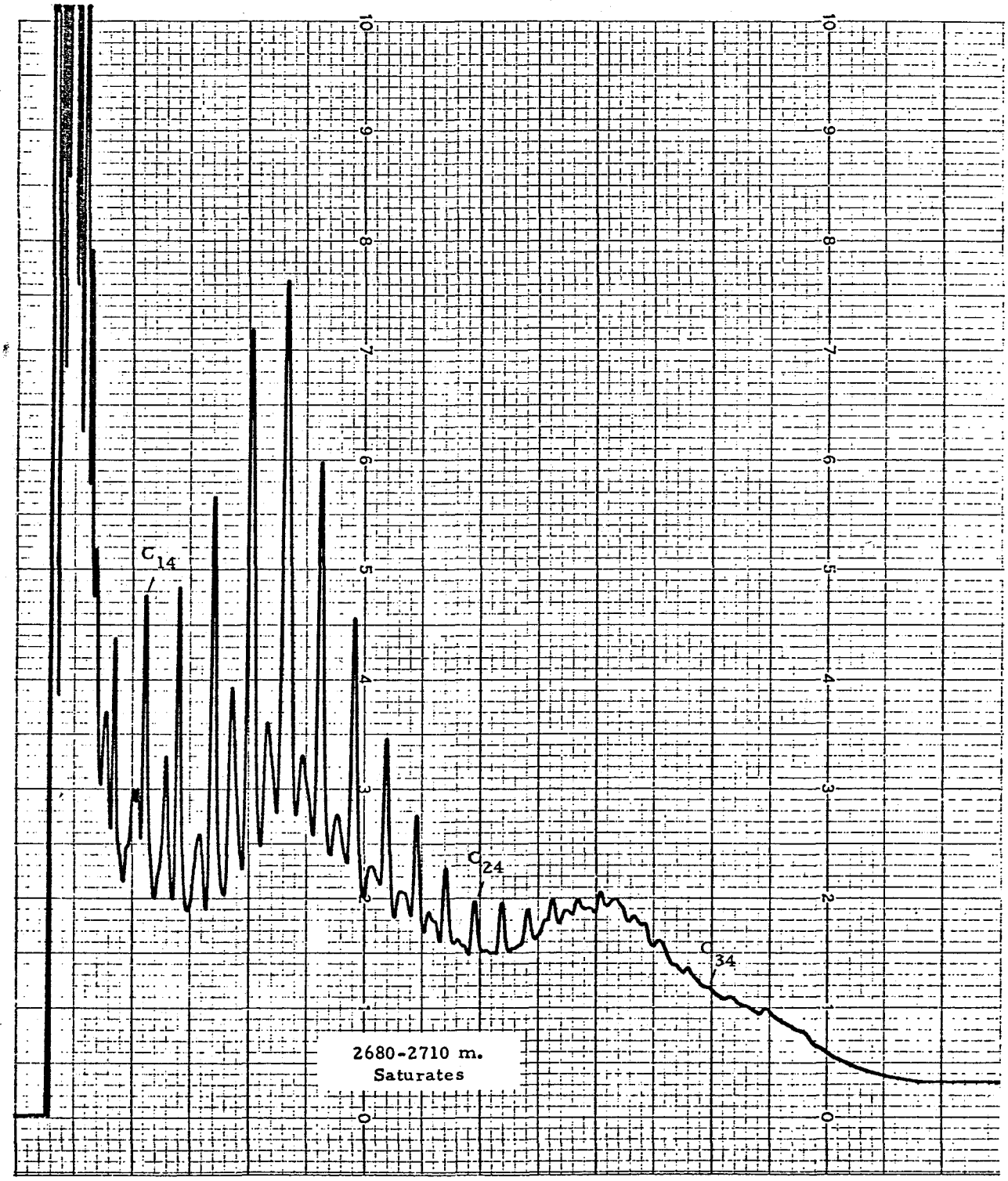
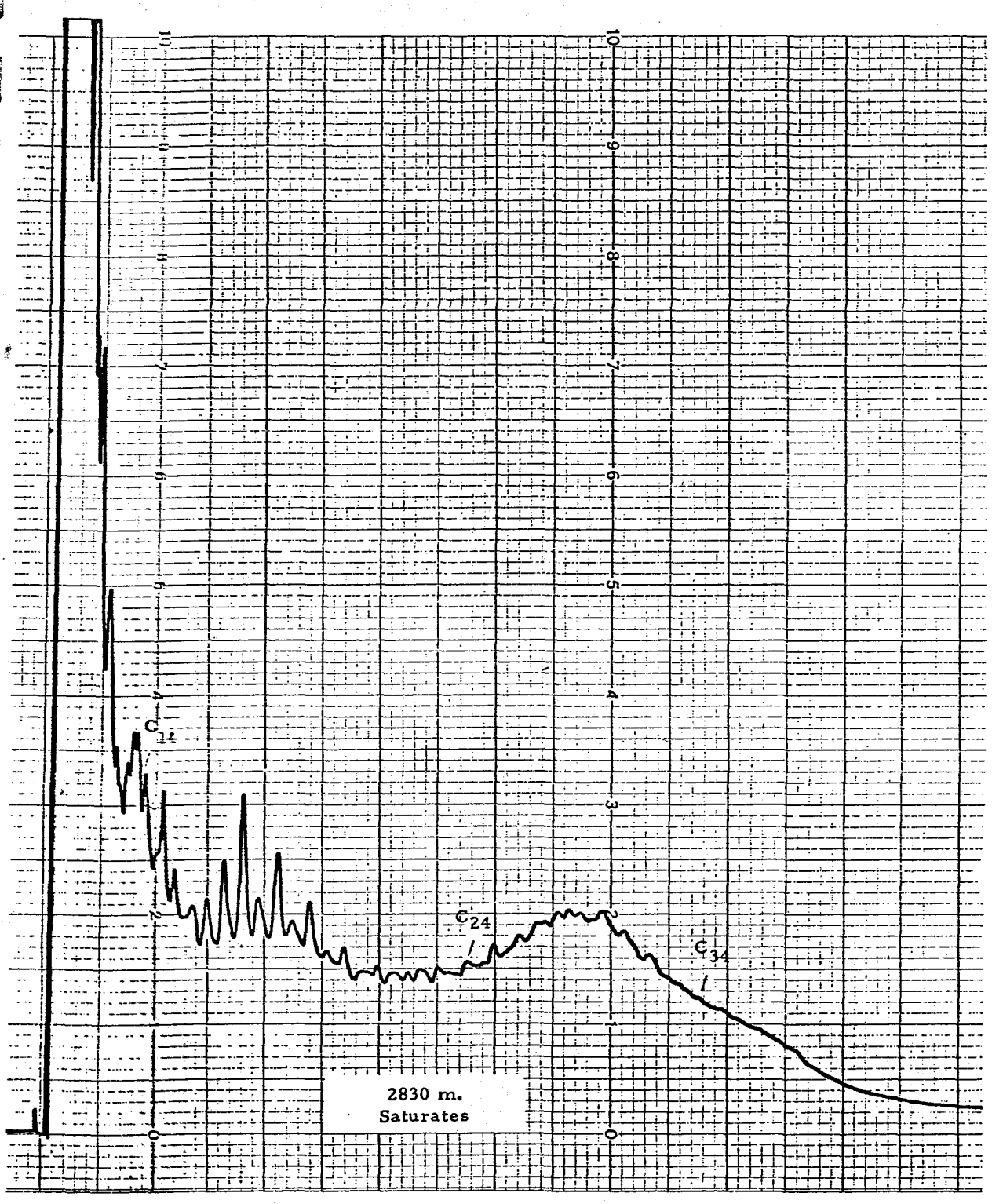
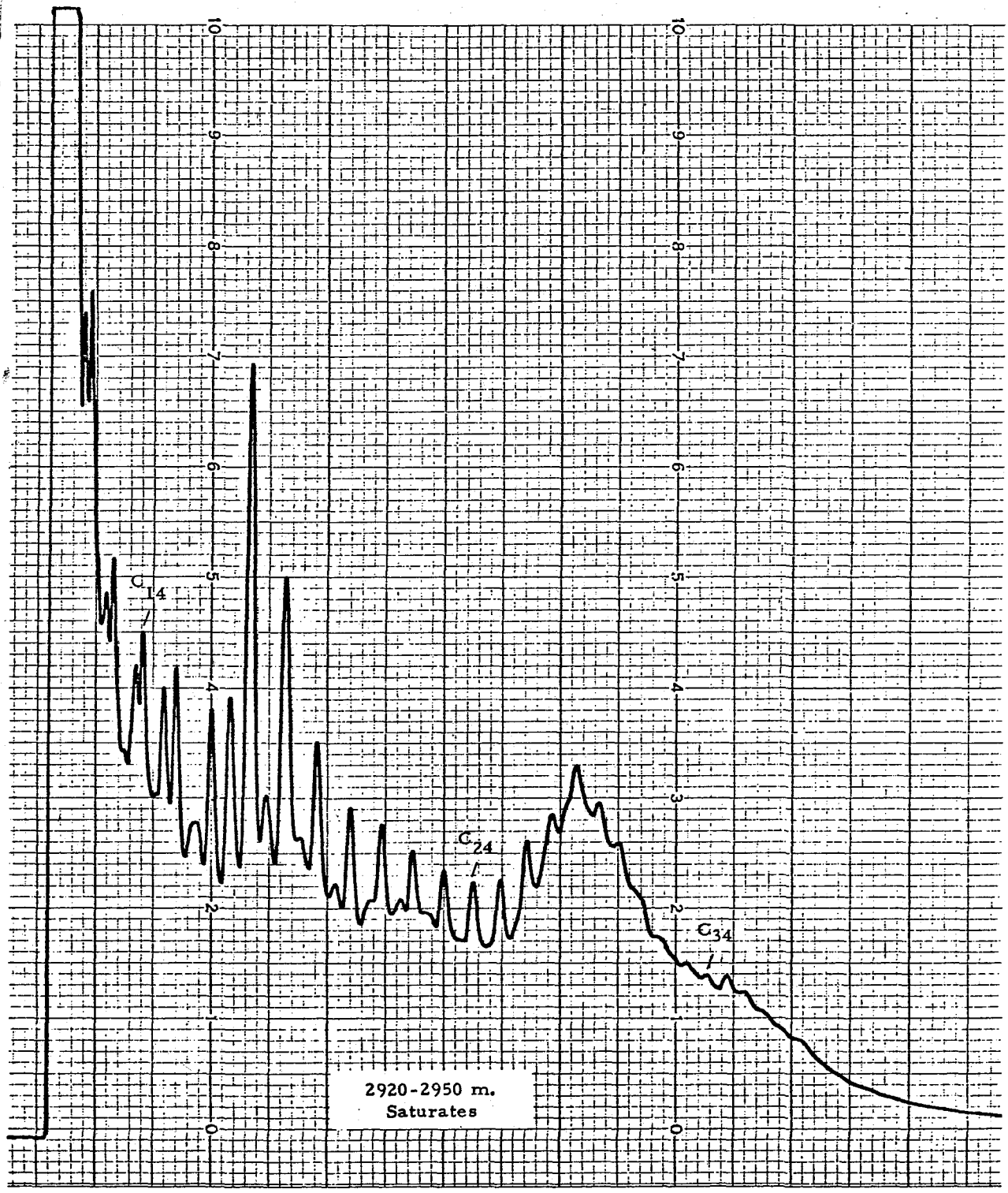
Saturates

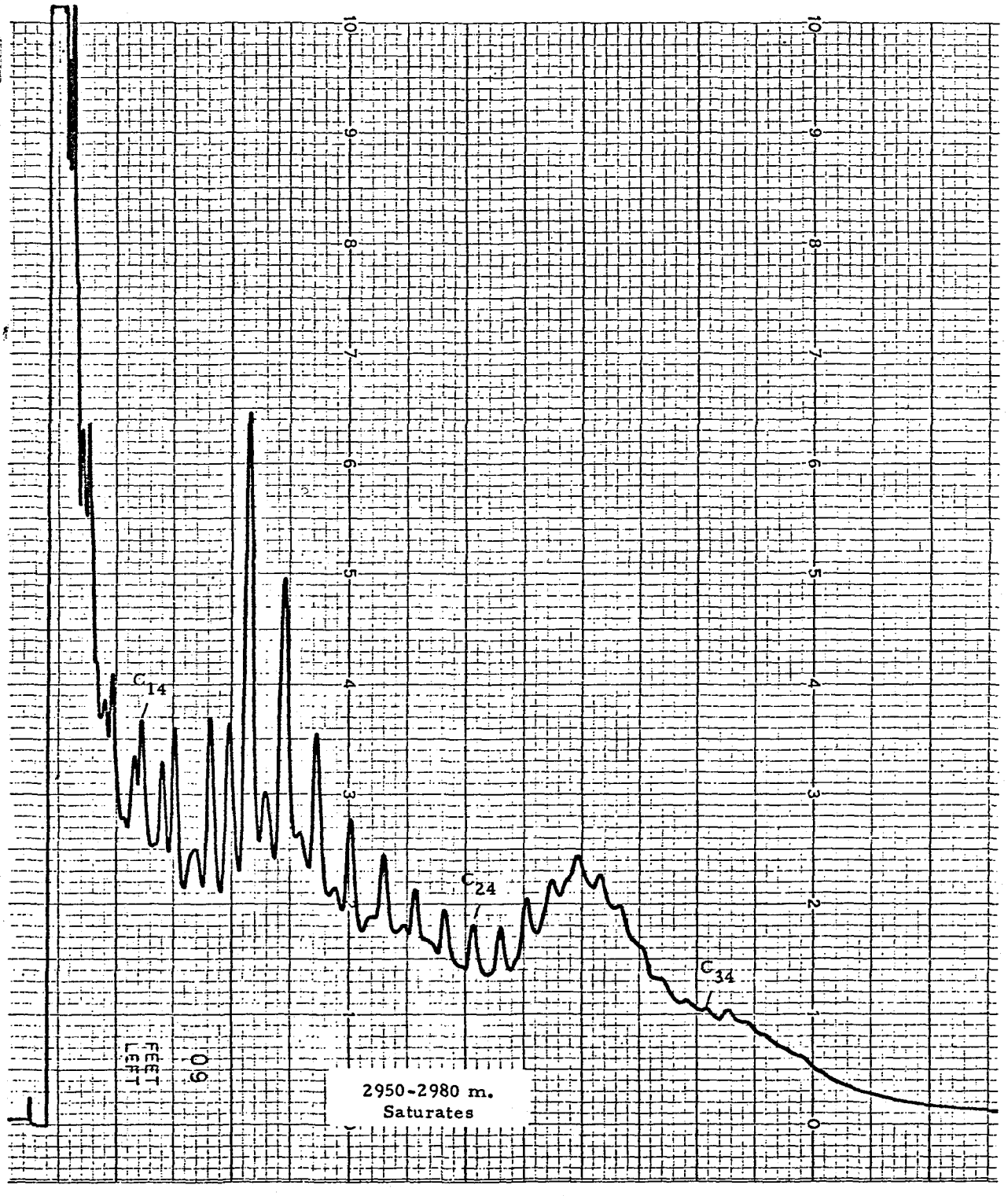

C14
C24
C34
93
FEET
LEFT
2110-2140 m.
Saturates

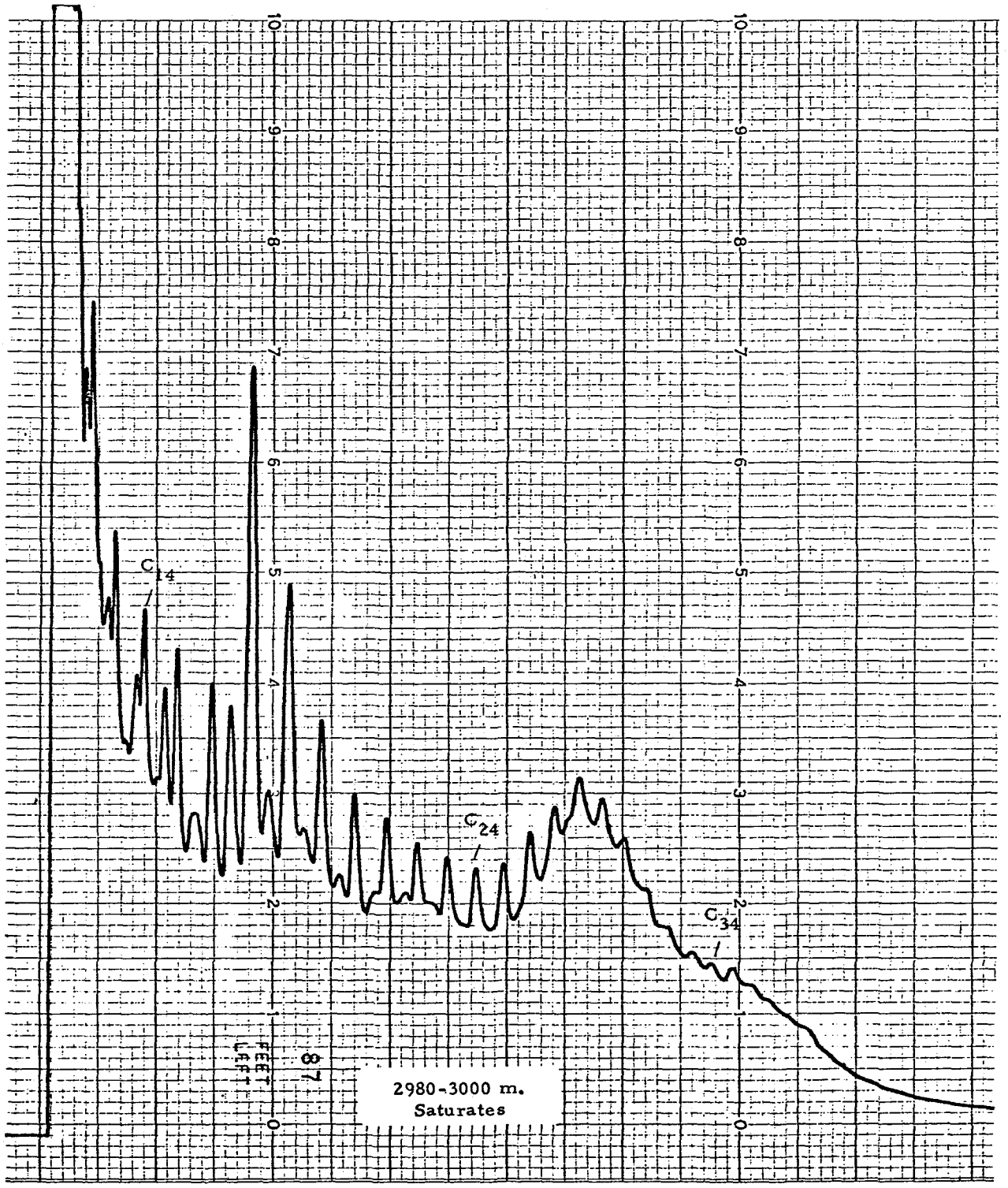

10
9
8
7
6
5
4
3
2
1
0
C_{14}
C_{24}
C_{34}
2620-2650 m.
Saturates
FEET
FEET
22

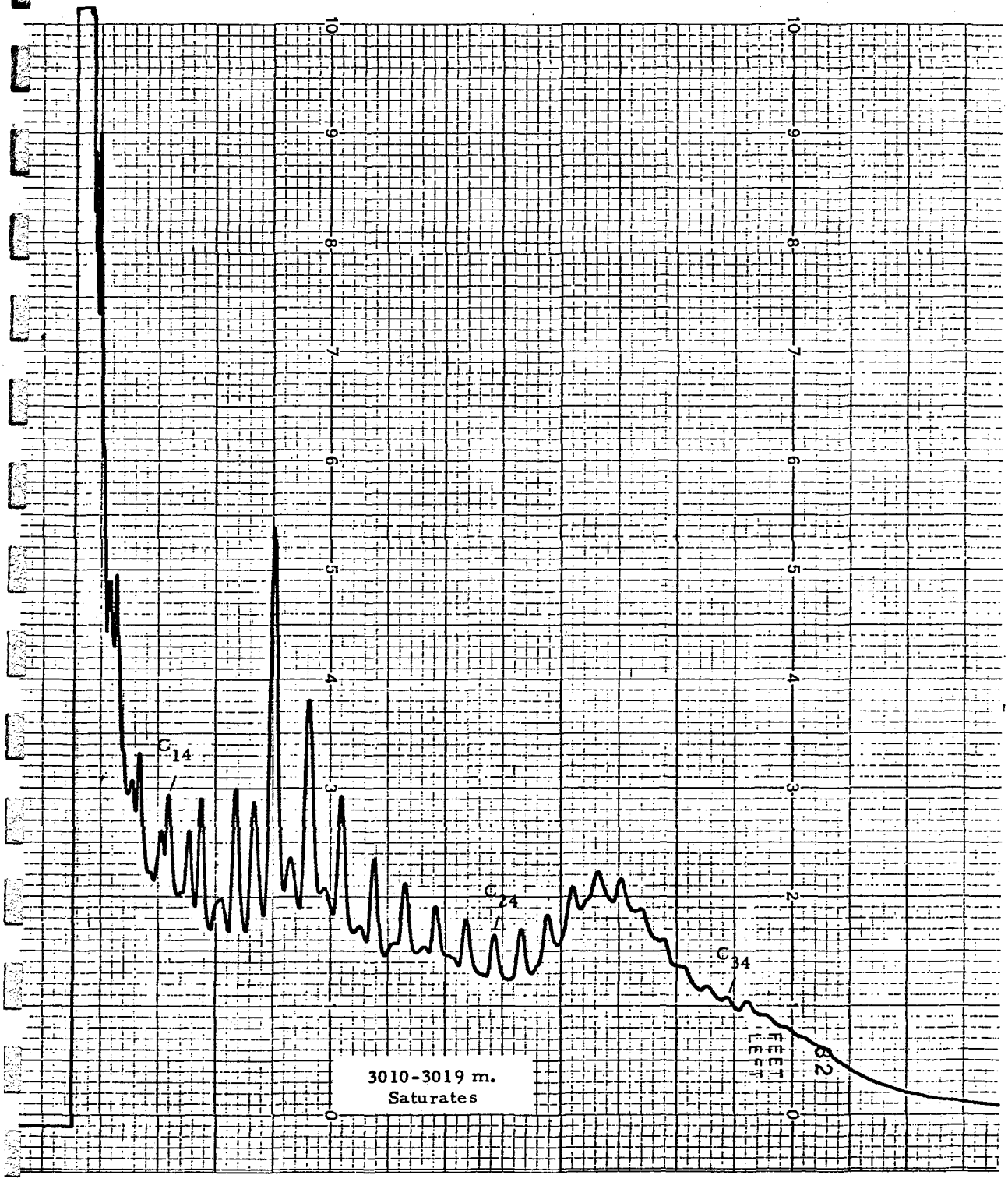

C14
C24
C34
2680-2710 m.
Saturates

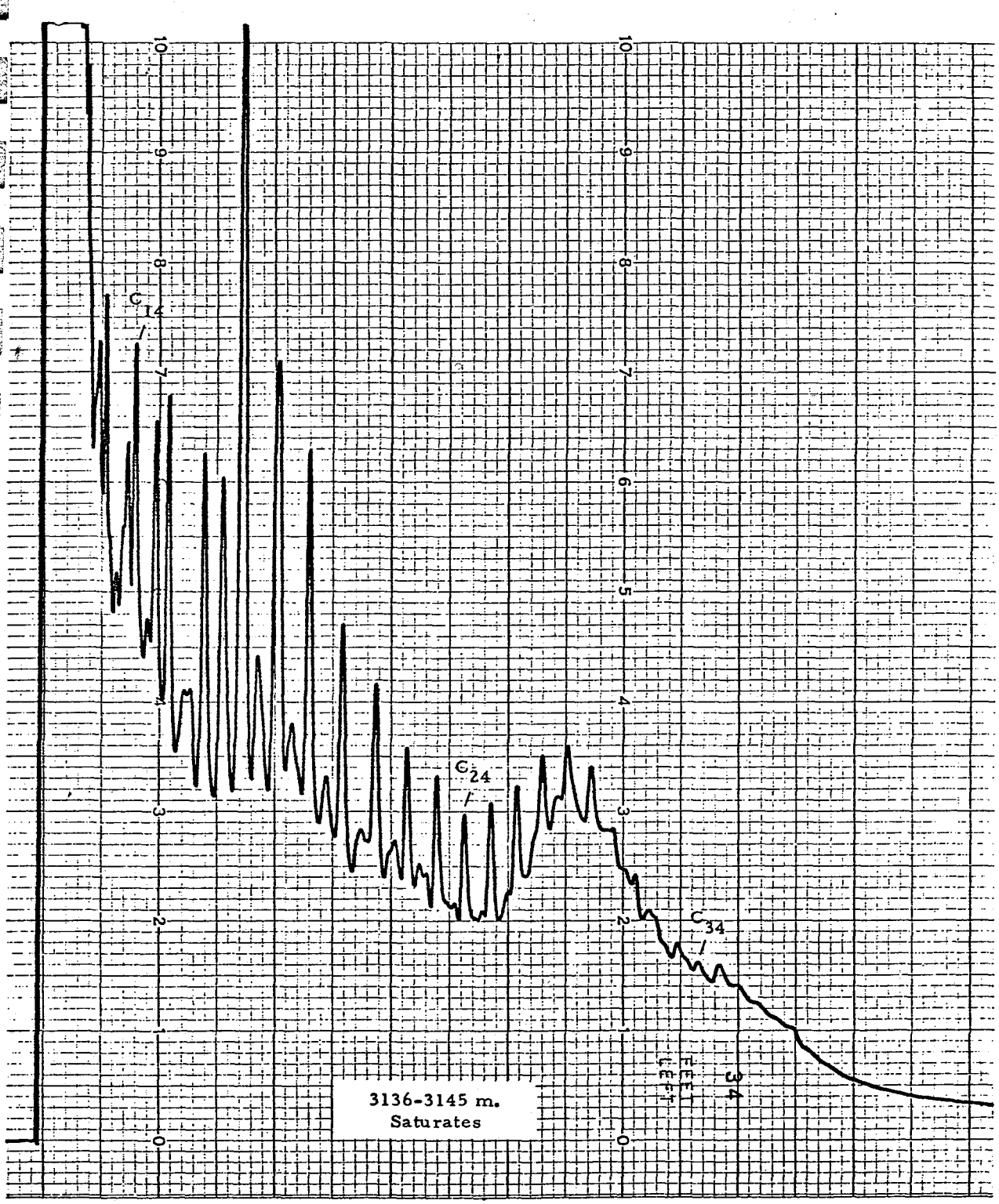

C14
C24
C34
2830 m.
Saturates

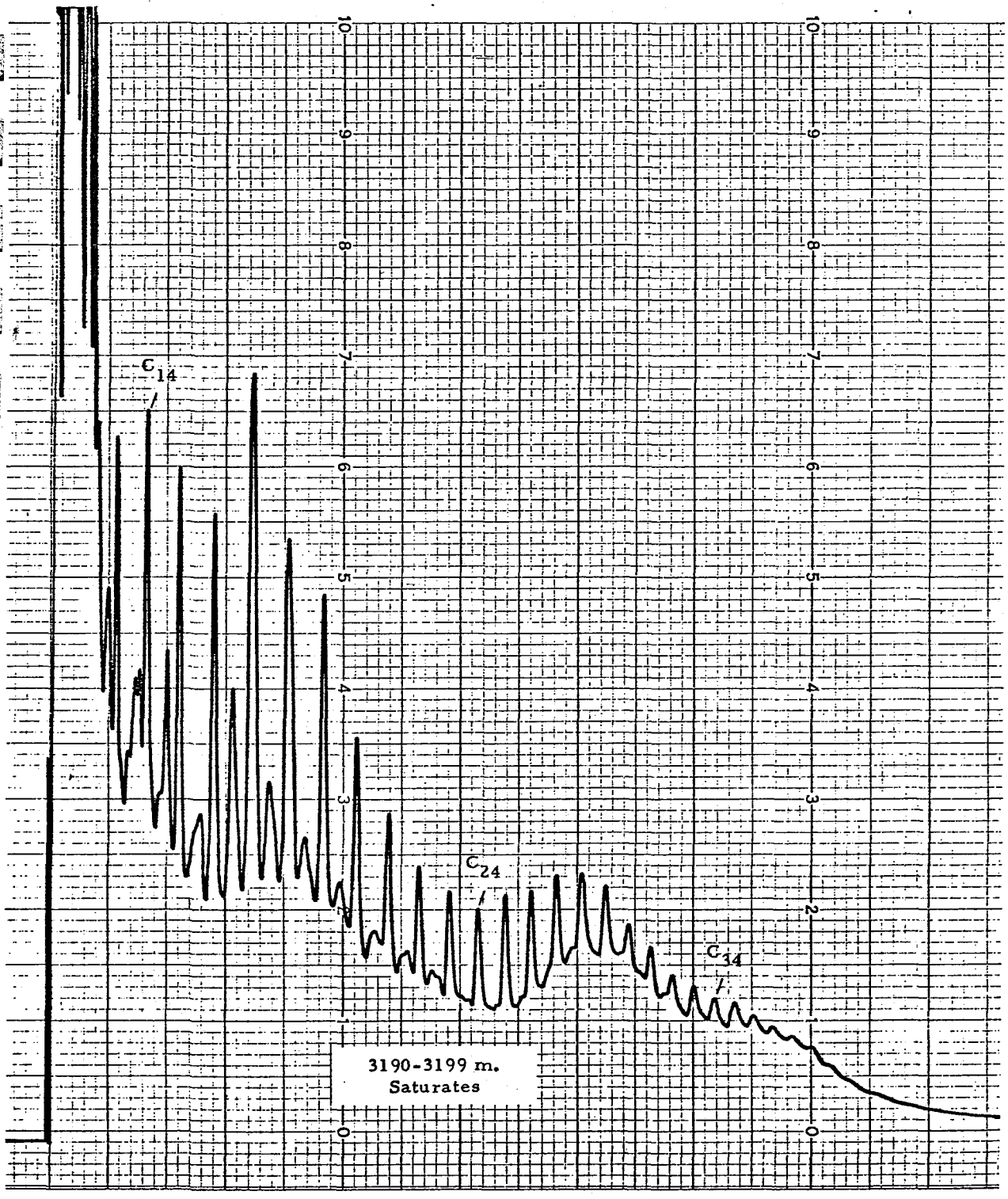

10
9
8
7
6
5
4
3
2
1
0
C_{14}
C_{24}
C_{34}
2920-2950 m.
Saturates

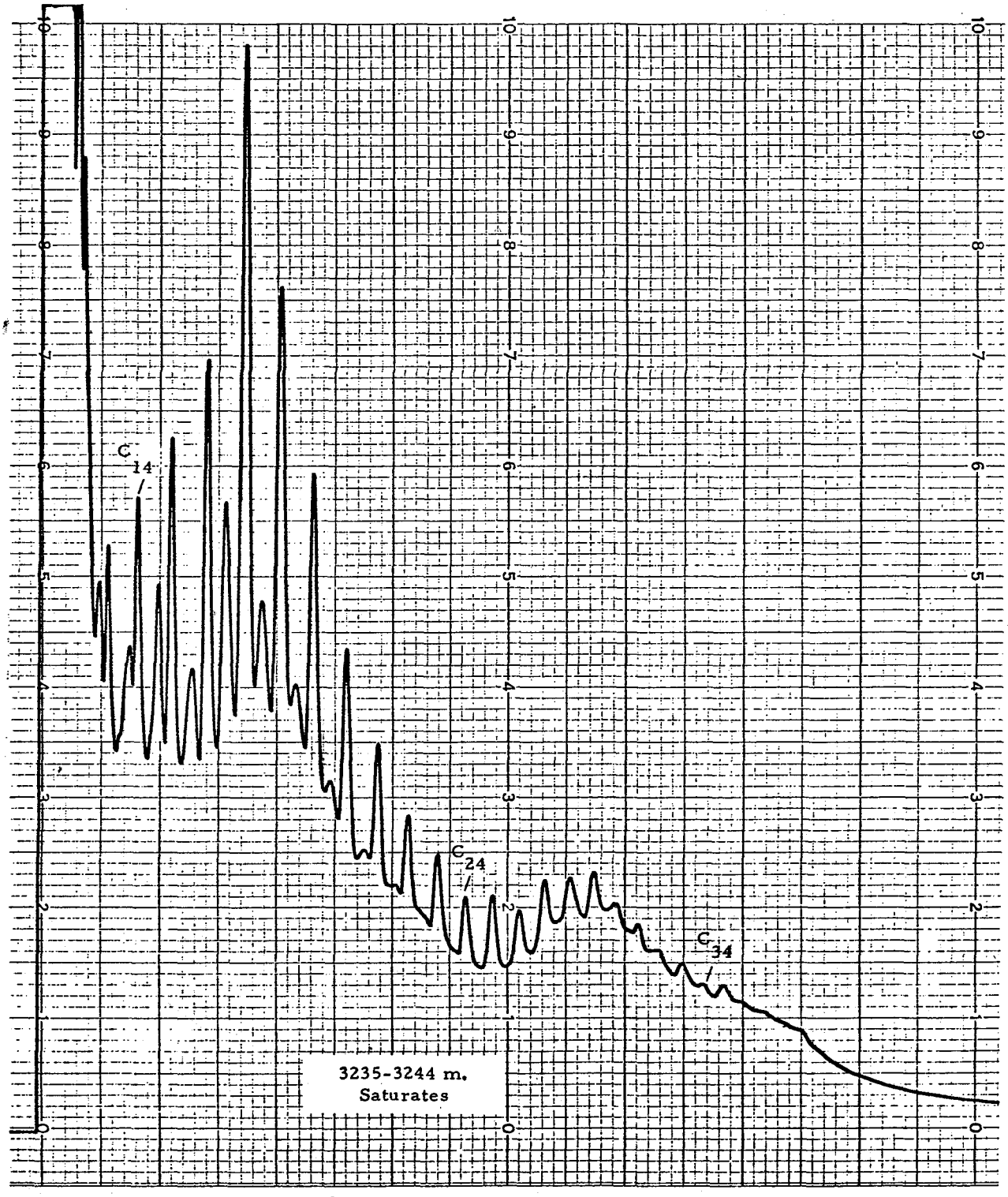

C_{14}
C_{24}
C_{34}
2950-2980 m.
Saturates
FEET
LEFT
0.6

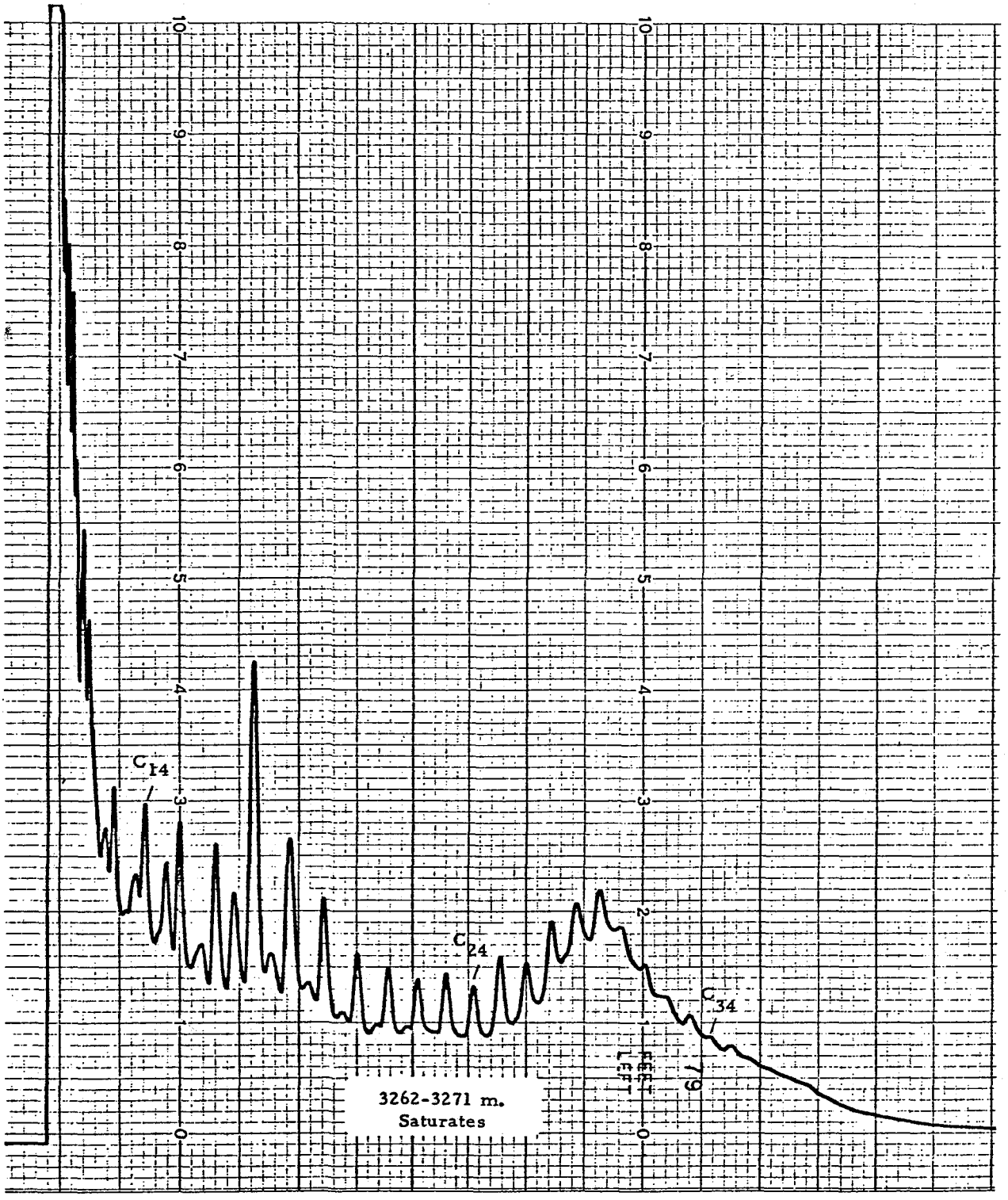

C14
C24
C34
2980-3000 m.
Saturates
FEET
10
9
8
7
6
5
4
3
2
1
0

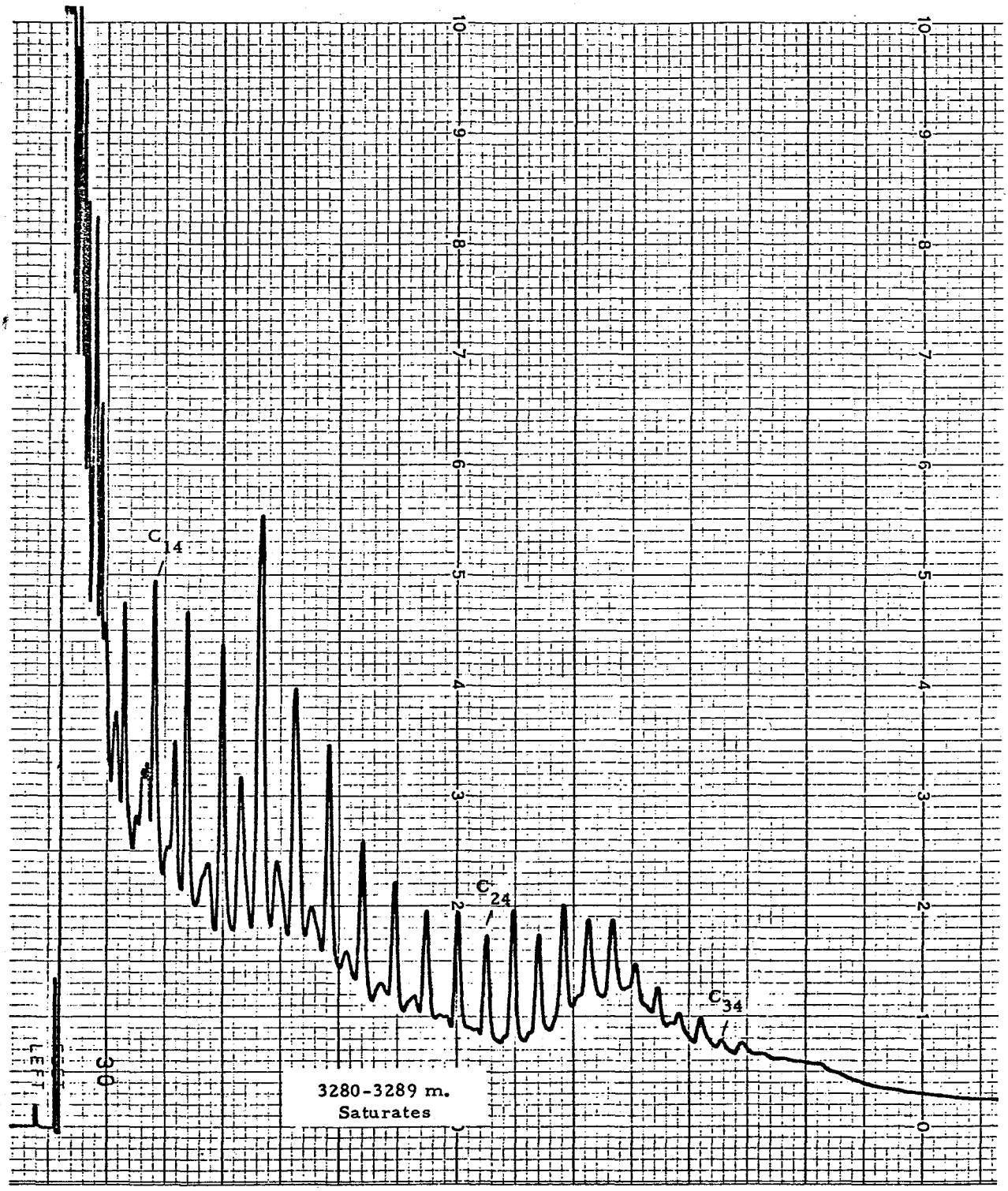

10
9
8
7
6
5
4
3
2
1
0
C_{14}
C_{24}
C_{34}
3010-3019 m.
Saturates
FEET
FEET
82

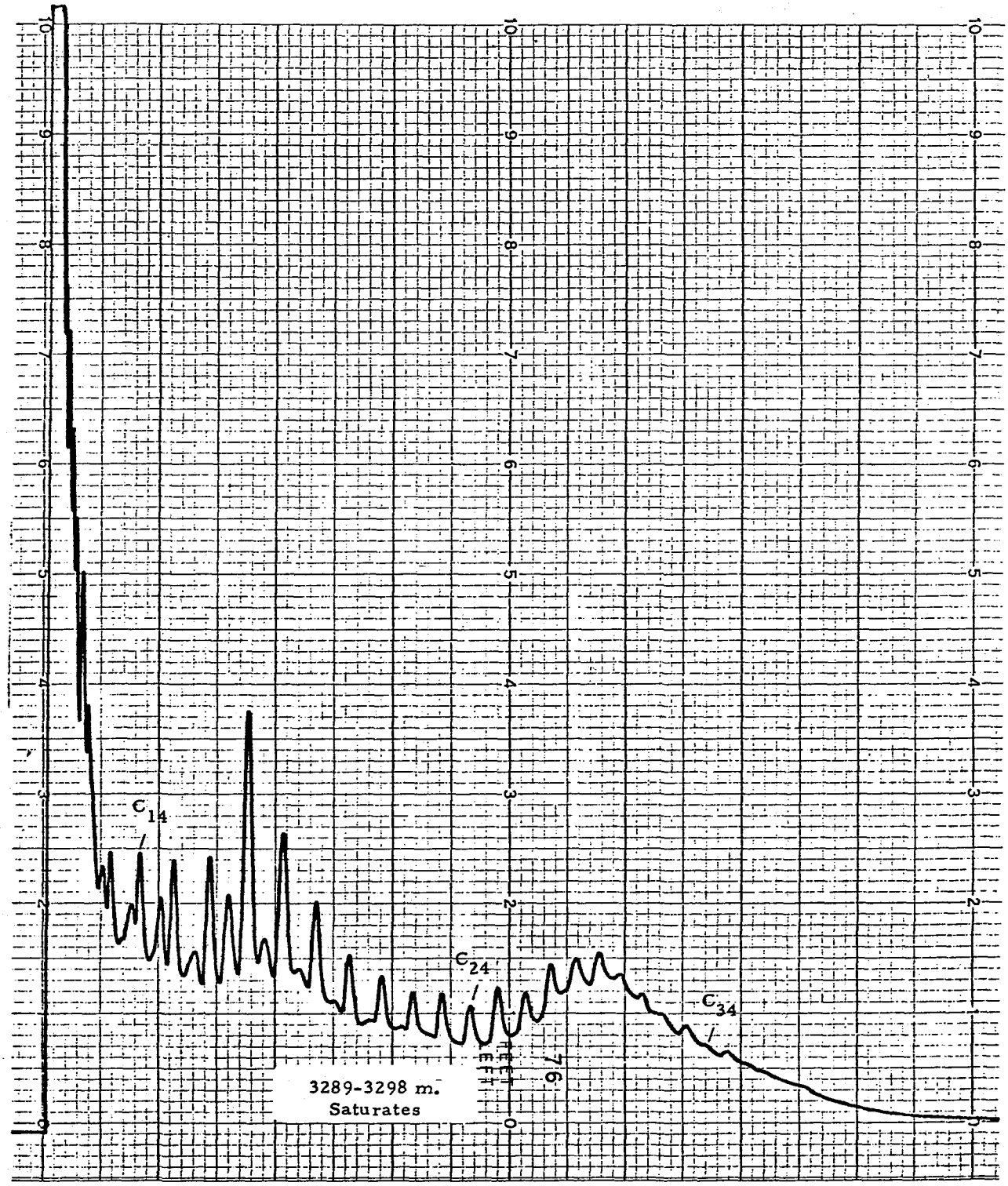

C14
C24
C34
3136-3145 m.
Saturates
FEET

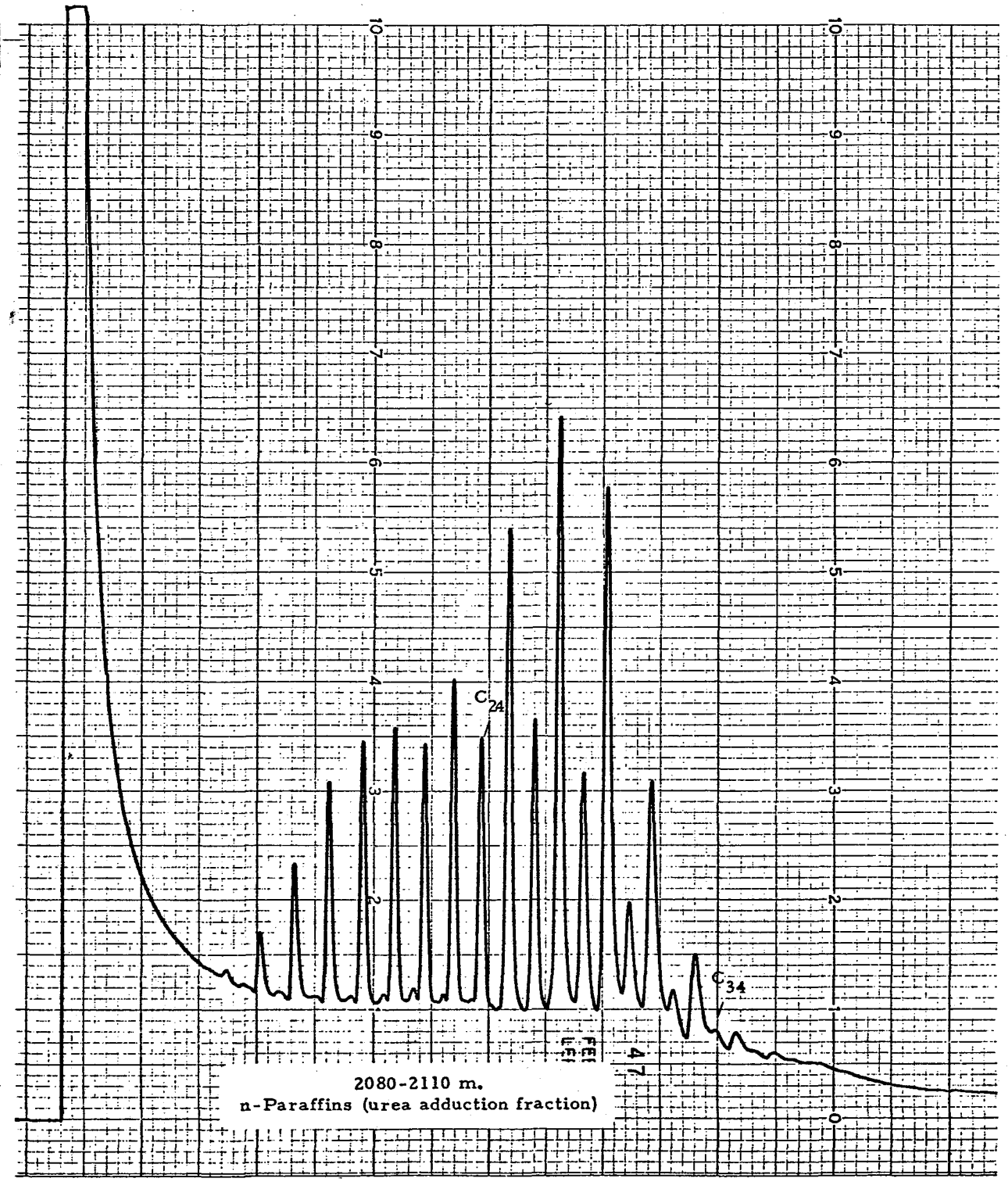

C14
C24
C34
3190-3199 m.
Saturates

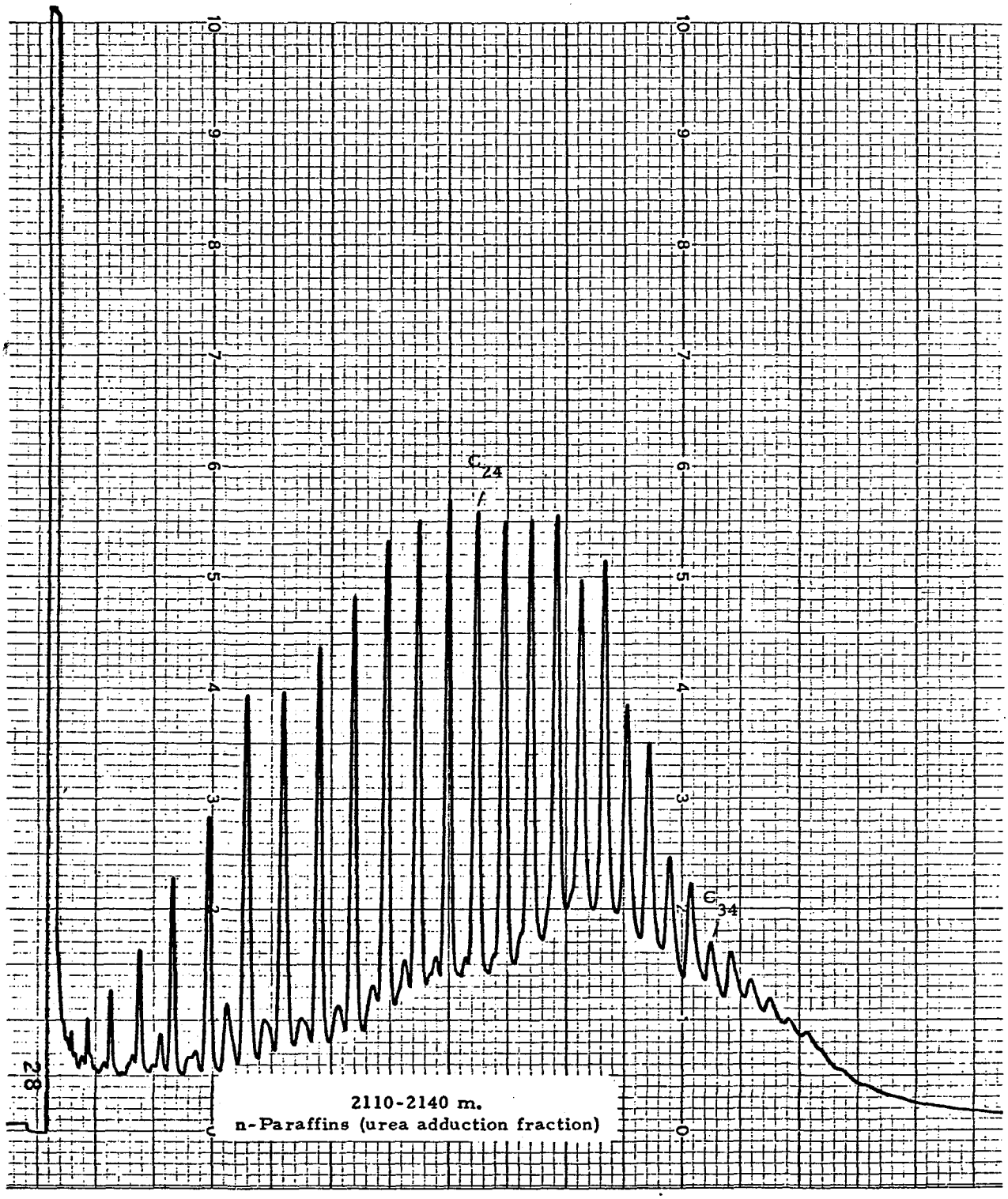

C14
C24
C34
3235-3244 m.
Saturates

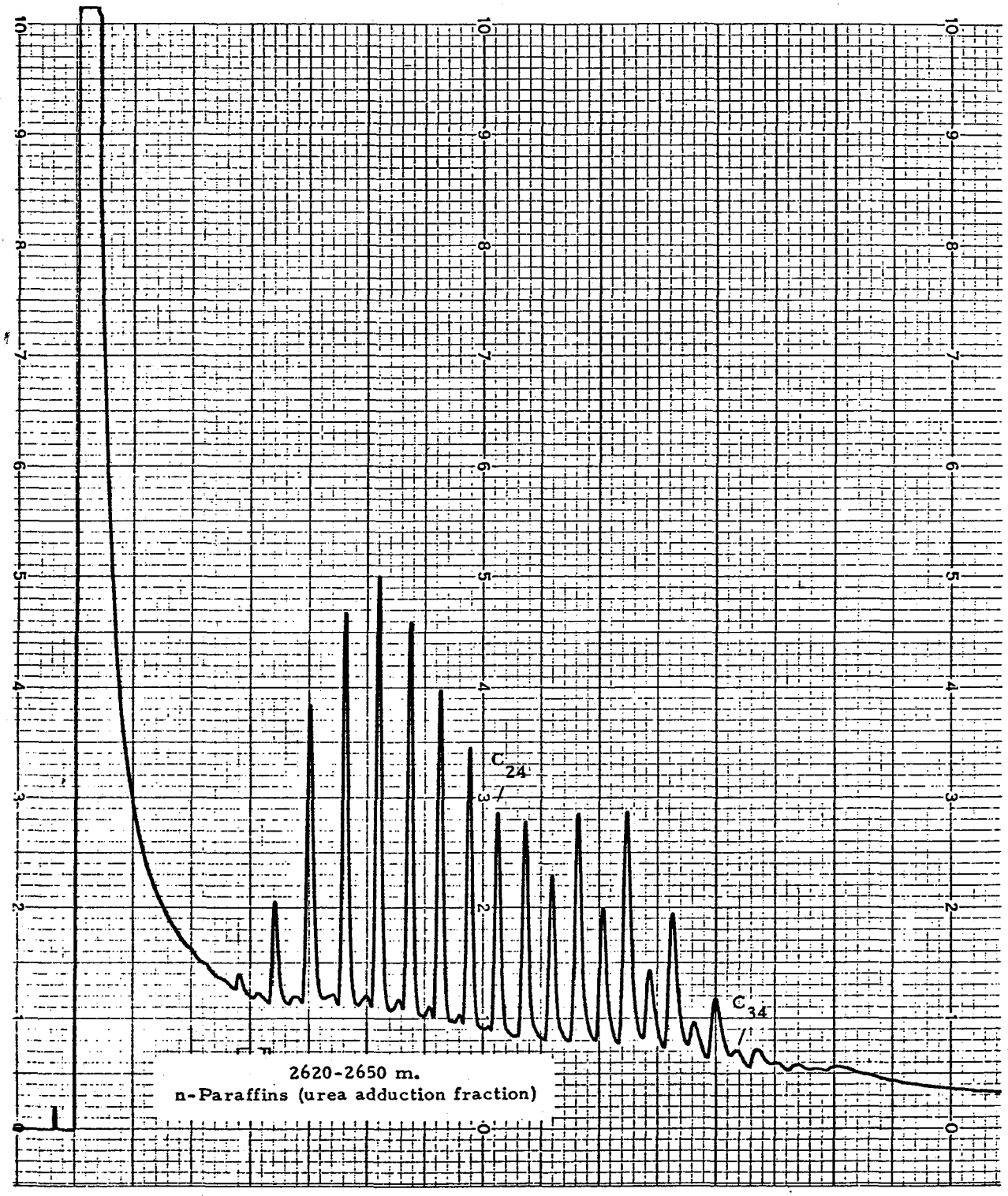

C14
C24
C34
3262-3271 m.
Saturates
79
REF
LEFT

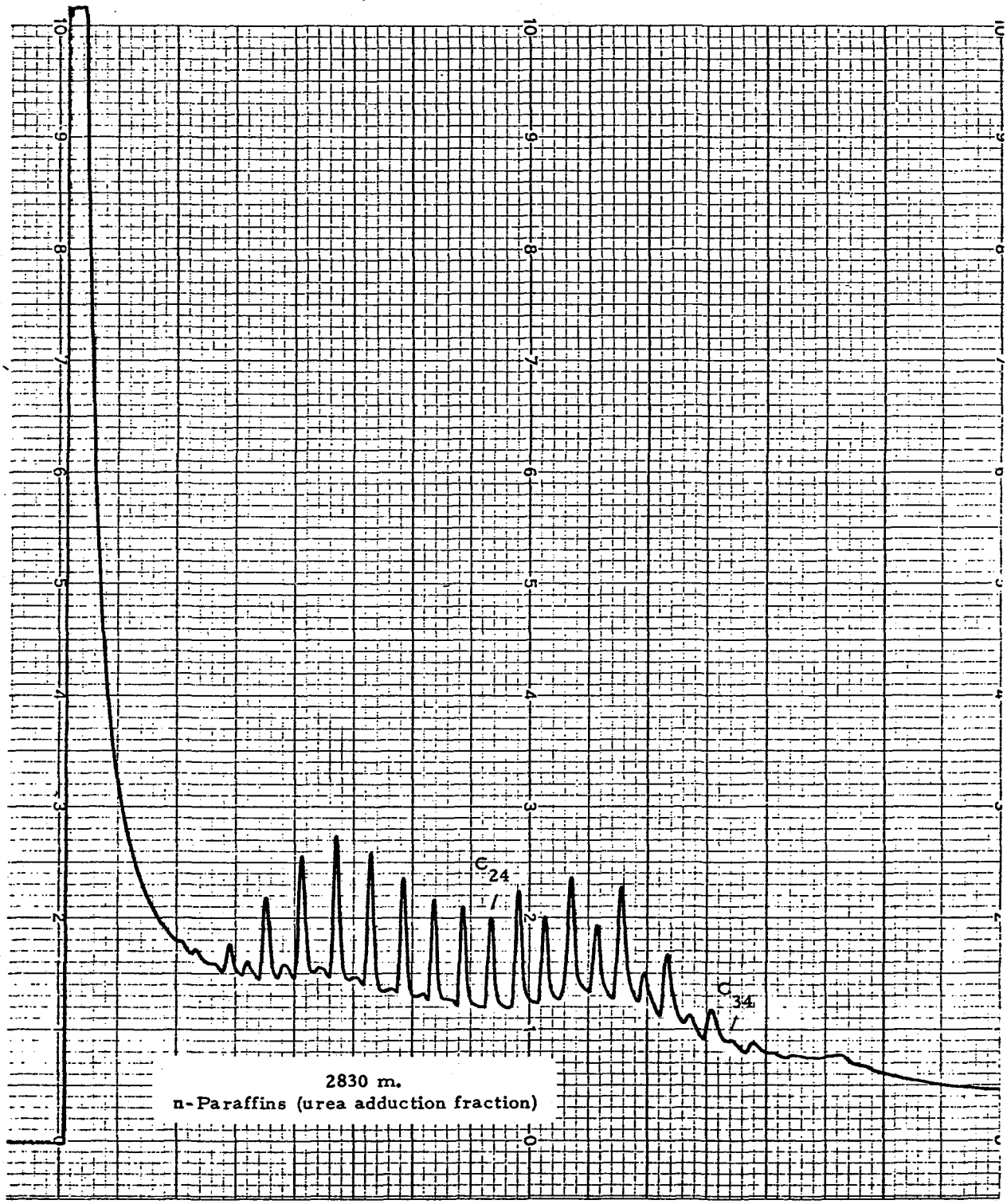

C14
C24
C34
3280-3289 m.
Saturates
LEFT
30

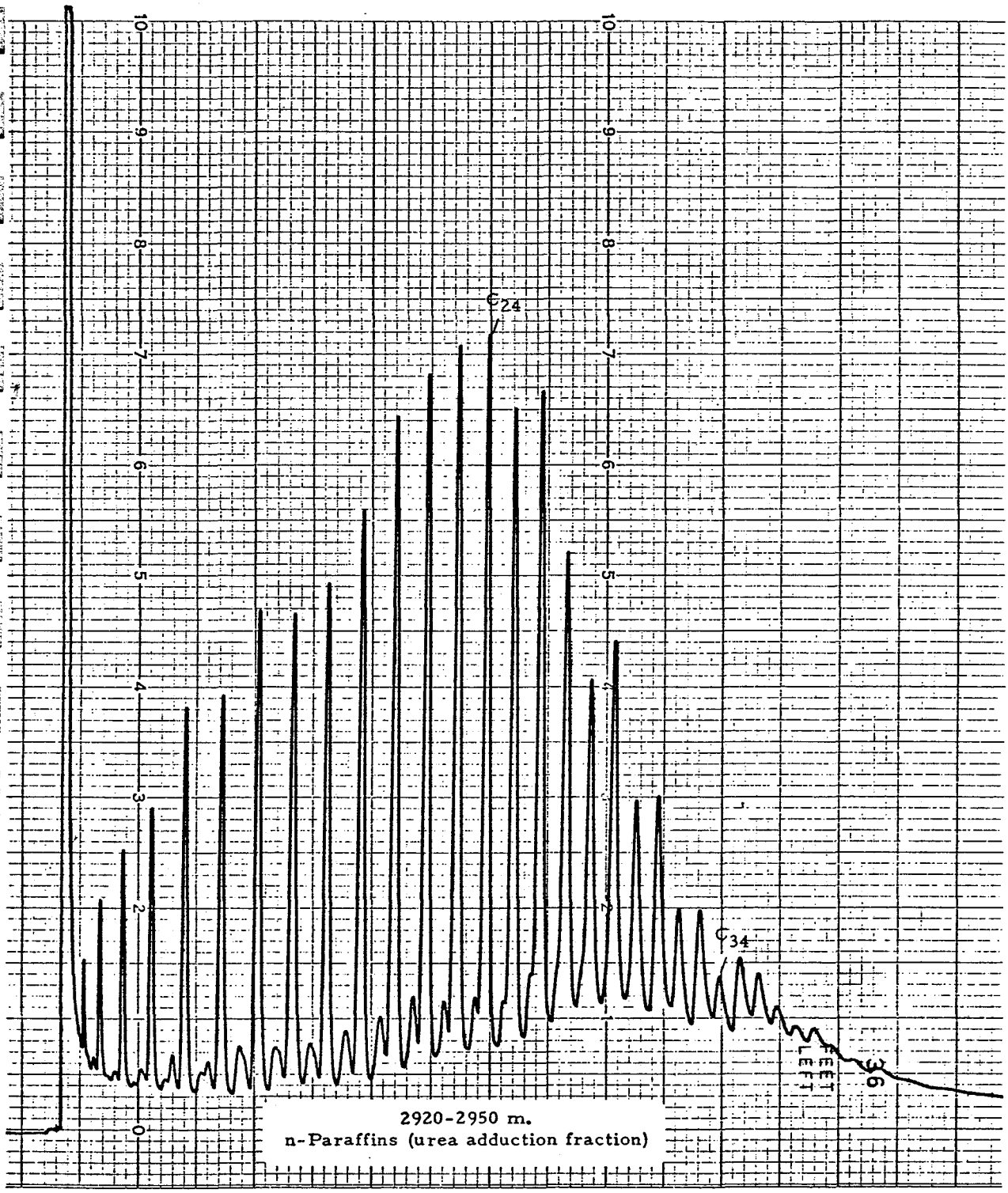

C_{14}
C_{24}
C_{34}
3289-3298 m.
Saturates
FEET
76

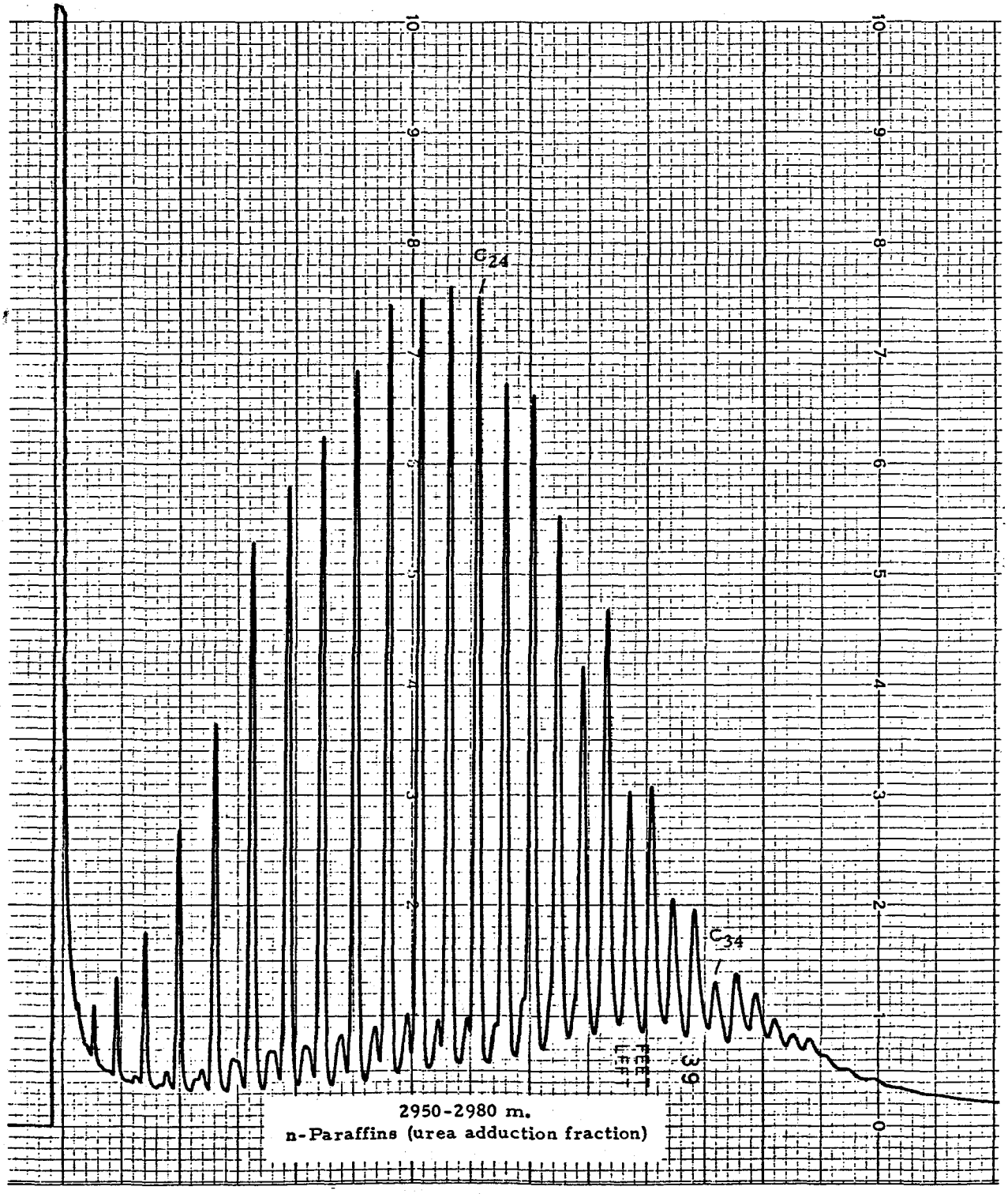

C24
C34
2080-2110 m.
n-Paraffins (urea adduction fraction)

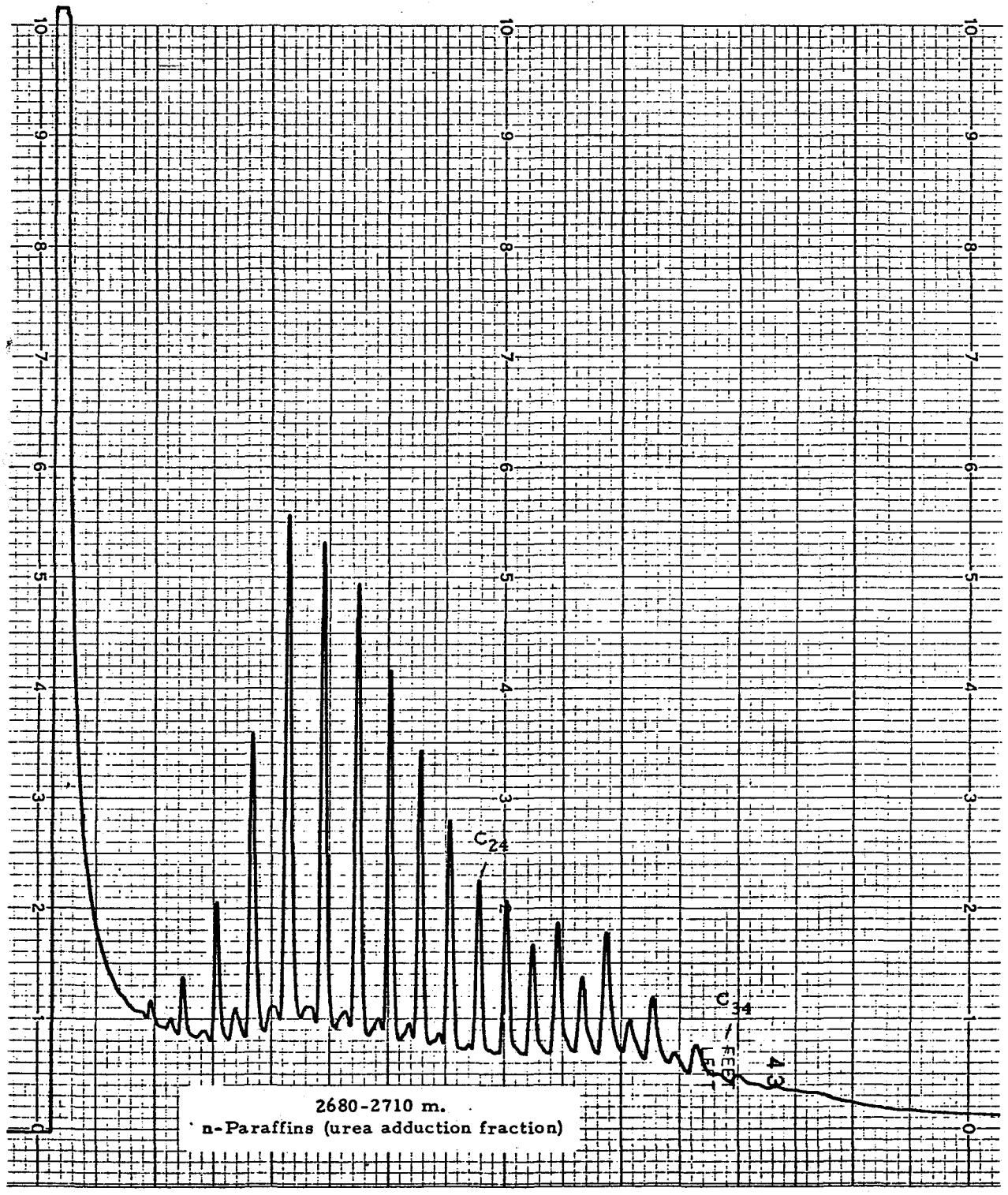

C24
C34
2110-2140 m.
n-Paraffins (urea adduction fraction)

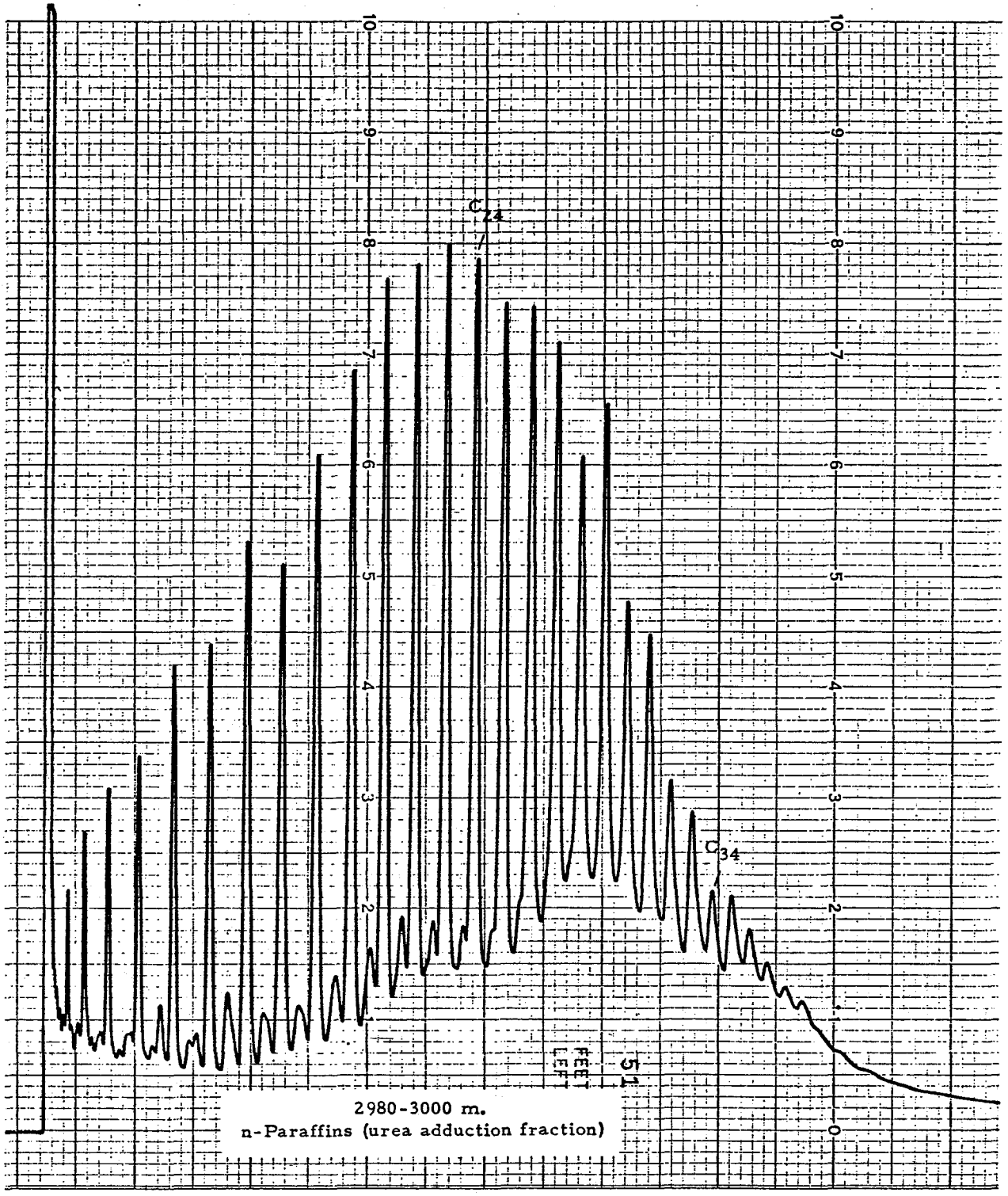

C24
C34
2620-2650 m.
n-Paraffins (urea adduction fraction)


C_{24}
C_{34}
2830 m.
n-Paraffins (urea adduction fraction)

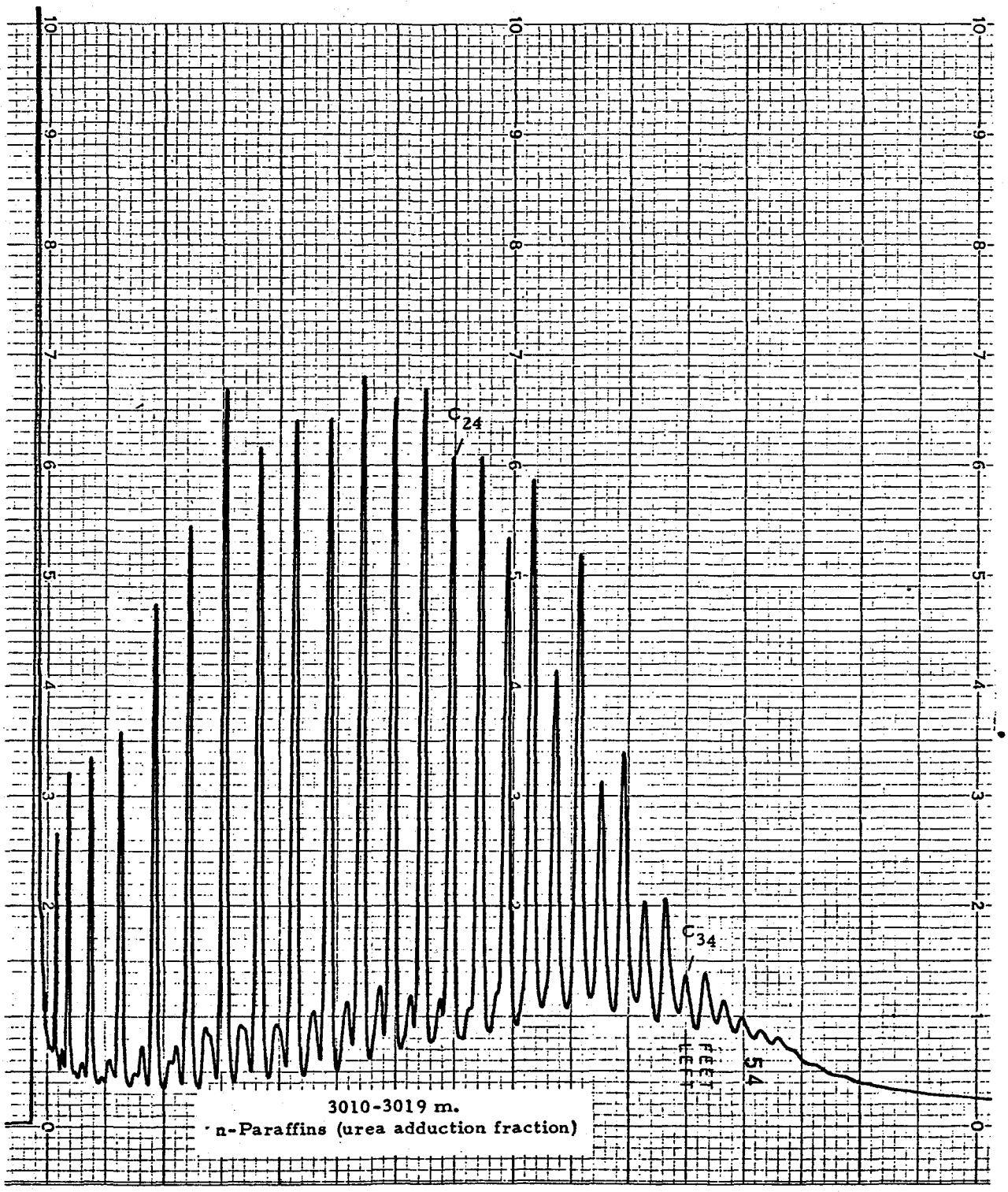

C_{24}
C_{34}
C_{36}
2920-2950 m.
n-Paraffins (urea adduction fraction)

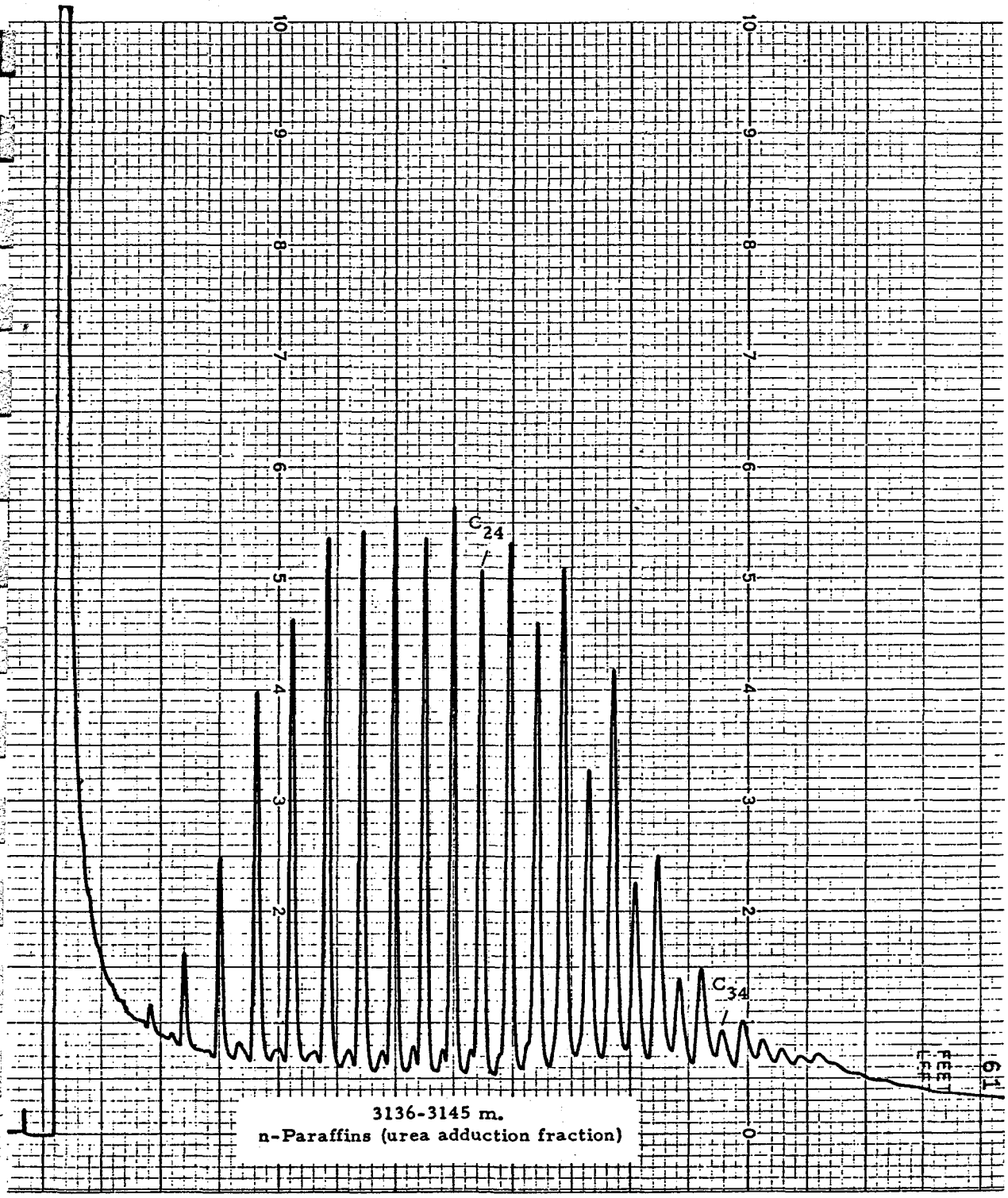

C24
C34
FEET
2950-2980 m.
n-Paraffins (urea adduction fraction)

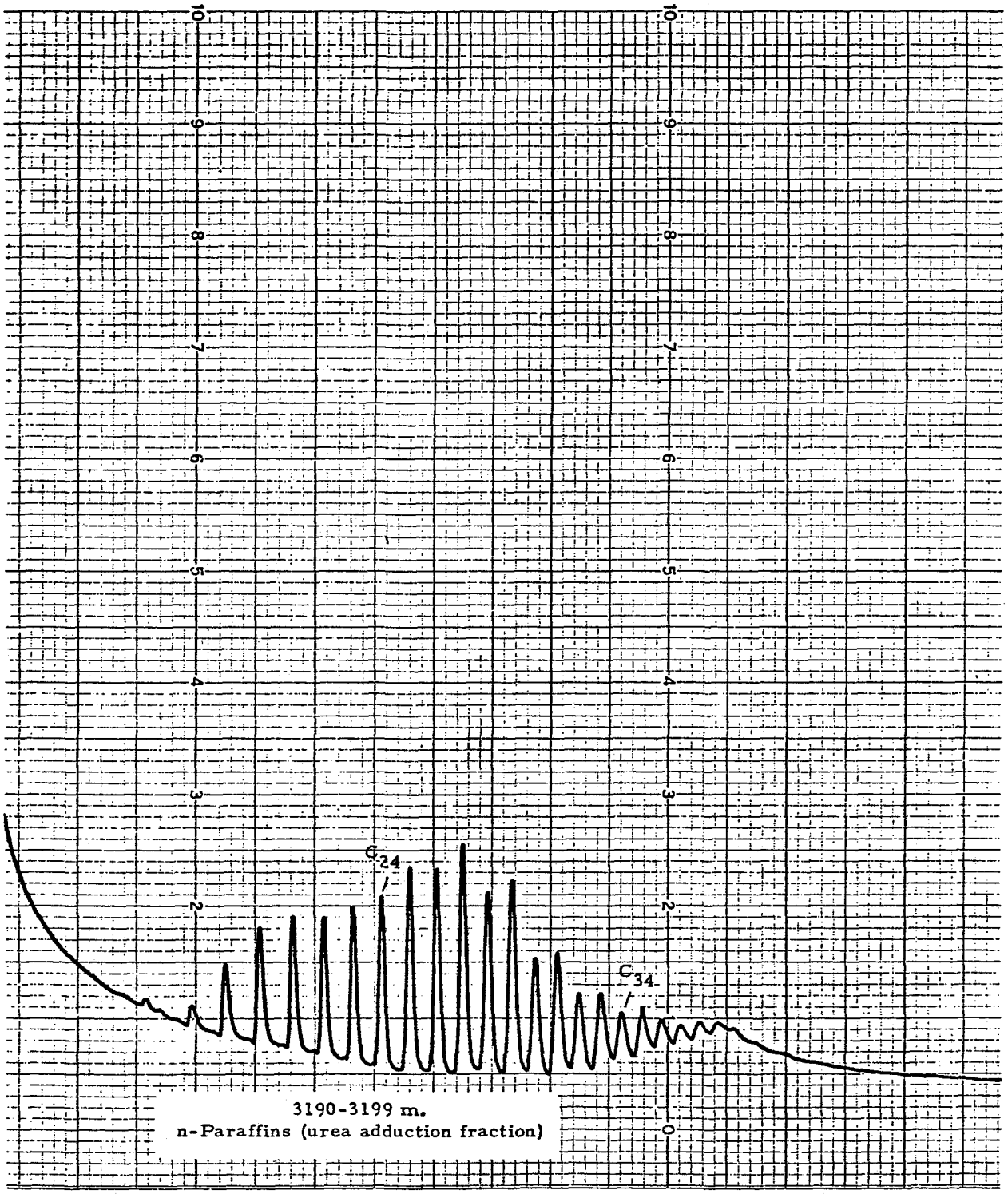

C_{24}
C_{34}
2680-2710 m.
n-Paraffins (urea adduction fraction)

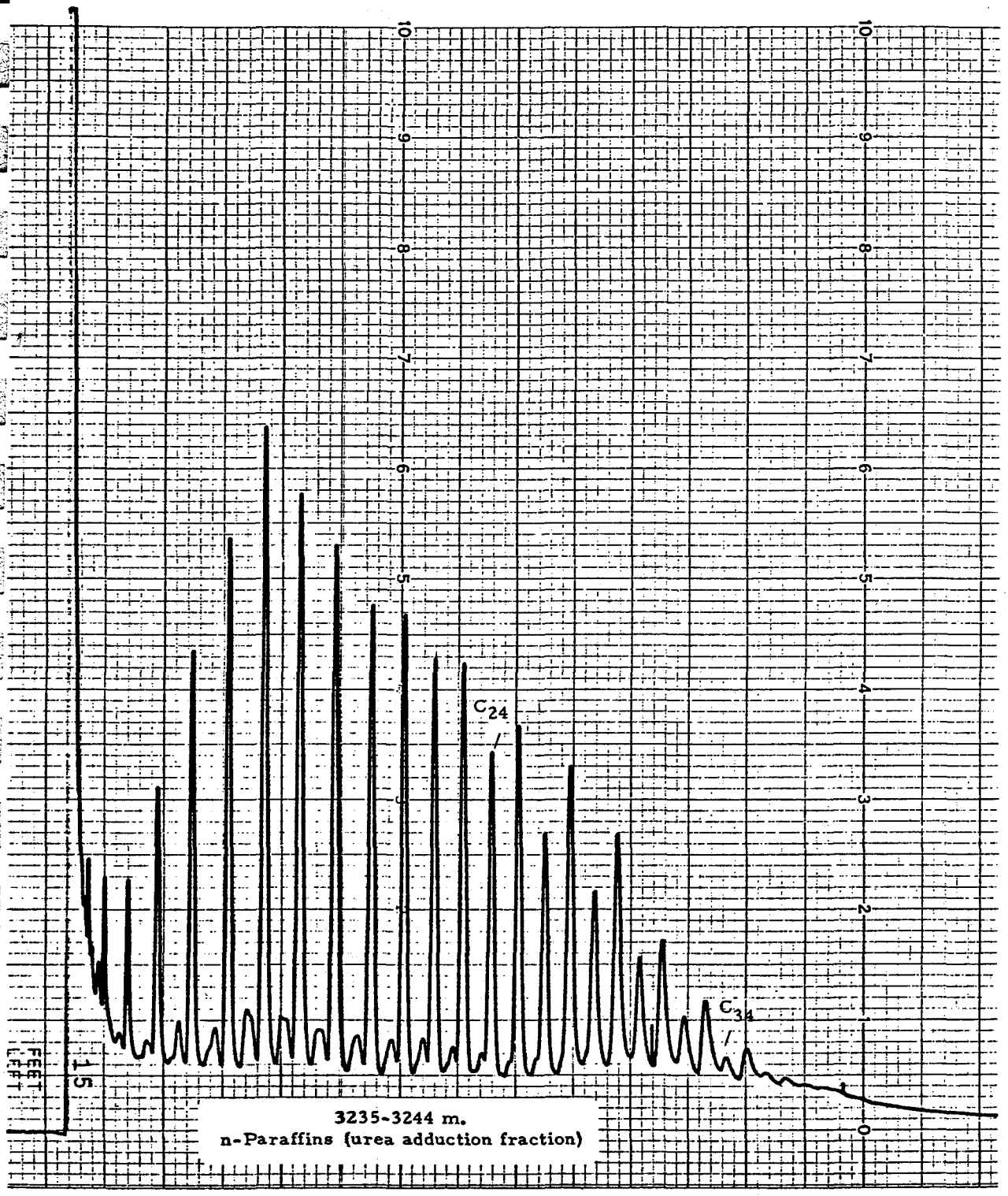


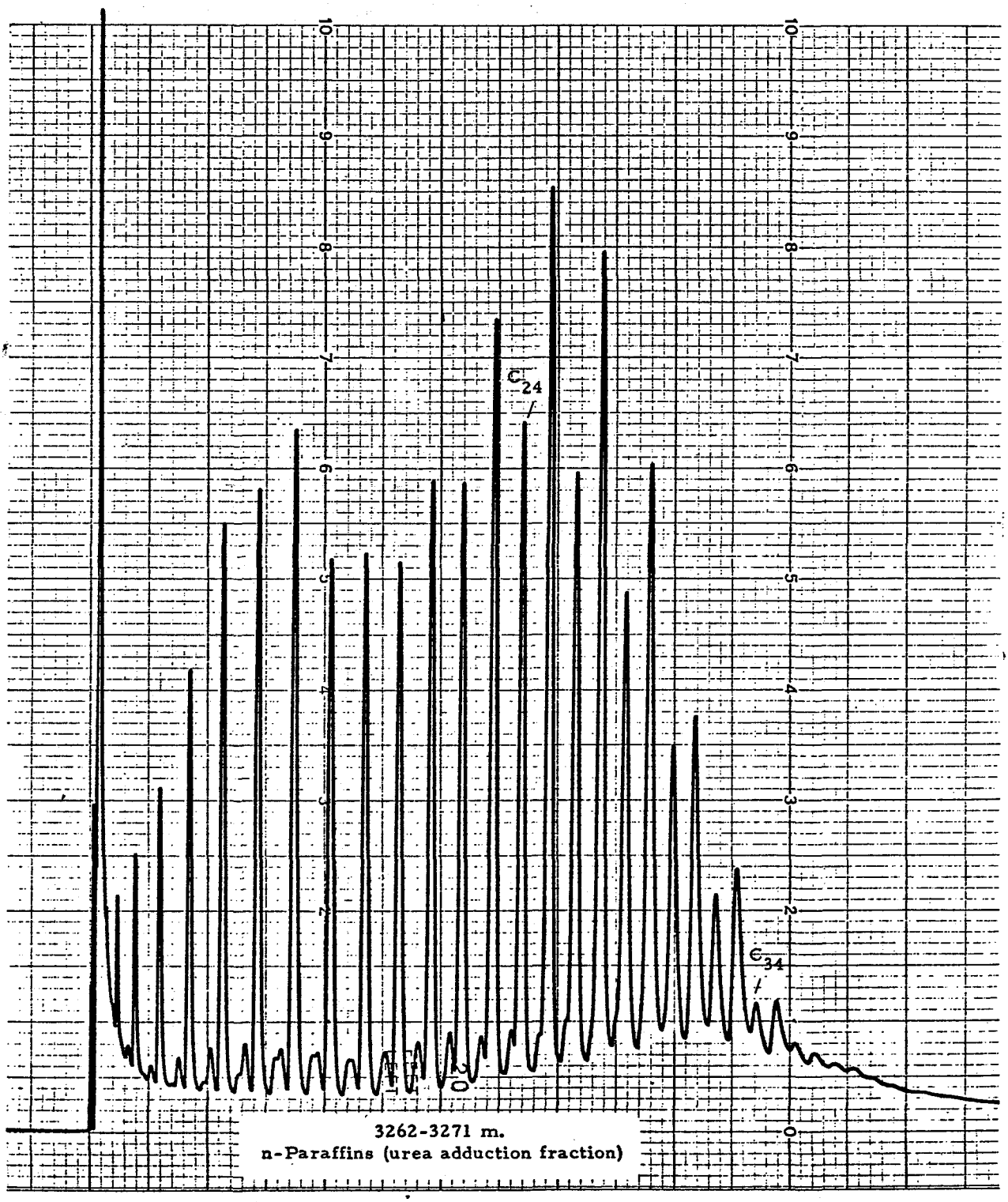
2980-3000 m.
n-Paraffins (urea adduction fraction)

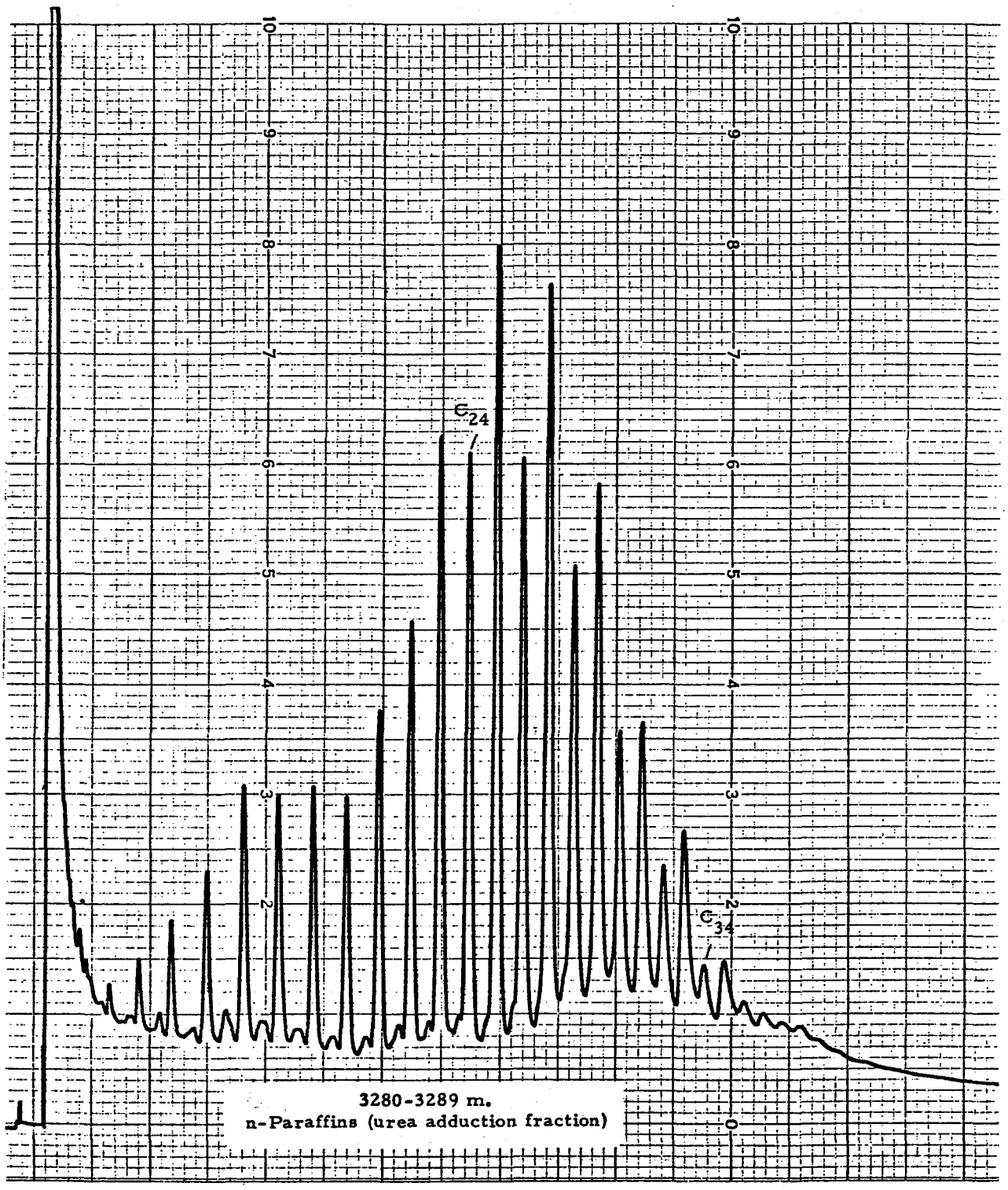

C24
C34
54
FEET
FEET
3010-3019 m.
n-Paraffins (urea adduction fraction)

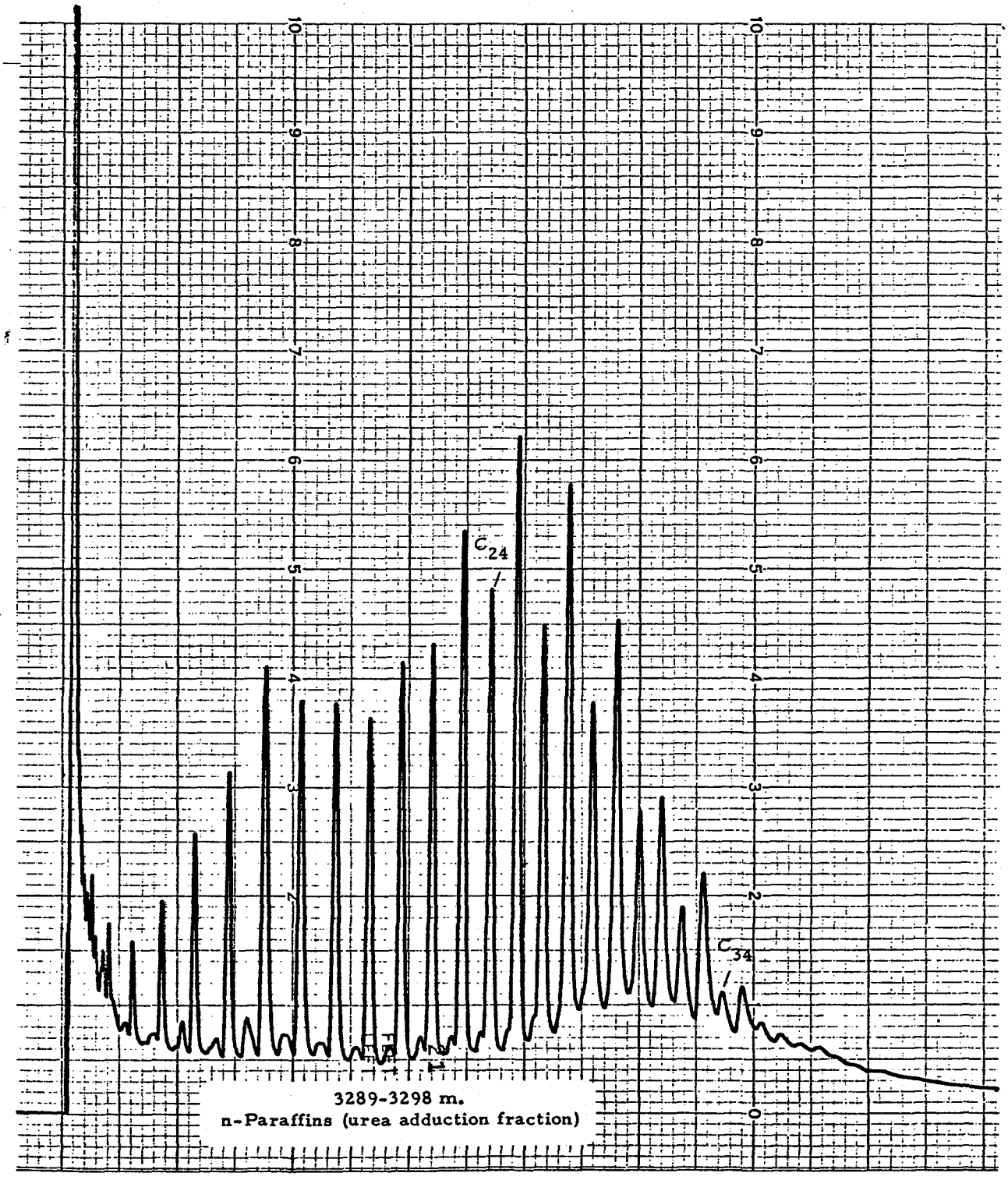

C_{24}
C_{34}
3136-3145 m.
n-Paraffins (urea adduction fraction)

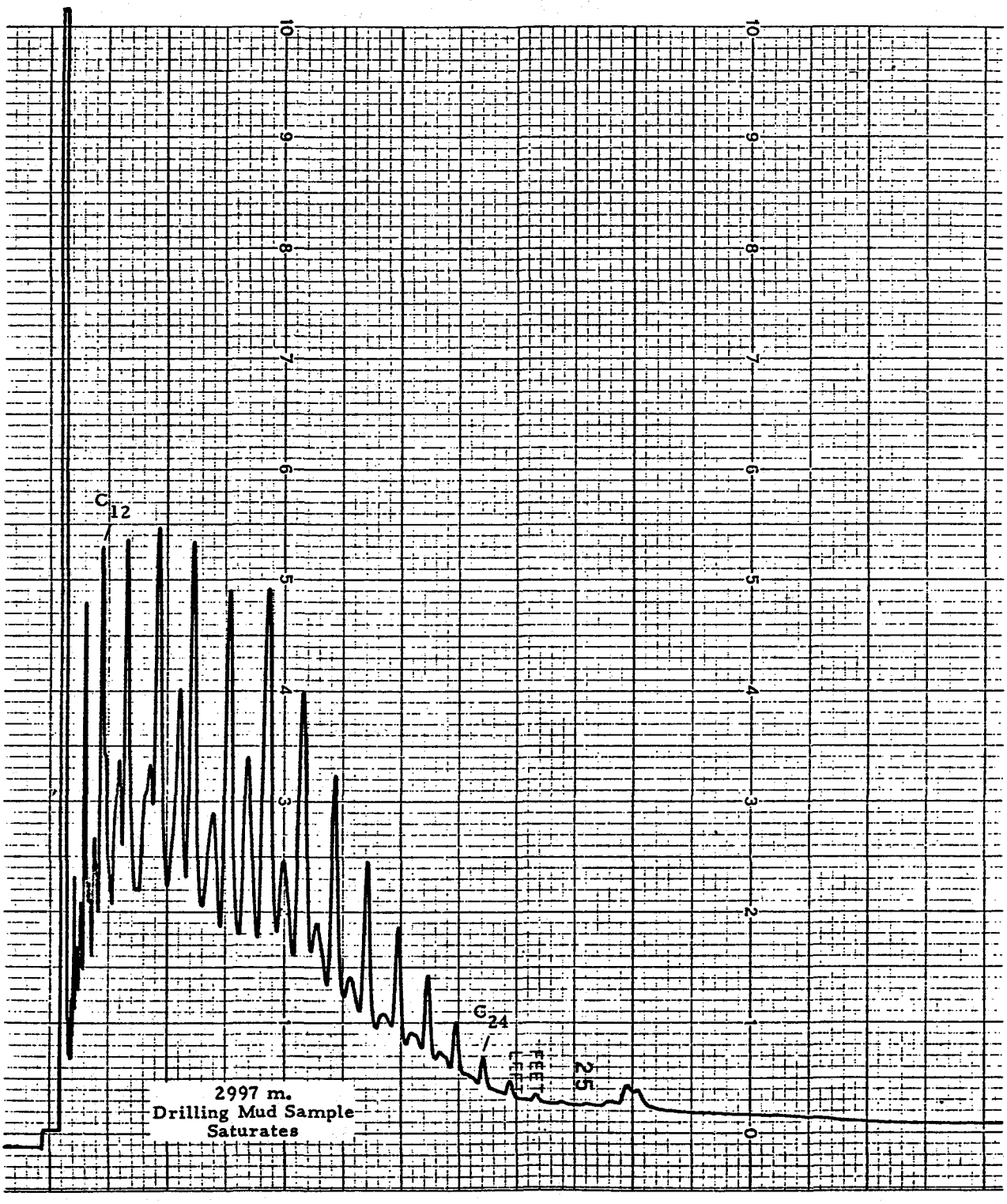

10
9
8
7
6
5
4
3
2
1
0
C_{24}
C_{34}
3190-3199 m.
n-Paraffins (urea adduction fraction)


C_{24}
C_{34}
FEET
15
3235-3244 m.
n-Paraffins (urea adduction fraction)


C24
C34
3262-3271 m.
n-Paraffins (urea adduction fraction)


C24
C34
3280-3289 m.
n-Paraffins (urea adduction fraction)


C_{24}
C_{34}
3289-3298 m.
n-Paraffins (urea adduction fraction)


C12
C24
2997 m.
Drilling Mud Sample
Saturates
10
9
8
7
6
5
4
3
2
1
0

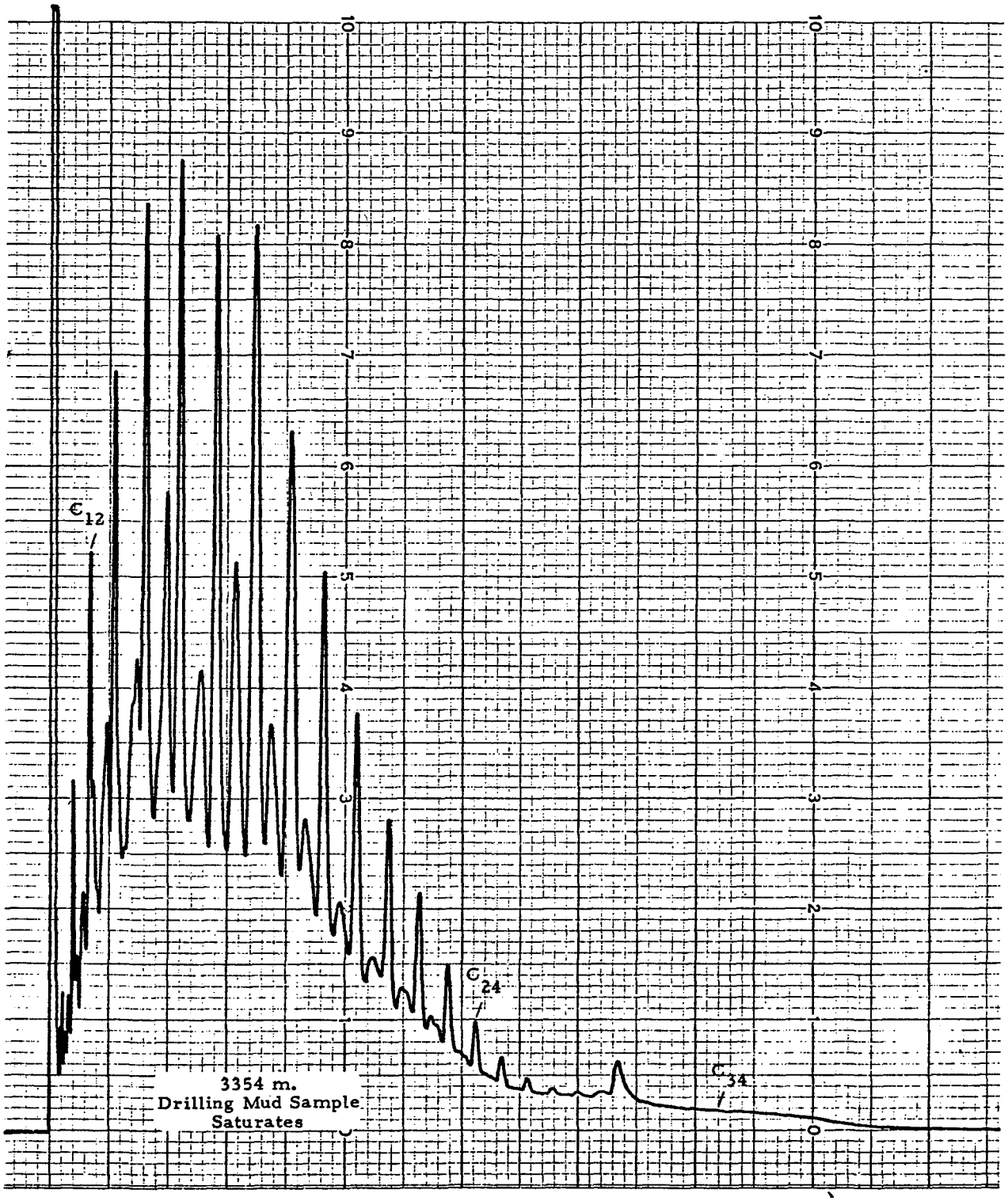
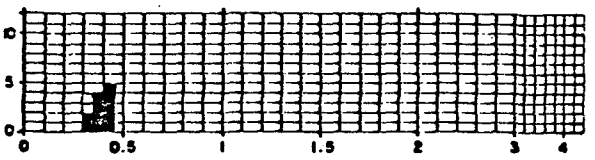
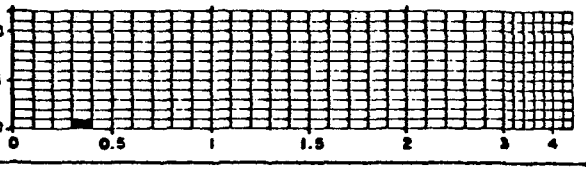
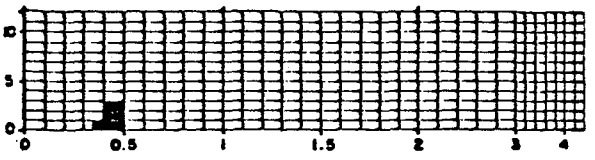
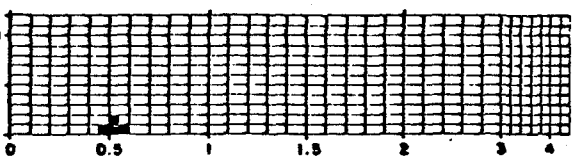
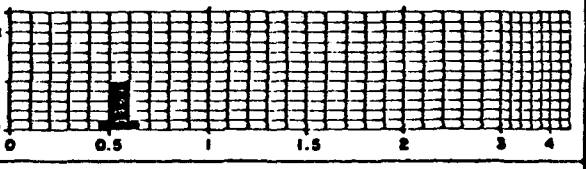
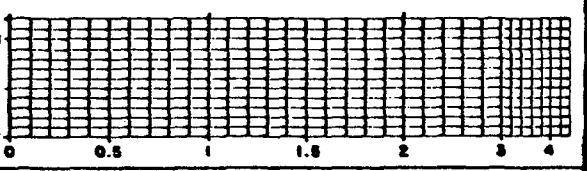
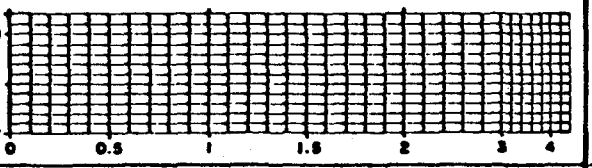
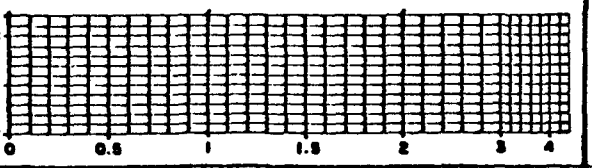
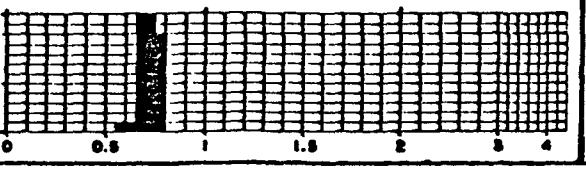
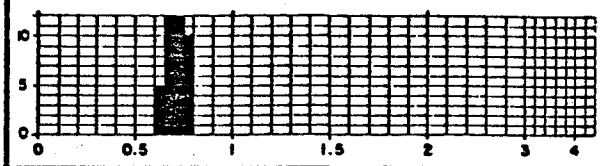
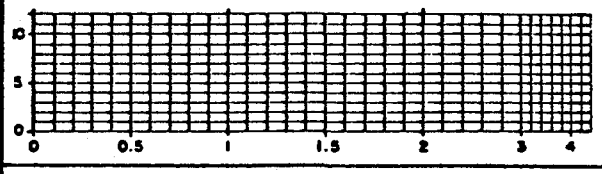
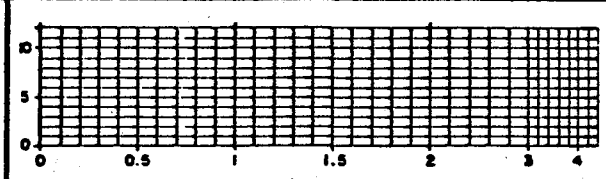
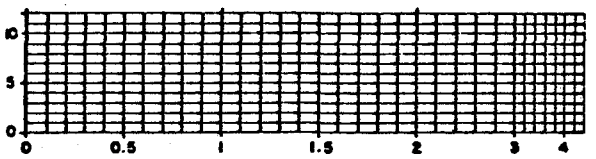
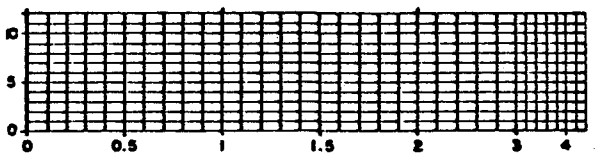
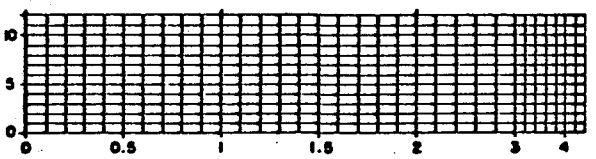
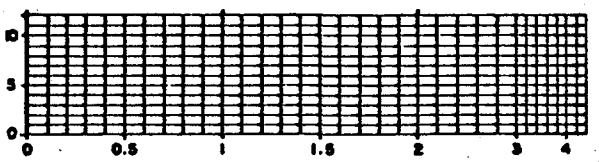
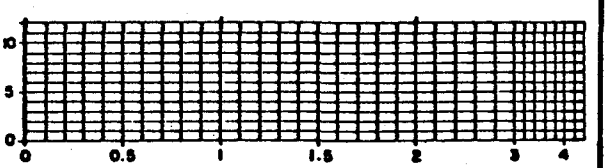
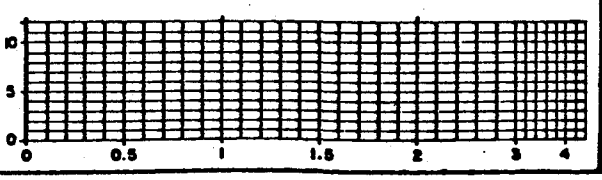

C12
C24
C34
3354 m.
Drilling Mud Sample
Saturates

Table 5. Vitrinite Reflectivity Data

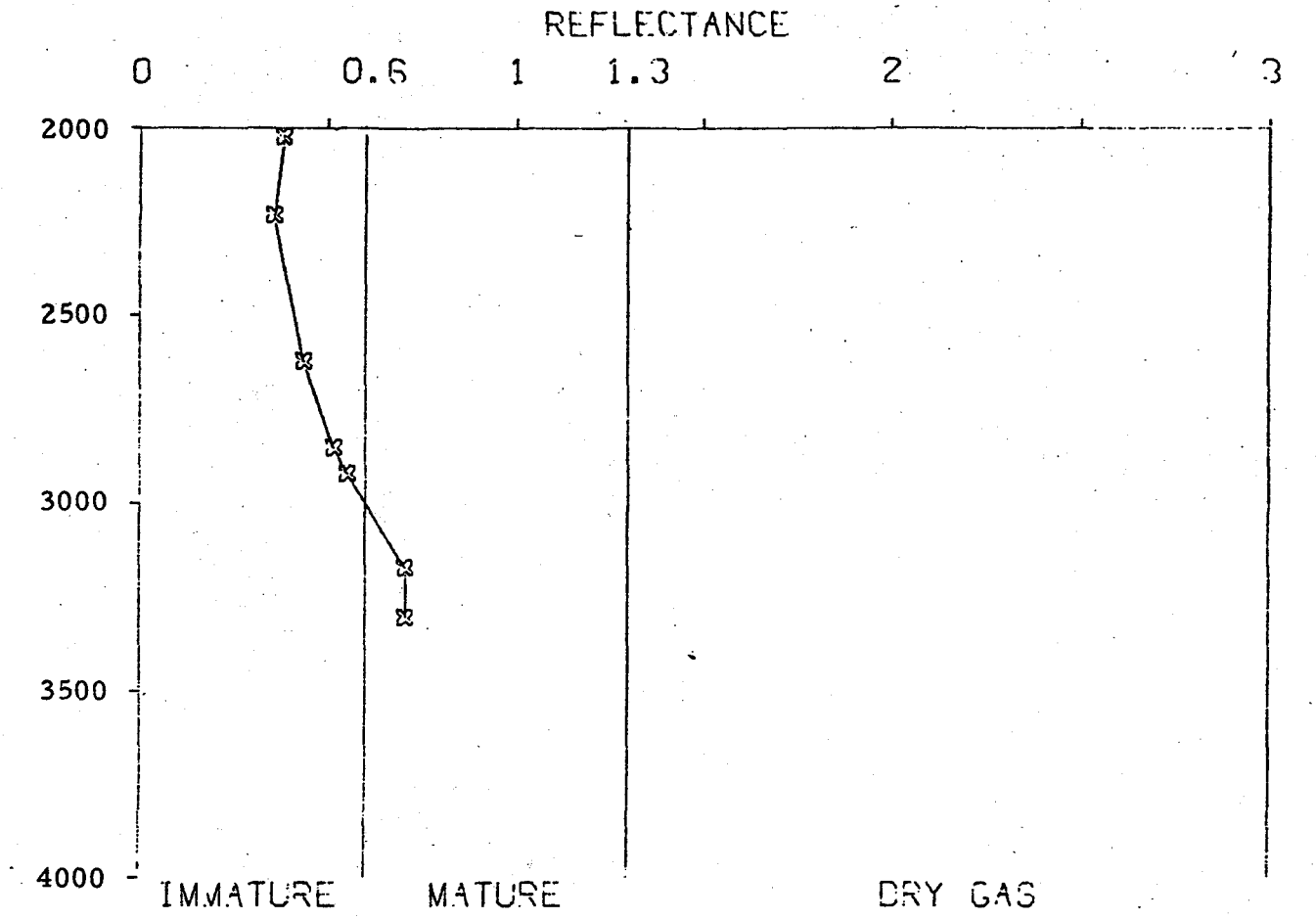
Depth (m)	Sample Type	Lithology	Remarks	Reflectivity Values (R_o) vs. Number of Measurements	R_o * (mean)
2020	ctgs	Siltstone with minor loose sand	Recycling and pyrite		0.38 (11)
2230-2260	ctgs	Siltstone	Recycling		0.35 (2)
2590-2620	ctgs	Siltstone and sandstone	Recycling		0.44 (7)
2820-2850	ctgs	Siltstone	Recycling some vitrinite >1.0		0.52 (4)
2890-2920	ctgs	Siltstone with minor limestone	Recycling and pyrite		0.55 (12)
2920-2950	ctgs	Siltstone and limestone	Cave material of 0.2-0.35 R_o		Sample Unsuitable
2980-3000	ctgs	Siltstone, limestone, and sandstone	Cave material of 0.2-0.4 R_o		Sample Unsuitable
3109-3118	ctgs	Sandstone with minor siltstone	Cave material		Sample Unsuitable
3172-3181	ctgs	Siltstone with minor sand	Recycling but good sample		0.71 (40)

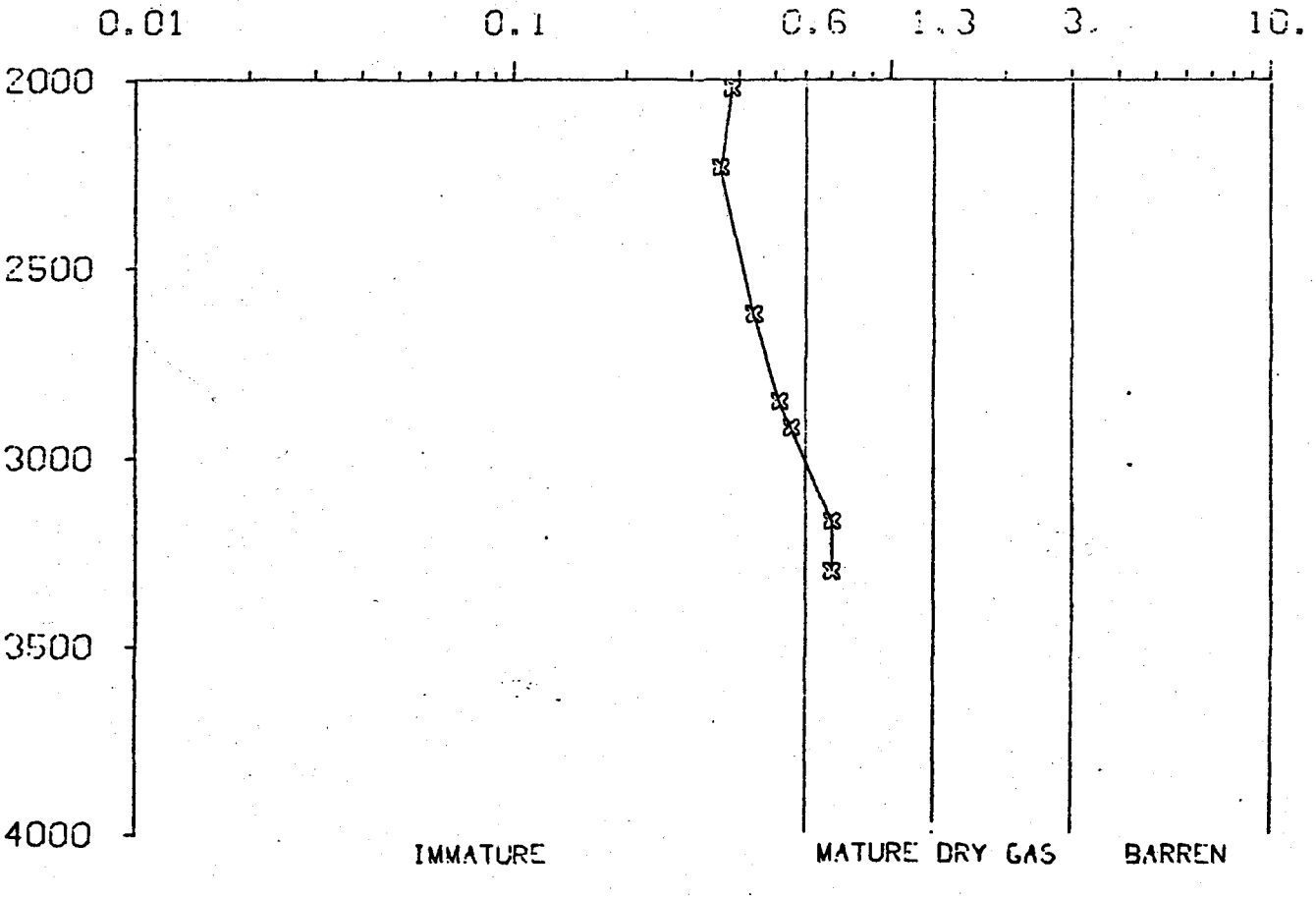
* Value in parenthesis indicates number of particles measured.

Table 5. Vitrinite Reflectivity Data (con't.)

Depth (m)	Sample Type	Lithology	Remarks	Reflectivity Values (R_o) vs. Number of Measurements	R_o * (mean)
3307-3316	ctgs	Siltstone, sand, coal, and lime-stone	Recycling but good sample		0.71 (40)
					
					
					
					
					
					
					
					

* Value in parenthesis indicates number of particles measured.


REFLECTANCE
0
0.6
1
1.3
2
3
2000
2500
3000
3500
4000
IMMATURE
MATURE
DRY GAS


0.01
0.1
0.6
1.3
3.
10.
2000
2500
3000
3500
4000
IMMATURE
MATURE DRY GAS
BARREN