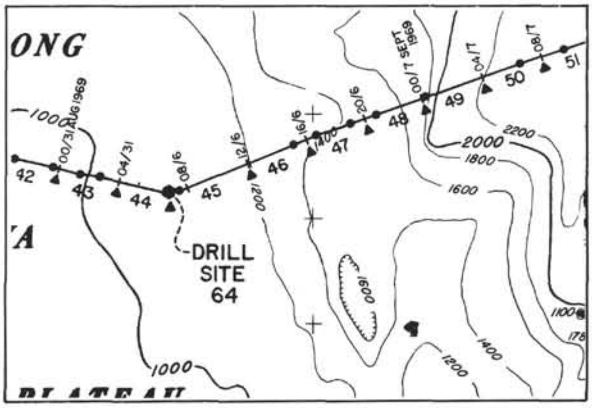
6. SITE 64

Shipboard Scientific Party[1]



Occupied: August 31–September 6, 1969.

Position: 1° 44.56′N., 158° 36.51′E. (Hole 64.0).
1° 44.44′N., 158° 36.54′E. (Hole 64.1).

Water Depth: 2052 meters.

Total Depth: 985 meters, in middle Eocene cherty limestone.

Holes Drilled: Two holes.

Cores Taken: Twenty-two cores.

Main Results: The drill penetrated an apparently uninterrupted sequence of highly calcareous pelagic sediments ranging in age from late middle Eocene to recent. The moderately smooth basal seismic reflector was not reached, but probably was less than 150 meters below the bit. The many reflectors traceable on reflection profiles in this region are due mainly to alternation of slightly more and less well indurated layers. Diagenesis caused greater induration and compaction, progressive loss of color, and increasing silicification and calcite solution and recrystallization. Rates of accumulation averaged about 23 m/m.y.

BACKGROUND AND OBJECTIVES

The Ontong Java Plateau–sometimes referred to as the Solomon Rise–is an extraordinary region of the Pacific. It consists of a broad, shallow (2000 meters), smooth, and nearly level surface extending over an area nearly 5 degrees on a side, dropping away on the west and east sides along irregular slopes and on the southwest into a narrow curving trough that separates the plateau from the rugged and tectonically unstable Solomon Islands (Plate 1, and Figure 1). Beneath the sea floor, reflection profiles (Woollard, 1967, Figs. 12-14) reveal a sedimentary column about 1-second (about 1 kilometer) thick (Figures 2 and 3), resting on a smooth basal reflector. Within the sediments are dozens of reflectors, some of which can be traced for hundreds of kilometers–the reflection profiles taken on Leg 7 (Reflection Records 39 through 48 in the Reflection Seismology Chapter) are typical of the region. Still deeper, refraction profiles (Woollard *et al.*, 1970; Furumoto *et al.*, 1970) show abnormal crustal sections, consisting of a layer with p-wave velocities of about 6.3 km/sec extending to depths of about 20 kilometers. The M-discontinuity is not discernible beneath the Plateau.

The Pacific Panel put a high priority on a site on the Plateau for several reasons:

1. The thick sedimentary section, if mainly pelagic, might extend well back into the Mesozoic, assuming that conventional estimates of pelagic carbonate sediment accumulation rates (about 10 m/m.y.) maintained here.

2. If, on the other hand, the section includes terrigenous detritus or large amounts of pyroclastic material, then we should be able to learn something of the tectonic history of the Solomon Island area and of the trough between the Solomons and the Plateau.

3. The numerous extensive seismic reflectors can be sampled to learn their nature. Guesses included chert, ash, diatomaceous fluff and limestone. The chert possiblity was the most worrisome to the panel–and to the Leg 7 scientific party, at least until we had drilled Sites 62 and 63–because shallow chert layers might have proved too difficult to penetrate.

4. The smooth basement could be sampled. Guesses included thick chert, hard crystalline limestone and basalt, any of which would fit the measured seismic velocity of about 5.6 km/sec.

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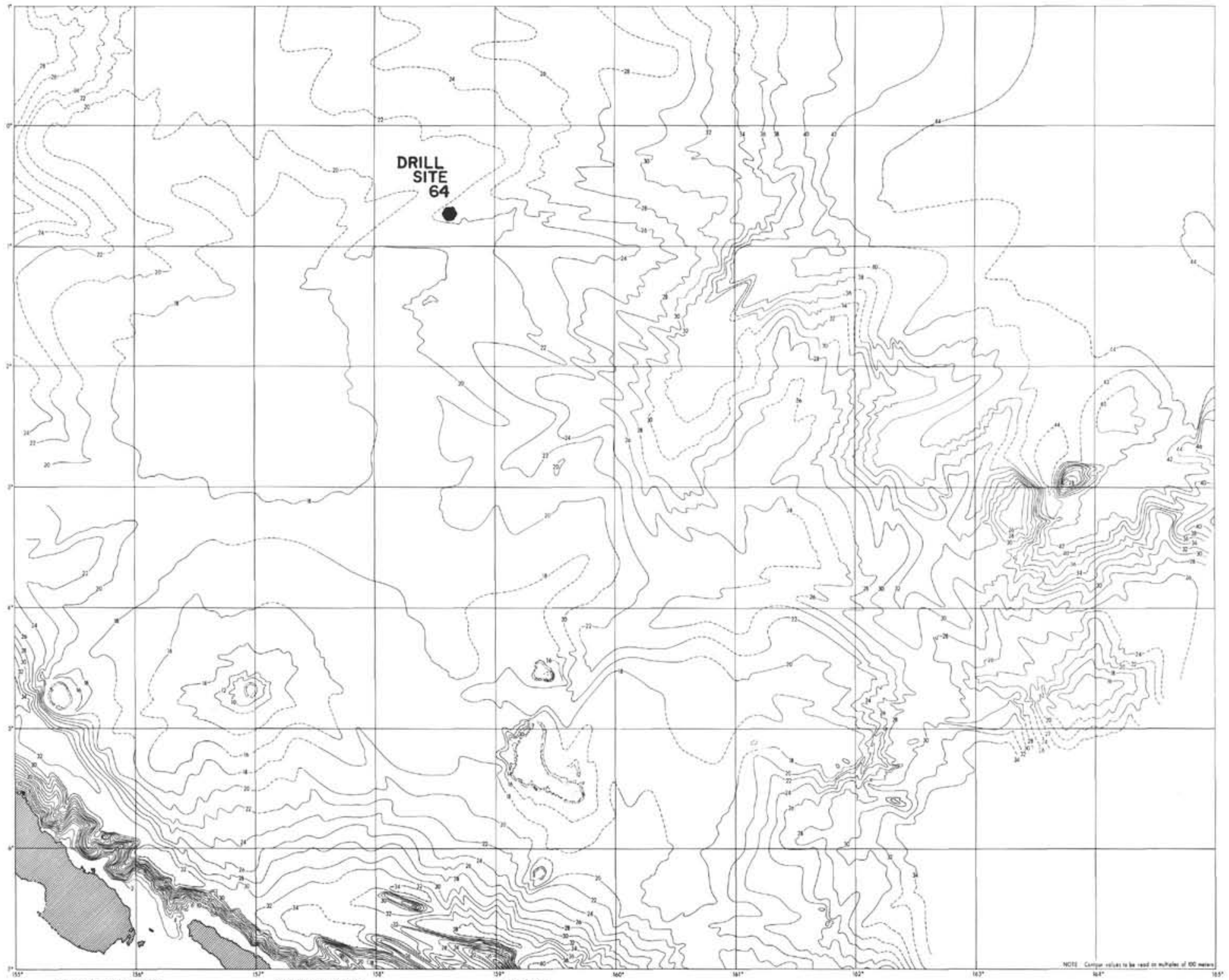
[1] E. L. Winterer and W. R. Riedel, Scripps Institution of Oceanography, La Jolla, California; R. M. Moberly, Jr., J. M. Resig and L. W. Kroenke, Hawaii Institute of Geophysics, Honolulu, Hawaii; E. L. Gealy, Scripps Institution of Oceanography, La Jolla, California; G. R. Heath, Oregon State University, Corvallis, Oregon; Paul Brönnimann, University of Geneva, Geneva, Switzerland; Erlend Martini, University of Frankfurt, Frankfurt, Germany; T. R. Worsley, University of Illinois, Urbana, Illinois.



Bathymetry of the Ontong Java Plateau
Hawaii Institute of Geophysics
University of Hawaii

Contoured by: Loren W. Kroenke
Assisted by: Theodore L. Orwig, Paul F. Eyre, James W. Ball
Drawn by: Richard R. Rhodes

Sources of Data:
1. Hawaii Institute of Geophysics Surveys since 1965
2. 1964 U.S.S. Wandank data reported by Rose, *et al* (1969), and HMS Dampier bathymetry also reported by Rose, *et al* (1969)
3. Compiled track charts kindly supplied by the Australian Hydrographer

Figure 1. *Bathymetry of the Ontong Java Plateau.*

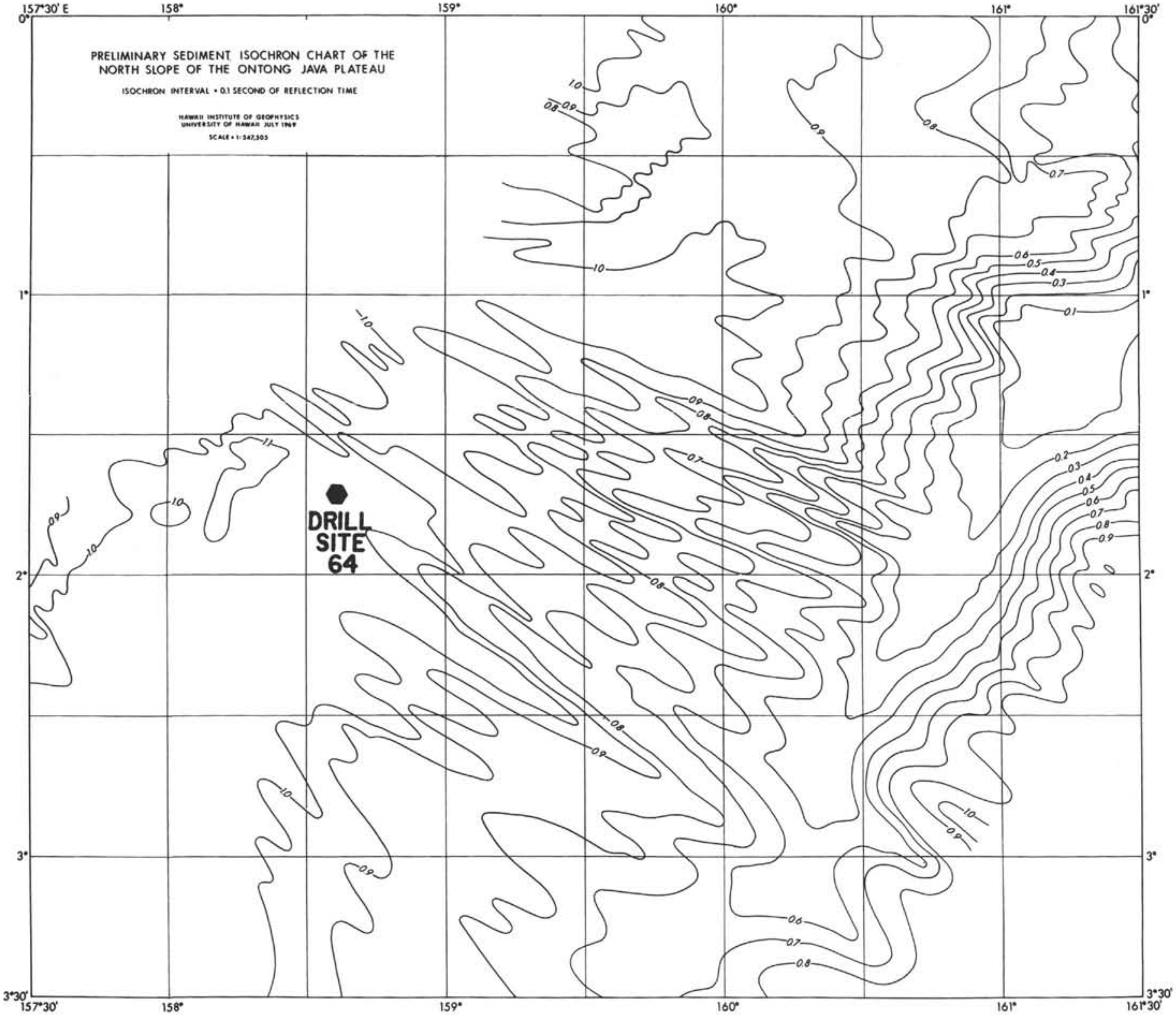


Figure 2. *Preliminary sediment isochron chart of the north slope of the Ontong Java Plateau.*

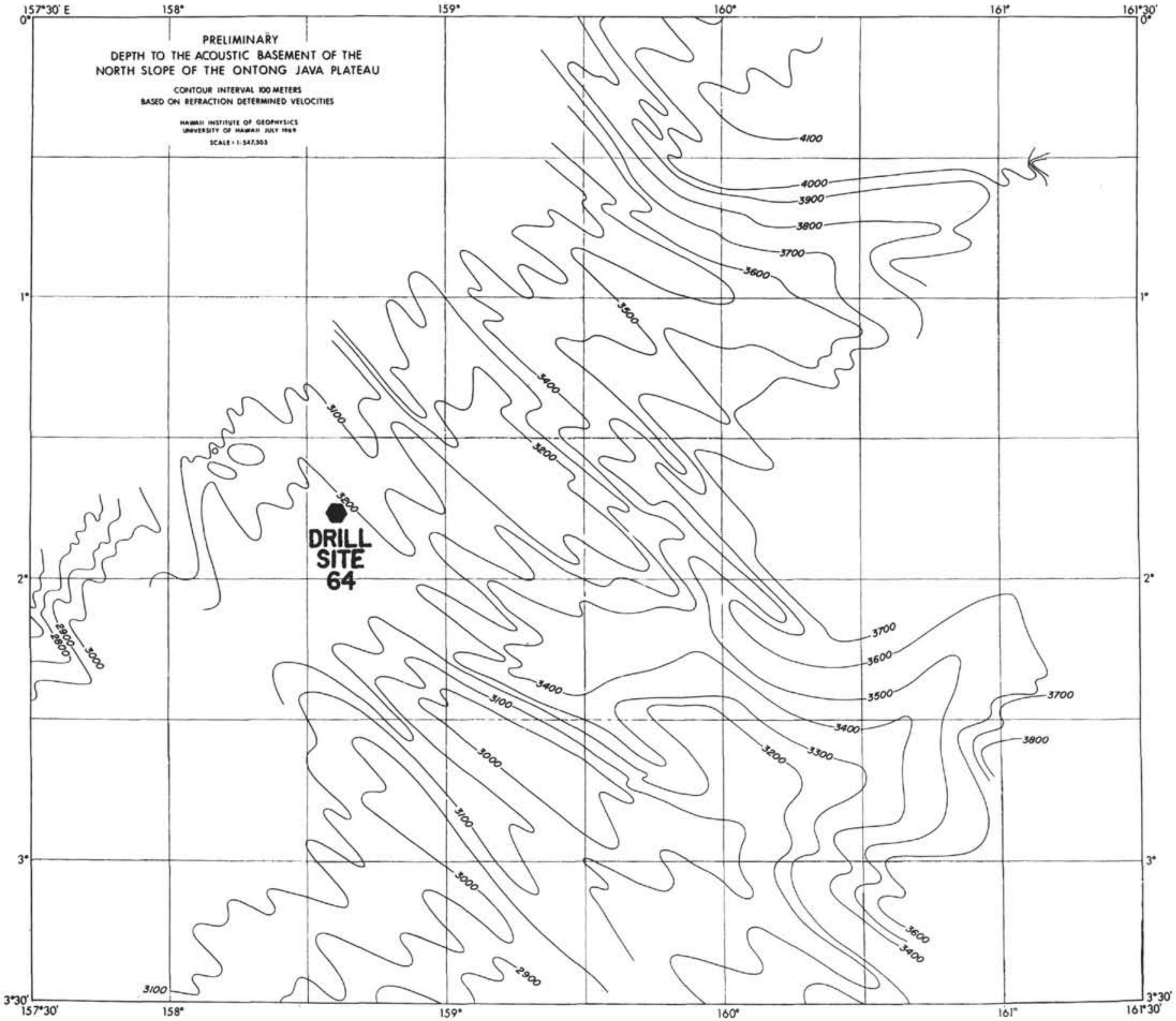


Figure 3. *Preliminary depth to the acoustic basement of the north slope of the Ontong Java Plateau.*

In the light of our experience at Sites 62 and 63, the shipboard party felt fairly confident that the sedimentary section would somewhat resemble that at Site 62, and that at least the shallow reflectors should offer no special difficulties to the drill. The section might even prove to be a superior place to continue and extend downward the detailed biostratigraphic column begun at the previous two sites.

OPERATIONS

Site Survey and Approach

During the approach to Site 64, the air gun and compressor failed briefly resulting in a loss of reflection records for a little over two hours (Figure 4). The system was repaired, however, in time to obtain sufficient data in the vicinity of the site to determine that a typical sedimentary section was present, characteristic of the Ontong Java Plateau. Water depth was 2046 meters (1098 fathoms) at the site. Sediment thickness is about 1.06 seconds with the first prominent basal reflector occurring at 0.95 seconds. At least sixteen reflectors were observed on crossing the tentative drilling site (Figure 4).

Drilling Operations

On arriving at the site at 0730 hours on August 31, we dropped the ORE beacon, which had been chosen for this deep hole because of its promised long life. It failed within moments, so a Burnett beacon was dropped and the drill string was lowered to the sea floor, using a Hycalog flat-faced diamond bit. A core was taken at the sea floor and thereafter at approximately 100-meter intervals.

Drilling rates (shown graphically on the Site Summary Log) decreased rather gradually from about 300 m/hr at the surface to about 60 m/hr at 400 meters, but decreased markedly to around 10 m/hr in the interval between about 430 and 510 meters, corresponding to a prominent set of reflectors of the seismic profile record at the site. Below 510 meters the rates fluctuated between about 15 and 50 m/hr, with a pronounced drop at about 710 meters.

The higher cores were simply punched rather than drilled, but lower cores required increasing amounts of time to cut. While attempting to retrieve Core 10 at 851 meters, the shear pin on the barrel failed, and we were forced to abandon the hole and retrieve the entire drill string.

About two hours after the bit had been raised above the sea floor, the beacon suddenly failed. It seems quite possible that slumping of the loose ooze around the mouth of the hole, which was probably cratered, upset or even partly buried the beacon.

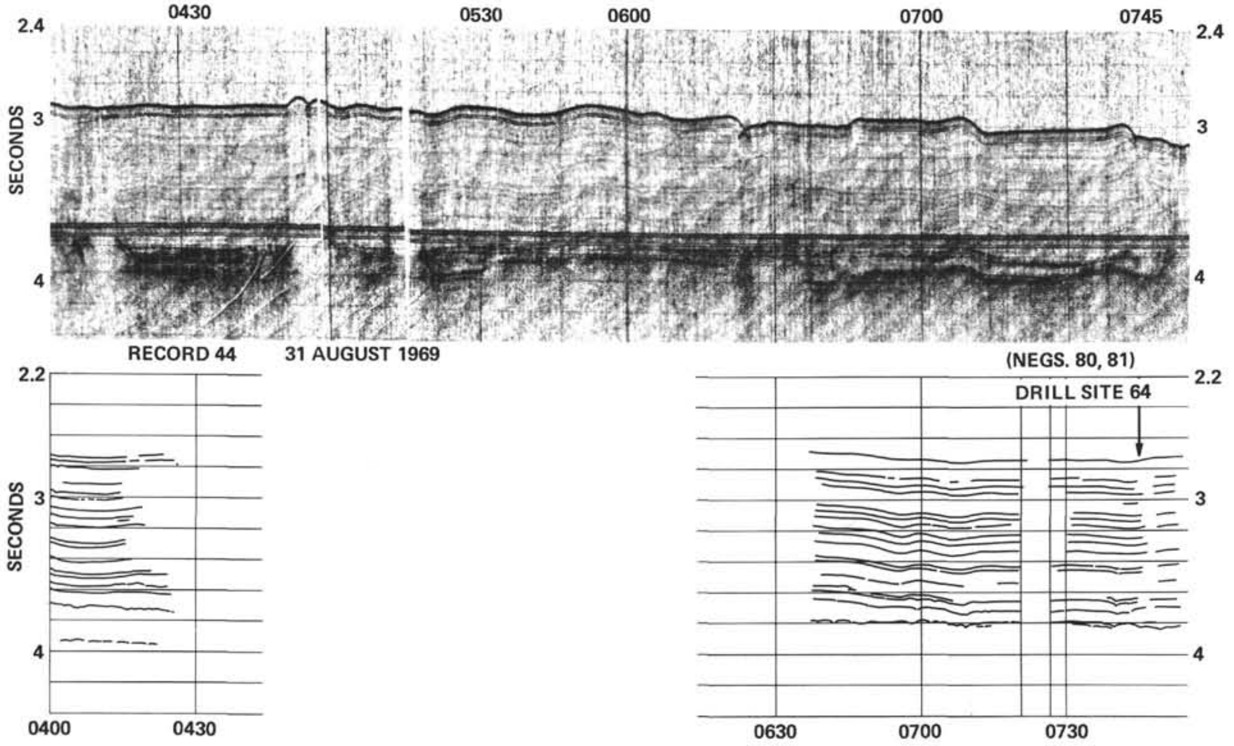


Figure 4. *Seismic reflection profile taken from D/V* Glomar Challenger *on approaching Site 64, and a line-drawing interpretation of the profile. Site 64 is located at the right (east) end of the profile. See Plate 1 for location. (Record No. 45)*

Another beacon was dropped and the ship moved about 60 meters to the west of that beacon to begin the second hole. The bit was washed down to 433 meters where a sequence of five continuous cores was cut to sample a group of reflectors shown on the seismic profiles. Coring was then continued in an effort to sample between the intervals cored of the first hole. This program was carried to Core 10 at 972 meters. In drilling ahead from that point, the bit met a very hard layer at 983 meters. The next 7-foot interval was cored, but only one foot of cherty limestone was recovered. On the next attempt to core, the bit made no progress at all in two hours of drilling, and the hole was abandoned. Inspection of the bit showed it to be worn completely smooth with no diamonds left.

SITE SUMMARY

Lithology

Examination of the cores recovered at Site 64 suggests that carbonate ooze has been the dominant sediment on that part of the Ontong Java Plateau from Eocene time to the present. Lithologic variation in the drilled and cored section, nearly 1000 meters thick, is small and can be attributed to varying degrees of diagenetic change in the ooze.

The bulk of the ooze is composed of nannofossils. However, the amounts of the coarser-grained and less-voluminous components–tests of planktonic and benthonic foraminifers and of radiolarians, sponge spicules, and vitric ash–vary enough to produce repeated fluctuations in the texture and silica content of beds in the section.

The Quaternary nannofossil chalk ooze at the top of the section is very soft, highly colored, and distinctly mottled. The Eocene limestone and chert at the bottom of Hole 64.1 are hard and nearly without chroma, but undoubtedly were originally chalk ooze, too. The principal diagenetic changes are compaction and silicification leading to lithification, and loss of color. Definition of terms for the degree of lithification (chalk oozes, chalks, and limestones) is given in Chapter 2.

The four cores above about 400 meters contain chalk ooze that shows with depth on increasing firmness and color values toward pale tints or white, and decreasing color chroma and variety of hue, so that mottles and bedding nearly vanish. Between 400 and 750 meters, chalk ooze alternates with chalk, commonly within the same core. Induration in the section between 433 and 479 meters could be examined in detail, as that section was cored continuously (Cores 1 through 5 of Hole 64.1). Most of the thirty sections contain both chalk ooze and chalk, but four intervals dominated by chalk occur about 10 to 12 meters apart. Unfortunately, intervals of muddy slurry interfere with the precise measurements of the spacing of these chalks, and hinder a detailed examination of the gradual changes between ooze and chalk. Nevertheless, it appears that for the middle part of the section drilled, contacts between alternating intervals of ooze and chalk constitute the abundant good seismic reflecting horizons of the Ontong Java Plateau.

In a similar fashion, both friable chalk and non-friable, harder limestone are found alternating with one another in deeper cores. The limestone beds and layers of incipient silicification, discussed below, are probably the reflectors of that part of the sedimentary section. Fluctuations in the drilling rates and in the physical properties of cored rock also reflect these changes in lithification.

All of the cores from the sea floor to the total depth of drilling contain radiolarians and glass shards, which are often abundant, and rare sponge spicules. Below about 700 meters there is strong evidence that part of the silica of at least some of these components has mobilized within the sediment. Radiolarians in much of the chalk and limestone have been "welded" to one another at tangential contacts, forming clotty or spongy networks through the rock that become evident as the carbonate is dissolved in weak acid. Such insoluble parts of chalk or limestone fragments retain the form of the fragments after solution of the carbonate. In some smear slides radiolarians are seen to be partly corroded.

At about 983 meters depth, and almost certainly correlative with the very prominent seismic reflector at about 0.97 seconds, the drilling rate decreased markedly and cherty limestone was cored. The chert clearly replaces the limestone. In hand specimen, blebs and anastomosing worm-like protrusions of gray to olive-gray chert cut limestone. Replacement favors some beds, but much of the chert cuts across bedding. The pieces recovered total only about 20 centimeters of about 150 centimeters supposedly cut in Core 11 of Hole 64.1, and thus may not be representative of the true proportions of the lithologies. However, for the recovered material, chert makes up about 20 per cent, limestone about 50 per cent, and chalk about 30 per cent.

In the specimens from below 983 meters sectioned for thin sections, silicification has progressed from chalcedonic fillings of foraminifer tests, through replacement of the nannofossil micritic matrix by cryptocrystalline cristobalite, to growth of a microcrystalline chalcedony mosaic throughout the matrix. Silicification appears to favor beds with more and larger foraminifers. In the chert, the thicker walls of larger foraminifers remain carbonate, but their calcite commonly is corroded at

TABLE 1
Site 64, Leg 7

Hole	Interval (ft)	(m)	Cores Drilled	Core Cut (ft)	(m)	Core Recovered (ft)	(m)	Core %	Recovery %
64-0	0-30	0-9	Core 1	30	9.1	30	9.1		
	30-325	99-108							
	325-355		Core 2	30	9.1	29	8.8		
	663-693	202-211	Core 3	30	9.1	30	9.1		
	693-998		Drilled						
	998-1028	304-313	Core 4	30	9.1	30	9.1		
	1028-1343		Drilled						
	1343-1373	409-418	Core 5	30	9.1	30	9.1		
	1373-1657		Drilled						
	1657-1687	505-514	Core 6	30	9.1	30	9.1		
	1687-2001		Drilled						
	2001-2031	610-619	Core 7	30	9.1	30	9.1		
	2031-2314		Drilled						
	2314-2330	705-710	Core 8	16	4.9	12	3.7		
	2330-2536		Drilled						
	2536-2564	773-781	Core 9	28	8.5	16	4.9		
	2564-2788		Drilled						
	2788-2800	848-851	Core 10	12	3.7	10	3.0		
	2800 (851m)	Totals	10	266	81.1	247	75.3		
64-1	0-1422		Drilled						
	1422-1452	433-442	Core 1	30	9.1	30	9.1		
	1452-1482	442-451	Core 2	30	9.1	30	9.1		
	1482-1512	451-461	Core 3	30	9.1	30	9.1		
	1512-1542	461-470	Core 4	30	9.1	30	9.1		
	1542-1572	470-479	Core 5	30	9.1	30	9.1		
	1572-1853		Drilled						
	1853-1875	565-571	Core 6	22	6.7	22	6.7		
	1875-2168		Drilled						
	2168-2175	661-663	Core 7	7	2.1	17	5.1		
	2175-2448		Drilled						
	2448-2458	746-749	Core 8	10	3.0	8	2.4		
	2458-2989		Drilled						
	2989-3005	911-916	Core 9	16	4.9	16	4.9		
	3005-3179		Drilled						
	3179-3189	969-972	Core 10	10	3.0	10	3.0		
	3189-3225		Drilled						
	3225-3231	983-985	Core 11	6	1.8	1	0.3		

TABLE 1 – *Continued*

Hole	Interval (ft)	(m)	Cores Drilled	Core Cut (ft)	(m)	Core Recovered (ft)	(m)	Core %	Recovery %
64-1	3231-3231	985-985	Core 12	0	2.1	Trace			
	3231 (985m)	Totals	12	221	67.4	224	68.3	7	101
Site Totals	6031 (1836m)		22	487	148.4	467	142.3	8	96

the edges and partly replaced by bladed chalcedony pseudomorphs after the prismatic calcite.

Physical and Chemical Properties

The physical and chemical properties of cores obtained at Site 64 are summarized in Table 2 and are displayed as a function of depth in the Site Summary at the end of this chapter. The significance of these data is discussed in separate contributions elsewhere in this volume.

Paleontologic and Biostratigraphic Summary

Foraminifera

Foraminifera indicative of Zones N. 23 to P. 12-14 were sampled at this site. The foraminiferal faunas are notable for their good preservation in all but the lowermost samples of Eocene age. Samples from Hole 64.1, Cores 9 and 10 are similar to those of the present abyssal facies in which solution has removed the small and less resistant species, and where foraminifera are outnumbered by radiolarians. In Core 11 above the chert in which coring halted, the relatively rare foraminifera have tests which are crystalline appearance.

The following is a listing of the state of foraminiferal preservation and preliminary age assignments:

Core	Preservation	Age
64.0-0 (top)	Good	N. 23
64.0-1	Good	N. 22
64.0-2	Good	N. 19
64.0-3	Good	N. 17
64.0-4	Good	N. 13
64.0-5	Good	N. 10-11
64.0-6	Good	N. 5
64.0-7	Good	N. 3
64.0-8	Good	N. 2-N. 3 (base)
64.0-9	Good	N. 2
64.0-10	Good	P. 18-P. 20
64.1-1	Good	Upper N. 8-1 N. 9
64.1-2	Good	Upper N. 7-1 N. 8
64.1-3	Good	N. 6
64.1-4	Good	N. 6
64.1-5	Good	N. 6
64.1-6	Good	Upper N. 3-N. 4 base
64.1-7	Good	N. 3 and N. 2
64.1-8	Good	N. 2
64.1-9	Solution in evidence, resistant forms remaining	P. 16
64.1-10	Solution in evidence	P. 14 or older
64.1-11	Foraminifera crystalline in appearance, few in number and poorly preserved.	P. 12-P. 14

Calcareous Nannofossils

In Hole 64.0, ten survey-cores were recovered down to the terminal depth of 851 meters, yielding calcareous nannoplankton of Zone NP 24 in the lowest core. In the second hole (64.1) a continuous sequence of five cores was obtained from the lowest Middle Miocene to the highest Lower Miocene (Zones NN 5 to NN 4), and the following survey-coring (7 cores) reached 985 meters, where drilling was terminated in cherty limestone of early Upper Eocene age (standard calcareous nannoplankton Zone NP 16).

Due to the lack of almost all *Helicopontosphaera* species, except *H. kamptneri* in the upper part of the column, the boundary between NN 4 and NN 5 has been chosen by the first appearance of *Discoaster exilis,* which is believed to appear at approximately the same level at which *Helicopontosphaera ampliaperta* dies out. In the Upper Eocene Core 9 of Hole 64.1 the

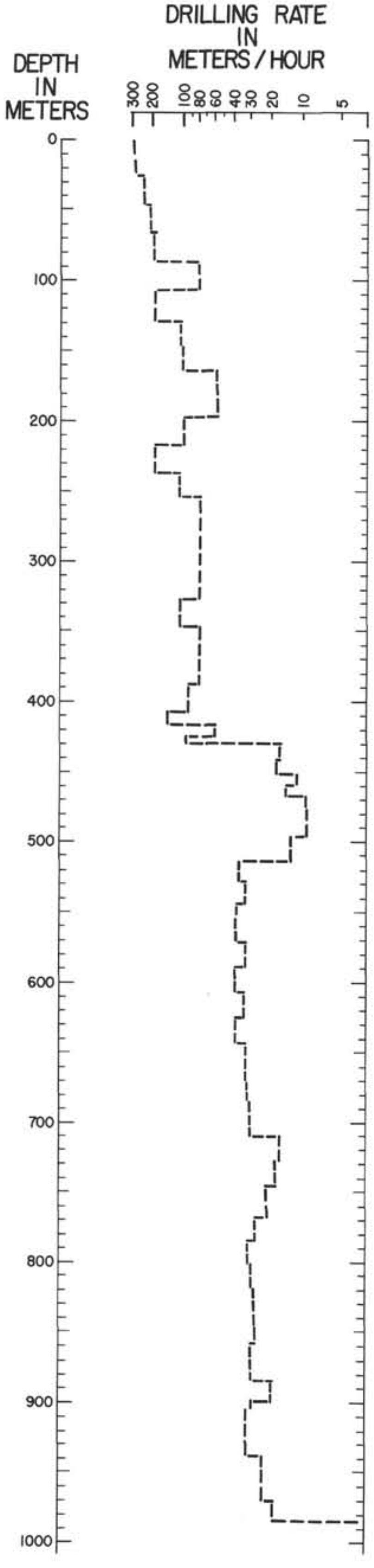


Figure 5. *Drilling rate, Site 64. Note that the abscissa is an inverted logarithmic scale.*

content, in the upper part of the column averages about 65 per cent, and the resulting bulk density is about 1.6. A 50 per cent compaction would change these values to about 30 per cent and 2.2, which is consistent with the GRAPE data.

Paleobathymetry and the Position of the Lysocline

The fact that no signs of dissolution of foraminifers is seen in samples younger than Eocene indicates that the sea floor has stood above the lysocline since then. In Eocene samples, the evidence of dissolution of certain species of foraminifers suggests that the sea floor lay at that time below the lysocline. The absolute depths of the lysocline are still unknown.

Velocity Profile

Site 64 was crossed after departure (Figure 6) bearing 164° at a distance of 400 feet (121.9 meters). The first prominent deep reflector, correlated with the chert cored at 983 meters, is at 0.97 seconds giving an average velocity for the drilled column of 2.03 km/sec. The prominent basal reflector, which may well be basaltic basement, occurs at 1.04 seconds.

In order to determine depths to the various reflecting horizons, our profiles were correlated with unpublished intersecting profiles taken by vessels of the Hawaii Institute of Geophysics. Sonobuoy refraction measurements are available for the HIG profiles. Key reflectors from the HIG profiles have been correlated with reflectors at Site 64 at 0.43, 0.71, 0.92, and 1.04 seconds. From this, the following velocity-depth relation was derived:

$\bar{V}$	Reflection	Depth Below Sea Floor
1.7 km/sec	0-0.43 seconds	0-366 meters
2.1 km/sec	0.43-0.71 seconds	366-660 meters
2.3 km/sec	0.71-0.92 seconds	660-902 meters
3.3 km/sec	0.92-1.04 seconds	902-1100 meters

Changes in the induration of the cores suggest velocity changes near the transition from chalk-ooze to firm chalk at about 400 meters and near the transition from chalk to limestone at about 700 meters. The interval with an average velocity of 2.3 km/sec embodies values between 2.3 and 2.5 km/sec in the actual sonobuoy measurements, the interval with an average velocity of 3.3 km/sec likewise incorporates the values ranging from 3.0 and 3.8 km/sec. The average velocities used were obtained from a series of closely agreeing sonobuoy measurements within 100 kilometers south of Site 64. The possibility of miscorrelation could easily introduce an error of more than 20 meters in the determination of the depth to any reflecting horizon. Furthermore, it is questionable whether boundaries assigned to the average velocities are coincident with reflectors. Layers having determined or assigned

TABLE 2
Physical Properties of Cores from Site 64

Identification	Lithology	Physical Properties								
		Saturated Bulk Density (Sect. Wt.)[a] gm/cm^3	Saturated Bulk Density (GRAPE)[b] gm/cm^3	Mean Grain Density[c] gm/cm^3	Porosity (Calculated)[d] Per Cent	Porosity (Drying, Ship)[e]		Penetrometer[f] cm	Sonic Velocity[g] m/sec.	Natural Gamma Radiation[h]
						Interval cm	Per Cent			
Hole 64.0										
Core 1-1	Foraminiferal, Nannofossil Chalk Ooze		1.482	2.71	72.8	47.0	72.0	1.77		
1-2	Foraminiferal, Nannofossil Chalk Ooze		1.492	2.71	72.3	50.0	67.7	1.42		649
1-3	Foraminiferal, Nannofossil Chalk Ooze		1.498	2.71	71.9	40.0	70.9	1.40	1451	552
1-4	Foraminiferal, Nannofossil Chalk Ooze	1.492	1.508	2.71	71.3	20.0	72.8	0.86	1491	395
1-5	Foraminiferal, Nannofossil Chalk Ooze	1.467	1.505	2.71	71.5				1450	383
1-6	Foraminiferal, Nannofossil Chalk Ooze		1.497	2.71	71.9					380
Core 2-1	Foraminiferal, Nannofossil Chalk Ooze		1.606	2.71	65.6			0.83	1459	263
2-2	Foraminiferal, Nannofossil Chalk Ooze		1.597	2.71	66.0			1.22	1470	224
2-3	Foraminiferal, Nannofossil Chalk Ooze	1.550	1.594	2.71	66.2			0.81		206
2-4	Foraminiferal, Nannofossil Chalk Ooze	1.608	1.662	2.71	62.2			0.75	1464	224
2-5	Foraminiferal, Nannofossil Chalk Ooze	1.622	1.680	2.71	61.1			0.79	1512	254
2-6	Foraminiferal, Nannofossil Chalk Ooze	1.624	1.667	2.71	61.9			0.68	1469	228
Core 3-1	Nannofossil Chalk Ooze	1.642	1.688	2.71	60.6			1.07	1512	173
3-2	Nannofossil Chalk Ooze	1.665	1.715	2.71	59.0			0.72	1544	139

[a] Saturated bulk density derived by dividing net section weight by volume.

[b] Saturated bulk density derived from gamma ray attenuation data (see text). Value given is average of all valid data points per section.

[c] Mean grain density is assigned, considering selected grain density measurements made and reported elsewhere in this volume, and gross mineralogy of the section.

[d] Porosity is calculated: $\phi = \frac{\rho_g - \rho_B}{\rho_g - \rho_f}$; ρ_B is from GRAPE, average per section ρ_g is from column 5; $\rho_f = 1.024$; units in per cent of total volume.

TABLE 2 – *Continued*
Physical Properties of Cores from Site 64

	Grainsize[i]					Carbon/Calcium Carbonate			Interstitial Water				
	Interval cm	Sand Per Cent	Silt Per Cent	Clay Per Cent	Classification	Interval cm	Calcium Carbonate Per Cent	Organic Carbon Per Cent	Interval cm	pH	Eh (mu)	Temp°C	Salinity %
						2.0	82.8	0.0					
						20.0	81.3	0.0					
	7.0	35.7	20.8	43.5	Sand-Silt-Clay	47.0	79.7	0.0					
						67.0	80.5	0.0					
						135.0	82.0	0.0					
						50.0	81.1	0.0					
						95.0		0.0					
	29.0	35.3	28.8	36.0	Sand-Silt-Clay	110.0	80.3	0.0					
						121.0	78.3	0.0					
						131.0	74.4	0.0					
						16.0	77.8	0.0					
	2.0	41.3	26.2	32.5	Sand-Silt-Clay	40.0	80.6	0.0	119-127	7.82	-320	24	34.1
						131.0	85.8	0.0					
	3.0	32.8	25.0	42.2	Sand-Silt-Clay	20.0	77.8	0.0					
	2.0	31.3	23.7	43.2	Sand-Silt-Clay	20.0	82.6	0.0					
	73.0	35.7	23.7	40.6	Sand-Silt-Clay	88.0	82.1	0.0					
						51.0	86.6	0.0					
	4.0	31.6	28.6	39.8	Sand-Silt-Clay	20.0	88.5	0.0	108-119	7.72	+116	25	34.1
	5.0	20.7	28.3	51.1	Sand-Silt-Clay	20.0	88.6	0.0					
	4.0	26.2	26.8	47.0	Sand-Silt-Clay								
	1.0	28.0	23.5	48.5	Sand-Silt-Clay	20.0	91.0	0.0					
	1.0	13.6	26.8	59.6	Silty Clay	20.0	92.7	0.0					
	4.0	17.4	26.6	56.0	Silty Clay	20.0	95.5	0.0					

[e] Porosity is by drying (shipboard measurements) and is corrected for salt.

[f] Only the minimum penetrometer measurement per section is given.

[g] Sonic velocity measurements were made aboard ship and are corrected to 23°C. Maximum of three measurements per section is shown.

[h] Natural gamma radiation: Average of middle 16 of 20 counts/3 inch/1.25 minutes minus 1350 background.

[i] Grainsize: Sand per cent of total weight greater than .062 millimeter; clay per cent of total weight less than .0039 millimeter; silt remainder of total weight.

Identification	Lithology	Physical Properties								
		Saturated Bulk Density (Sect. Wt.)[a] gm/cm^3	Saturated Bulk Density (GRAPE)[b] gm/cm^3	Mean Grain Density[c] gm/cm^3	Porosity (Calculated)[d] Per Cent	Porosity (Drying, Ship)[e]		Penetrometer[f] cm	Sonic Velocity[g] m/sec.	Natural Gamma Radiation[h]
						Interval cm	Per Cent			
Hole 64.0 – *Continued*										
Core 3-3	Nannofossil Chalk Ooze	1.648	1.719	2.71	58.8	41.0	60.6	0.51	1488	170
3-4	Nannofossil Chalk Ooze	1.663	1.685	2.71	60.8	20.0	61.4	0.81	1492	194
3-5	Nannofossil Chalk Ooze	1.676	1.707	2.71	59.5	30.0	61.0	0.58	1497	188
3-6	Nannofossil Chalk Ooze	1.637	1.703	2.71	59.7	50.0	61.6	0.49	1533	172
Core 4-1	Nannofossil Chalk Ooze		1.664	2.71	62.1					157
4-2	Nannofossil Chalk Ooze		1.674	2.71	61.5	85.0	62.6	0.88	1530	142
4-3	Nannofossil Chalk Ooze		1.715	2.71	59.0	39.0	62.2	0.48	1530	165
4-4	Nannofossil Chalk Ooze		1.708	2.71	59.4	52.0	62.0	0.23	1525	139
4-5	Nannofossil Chalk Ooze	1.698	1.712	2.71	59.2	110.0	63.0		1547	139
4-6	Nannofossil Chalk Ooze		1.724	2.71	58.5	20.0	59.4	0.36	1593	177
Core 5-1	Nannofossil Chalk Ooze	1.692	1.746	2.71	57.2	84.0	57.7	0.48	1550	111
5-2	Nannofossil Chalk Ooze	1.693	1.714	2.71	59.1	40.0	54.7		1716	150
5-3	Nannofossil Chalk Ooze		1.712	2.71	59.2				1581	163
5-4	Nannofossil Chalk Ooze		1.748	2.71	57.1				1599	148
5-5	Nannofossil Chalk Ooze	1.708	1.776	2.71	55.4				1634	169
5-6	Nannofossil Chalk Ooze		1.760	2.71	56.3				1681	140
Core 6-1	Nannofossil Marl Ooze		1.794	2.71	54.4				1664	122
6-2	Nannofossil Chalk Ooze	1.807	1.800	2.71	54.0				1673	
6-3	Nannofossil Chalk Ooze	1.777	1.793	2.71	54.4				1698	
6-4	Nannofossil Chalk Ooze	1.813	1.825	2.71	52.5				1699	
6-5	Nannofossil Chalk Ooze	1.821	1.838	2.71	51.7				1691	
6-6	Nannofossil Chalk Ooze	1.851	1.853	2.71	50.8				1762	121
Core 7-1	Nannofossil Chalk		1.690	2.71	60.5					110
7-2	Nannofossil Chalk		1.775	2.71	55.4				1699	
7-3	Nannofossil Chalk		1.762	2.71	56.2				1606	130

TABLE 2 – *Continued*

Grainsize[i]					Carbon/Calcium Carbonate			Interstitial Water				
Interval cm	Sand Per Cent	Silt Per Cent	Clay Per Cent	Classification	Interval cm	Calcium Carbonate Per Cent	Organic Carbon Per Cent	Interval cm	pH	Eh (mu)	Temp °C	Salinity %
4.0	9.0	26.0	65.0	Silty Clay	41.0	86.1	0.0					
5.0	13.3	26.5	60.1	Silty Clay	20.0	93.1	0.0	80-90	7.46	-130	25	34.1
2.0	14.9	24.1	61.0	Silty Clay	30.0	91.6	0.0					
4.0	5.5	29.2	65.3	Silty Clay	50.0	87.6	0.0					
47.0	16.8	46.8	36.4	Clayey Silt	80.0	89.0	0.0					
8.0	15.5	47.6	36.9	Clayey Silt	85.0	88.3	0.0					
8.0	16.6	49.1	34.3	Clayey Silt	20.0 37.0	84.6 89.1	0.0					
12.0	14.5	49.3	36.2	Clayey Silt	52.0	71.0	0.0					
21.0	14.4	54.0	31.6	Clayey Silt	110.0	87.0	0.0	120-130	7.49	-220	25	34.1
4.0	17.4	42.4	40.1	Clayey Silt	20.0	91.0	0.0					
8.0	15.0	32.1	53.0	Silty Clay	84.0	90.5	0.0					
4.0	18.3	38.7	43.0	Silty Clay	40.0	86.3	0.0					
8.0	14.1	37.0	48.9	Silty Clay								
8.0	25.6	41.1	33.3	Sand-Silt-Clay	17.0	88.3	0.0					
4.0	24.1	39.0	36.9	Sand-Silt-Clay	20.0	83.6	0.0					
5.0	16.2	43.5	40.3	Clayey Silt								
4.0	12.0	51.9	36.1	Clayey Silt	20.0	45.6	0.0					
3.0	9.4	60.2	30.4	Clayey Silt	20.0	80.9	0.1					
4.0	8.4	55.7	35.9	Clayey Silt	20.0	90.8	0.0					
4.0	13.7	55.9	30.4	Clayey Silt	19.0	88.6	0.0					
4.0	11.6	56.7	31.7	Clayey Silt	20.0	75.3	0.1					
3.0	16.6	50.0	33.4	Clayey Silt								
22.0	18.0	47.1	34.9	Clayey Silt	30.0	84.7	0.2					
19.0	13.2	41.5	45.4	Silty Clay	30.0	86.0	0.0					
6.0	13.5	40.1	46.4	Silty Clay	29.0	86.9	0.1					

TABLE 2 – *Continued*

Identification	Lithology	Physical Properties								
		Saturated Bulk Density (Sect. Wt.)[a] gm/cm^3	Saturated Bulk Density (GRAPE)[b] gm/cm^3	Mean Grain Density[c] gm/cm^3	Porosity (Calculated)[d] Per Cent	Porosity (Drying, Ship)[e]		Penetrometer[f] cm	Sonic Velocity[g] m/sec.	Natural Gamma Radiation[h]
						Interval cm	Per Cent			
Hole 64.0 – *Continued*										
Core 7-4	Nannofossil Chalk		1.785	2.71	54.8				1686	118
7-5	Nannofossil Chalk		1.740	2.71	57.5				1624	132
7-6	Nannofossil Chalk		1.722	2.71	58.6				1663	104
Core 8-1	Nannofossil Chalk									
8-2	Nannofossil Chalk	1.909	1.916	2.71	47.1				1993	126
8-3	Nannofossil Chalk	1.913	1.919	2.71	46.9				2088	152
Core 9-1	Not opened									
9-2	Not opened									
9-3	Not opened									
Core 10-1	Nannofossil Chalk and Limestone		1.866	2.71	50.1				1969	192
10-2	Nannofossil Chalk and Limestone	1.922	1.947	2.71	45.2				2240	149
Hole 64.1										
Core 1-1	Nannofossil Chalk Ooze	1.733	1.789	2.71	54.6	20.0	55.3	0.43	1615	116
1-2	Nannofossil Chalk Ooze	1.737	1.782	2.71	55.0	24.0	56.3	0.21	1615	149
1-3	Nannofossil Chalk Ooze	1.751	1.767	2.71	55.9	20.0	53.3		1650	147
1-4	Nannofossil Chalk Ooze	1.746	1.781	2.71	55.1			0.05	1666	157
1-5	Nannofossil Chalk Ooze	1.782	1.813	2.71	53.2			0.18	1627	128
1-6	Nannofossil Chalk Ooze		1.756	2.71	56.6			0.34	1632	157
Core 2-1	Nannofossil Chalk and Chalk Ooze		1.720	2.71	58.7					163
2-2	Nannofossil Chalk and Chalk Ooze		1.742	2.71	57.4			0.06	1600	159
2-3	Nannofossil Chalk and Chalk Ooze		1.787	2.71	54.7				1593	140
2-4	Nannofossil Chalk and Chalk Ooze	1.761	1.815	2.71	53.1			0.40	1679	168
2-5	Nannofossil Chalk and Chalk Ooze	1.775	1.793	2.71	54.4			0.16	1631	134
2-6	Nannofossil Chalk and Chalk Ooze	1.771	1.812	2.71	53.2				1621	151
Core 3-1	Nannofossil Chalk and Chalk Ooze	1.774	1.815	2.71	53.1				1597	159
3-2	Nannofossil Chalk and Chalk Ooze	1.763	1.774	2.71	55.5				1576	153
3-3	Nannofossil Chalk and Chalk Ooze	1.766	1.796	2.71	54.2					121

TABLE 2 – *Continued*

	Grainsize[i]					Carbon/Calcium Carbon			Interstitial Water				
	Interval cm	Sand Per Cent	Silt Per Cent	Clay Per Cent	Classification	Interval cm	Calcium Carbonate Per Cent	Organic Carbon Per Cent	Interval cm	pH	Eh (mu)	Temp°C	Salinity %
	17.0	10.4	40.5	49.2	Silty Clay	49.0	88.6	0.0					
	11.0	13.0	43.7	43.2	Clayey Silt	53.0	89.4	0.1					
	7.0	16.8	45.1	38.1	Clayey Silt	20.0	91.0	0.1					
	2.0	7.5	33.9	58.6	Silty Clay	20.0	85.9	0.0					
	1.0	5.1	51.1	43.8	Clayey Silt	20.0	86.1	0.0					
	25.0	6.9	49.8	43.3	Clayey Silt	27.0	87.9	0.1					
	2.0	10.1	51.7	38.2	Clayey Silt	20.0	84.5	0.0					
	19.0	19.1	44.7	36.2	Clayey Silt	28.0	90.7	0.0					
	2.0	14.5	47.3	38.2	Clayey Silt	25.0	79.7	0.1					
	5.0	14.4	45.7	39.9	Clayey Silt	20.0	69.3	0.1					
	4.0	19.0	42.2	38.7	Clayey Silt	20.0	90.1	0.0					
	4.0	18.4	48.1	33.4	Clayey Silt	20.0	90.8	0.0					
	10.0	21.0	47.3	31.7	Sand-Silt-Clay	21.0	86.4	0.1	0-7	7.41	-330	25	
	25.0	22.6	42.5	34.9	Sand-Silt-Clay	41.0	83.6	0.0					
	6.0	23.1	47.6	29.3	Sand-Silt-Clay	26.0	85.0	0.0					
	20.0	21.6	42.8	35.6	Sand-Silt-Clay	33.0	82.0	0.1					
	3.0	20.1	47.9	32.0	Sand-Silt-Clay	19.0	88.6	0.0					
	5.0	13.5	46.3	40.2	Clayey Silt	20.0	88.6	0.0	72-150				
	3.0	16.0	54.8	29.2	Clayey Silt	20.0	91.5	0.0					
	9.0	23.5	51.7	24.7	Sand-Silt-Clay	20.0	89.3	0.0					
	3.0	10.9	61.7	27.5	Clayey Silt	22.2	87.4	0.0					
	7.0	11.5	59.5	29.0	Clayey Silt	20.0	90.1	0.0					

TABLE 2 – *Continued*

Identification	Lithology	Saturated Bulk Density (Sect. Wt.)[a] gm/cm^3	Saturated Bulk Density (GRAPE)[b] gm/cm^3	Mean Grain Density[c] gm/cm^3	Porosity (Calculated)[d] Per Cent	Porosity (Drying, Ship)[e]		Penetrometer[f] cm	Sonic Velocity[g] m/sec.	Natural Gamma Radiation[h]
						Interval cm	Per Cent			
Hole 64.1 – *Continued*										
Core 3-4	Nannofossil Chalk and Chalk Ooze	1.783	1.807	2.71	53.6				1645	121
3-5	Nannofossil Chalk and Chalk Ooze	1.781	1.773	2.71	55.6				1645	142
3-6	Nannofossil Chalk and Chalk Ooze	1.749	1.774	2.71	55.5					144
Core 4-1	Nannofossil Chalk and Chalk Ooze		1.752	2.71	56.8				1653	157
4-2	Nannofossil Chalk and Chalk Ooze	1.769	1.763	2.71	56.2				1601	132
4-3	Nannofossil Chalk and Chalk Ooze	1.782	1.769	2.71	55.8				1672	151
4-4	Nannofossil Chalk and Chalk Ooze	1.741	1.756	2.71	56.6				1585	161
4-5	Nannofossil Chalk and Chalk Ooze	1.778	1.799	2.71	54.0				1720	153
4-6	Nannofossil Chalk and Chalk Ooze	1.803	1.820	2.71	52.8				1759	157
Core 5-1	Nannofossil Chalk and Chalk Ooze		1.734	2.71	57.9					134
5-2	Nannofossil Chalk and Chalk Ooze		1.772	2.71	55.6				1526	163
5-3	Nannofossil Chalk and Chalk Ooze	1.759	1.799	2.71	54.0				1613	149
5-4	Nannofossil Chalk and Chalk Ooze	1.755	1.828	2.71	52.3				1559	153
5-5	Nannofossil Chalk and Chalk Ooze		1.852	2.71	50.9				1585	143
5-6	Nannofossil Chalk and Chalk Ooze		1.827	2.71	52.4				1597	144
Core 6-1	Nannofossil Chalk and Limestone		1.847	2.71	51.2				1727	158
6-2	Nannofossil Chalk and Limestone	1.806	1.818	2.71	52.9				1721	137
6-3	Nannofossil Chalk and Limestone	1.823	1.822	2.71	52.6				1785	152
6-4	Nannofossil Chalk and Limestone	1.798	1.832	2.71	52.1				1775	110
Core 7-1	Nannofossil Chalk and Limestone		1.771	2.71	55.7					148
7-2	Nannofossil Chalk and Limestone	1.842	1.839	2.71	51.6				1772	154
7-3	Nannofossil Chalk and Limestone	1.840	1.841	2.71	51.5				1738	161
7-4	Nannofossil Chalk and Limestone	1.835	1.807	2.71	53.6				1782	147

TABLE 2 – *Continued*

Grainsize[i]					Carbon/Calcium Carbonate			Interstitial Water				
Interval cm	Sand Per Cent	Silt Per Cent	Clay Per Cent	Classification	Interval cm	Calcium Carbonate Per Cent	Organic Carbon Per Cent	Interval cm	pH	Eh (mu)	Temp°C	Salinity %
20.0	12.3	59.0	28.7	Clayey Silt	32.0	89.6	0.0					
17.0	8.5	57.7	33.8	Clayey Silt	25.0	92.9	0.0	141-150	7.23	-327	25	35.2
14.0	9.1	55.5	35.5	Clayey Silt	20.0	90.8	0.0					
10.0	16.9	48.8	34.3	Clayey Silt	18.0	86.6	0.0					
3.0	13.2	54.0	32.8	Clayey Silt	20.0	90.3	0.0					
4.0	16.2	49.8	34.0	Clayey Silt								
3.0	10.1	53.6	36.3	Clayey Silt	15.0	86.5	0.0					
4.0	9.9	49.4	40.7	Clayey Silt	20.0	84.0	0.0					
2.0	9.1	54.7	36.2	Clayey Silt	20.0	87.5	0.0					
25.0	8.1	55.9	36.1	Clayey Silt	32.0	82.8	0.0					
97.0	6.7	55.0	38.3	Clayey Silt	104.0	85.0	0.0					
4.0	10.4	56.0	33.6	Clayey Silt	20.0	85.8	0.0					
2.0	11.8	62.2	26.1	Clayey Silt	20.0	90.2	0.0					
2.0	11.2	58.4	30.4	Clayey Silt	20.0	92.3	0.0					
1.0	12.5	54.3	33.2	Clayey Silt	20.0	88.6	0.0					
3.0	19.2	49.7	31.1	Clayey Silt	23.0	88.6	0.0					
2.0	15.8	51.1	33.1	Clayey Silt	20.0	87.5	0.0					
2.0	19.0	51.5	29.6	Clayey Silt	20.0	87.1	0.0					
4.0	17.1	44.8	38.1	Clayey Silt	20.0	91.6	0.0					
99.0	9.9	55.6	34.5	Clayey Silt	106.0	85.8	0.0					
4.0	6.9	49.2	43.9	Clayey Silt	22.0	81.0	0.0					
5.0	8.3	52.1	39.6	Clayey Silt	23.0	84.3	0.0					
4.0	5.1	54.1	40.8	Clayey Silt	12.0	90.8	0.0					

TABLE 2 – *Continued*

Identification	Lithology	Physical Properties								
		Saturated Bulk Density (Sect. Wt.)[a] gm/cm^3	Saturated Bulk Density (GRAPE)[b] gm/cm^3	Mean Grain Density[c] gm/cm^3	Porosity (Calculated)[d] Per Cent	Porosity (Drying, Ship)[e]		Penetrometer[f] cm	Sonic Velocity[g] m/sec.	Natural Gamma Radiation[h]
						Interval cm	Per Cent			
Hole 64.1 – *Continued*										
Core 8-1	Nannofossil Chalk		1.706	2.71	59.5					
8-2	Nannofossil Chalk	1.903	1.889	2.71	48.7				1925	168
Core 9-1	Nannofossil Chalk	1.837	1.848	2.71	51.1				1833	140
9-2	Nannofossil Chalk	1.866	1.842	2.71	51.5				1750	113
9-3	Nannofossil Chalk	1.911	1.884	2.71	49.0				1788	90
Core 10-1	Nannofossil Chalk		1.839	2.71	51.7				1839	110
10-2	Nannofossil Chalk	1.853	1.876	2.71	49.4				1798	145
Core 11-CC	Cherty Limestone									
Core 12-CC	Cherty Limestone									

index-species *Isthmolithus recurvus* is missing, but this is true for some other tropical areas. In the Eocene samples of Cores 10 and 11 of Hole 64.1, attributed to the *Discoaster tani nodifer* Zone, all species of the *Zygolithus dubius*–group apparently are missing, indicating its exclusion from this area in a similar manner to *Isthmolithus recurvus.*

Preservation is adequate for both discoasters and coccoliths throughout the section. Discoasters show slight secondary calcification at 200 meters but preservation for both groups is good at 300 meters. Discoasters become progressively more recrystallized with depth from this point and are moderately overgrown at the terminal drilling depth.

Radiolaria

Radiolarians are common and fairly well-preserved in all cores taken at this site, except at the bottom of the section (64.1-11) at about 980 meters below the sea floor, where they are altered and partly dissolved.

The assemblage in the surface core (64.0-1) is Quaternary, those at about 100 meters (64.0-2) are in the *Spongaster pentas* Zone, those at about 205 meters (64.0-3) are in the *Ommatartus antepenultimus* Zone, those at about 305 meters (64.0-4) are in the *Cannartus* (?) *petterssoni* Zone, and those from about 410 to 437 meters (64.0-5 and upper part of 64.1-1) are in the *Dorcadospyris alata* Zone. The continuously cored section from 437 to 479 meters (lower part of 64.1-1 through 64.1-5) is in the *Calocycletta costata* Zone. The assemblages at about 510, 570 and 615 meters (64.0-6, 64.1-6 and 64.0-7) are in the *Calocycletta virginis* Zone, those at about 665 meters (64.1-7) are in the *Lychnocanium bipes* Zone, those at about 710 to 750 and 775 meters (64.0-8, 64.1-8 and 64.0-8) are in the *Dorcadospyris ateuchus* Zone, those at about 850 meters (upper part of 64.0-10) are in the *Theocyrtis tuberosa* Zone, those at about 851 and 915 meters (lower part of 64.9-10 and 64.1-9) are in the upper part of the *Thyrsocyrtis bromia* Zone, and those at about 970 and possibly 984 meters (64.1-10 and possibly 64.1-11) are in the *Podocyrtis mitra* Zone.

There is probably a hiatus or a compressed section between 915 and 970 meters, because the 55-meter interval between Cores 64.1-9 and 64.1-10 seems too short to accommodate the lower part of the *Thyrsocyrtis bromia* Zone, the *Thyrsocyrtis tetracantha* Zone and the *Podocyrtis chalara* Zone.

TABLE 2 – *Continued*

	Grainsize[i]					Carbon/Calcium Carbonate			Interstitial Water				
	Interval cm	Sand Per Cent	Silt Per Cent	Clay Per Cent	Classification	Interval cm	Calcium Carbonate Per Cent	Organic Carbon Per Cent	Interval cm	pH	Eh (mu)	Temp°C	Salinity %
	100.00	7.4	51.2	41.4	Clayey Silt	110.0	88.6	0.0					
	1.0	5.4	50.5	44.1	Clayey Silt	20.0	89.3	0.0					
	9.0	4.7	45.7	49.5	Silty Clay	20.0	87.1	0.0					
	2.0	3.9	49.9	46.3	Clayey Silt	24.0	92.0	0.0					
	3.0	4.0	52.7	43.3	Clayey Silt	20.0	92.1	0.0					
	12.0	1.4	53.3	45.3	Clayey Silt	20.0	82.6	0.1					
	8.0	6.1	55.3	38.6	Clayey Silt	20.0	84.0	0.1					

DISCUSSION

Nature of Seismic Reflectors

A few seismic reflectors at this site can be closely correlated with certain lithologic changes, and there is every reason to suppose that improved means of measurement would result in identification of virtually all reflectors. The reflectors are associated with changes in the degree of induration of the calcareous sediments, and the more abrupt and important the change, the more sharp and strong the reflection. The plot of drilling rate (a semi-log plot) (Figure 5) shows a few of the major reflectors very clearly, and the less pronounced fluctuations, especially those in the lower half of the column, may also correspond to reflectors. The method of calculating drilling rate, from a crude penetration record on the "geolograph", generally averages over 10- or 20-meter intervals, and much more detail may be present than is shown on the graphs. On the other hand, variations of a factor of two are introduced by the differing techniques used by different drillers, and by changes in such external variables as the state of the sea.

Many of the reflectors at Site 64 can be traced on profiles for tens or even hundreds of kilometers, and this raises the question of the origin of the changes in degree of induration. The evidence of close parallelism of reflectors on the profiles speaks strongly for a time-stratigraphic control on induration, and this in turn suggests that thin depositional units are of wide extent on the Plateau.

Rates of Accumulation

Rates of accumulation are remarkably uniform at this site, as is shown on the accompanying graph (Figure 7). The gross shape of the curve may result mainly from increasing compaction in the older and deeper beds rather than from any real secular increase in the rates. The nearly monotonic downward increase in bulk density–shown on the Site Summary Log–and in sound velocity–measured by sonobuoys–coupled with the downward decrease in water content (and porosity) and the visual evidence of increasing hardness and silicification, all point in the direction of increasing compaction at depth.

If we take average rates in the upper few hundred meters of the section at about 25 m/m.y. and average rates in the lowest 200 meters as about half this value, and assume that the rate near the bottom was also *originally* 25, then the rocks would have been compacted by 50 per cent. Porosity, as measured by water

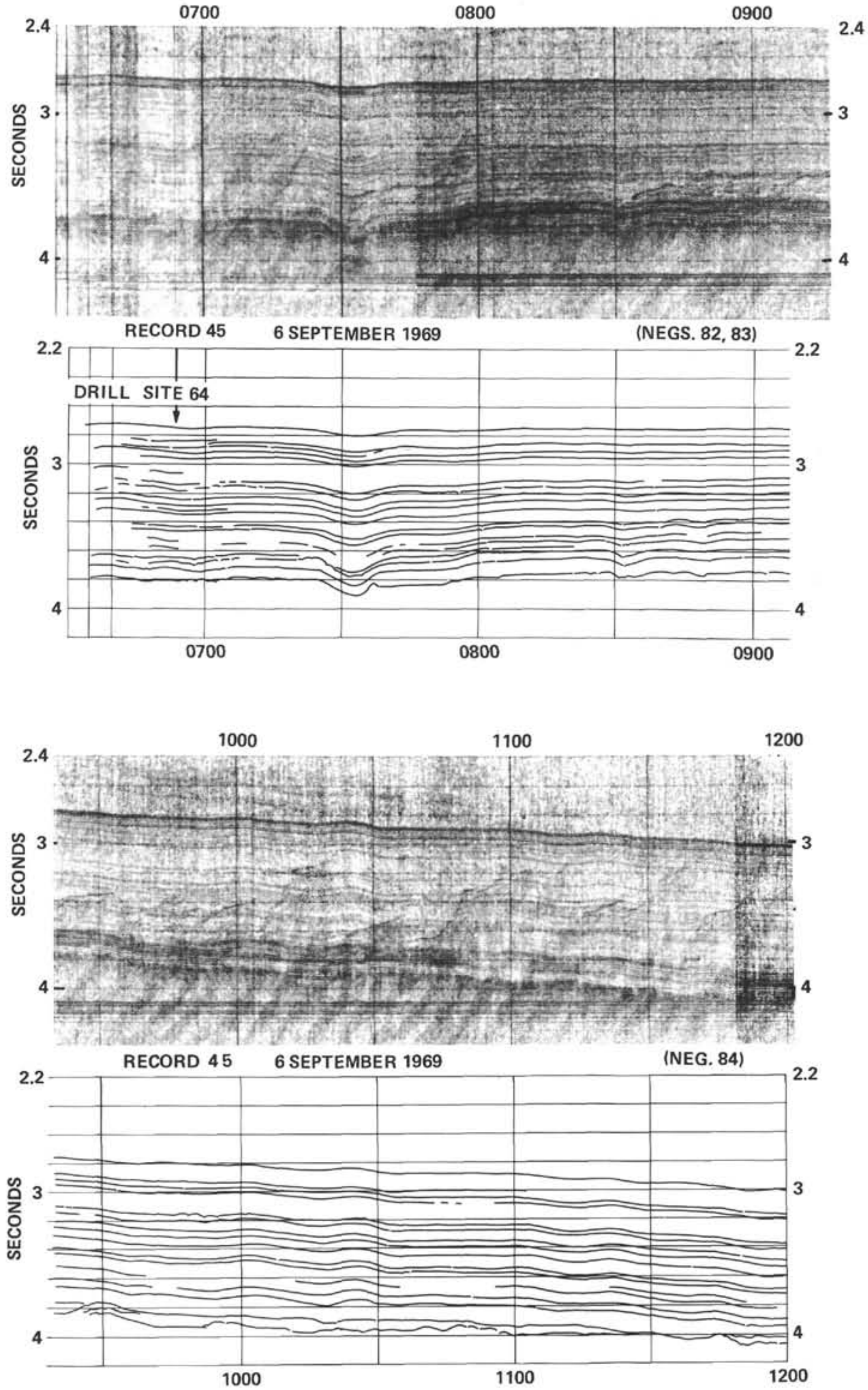


Figure 6. *Seismic reflection profile taken from D/V* Glomar Challenger *on departure from Site 64, and a line-drawing interpretation of the profile. Site 64 is located at the left (west) end of the profile. See Plate 1 for location. (Record No. 45)*

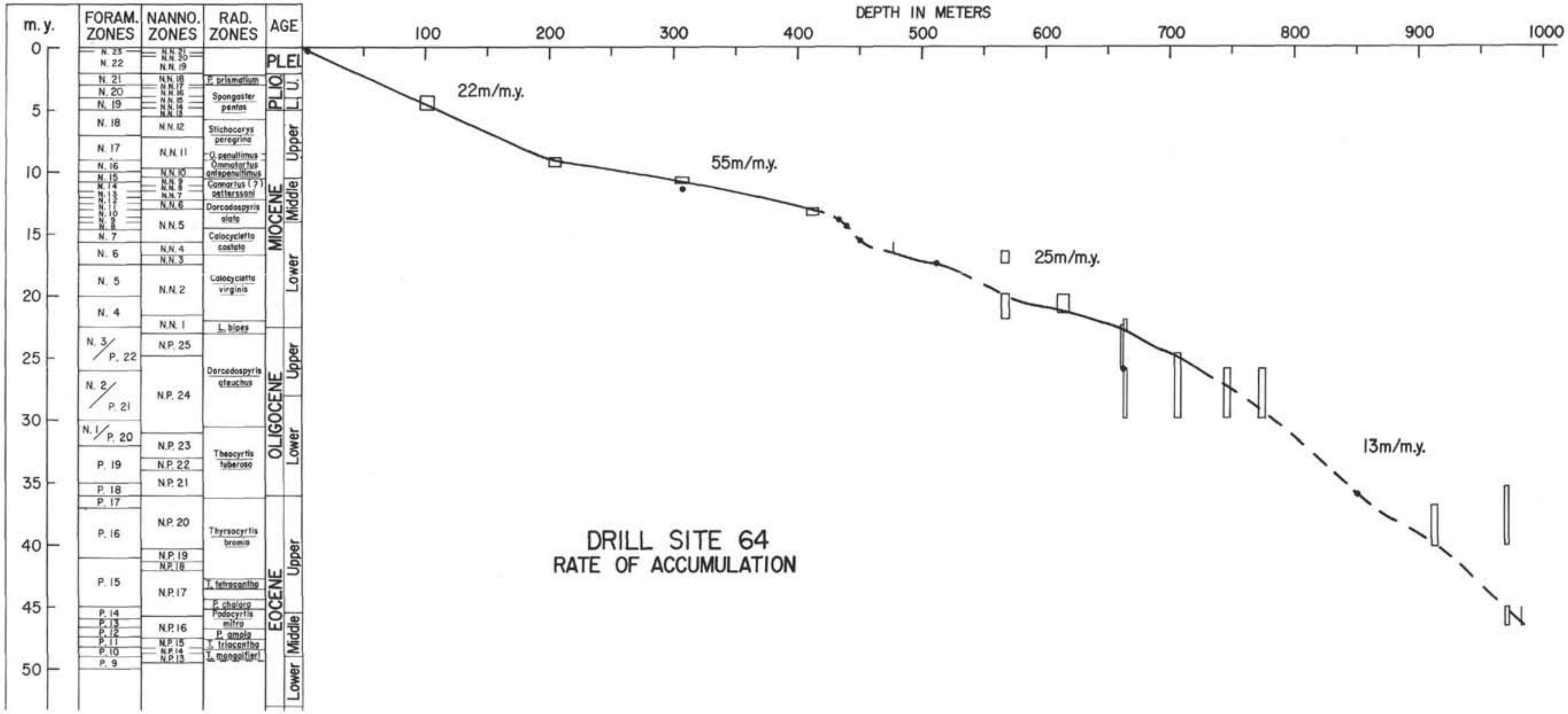


Figure 7. *Rate of sediment accumulation at Site 64.*

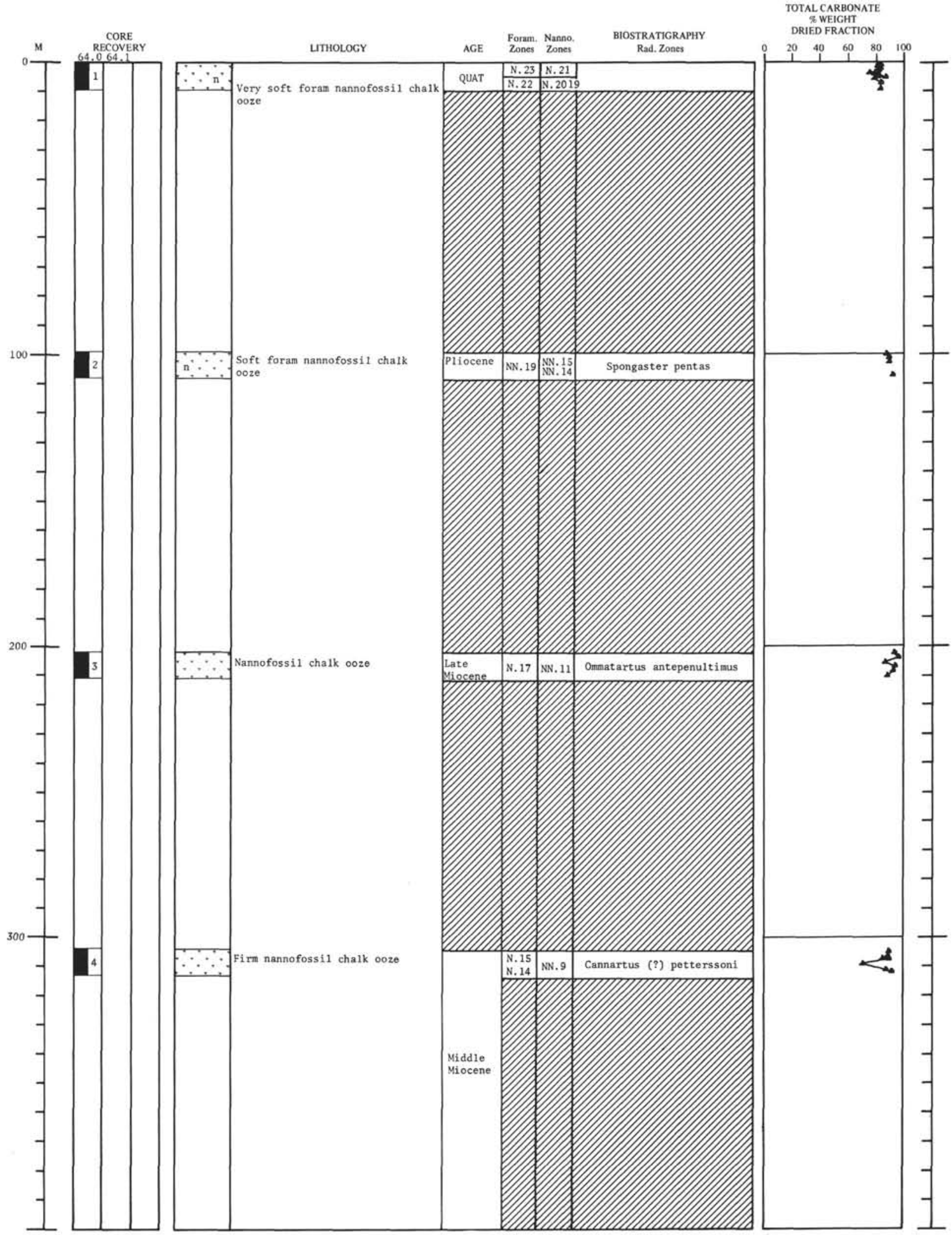
average velocities may migrate vertically, independent of reflectors. Similarly, determined velocities for a particular layered sequence may (and commonly do) change laterally. Despite these constraints, however, it is felt that the preceding velocity-depth relation is reasonable and furnishes a close approximation to the depth of the reflecting horizons.

References

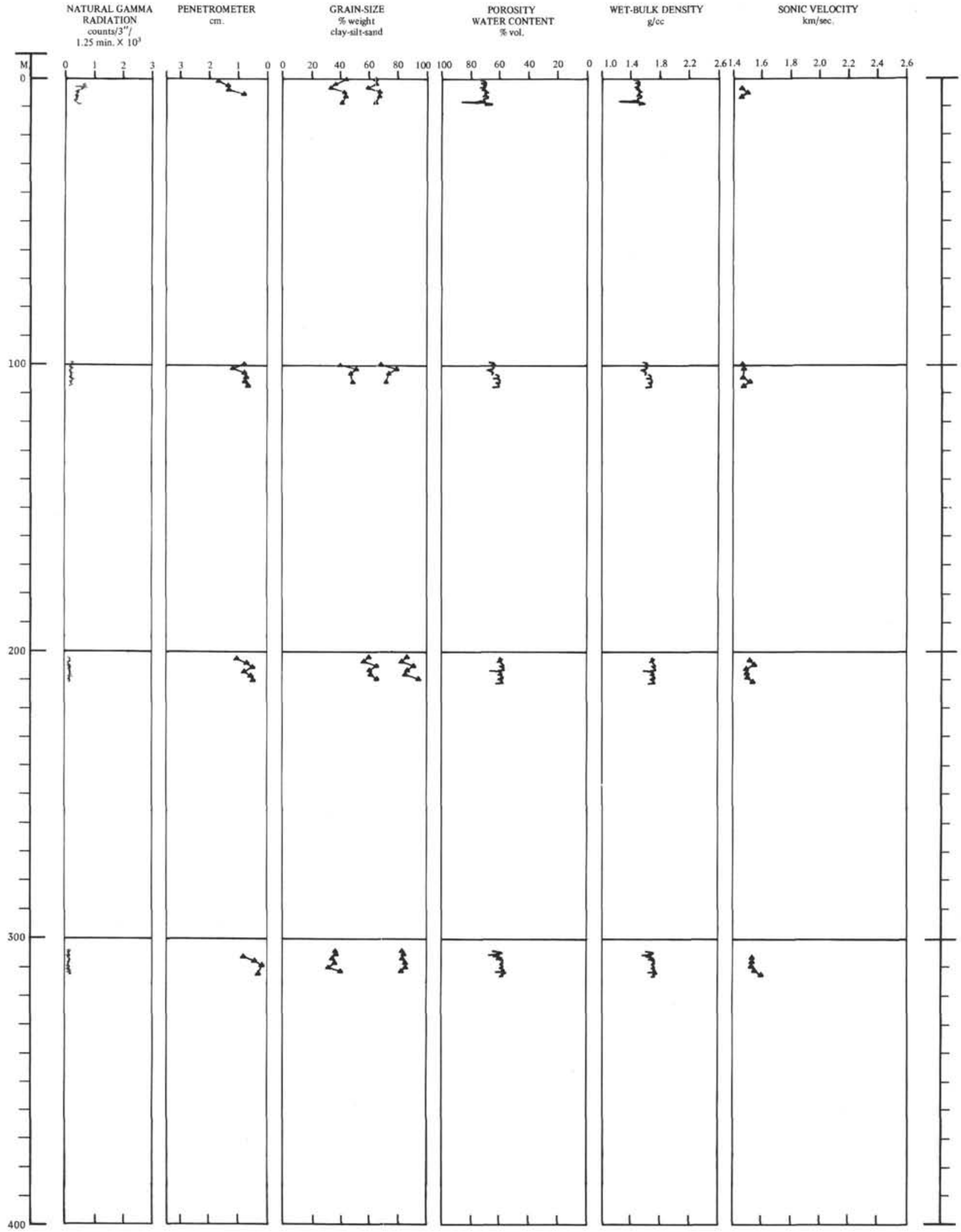
Furumoto, A. S., Hussong, D. M., Campbell, J. F., Sutton, G. H., Malahoff, A., Rose, J. C. and Woollard, G. P., 1970. Crustal and upper mantle structure of the Solomon Islands as revealed by seismic refraction survey of November-December 1966. *Pacific Sci.* **24**, 315.

Woollard, G. P., 1967. Cruise report on 1966 seismic refraction expedition to the Solomon Sea. *Hawaii Inst. Geophys. Rept.* 67.

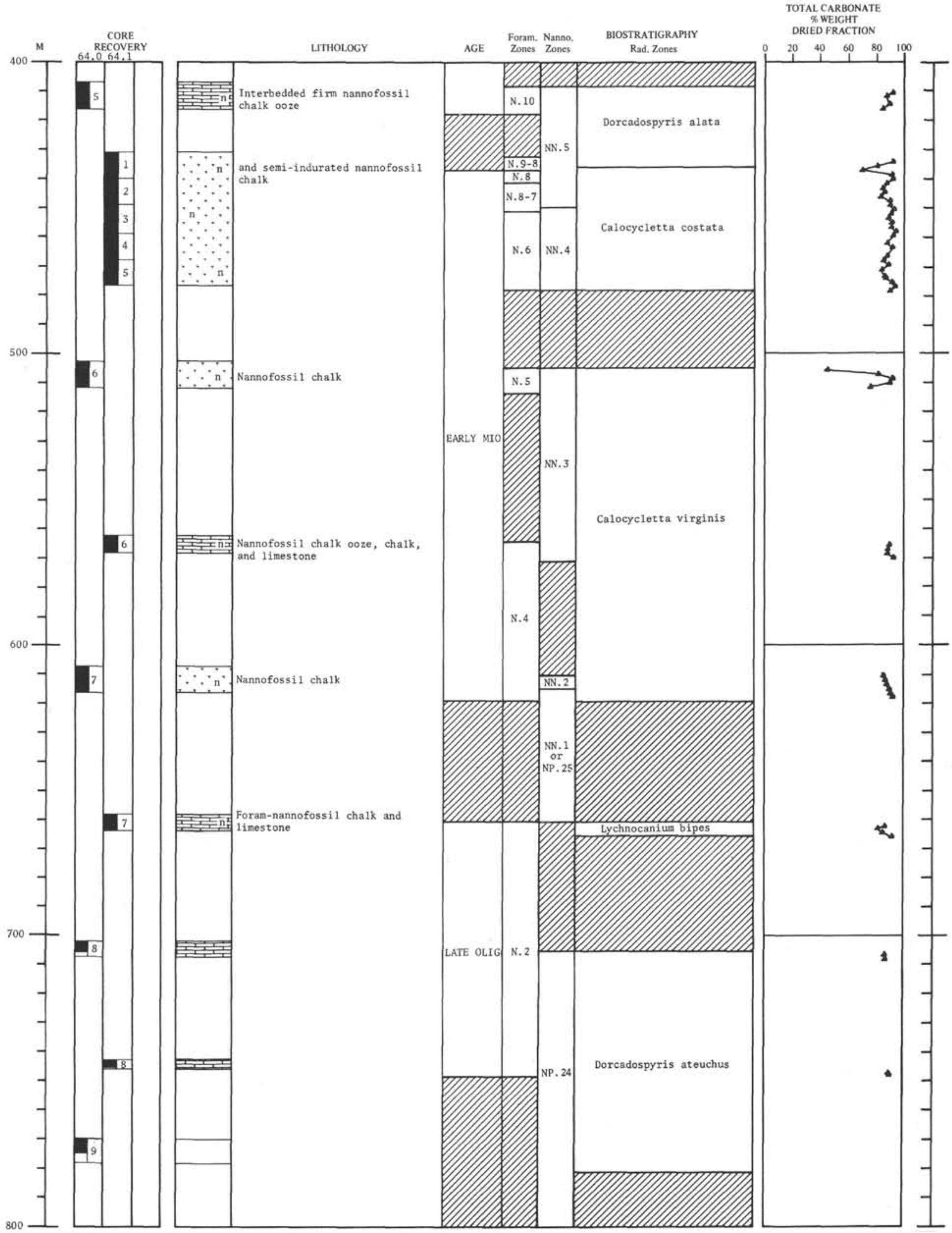
Woollard, G. P., Sutton, G. H., Wyrtki, K. and Chave, K. W., 1970. Progress report, contract ONR-N00014-70-A-0016-0001, for period 1 January–31 July 1970: *Hawaii Inst. Geophys. Rept.* 70.



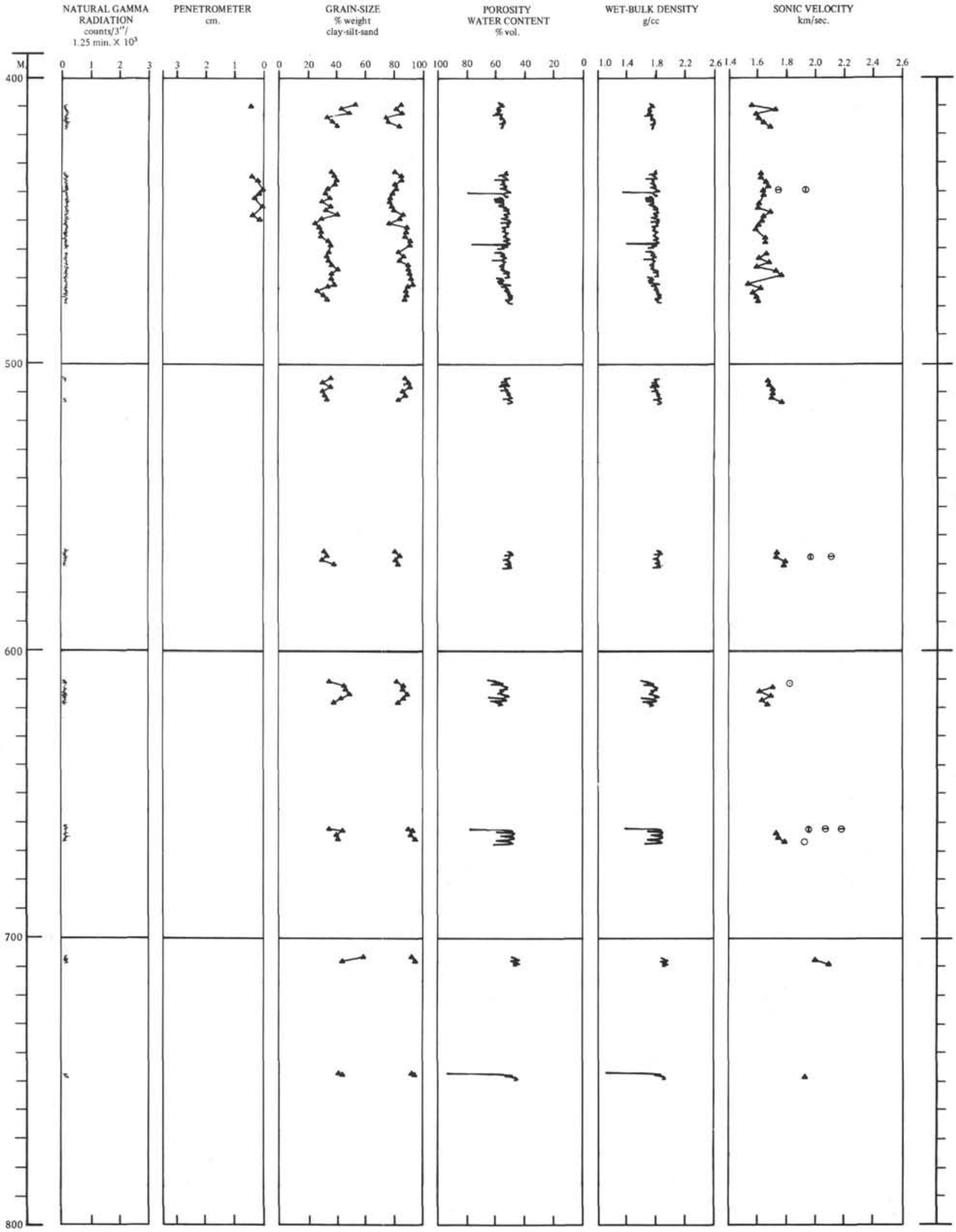
Lithology and biostratigraphy of Site 64, 0-400 m.



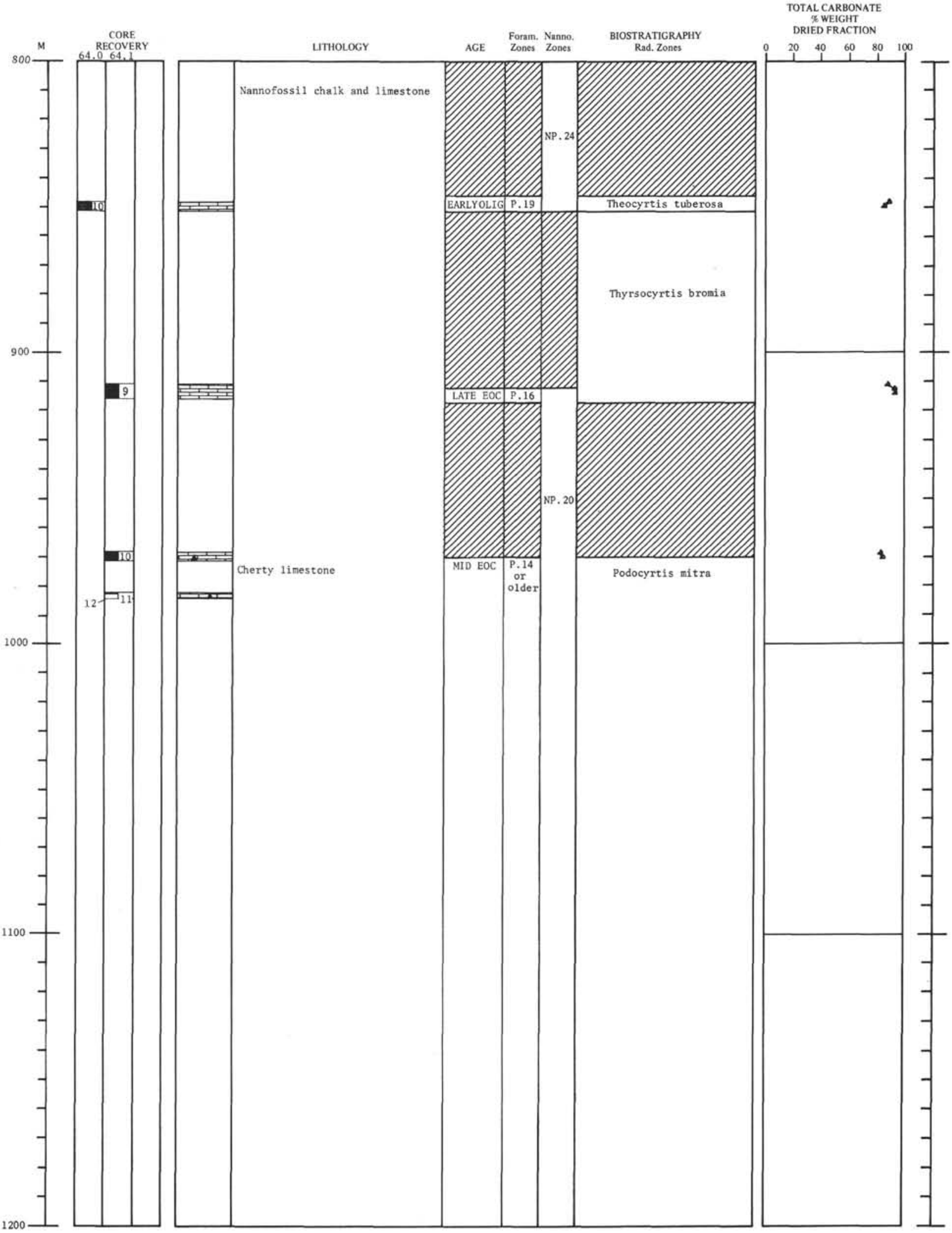
Physical properties of Site 64, 0-400 m.



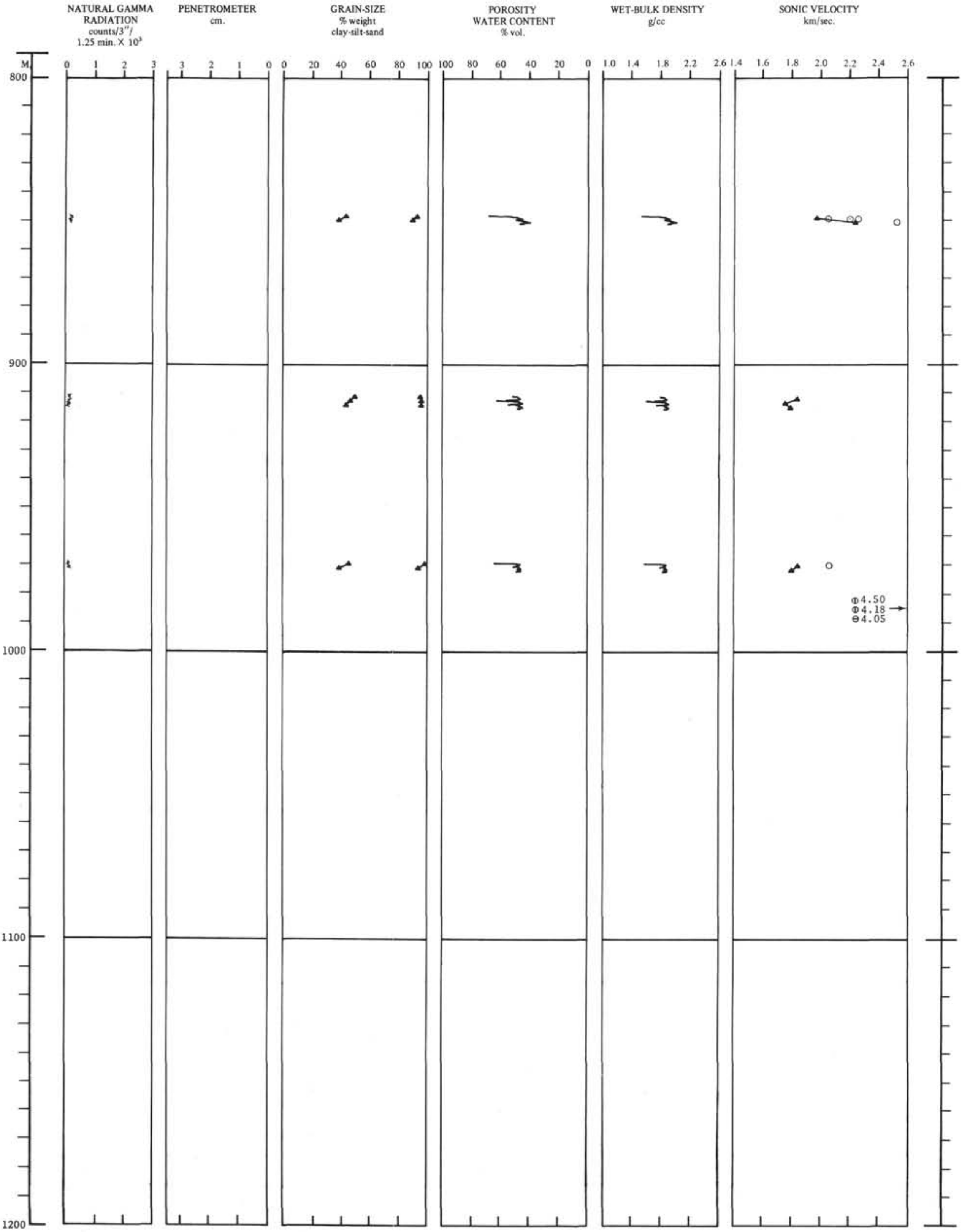
Lithology and biostratigraphy of Site 64, 400-800 m.



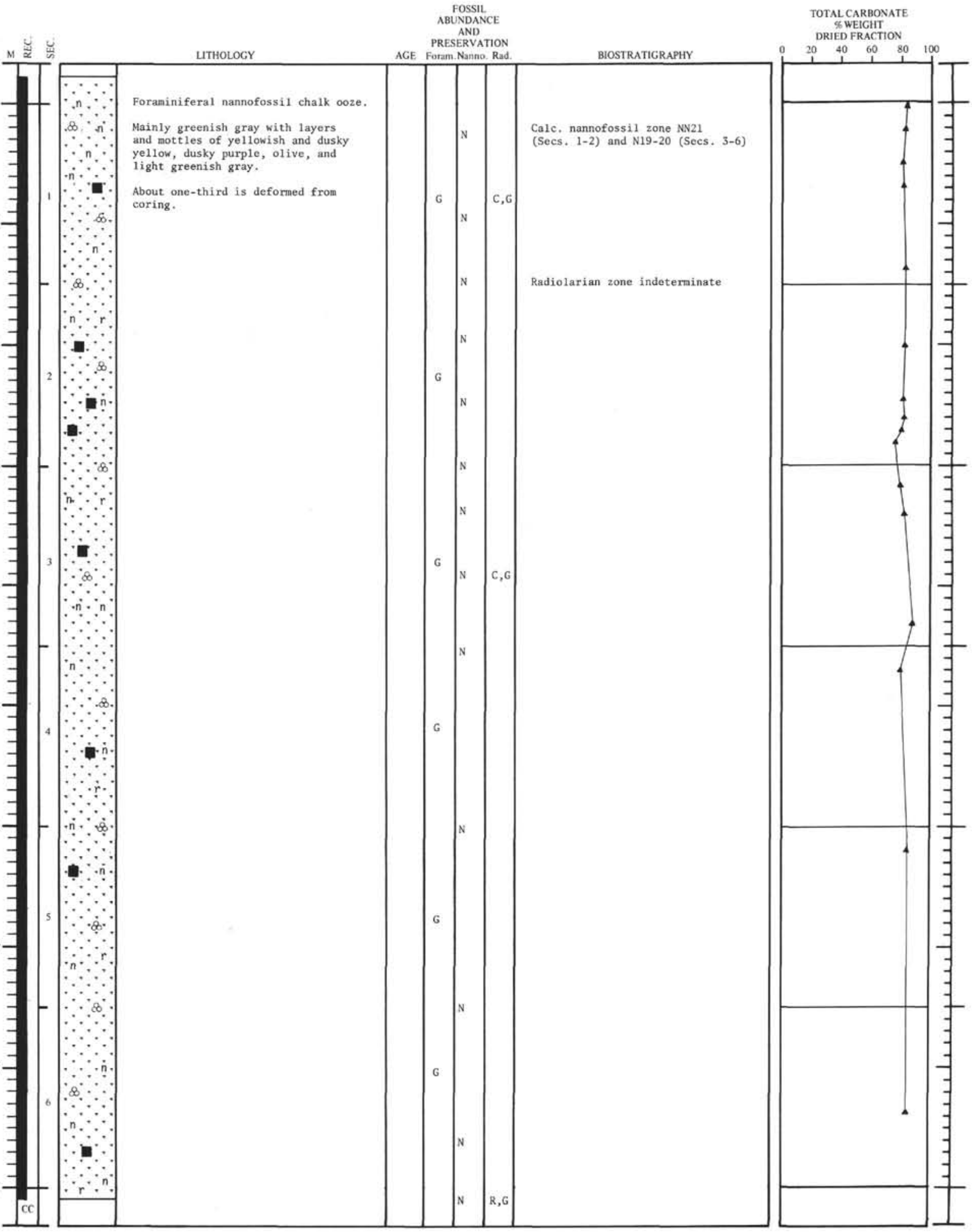
Physical properties of Site 64, 400-800 m.



Lithology and biostratigraphy of Site 64, 800-1200 m.



Physical properties of Site 64, 800-1200 m.



Foraminiferal nannofossil chalk ooze.

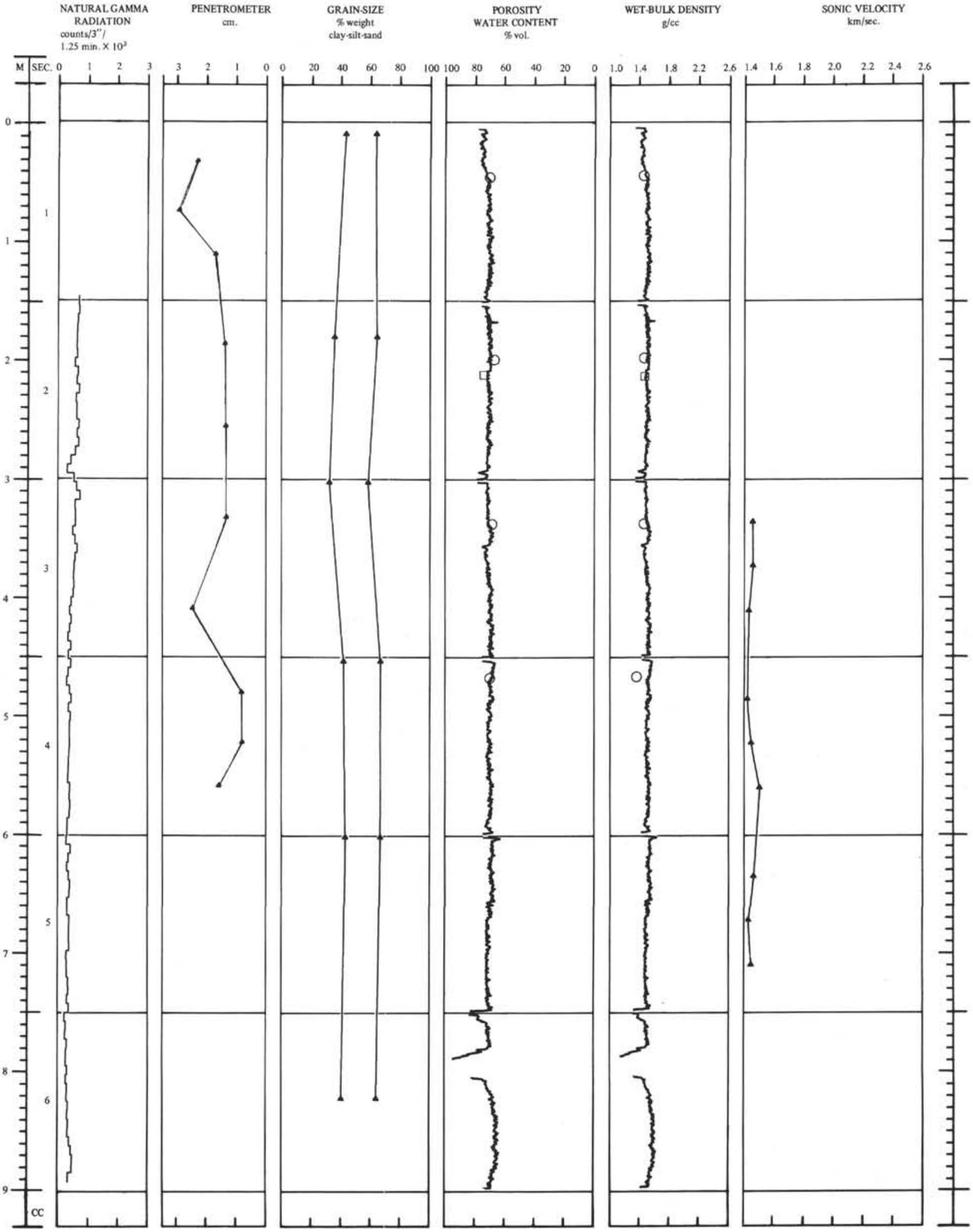
Mainly greenish gray with layers and mottles of yellowish and dusky yellow, dusky purple, olive, and light greenish gray.

About one-third is deformed from coring.

Calc. nannofossil zone NN21 (Secs. 1-2) and N19-20 (Secs. 3-6)

Radiolarian zone indeterminate

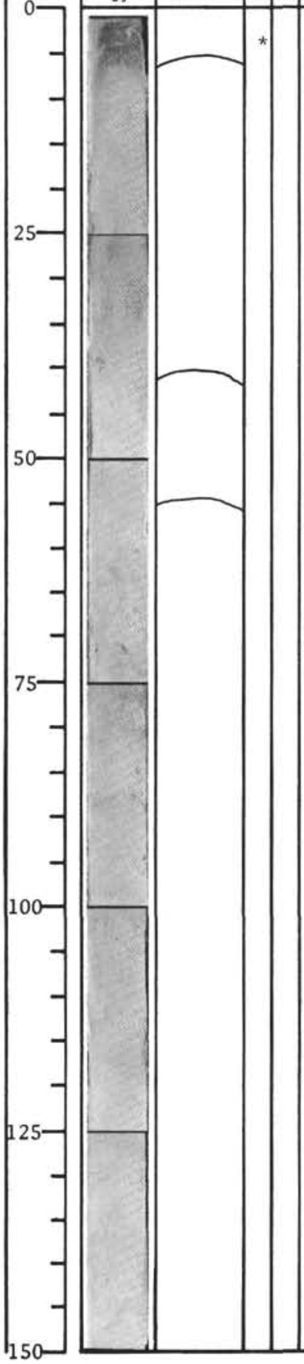
Lithology and biostratigraphy of Core 1, Hole 64.0.



Physical properties of Core 1, Hole 64.0.

Hole 64.0 Core 1
Section 1

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



FORAMINIFERAL NANNOFOSSIL CHALK OOZE

0-5cm:
10YR4/3 moderately yellowish brown.

5-40cm:
25Y6/4 dusky yellow.

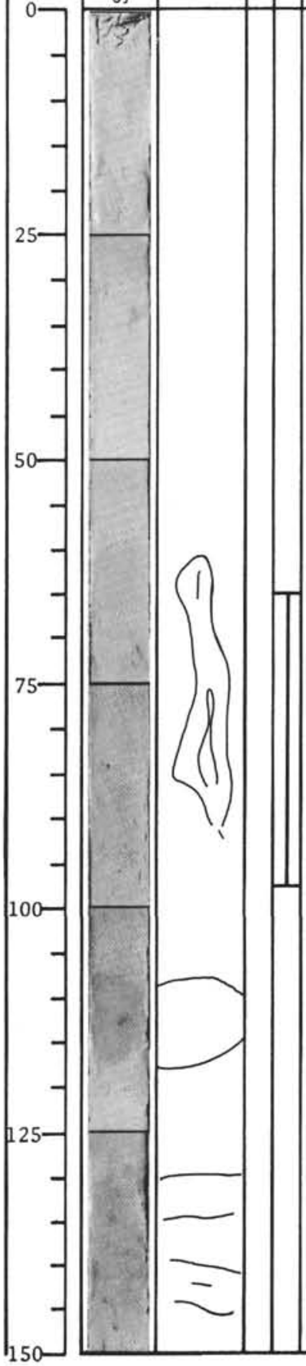
40-55cm:
5Y7/2 yellowish gray.

55-150cm:
5GY7/1 Greenish gray with moderate mottling of very dusky purple and grayish green 10G5/2, conc. above 90cm.

Soft calcareous ooze all contacts gradational.

Hole 64.0 Core 1
Section 2

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



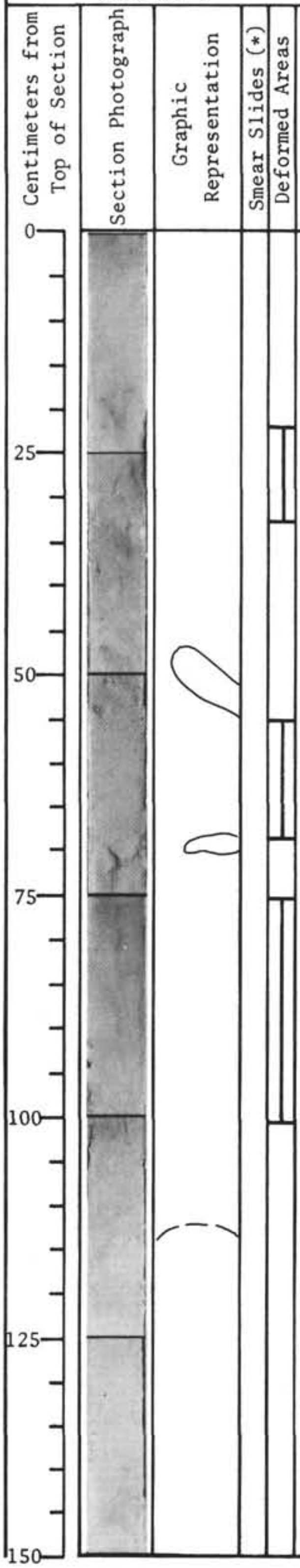
FORAMINIFERAL NANNOFOSSIL CHALK OOZE

Soft.

Basically greenish gray 5G7/1 with slight mottling of 5P2/2 very dusky purple and lesser pale olive 10Y6/2.

108-117, 130-150cm:
Greenish gray 5GY6/1 with slight 5P2/2 very dusky purple and pale green 10G6/2 mottling.

Hole 64.0 Core 1
Section 3



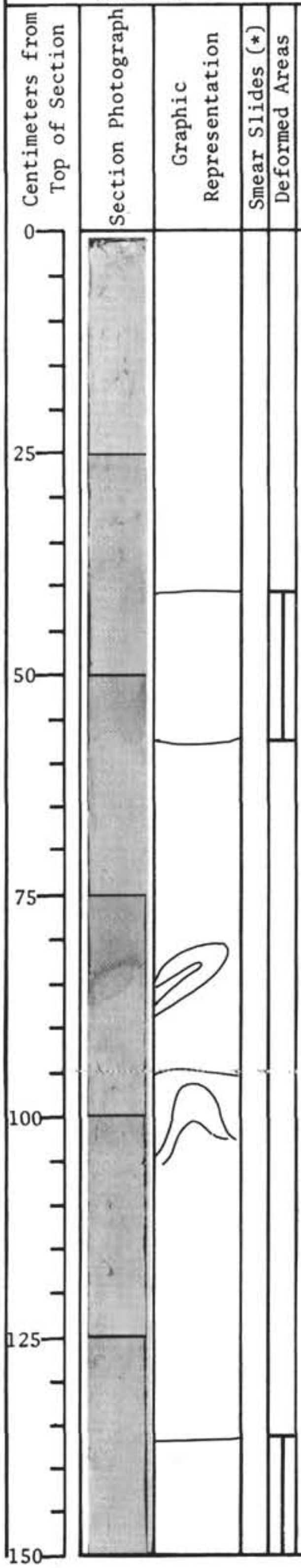
Description

NANNOFOSSIL CHALK OOZE

0-113cm:
Soft greenish gray 5GY6/1 with moderate mottling of 5P2/2 very dusky purple and pale greenish gray 5GY8.5/1.

113-150cm:
Pale greenish gray 5GY8.5/1 with mottling as above.

Hole 64.0 Core 1
Section 4

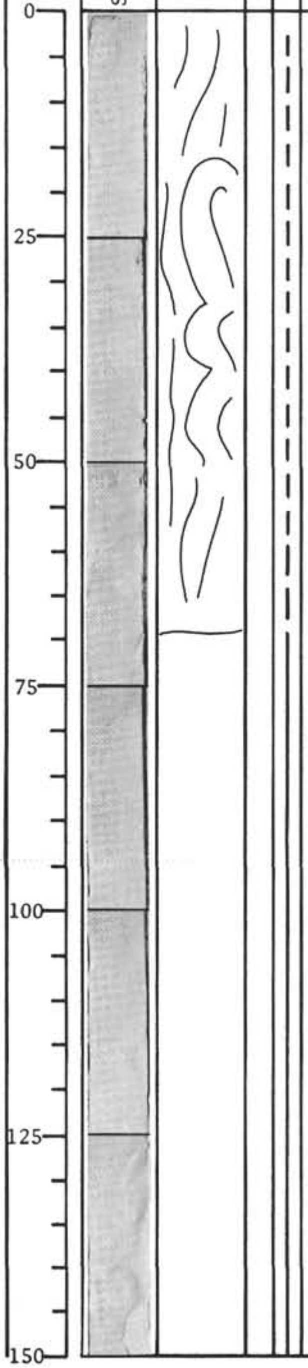


Description

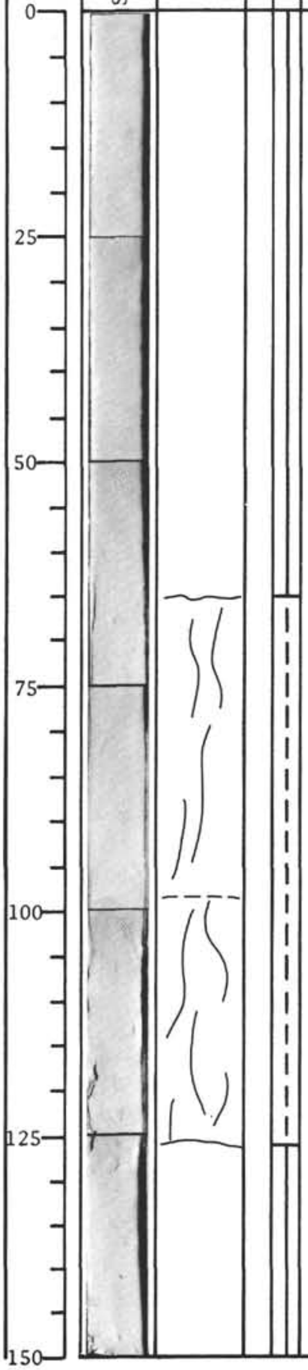
NANNOFOSSIL CHALK OOZE

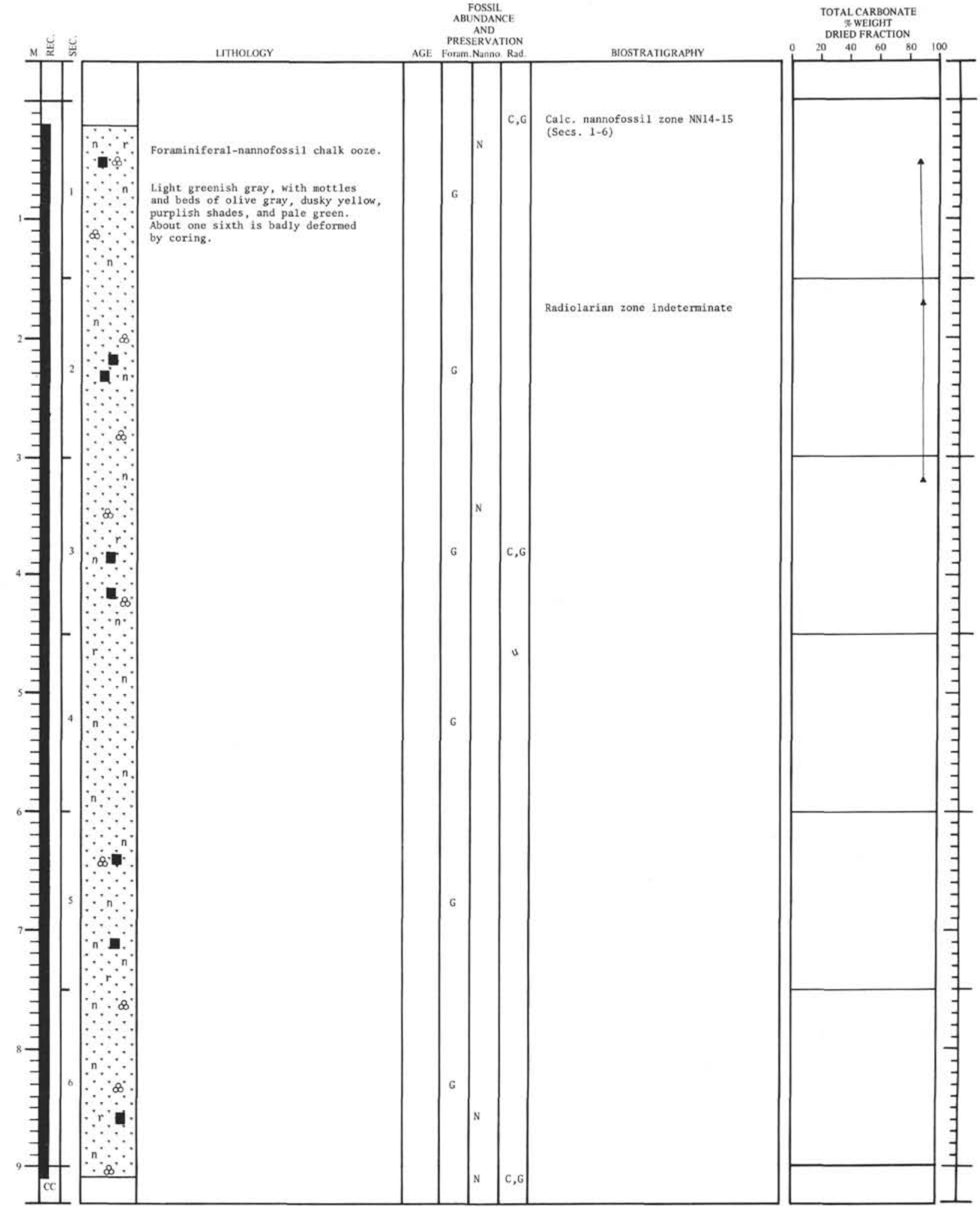
Soft greenish gray to light greenish gray 5GY6-7/1 with slight mottling of 5P2/2 very dusky purple and 5Y6/4 dusky yellow.

Hole 64.0 Core 1
Section 5

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description
					As Section 4

Hole 64.0 Core 1
Section 6

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description
					65-98cm: Greenish gray 5GY7/1 with dark greenish gray 5GY4/1 slight mottling. 98-125cm: Greenish gray 5GY6/1 with very dusky purple 5P2/2, dusky yellow 5Y6/4 and pale green 10G6/2 moderate mottling.



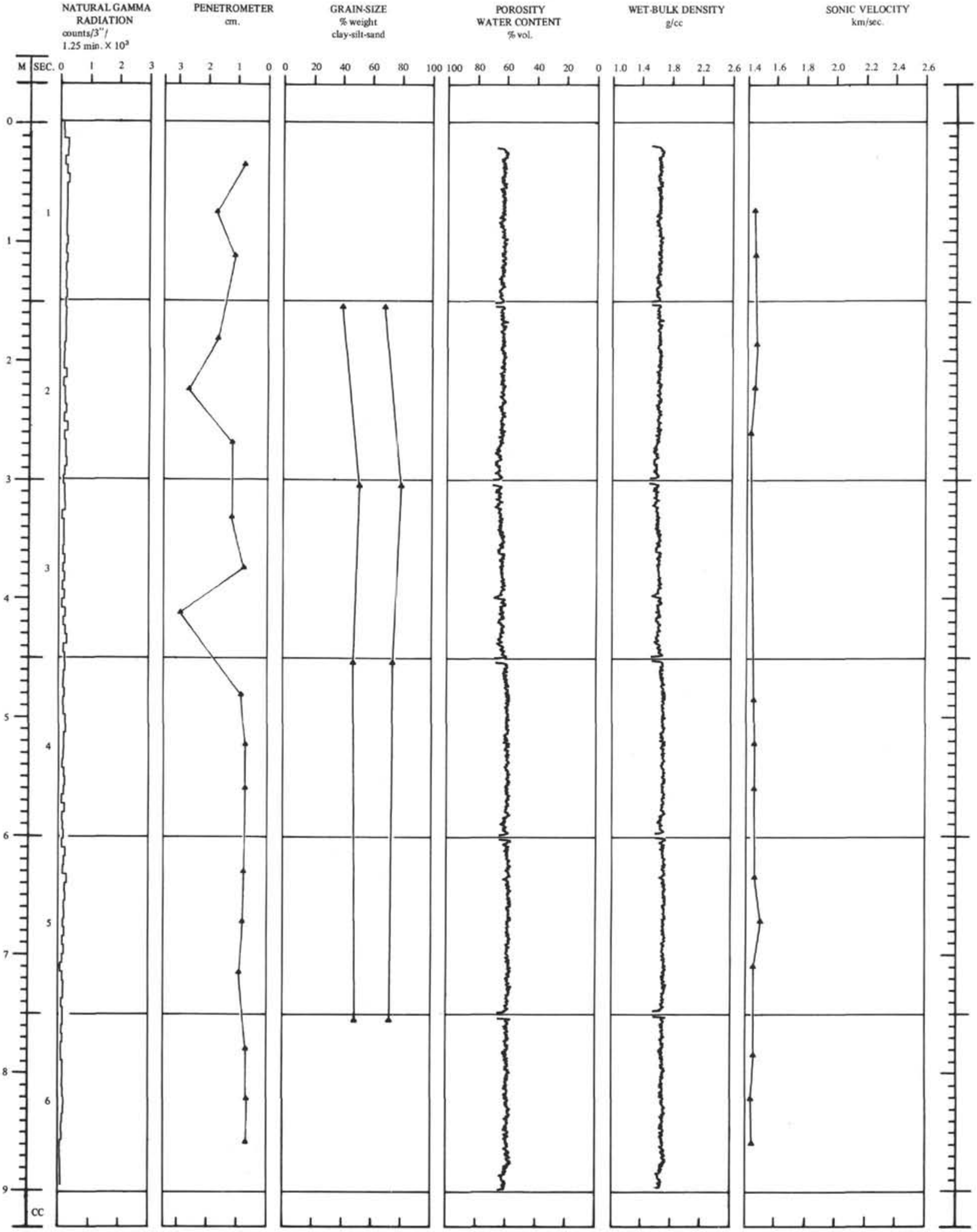
Foraminiferal-nannofossil chalk ooze.

Light greenish gray, with mottles and beds of olive gray, dusky yellow, purplish shades, and pale green. About one sixth is badly deformed by coring.

Calc. nannofossil zone NN14-15 (Secs. 1-6)

Radiolarian zone indeterminate

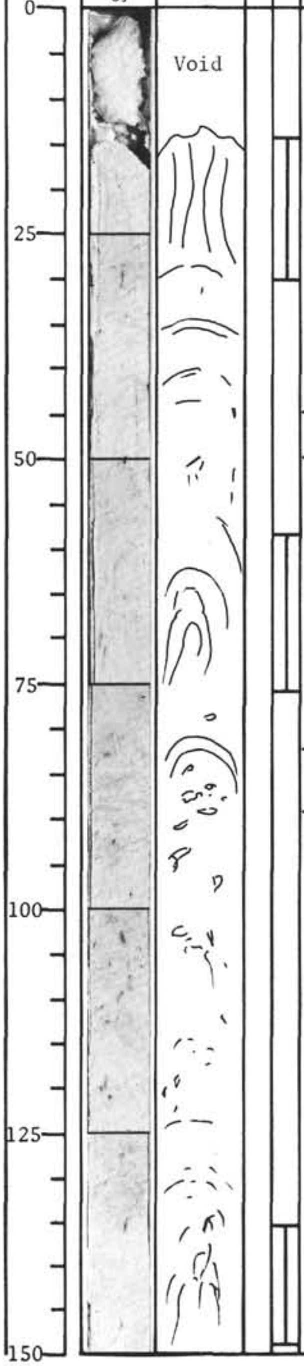
Lithology and biostratigraphy of Core 2, Hole 64.0.



Physical properties of Core 2, Hole 64.0.

Hole 64.0 Core 2
Section 1

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



FORAMINIFERAL NANNOFOSSIL CHALK OOZE

Alternating portions of slightly deformed, mottled ooze, and some deformed into vertical streaks and bands.

0-15cm: Void

← 2

← 2

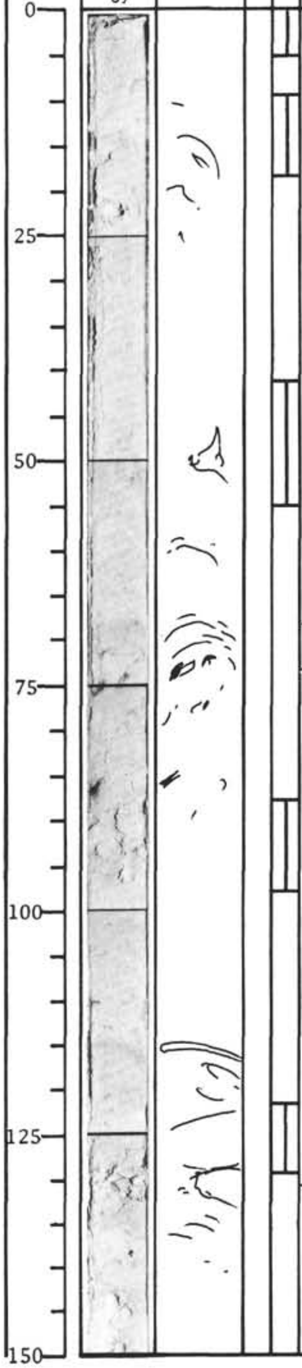
← 3

← 1

Basic color of core is light greenish gray 5G8/1, with beds and mottles of light olive gray (5Y6/1), dusky yellow (5Y6/4) (1) purple shades (purplish black 5P2/1 to grayish purple 5P5/2) (2), and pale green (5G7/2) (3).

Hole 64.0 Core 2
Section 2

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



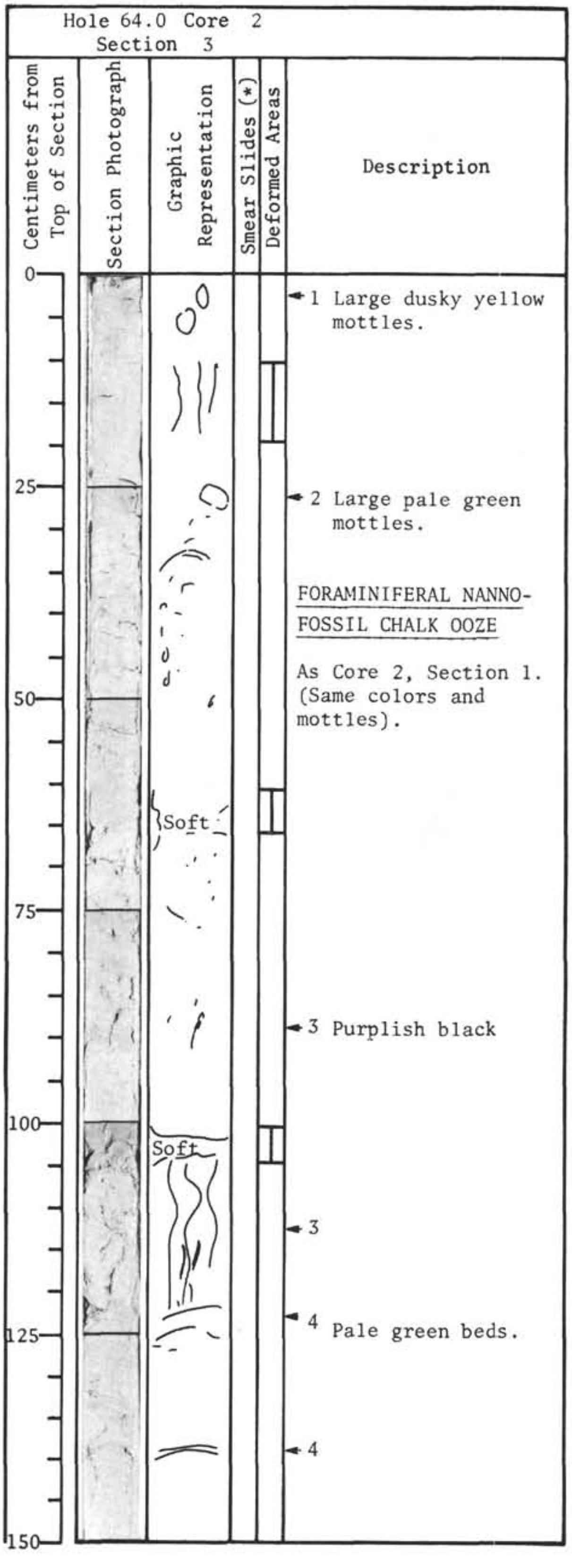
FORAMINIFERAL-NANNOFOSSIL CHALK OOZE

As Core 2, Section 1. Portions near 90 and 125cm badly deformed and wet.

← 1 Pale green beds

← 2 Purplish black

← 3 Dusky yellow



1 Large dusky yellow mottles.

2 Large pale green mottles.

FORAMINIFERAL NANNOFOSSIL CHALK OOZE

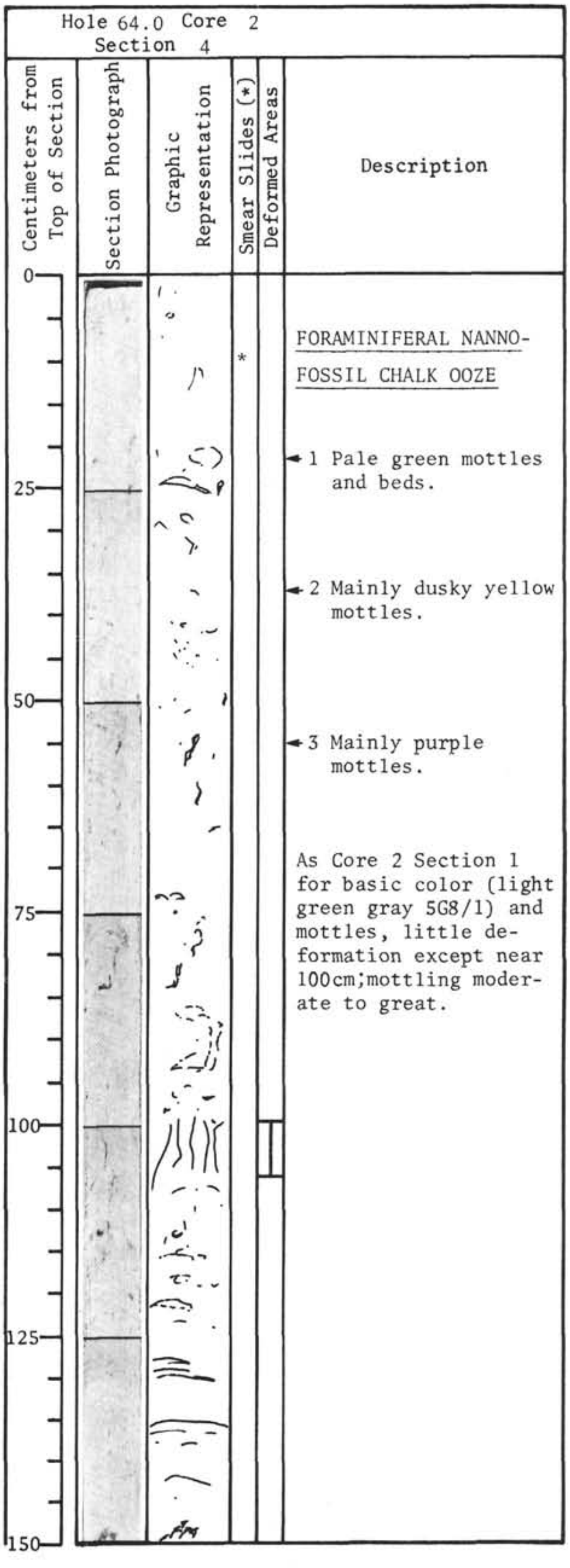
As Core 2, Section 1. (Same colors and mottles).

3 Purplish black

3

4 Pale green beds.

4



FORAMINIFERAL NANNOFOSSIL CHALK OOZE

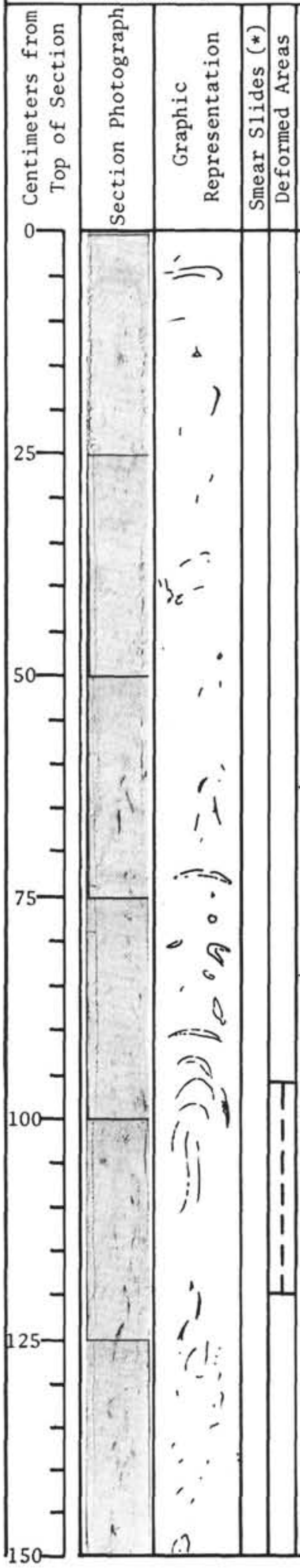
1 Pale green mottles and beds.

2 Mainly dusky yellow mottles.

3 Mainly purple mottles.

As Core 2 Section 1 for basic color (light green gray 5G8/1) and mottles, little deformation except near 100cm;mottling moderate to great.

Hole 64.0 Core 2
Section 5



Description

1 Light green

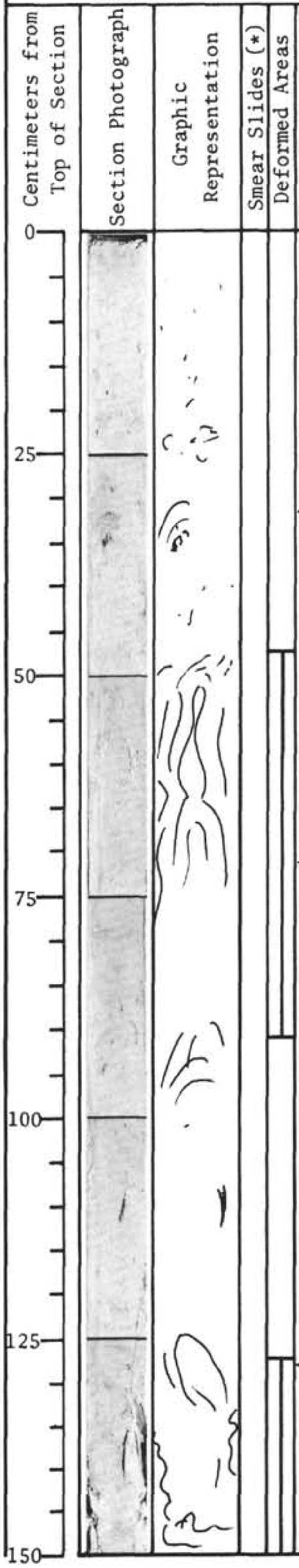
FORAMINIFERAL NANNOFOSSIL CHALK OOZE

As Core 2 Section 1 for basic color (5G8/1) and mottling.

2 Purplish black

3 Dusky yellow

Hole 64.0 Core 2
Section 6



Description

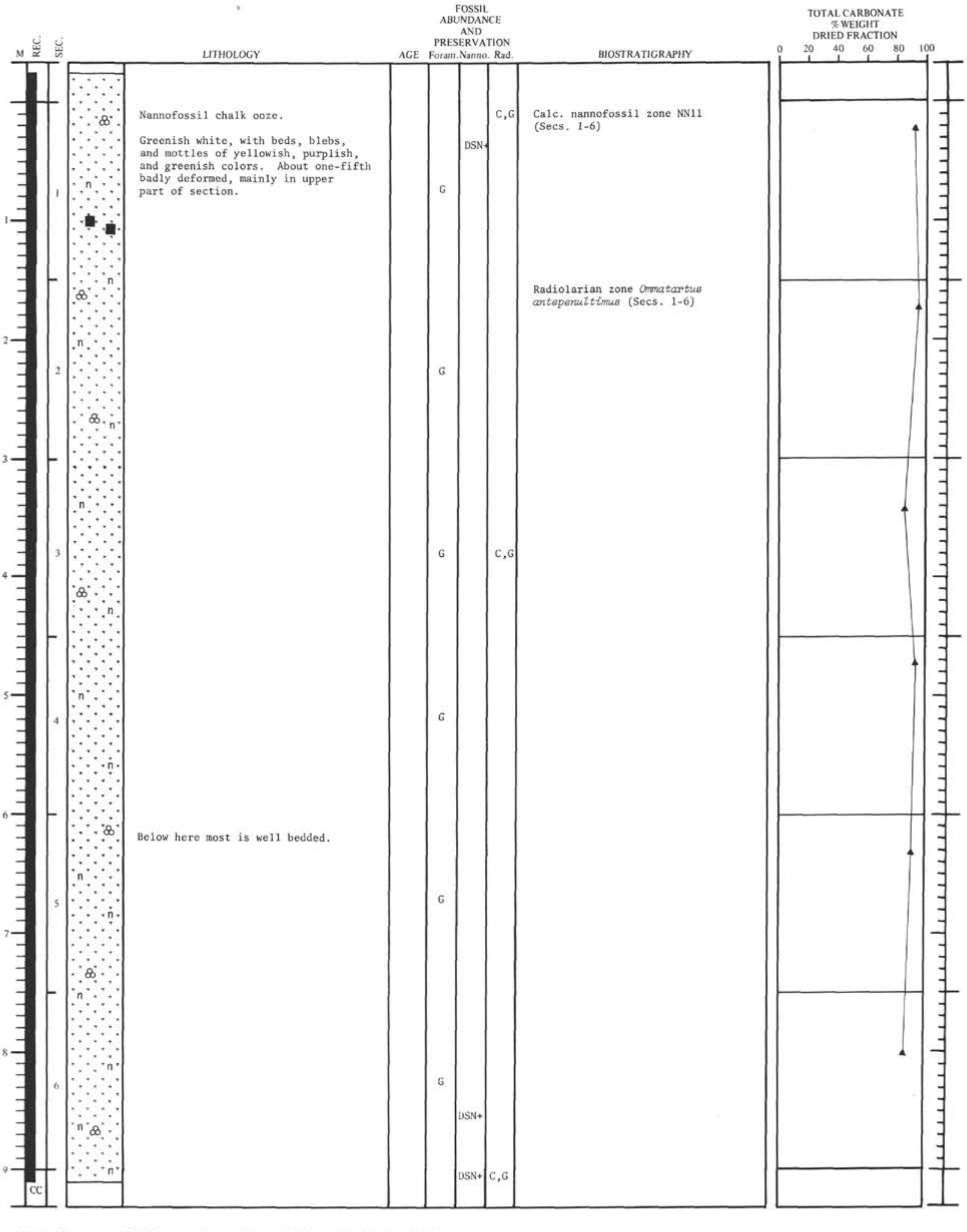
FORAMINIFERAL NANNOFOSSIL CHALK OOZE

As Core 2 Section 1, for background color and mottling.

1 Pale green mottles

2 Dusky yellow deformed mottles.

3 Grayish purple.



Nannofossil chalk ooze.

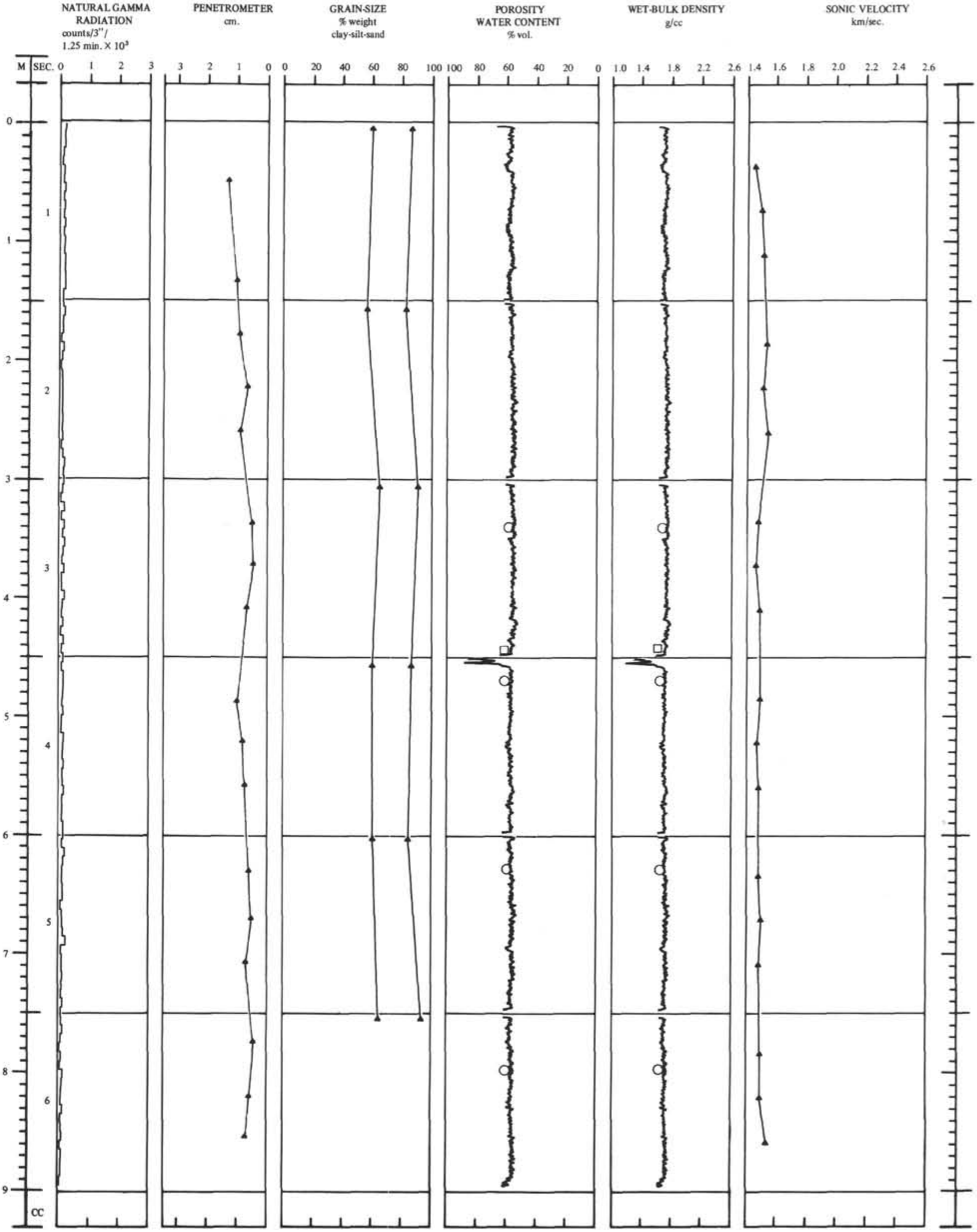
Greenish white, with beds, blebs, and mottles of yellowish, purplish, and greenish colors. About one-fifth badly deformed, mainly in upper part of section.

Below here most is well bedded.

Calc. nannofossil zone NN11 (Secs. 1-6)

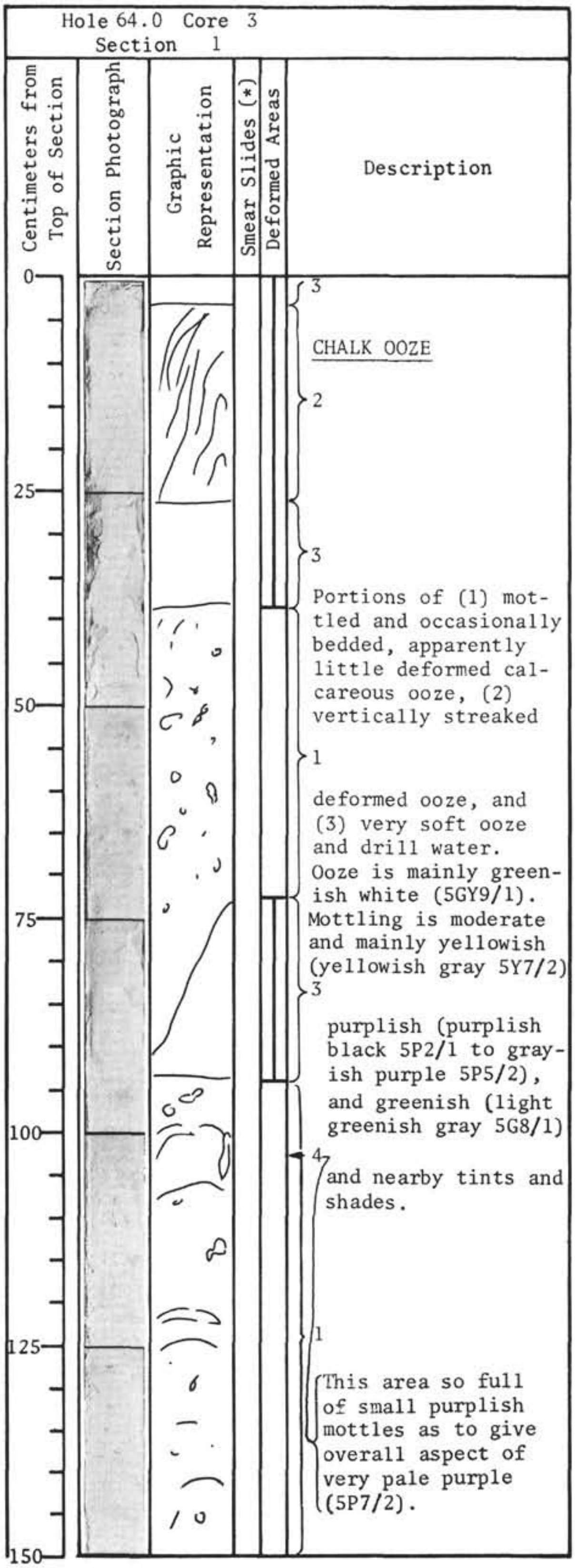
Radiolarian zone *Ommatartus antepenultimus* (Secs. 1-6)

Lithology and biostratigraphy of Core 3, Hole 64.0.



Physical properties of Core 3, Hole 64.0.

Hole 64.0 Core 3
Section 1

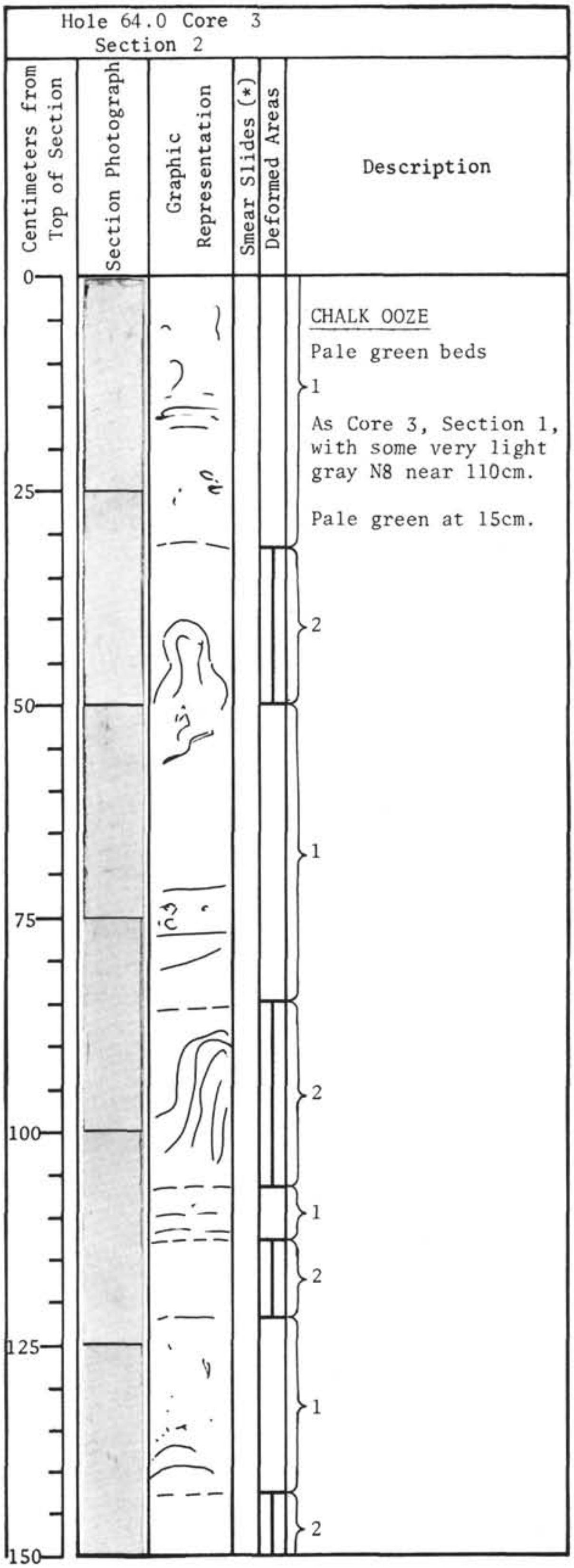


CHALK OOZE

Portions of (1) mottled and occasionally bedded, apparently little deformed calcareous ooze, (2) vertically streaked deformed ooze, and (3) very soft ooze and drill water. Ooze is mainly greenish white (5GY9/1). Mottling is moderate and mainly yellowish (yellowish gray 5Y7/2) purplish (purplish black 5P2/1 to grayish purple 5P5/2), and greenish (light greenish gray 5G8/1) and nearby tints and shades.

This area so full of small purplish mottles as to give overall aspect of very pale purple (5P7/2).

Hole 64.0 Core 3
Section 2

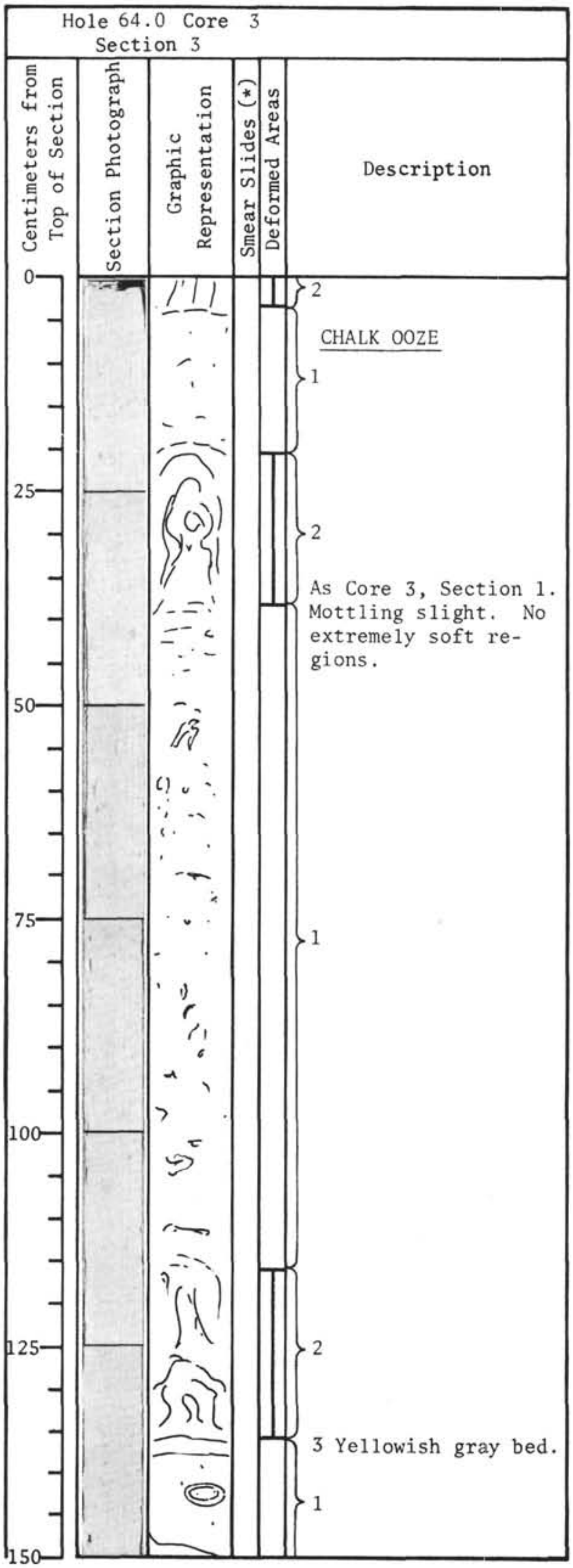


CHALK OOZE

Pale green beds

As Core 3, Section 1, with some very light gray N8 near 110cm.

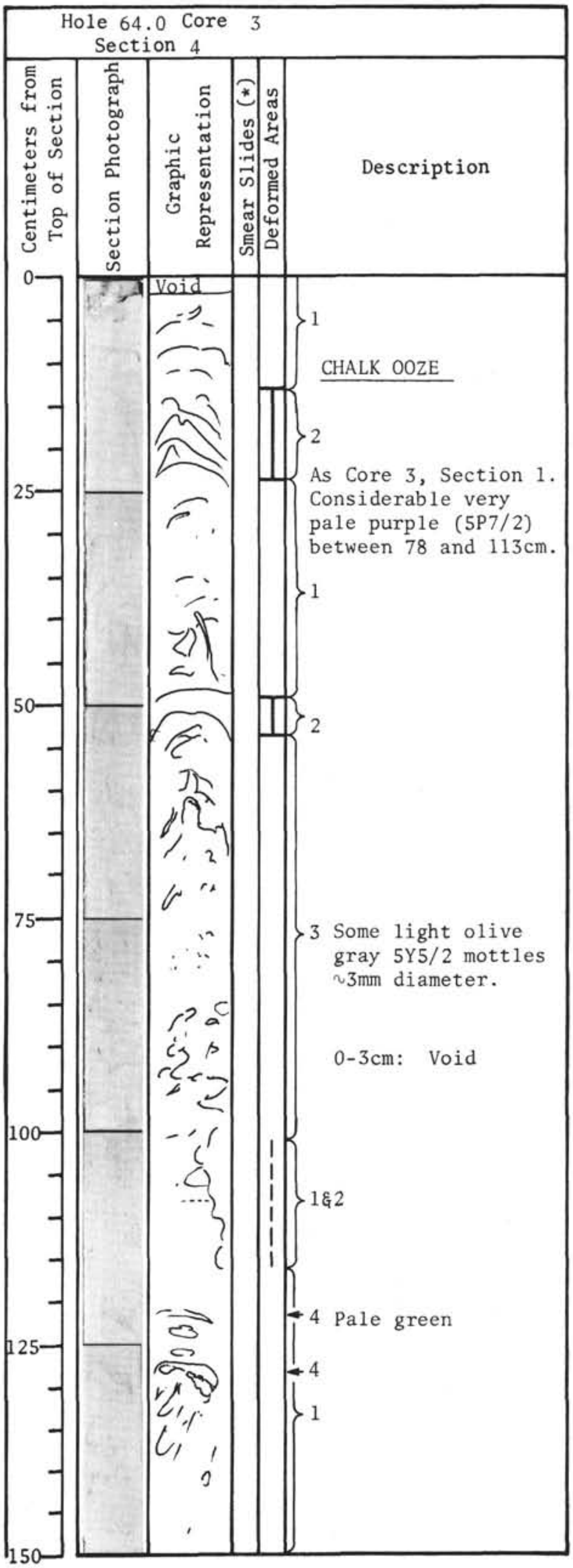
Pale green at 15cm.



CHALK OOZE

As Core 3, Section 1. Mottling slight. No extremely soft regions.

3 Yellowish gray bed.



CHALK OOZE

As Core 3, Section 1. Considerable very pale purple (5P7/2) between 78 and 113cm.

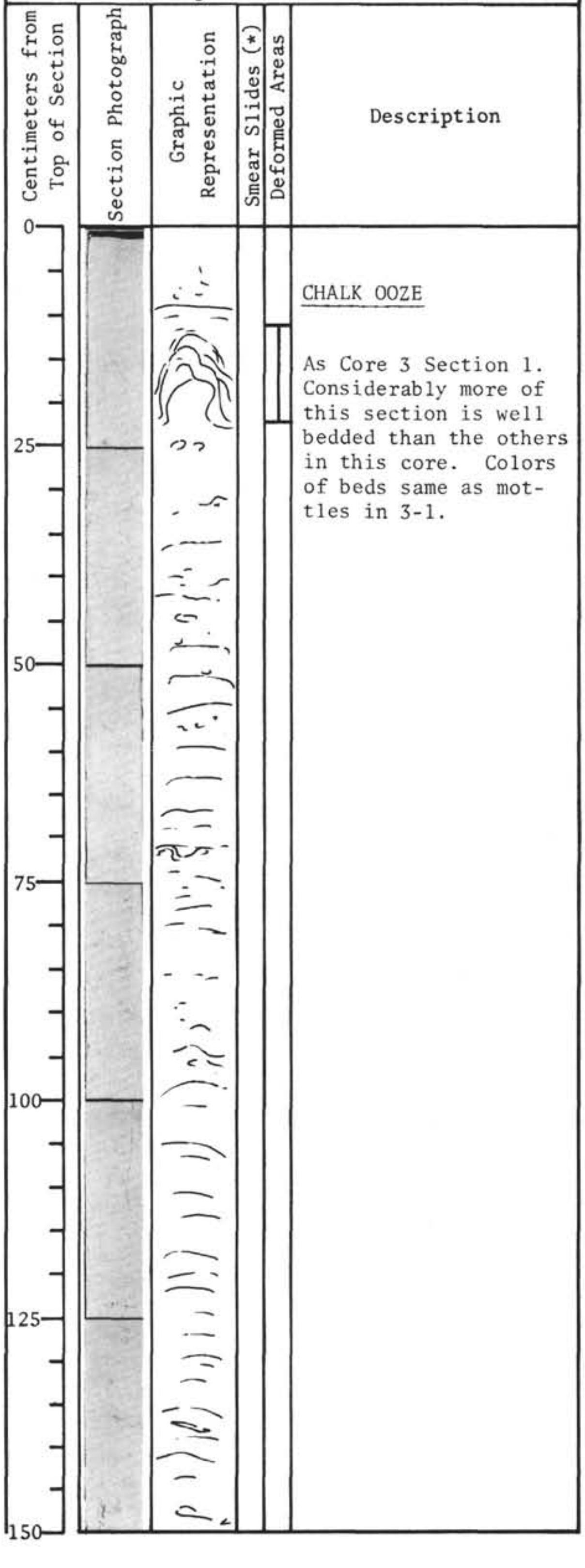
3 Some light olive gray 5Y5/2 mottles ∿3mm diameter.

0-3cm: Void

4 Pale green

4

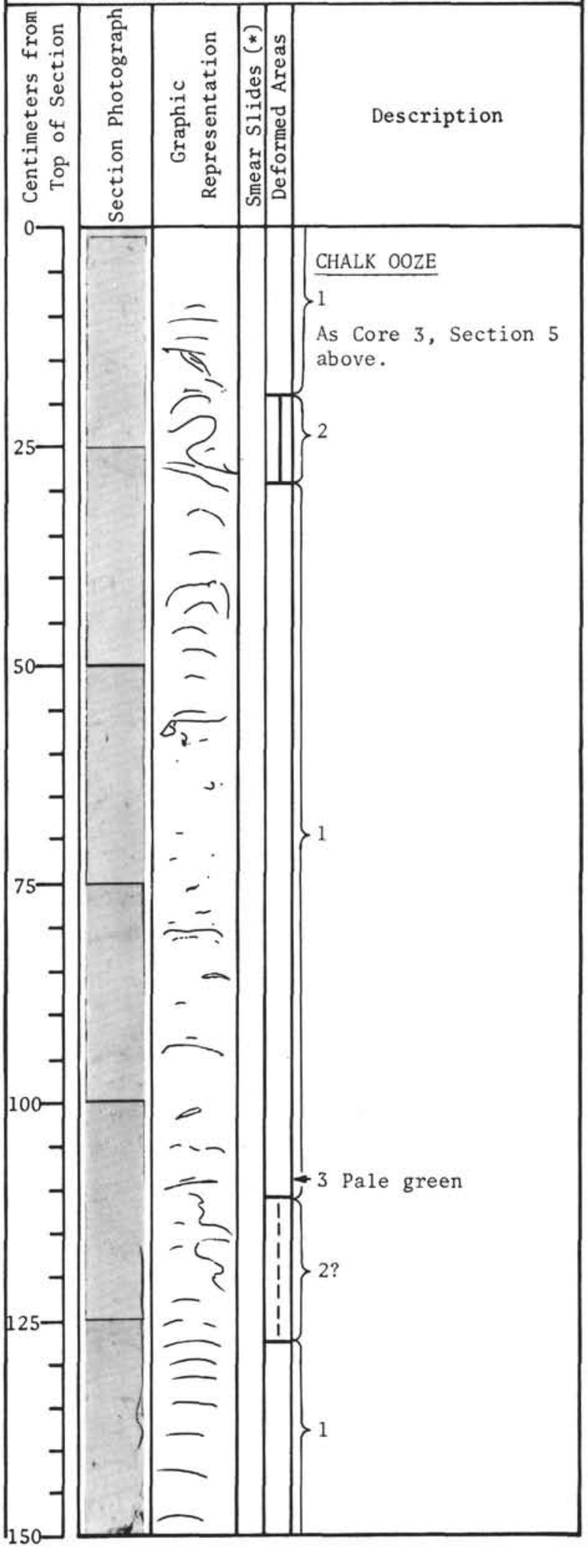
Hole 64.0 Core 3
Section 5



CHALK OOZE

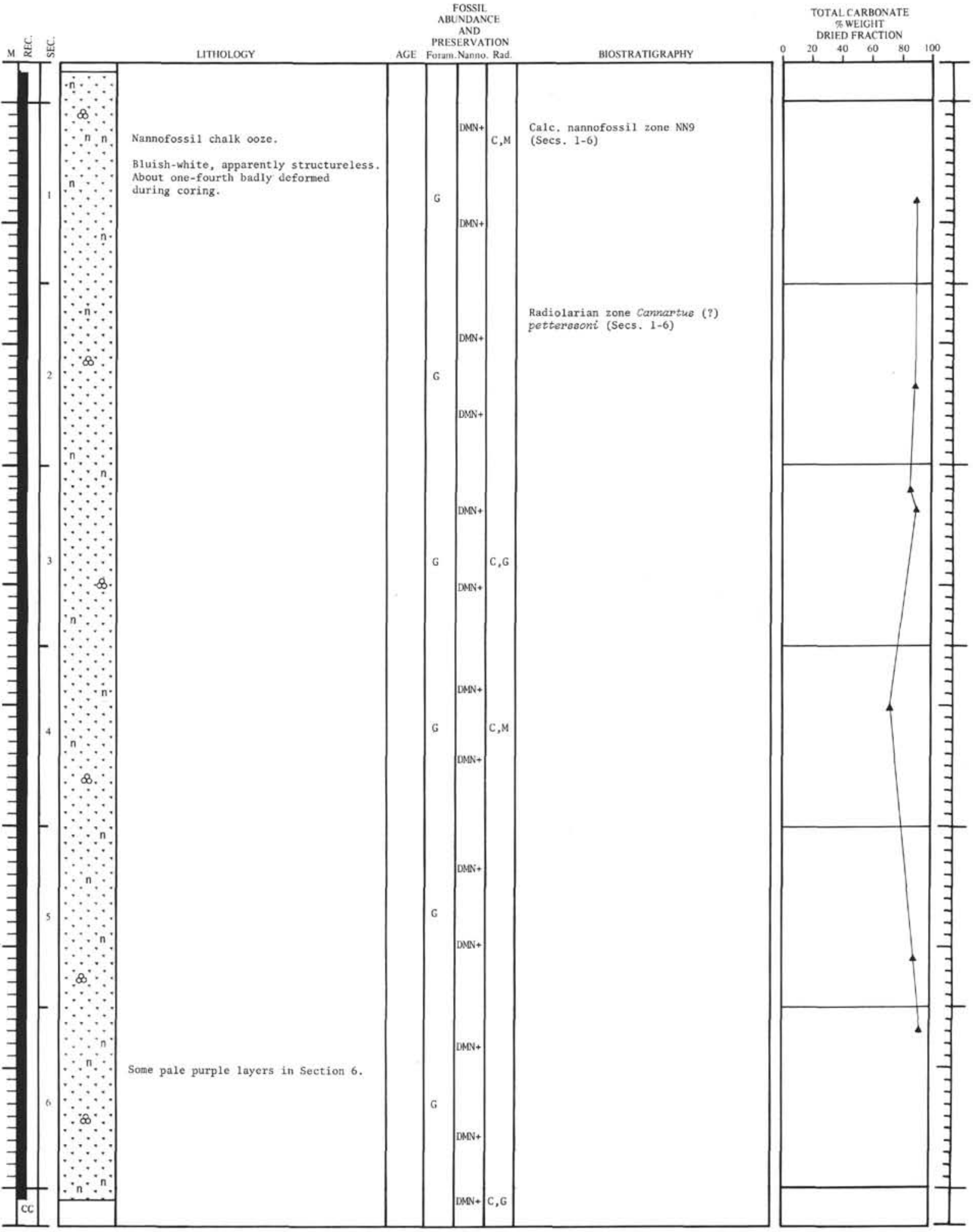
As Core 3 Section 1. Considerably more of this section is well bedded than the others in this core. Colors of beds same as mottles in 3-1.

Hole 64.0 Core 3
Section 6



CHALK OOZE

As Core 3, Section 5 above.



Nannofossil chalk ooze.

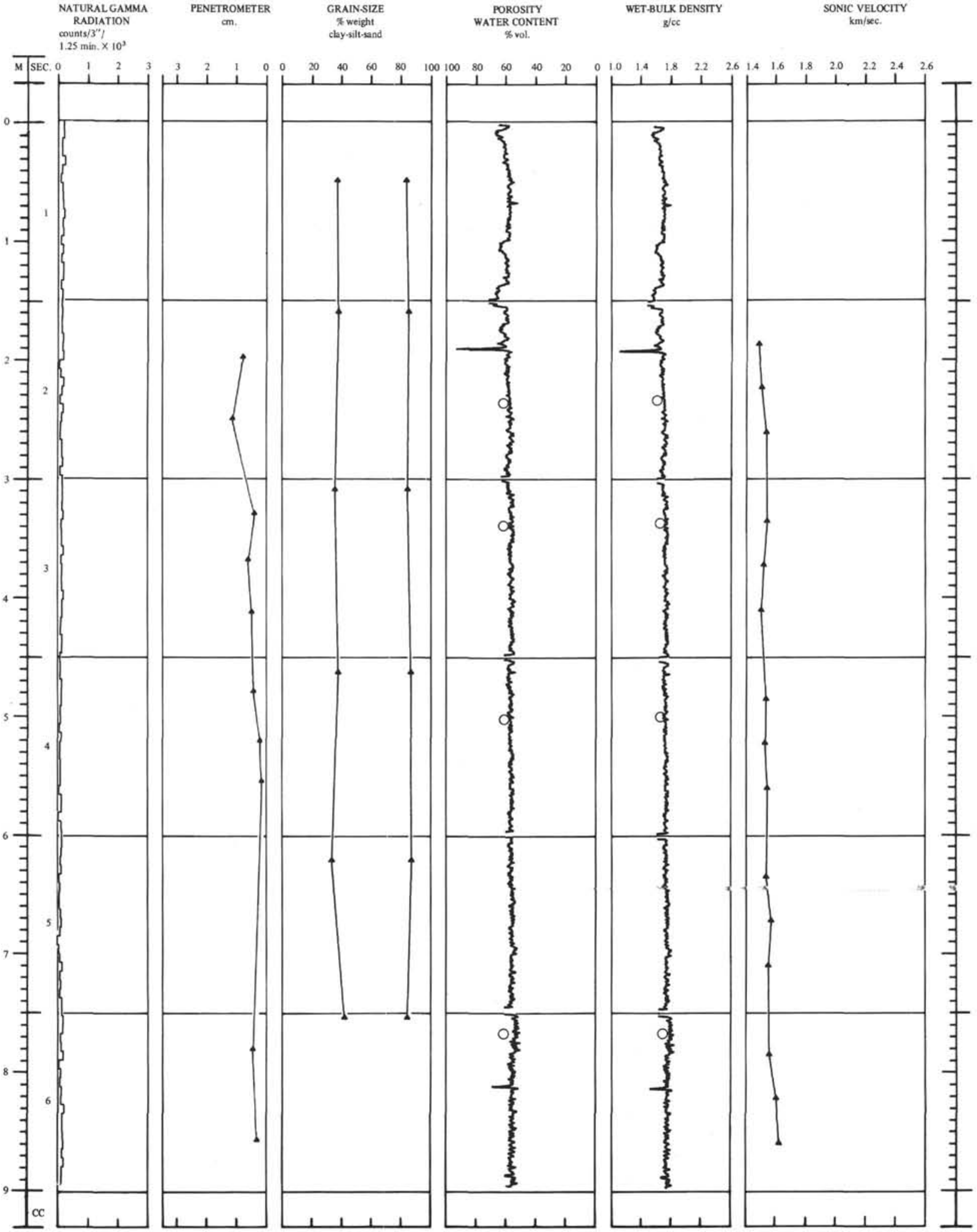
Bluish-white, apparently structureless. About one-fourth badly deformed during coring.

Some pale purple layers in Section 6.

Calc. nannofossil zone NN9 (Secs. 1-6)

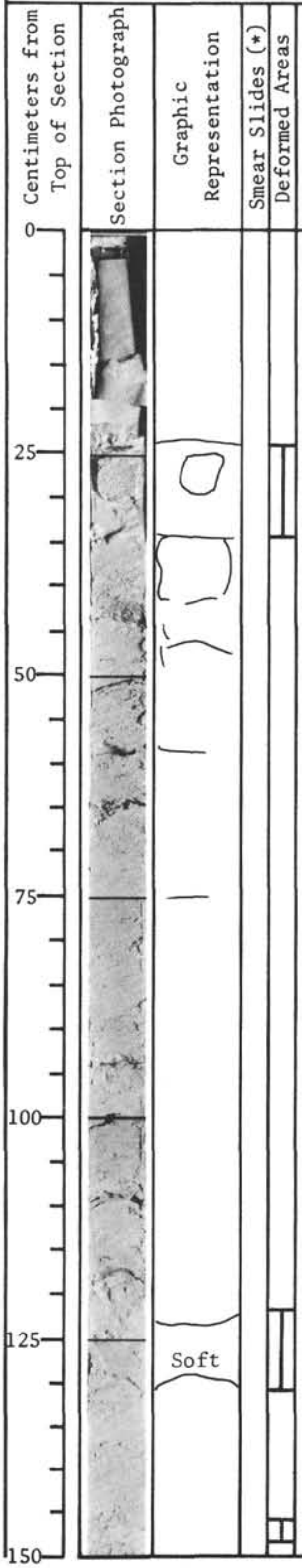
Radiolarian zone *Cannartus* (?) *petterssoni* (Secs. 1-6)

Lithology and biostratigraphy of Core 4, Hole 64.0.



Physical properties of Core 4, Hole 64.0.

Hole 64.0 Core 4
Section 1



Description

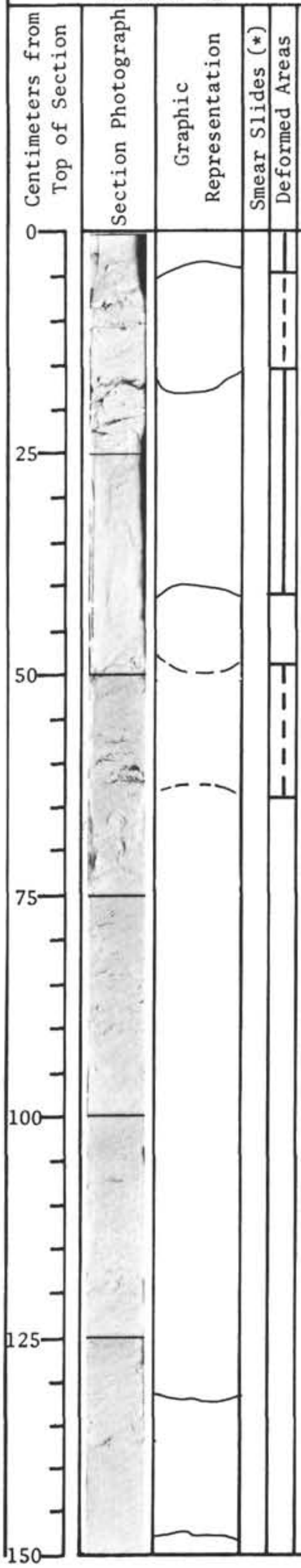
NANNOFOSSIL CHALK OOZE

Bluish white 5B9/1 calcareous ooze. A few portions fairly firm (eg. ~50, ~66, ~107 and 130cm).

No apparent mottles, beds, or contacts.

0-25cm: Void

Hole 64.0 Core 4
Section 2



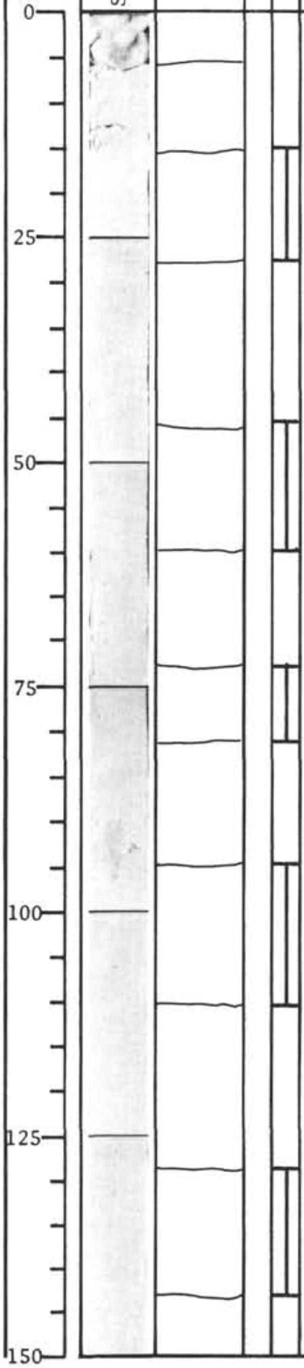
Description

NANNOFOSSIL CHALK OOZE

Bluish white (5B9/1) calcareous ooze like Core 4 Section 1. No apparent structures.

Hole 64.0 Core 4
Section 3

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



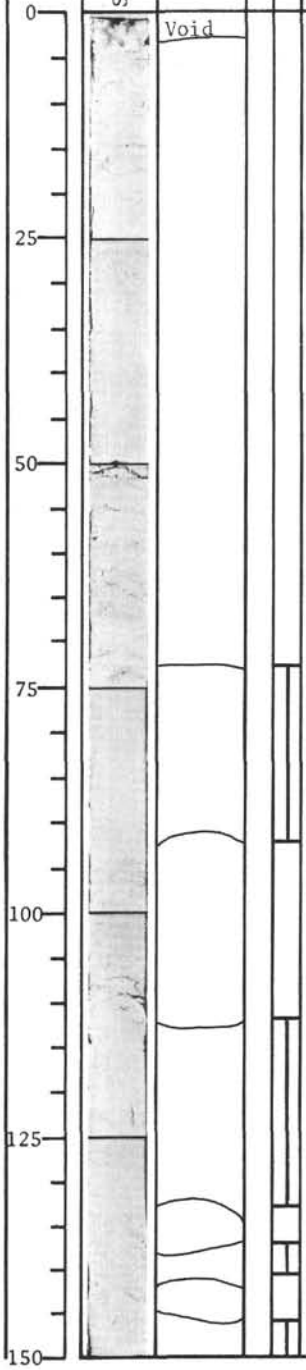
FORAMINIFERAL NANNO-FOSSIL CHALK OOZE

Very uniform structureless bluish white 5B9/1.

0-6cm: Void

Hole 64.0 Core 4
Section 4

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



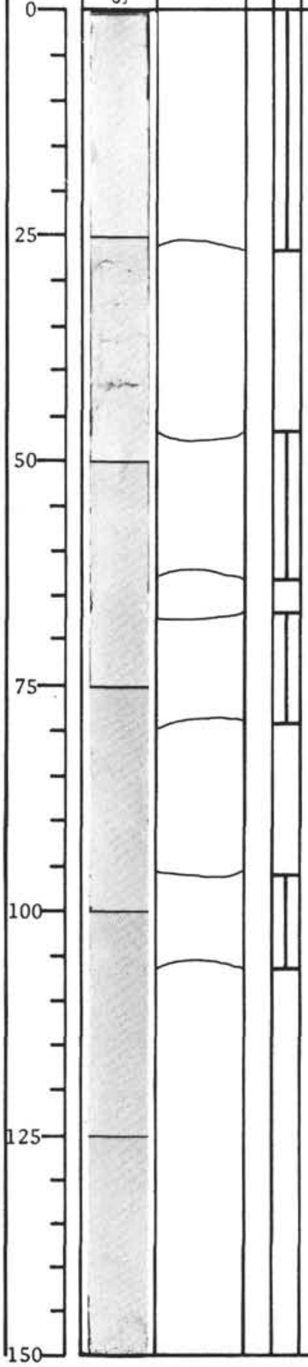
FORAMINIFERAL NANNO-FOSSIL CHALK OOZE

Uniform, structureless bluish white (5B9/2) chalk ooze. Some portions homogenized by the coring process.

0-3cm: Void

Hole 64.0 Core 4
Section 5

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description

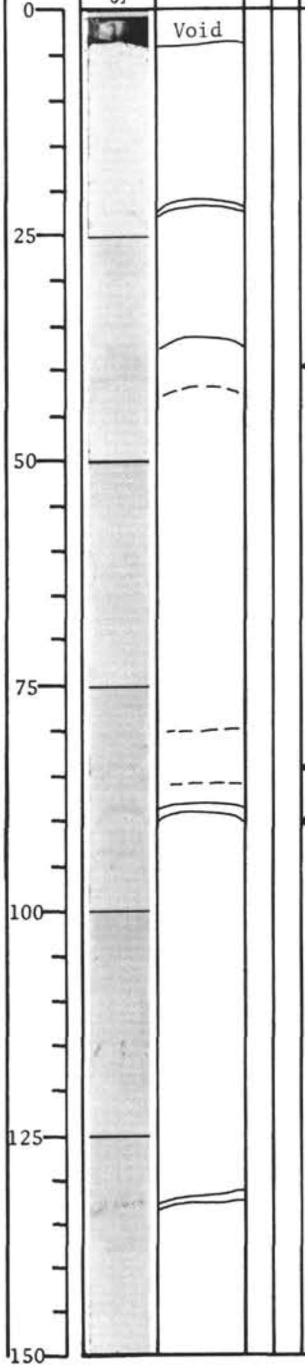


NANNOFOSSIL CHALK OOZE

Uniform, structureless bluish white (5B9/1) calcareous ooze; firmer portions separated by soft portions homogenized by the coring process.

Hole 64.0 Core 4
Section 6

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK OOZE

0-3cm: Void

Mostly featureless bluish white 5P2/2, with scattered pale purple 5P7/2 bands (1).

← 1

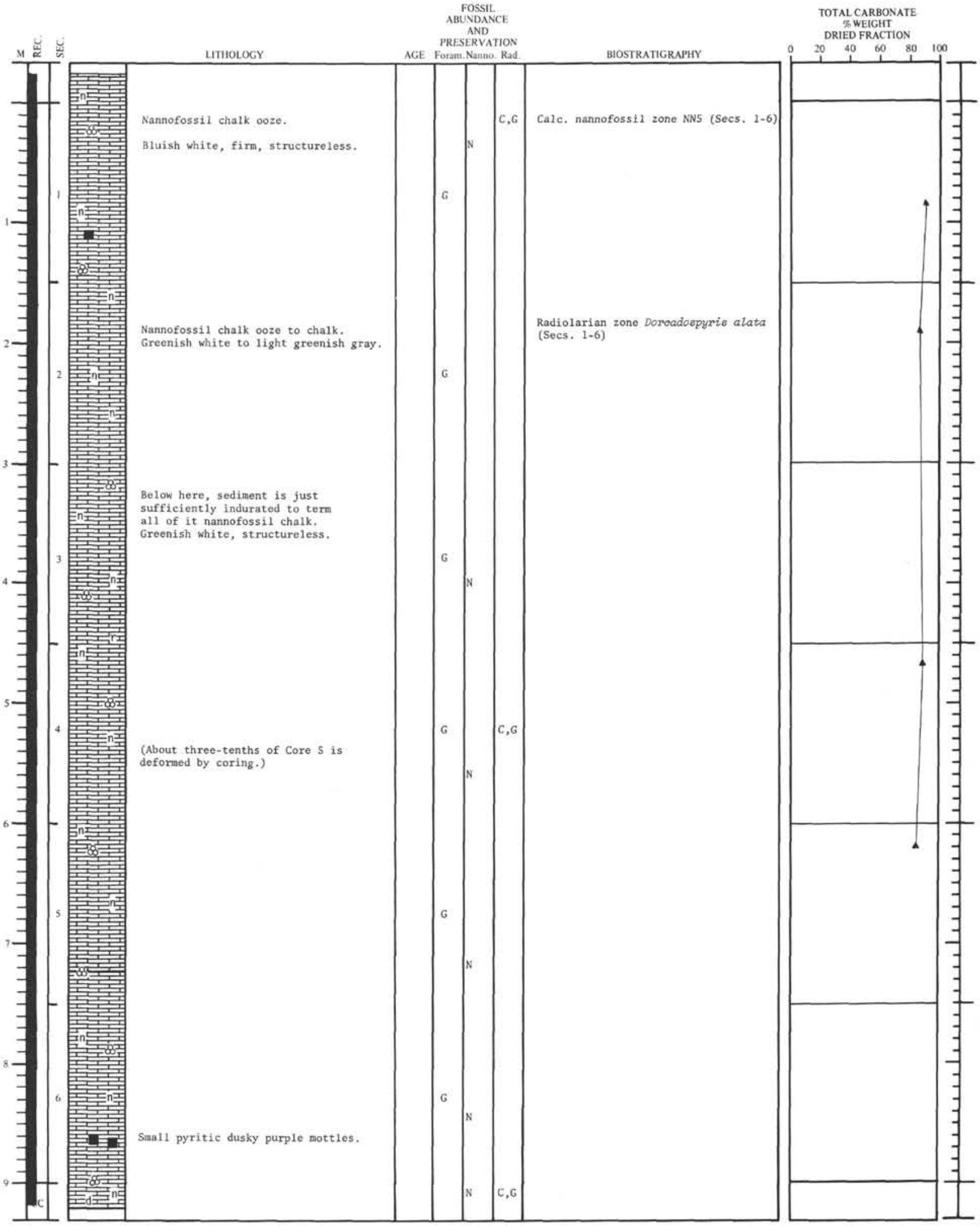
Locally very firm.

Horizontal bedding.

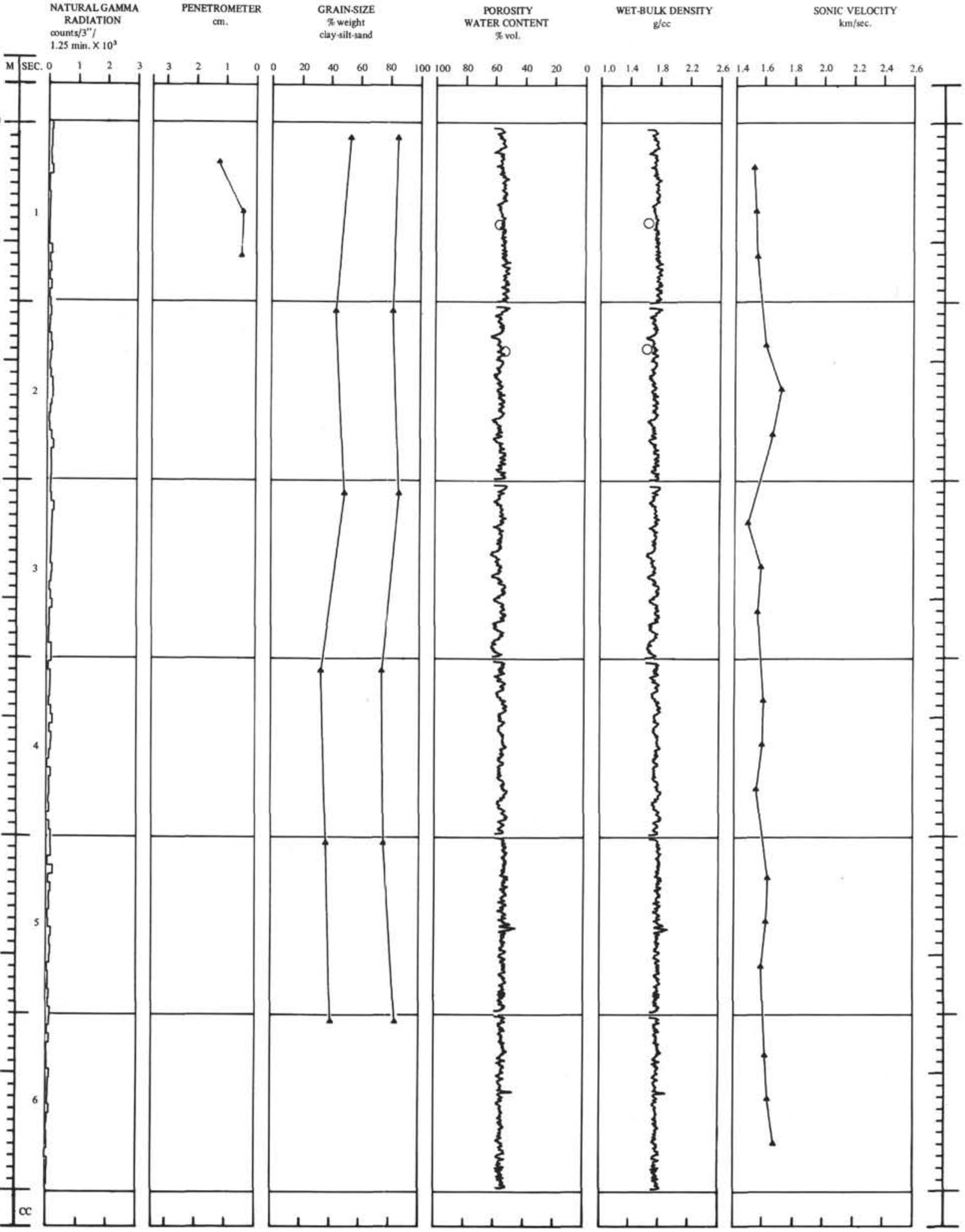
131cm:
Medium light gray N6.

← 1

← 1

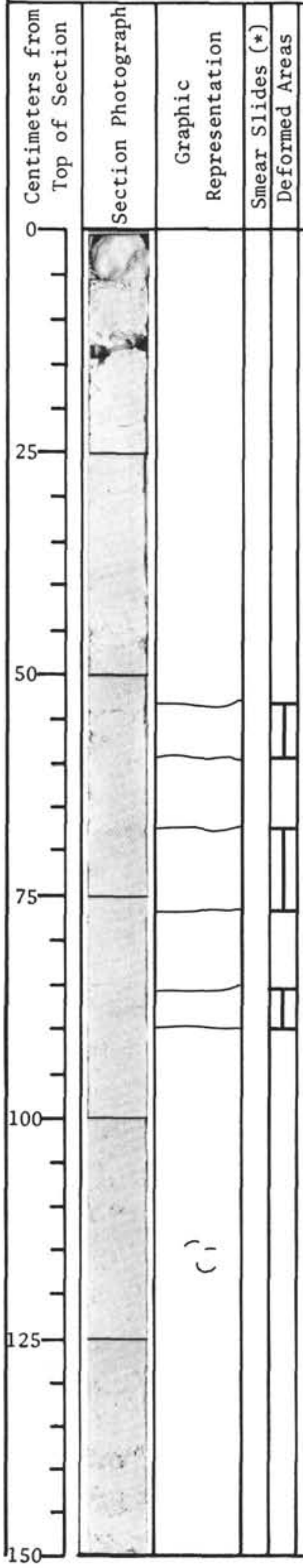


Lithology and biostratigraphy of Core 5, Hole 64.0.



Physical properties of Core 5, Hole 64.0.

Hole 64.0 Core 5
Section 1



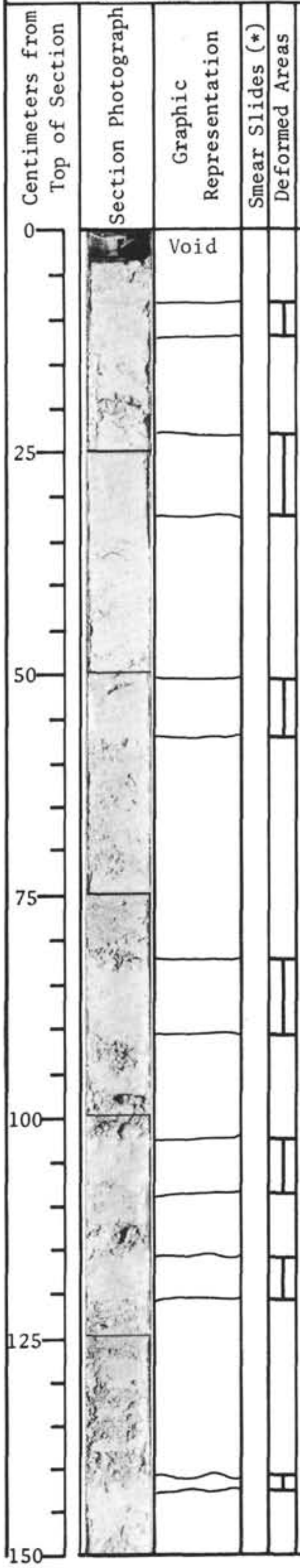
Description

NANNOFOSSIL CHALK OOZE

Bluish white 5B9/1 very firm, structureless with soft areas disturbed by drilling.

Small mottles of very dusky purple 5P2/2 at 115cm.

Hole 64.0 Core 5
Section 2



Description

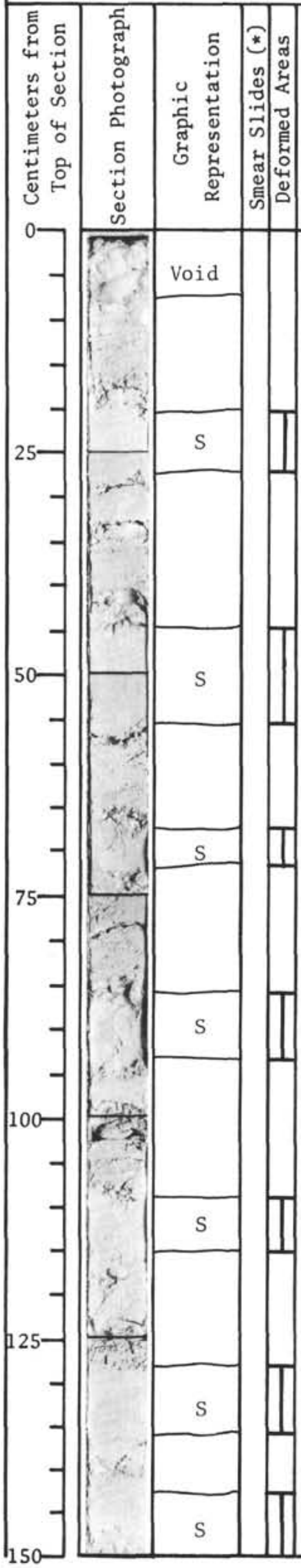
NANNOFOSSIL CHALK to CHALK OOZE

0-2cm: Void

2-120cm:
Semi-indurated greenish white 5GY9/1. Fractured by drilling. Soft areas homogenized by drilling.

120-150cm:
As above but light greenish gray 5G8/1.

Hole 64.0 Core 5
Section 3



Description

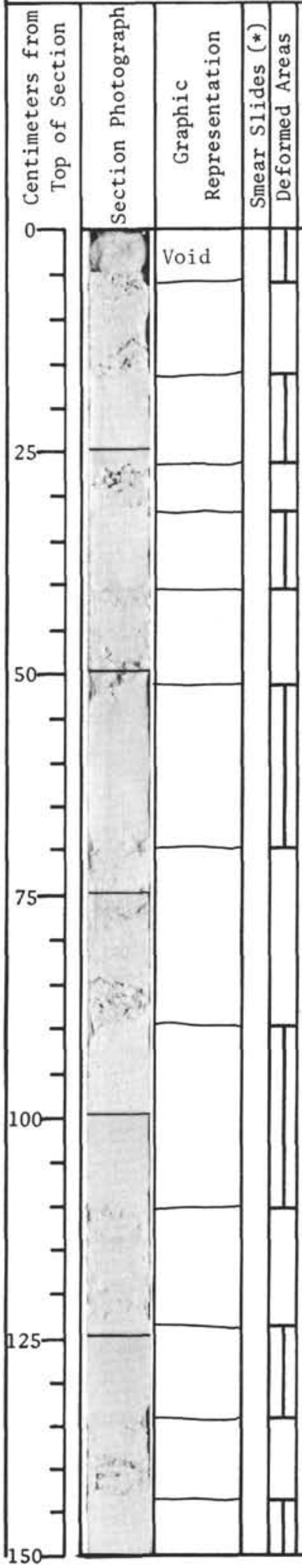
NANNOFOSSIL CHALK

0-6cm: Void

Shattered sections of indurated (just) material homogenized by drilling.

Structureless greenish white 5GY9/1 throughout.

Hole 64.0 Core 5
Section 4



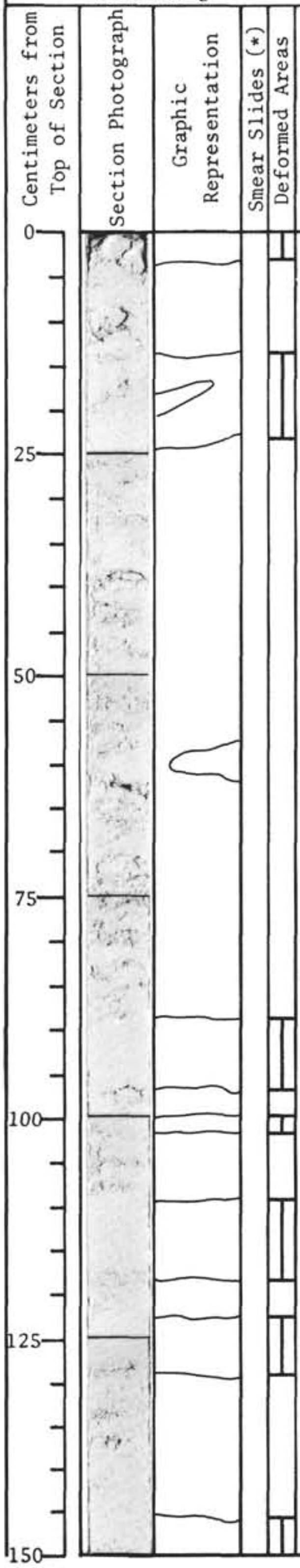
Description

NANNOFOSSIL CHALK

0-5cm: Void

As Section 3

Hole 64.0 Core 5
Section 5

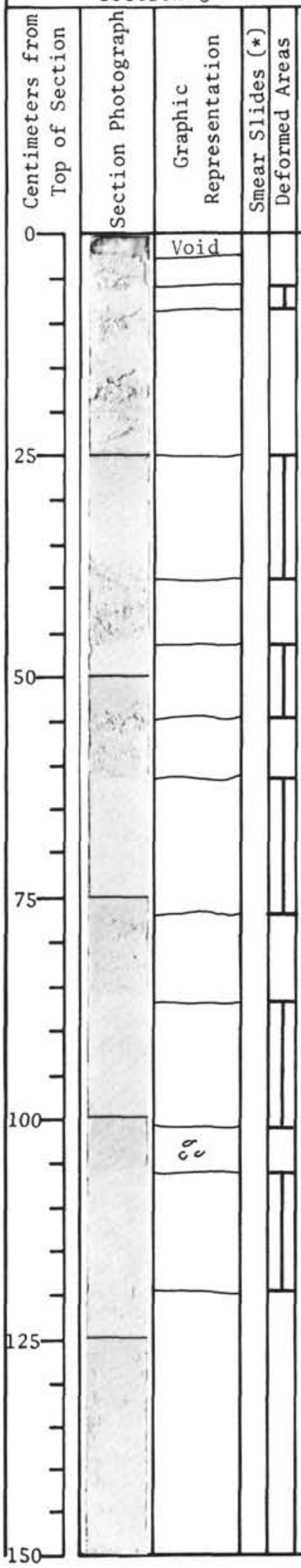


Description

NANNOFOSSIL CHALK

As Section 3

Hole 64.0 Core 5
Section 6



Description

NANNOFOSSIL CHALK

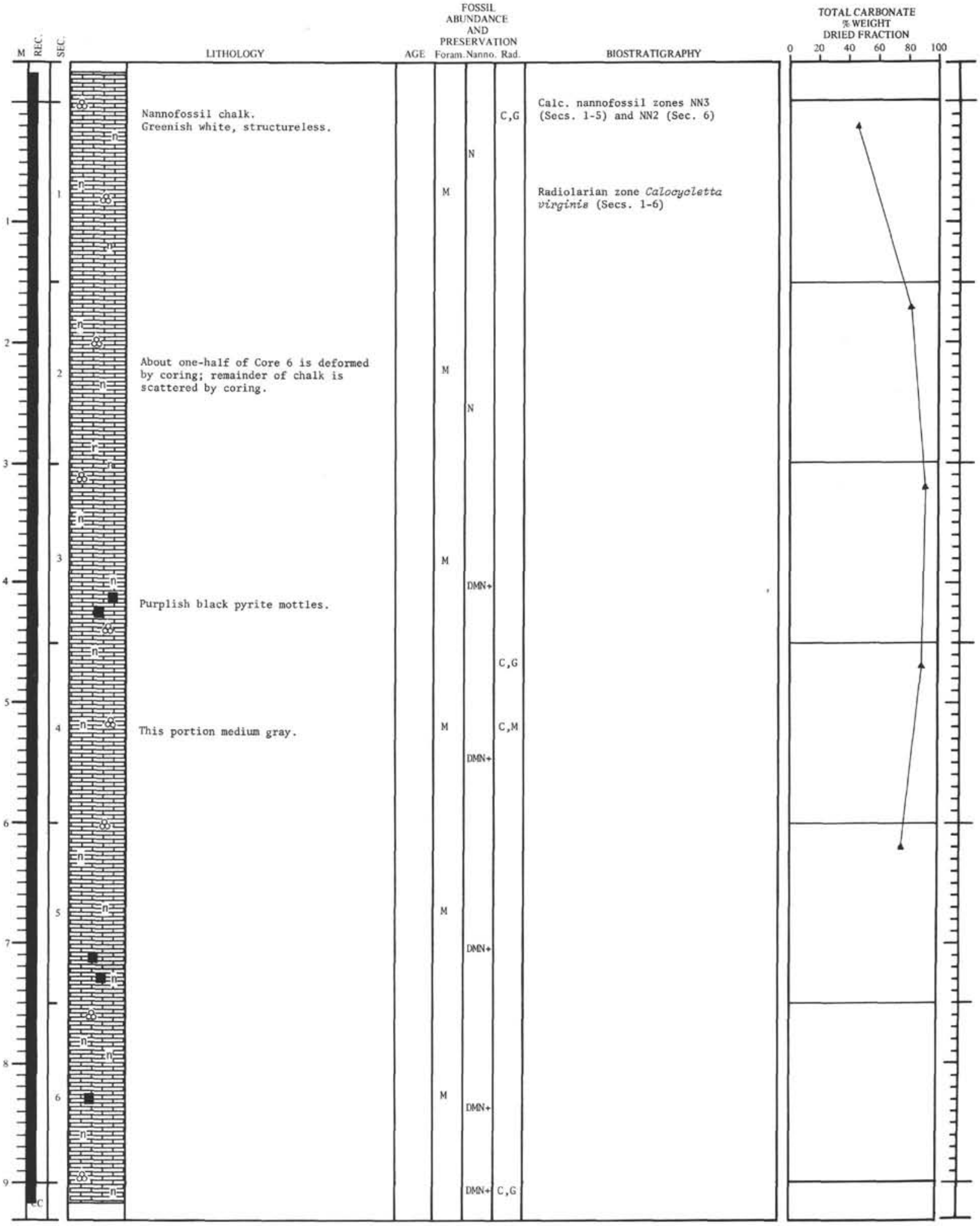
0-2cm: Void

As previous sections.

Greenish white 5GY9/1 consolidated to semi-consolidated shattered chalk separated by soft areas homogenized by drilling.

No structures.

Very dusky purple 5P2/2 mottles at 105cm.



Nannofossil chalk.
Greenish white, structureless.

About one-half of Core 6 is deformed by coring; remainder of chalk is scattered by coring.

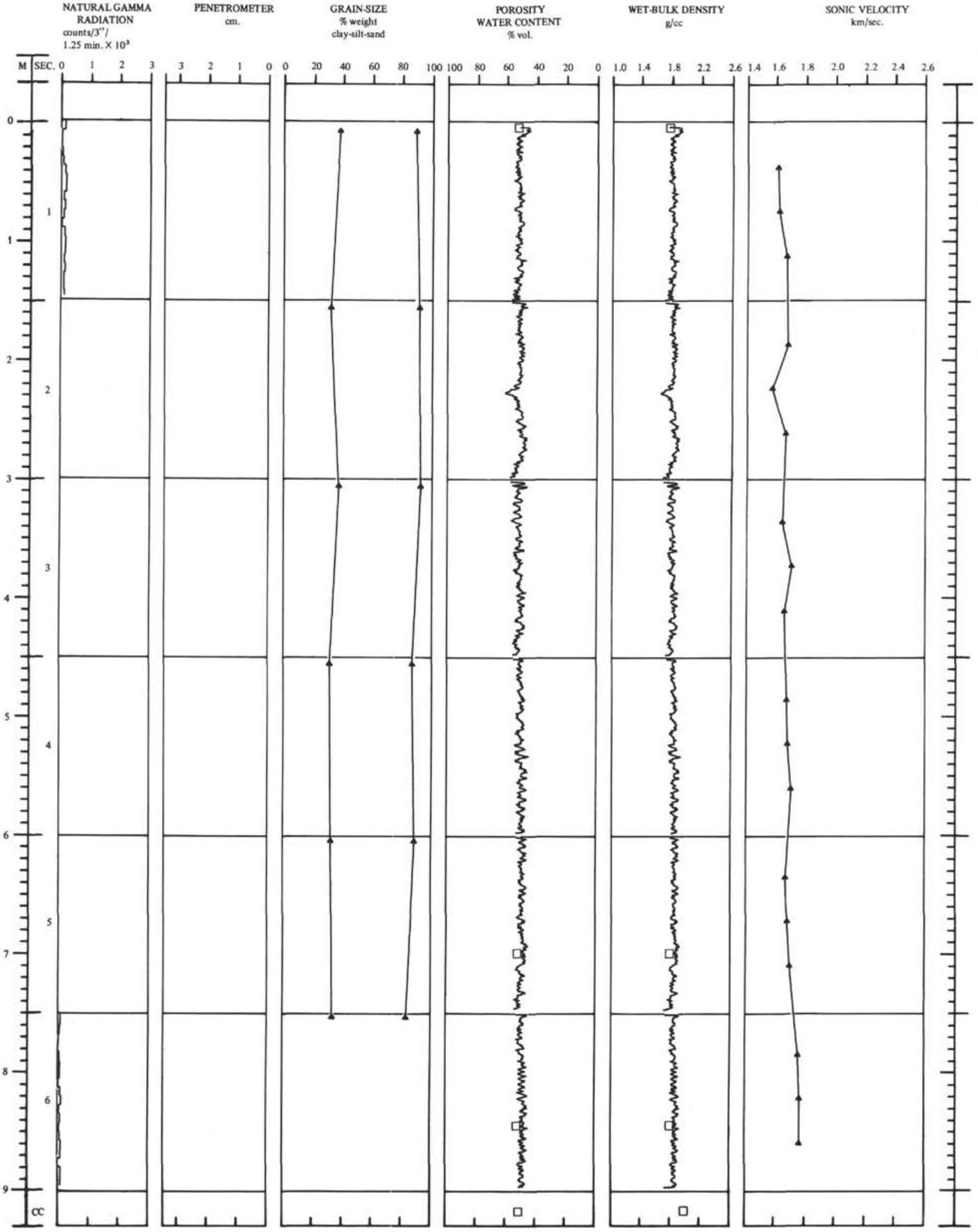
Purplish black pyrite mottles.

This portion medium gray.

Calc. nannofossil zones NN3 (Secs. 1-5) and NN2 (Sec. 6)

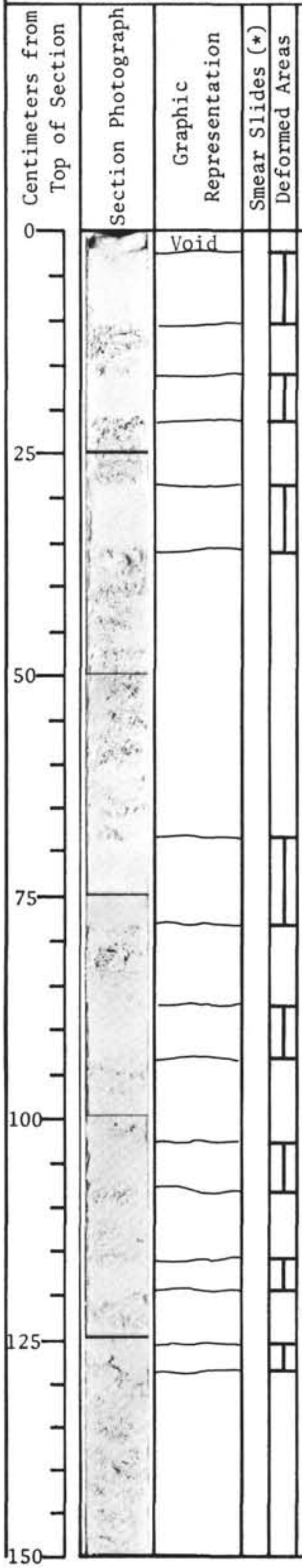
Radiolarian zone *Calocycletta virginis* (Secs. 1-6)

Lithology and biostratigraphy of Core 6, Hole 64.0.



Physical properties of Core 6, Hole 64.0.

Hole 64.0 Core 6
Section 1



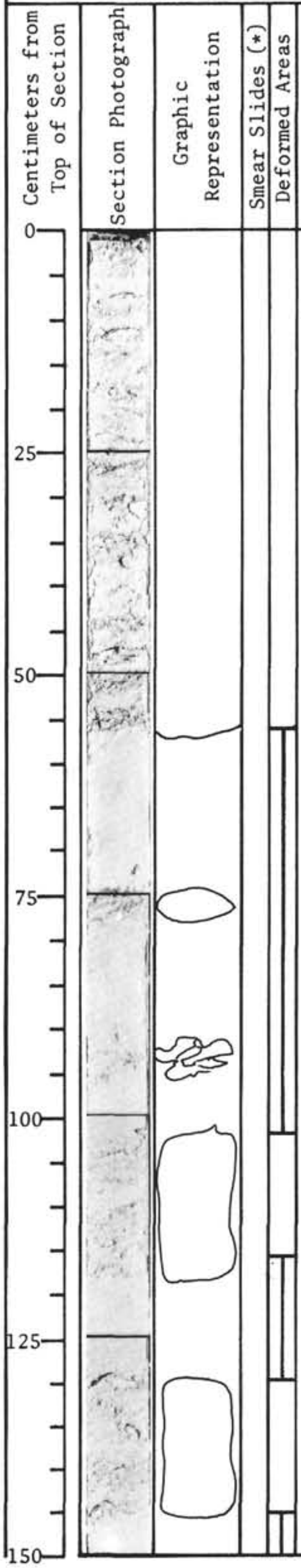
Description

NANNOFOSSIL CHALK

0-2cm: Void

Indurated to semi-indurated greenish white 5GY9/1 structureless shattered chalk separated by soft intervals homogenized (and created) by drilling.

Hole 64.0 Core 6
Section 2

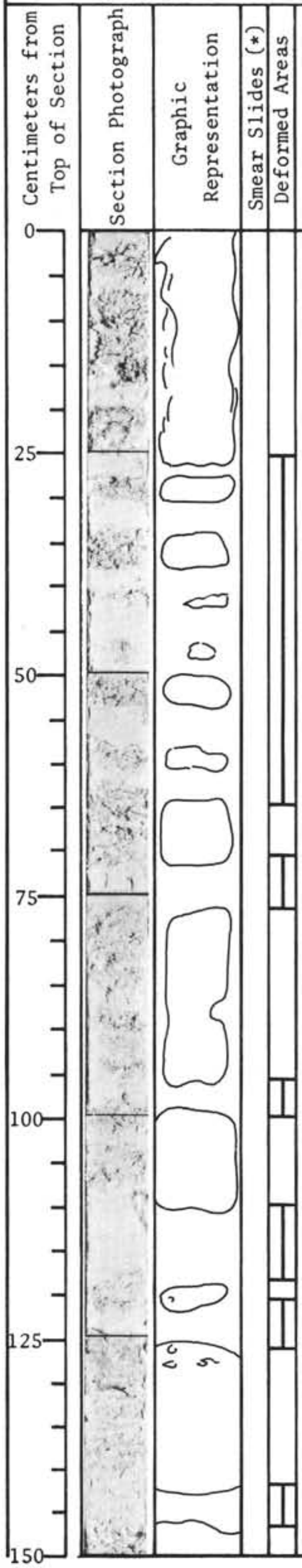


Description

NANNOFOSSIL CHALK

As Core 6 Section 1. 5GY9/1 fractured chalk.

Hole 64.0 Core 6
Section 3

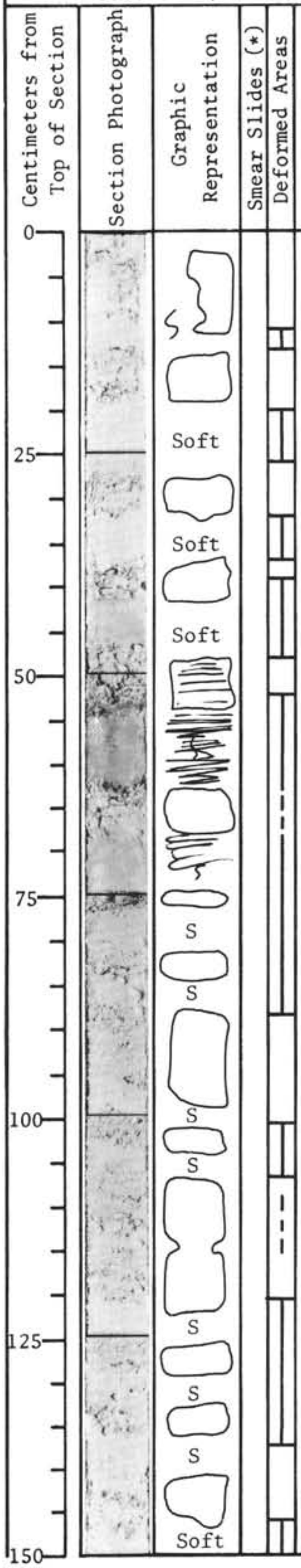


Description

NANNOFOSSIL CHALK

As Core 6 Section 1. Fractured greenish white (5GY9/1) chalk except some purplish black pyrite mottles (5P2/1) at 127cm.

Hole 64.0 Core 6
Section 4

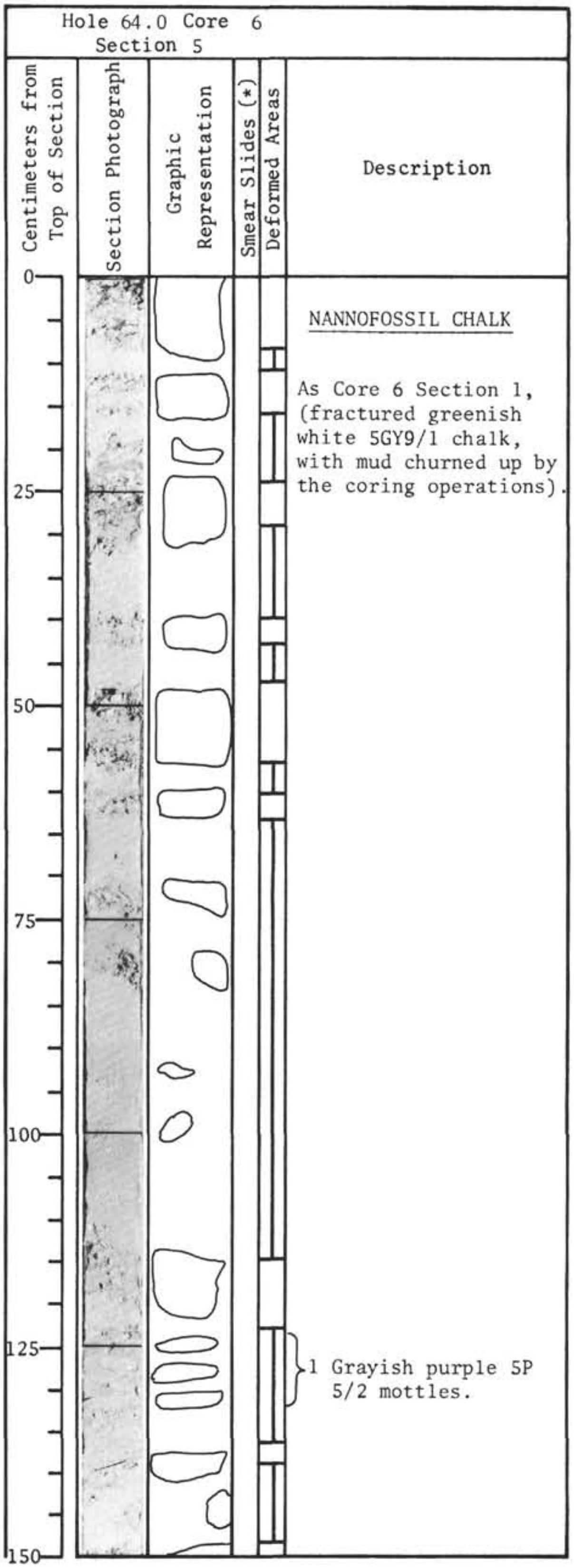


Description

NANNOFOSSIL CHALK

As Core 6 Section 1, fractured greenish white (5GY9/1) chalk, otherwise featureless, except 43-76cm darker to maximum of medium gray (N5) between 54-64.

Hole 64.0 Core 6
Section 5

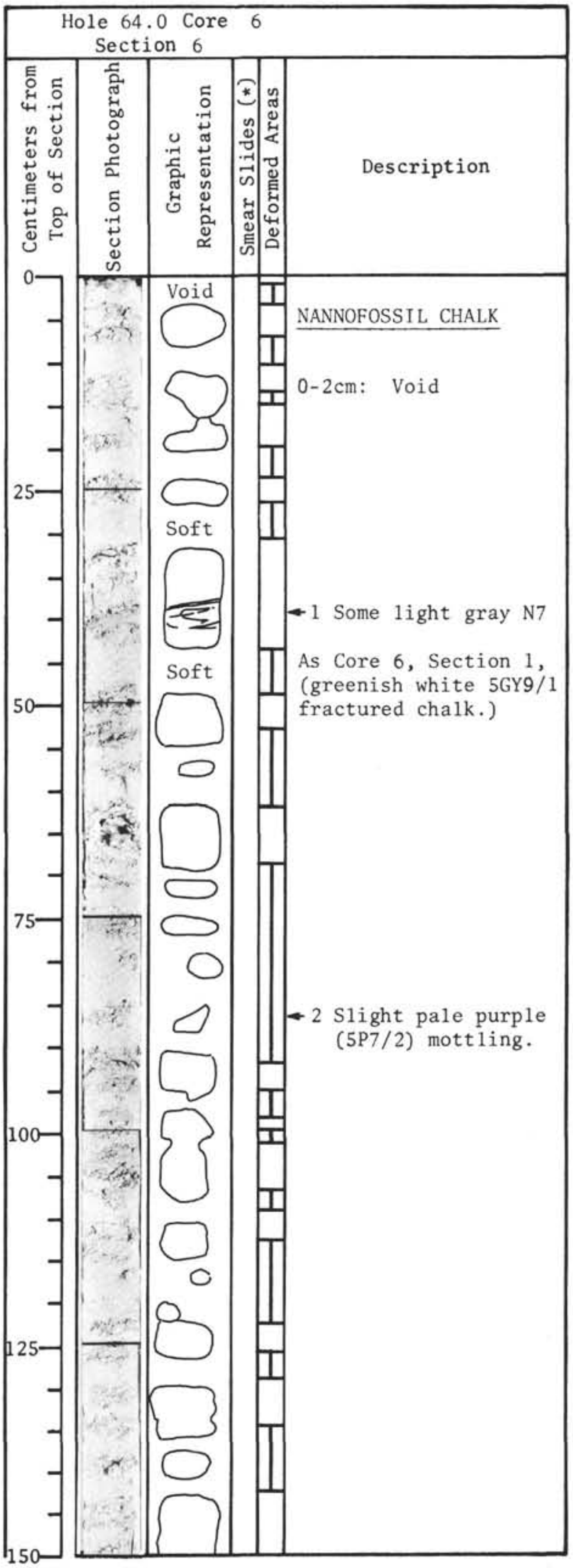


NANNOFOSSIL CHALK

As Core 6 Section 1, (fractured greenish white 5GY9/1 chalk, with mud churned up by the coring operations).

1 Grayish purple 5P 5/2 mottles.

Hole 64.0 Core 6
Section 6



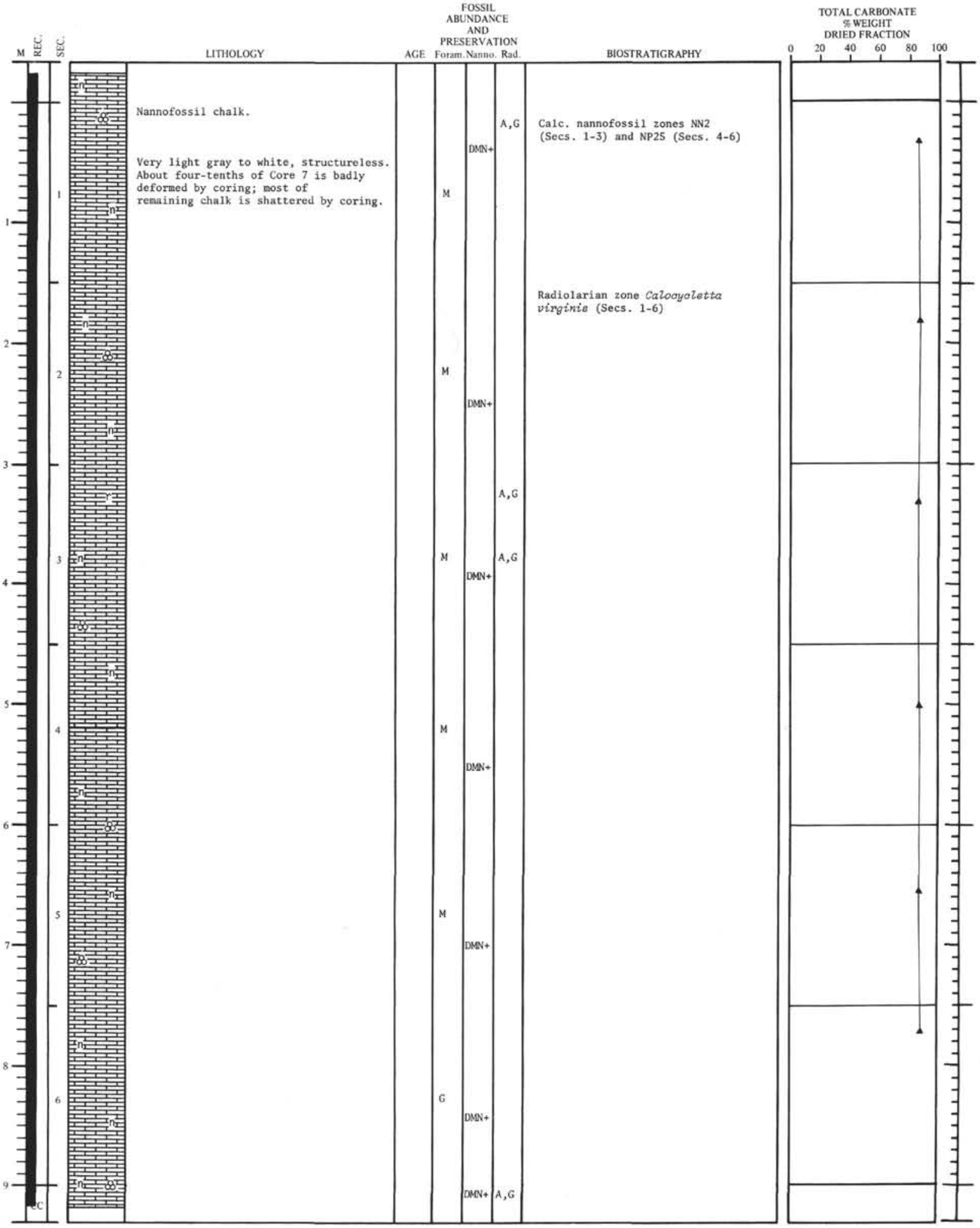
NANNOFOSSIL CHALK

0-2cm: Void

1 Some light gray N7

As Core 6, Section 1, (greenish white 5GY9/1 fractured chalk.)

2 Slight pale purple (5P7/2) mottling.



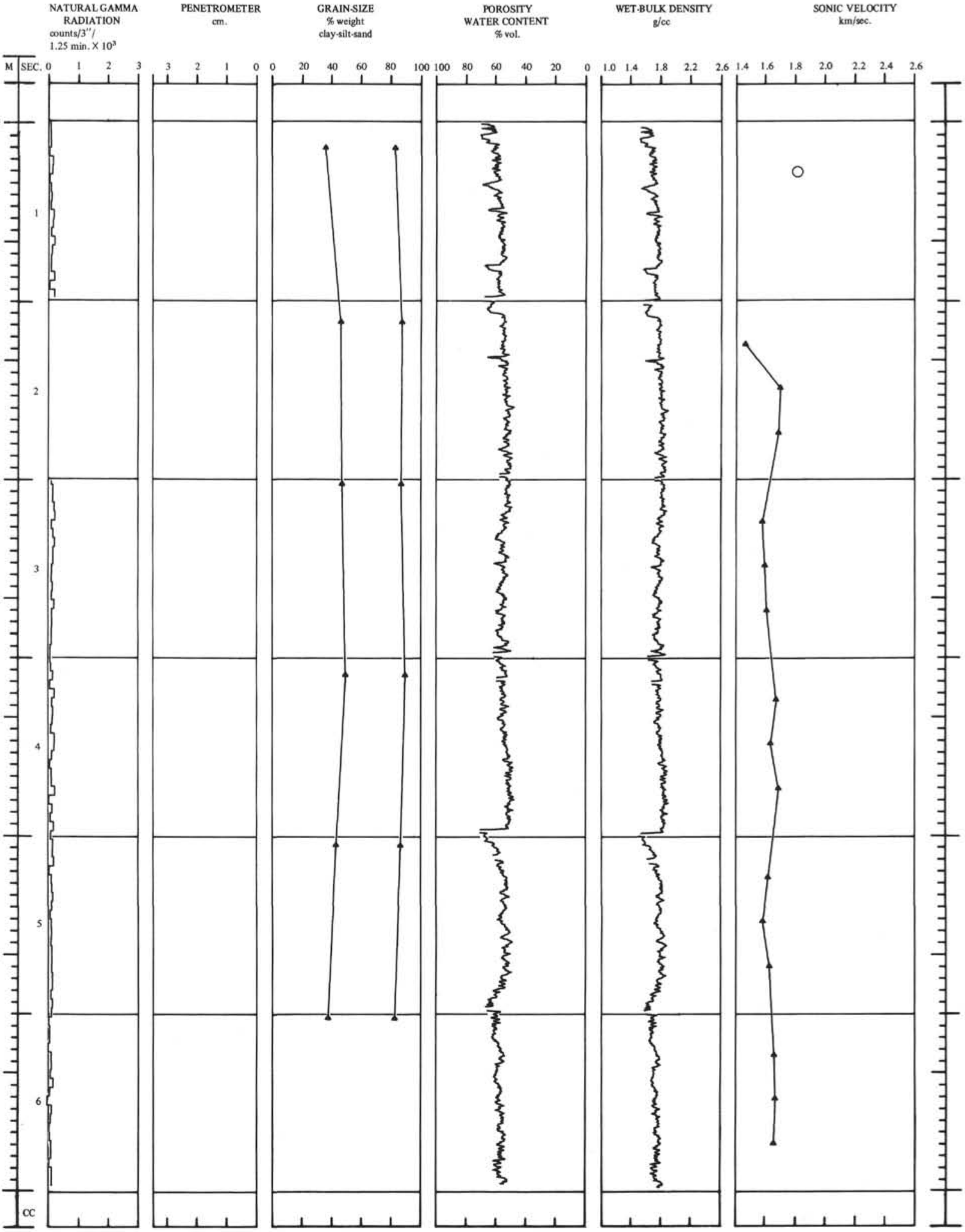
Nannofossil chalk.

Very light gray to white, structureless. About four-tenths of Core 7 is badly deformed by coring; most of remaining chalk is shattered by coring.

Calc. nannofossil zones NN2 (Secs. 1-3) and NP25 (Secs. 4-6)

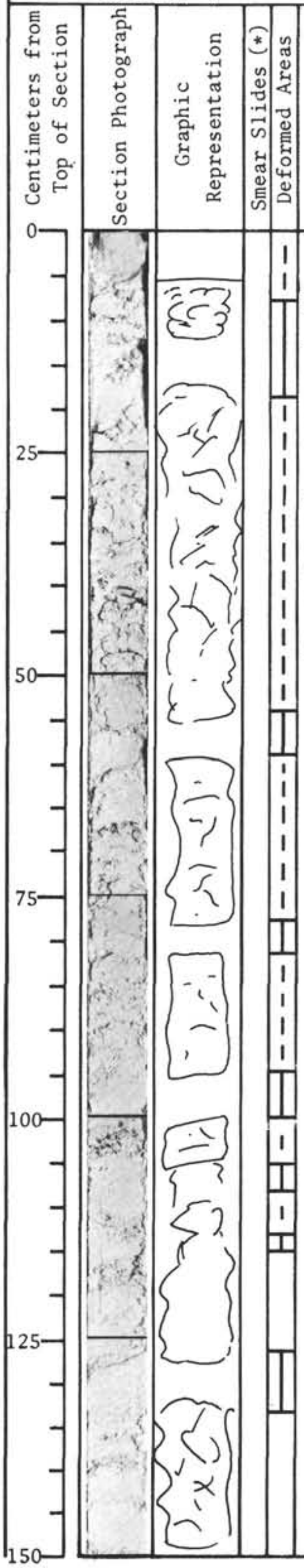
Radiolarian zone *Calocycletta virginis* (Secs. 1-6)

Lithology and biostratigraphy of Core 7, Hole 64.0.



Physical properties of Core 7, Hole 64.0.

Hole 64.0 Core 7
Section 1



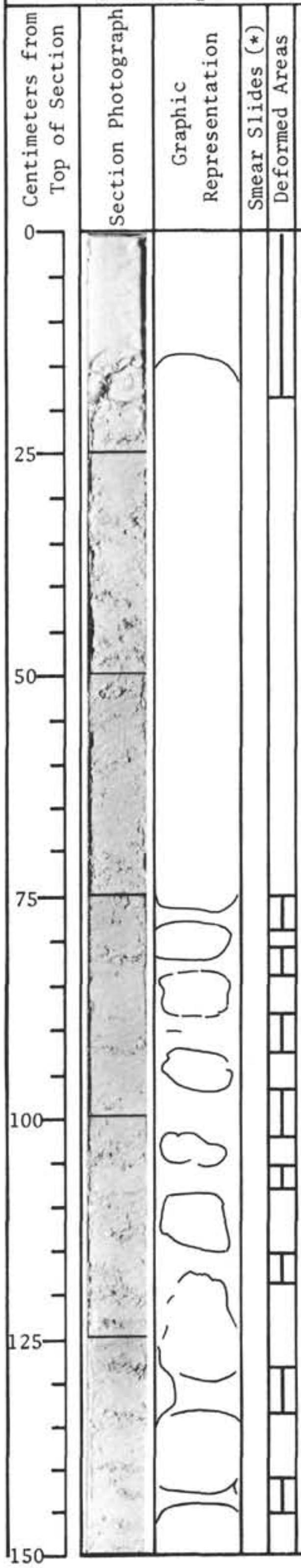
Description

NANNOFOSSIL CHALK

Very light gray (N8) to white (N9) chalk, fractured by coring. Portions of the fractured chalk are separated by portions of mud (and scattered fragments) of the same color and composition, formed during the coring process.

0-6cm: Void

Hole 64.0 Core 7
Section 2



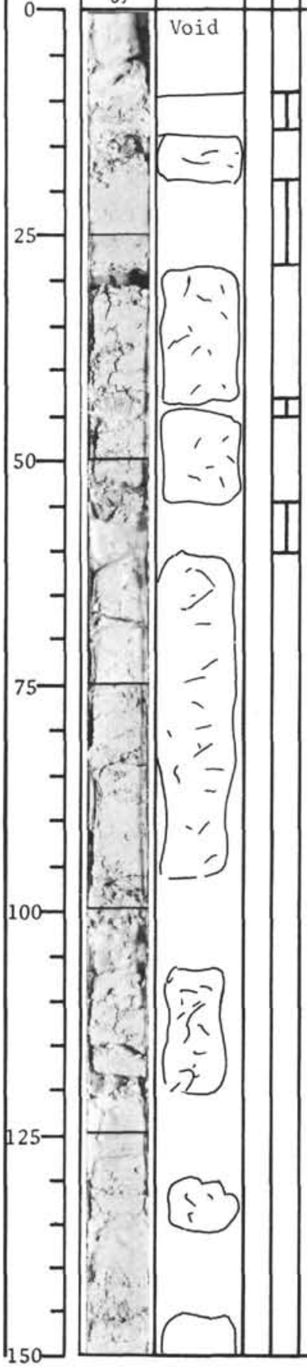
Description

NANNOFOSSIL CHALK

As Core 7, Section 1.

Hole 64.0 Core 7
Section 3

Centimeters from Top of Section
Section Photograph
Graphic Representation
Smear Slides (*)
Deformed Areas
Description



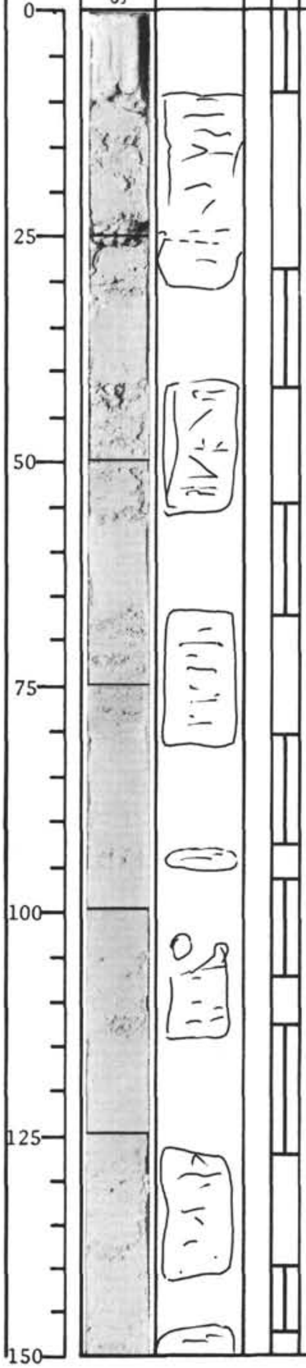
NANNOFOSSIL CHALK

0-7cm: Void

As Core 7, Section 1 very light gray (N8) fractured chalk.

Hole 64.0 Core 7
Section 4

Centimeters from Top of Section
Section Photograph
Graphic Representation
Smear Slides (*)
Deformed Areas
Description

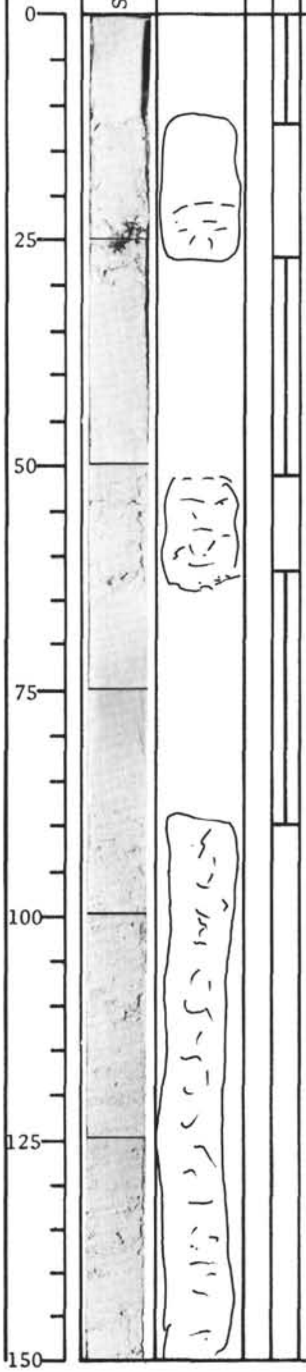


NANNOFOSSIL CHALK

As Core 7, Section 1. Fractured (by coring) white (N9) to very light gray (N8) chalk, in portions that are mainly chalk alternating with portions that are chalk mud formed by the coring process.

Hole 64.0 Core 7
Section 5

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description

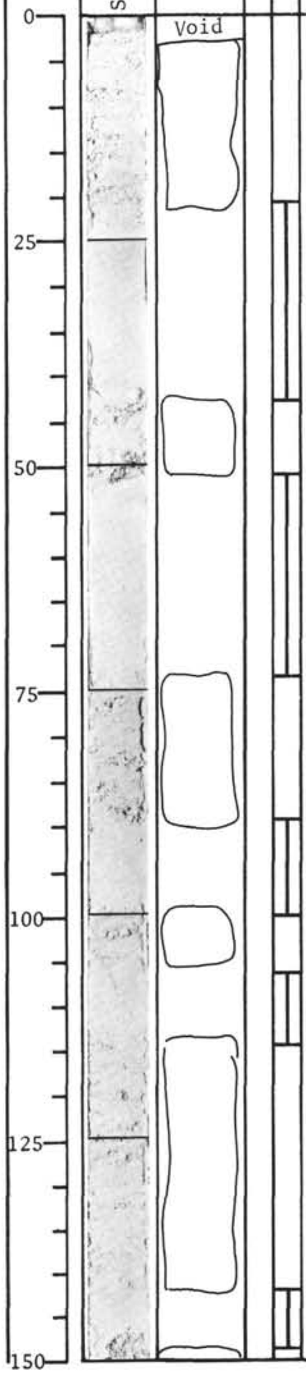


NANNOFOSSIL CHALK

White (N9) chalk as Core 7, Sections 1, 2, 3 and 4 above.

Hole 64.0 Core 7
Section 6

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description

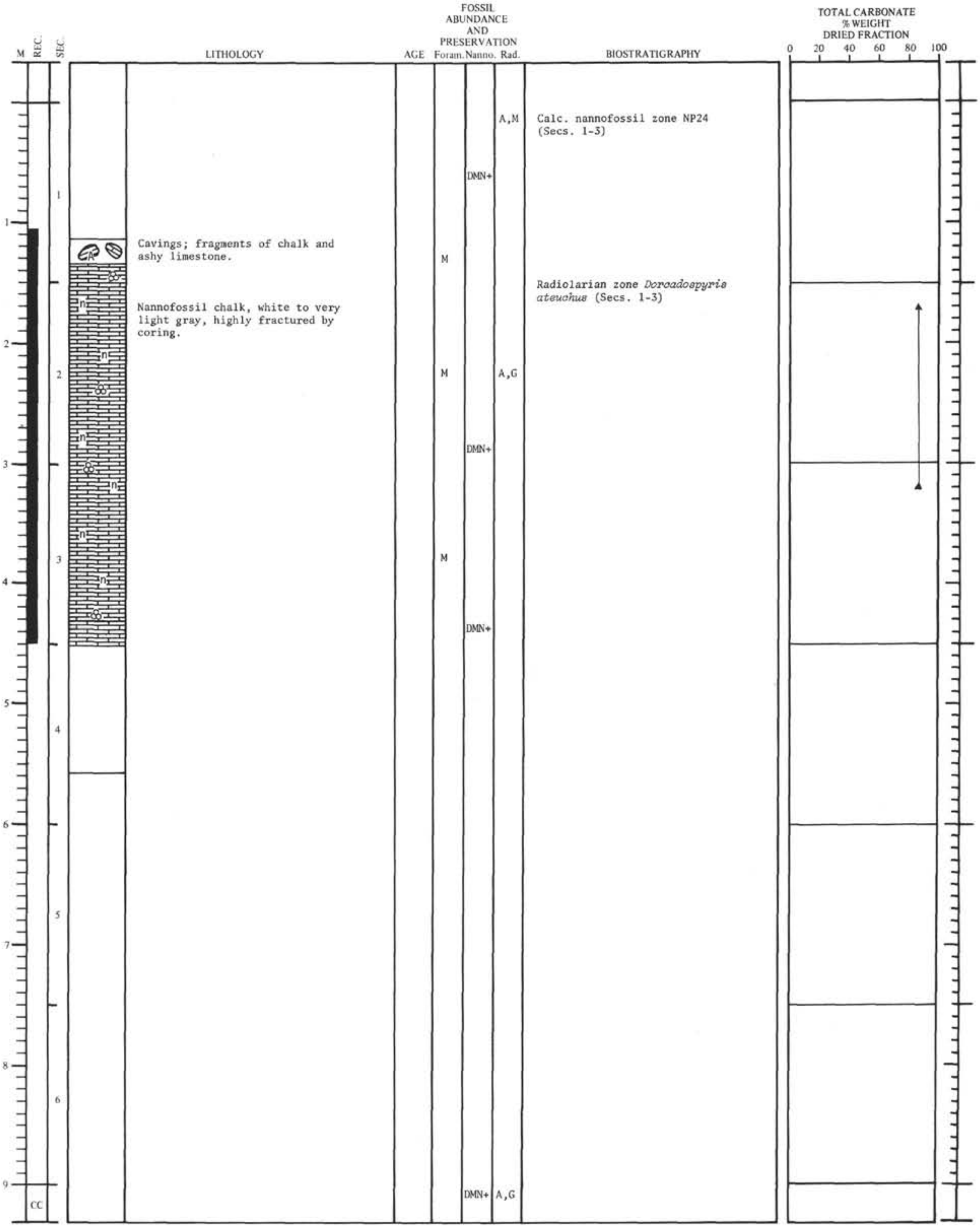


NANNOFOSSIL CHALK

As all other sections of this core.

(Very light gray (N8) to white (N9) chalk, fractured by coring.).

0-5cm: Void



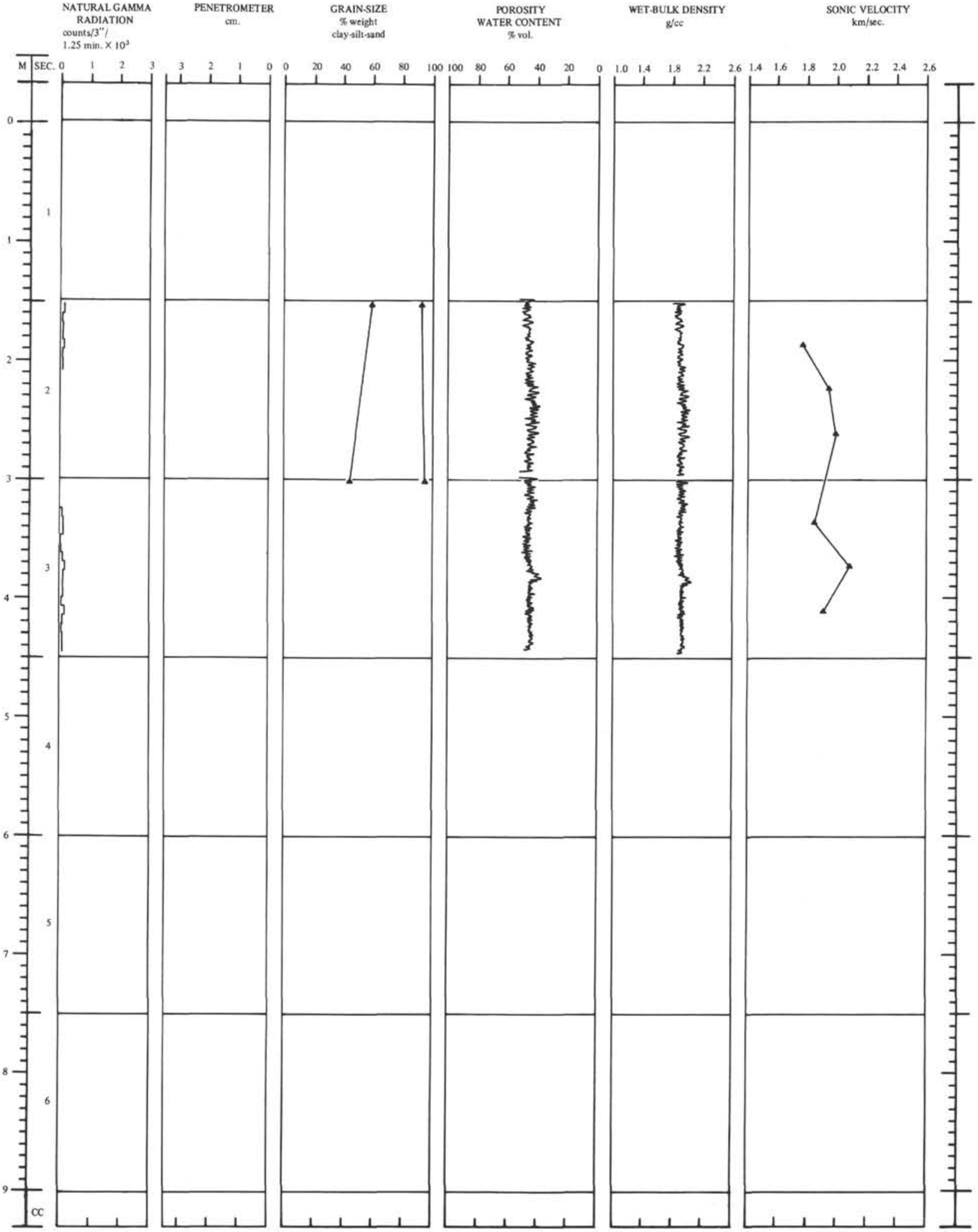
Cavings; fragments of chalk and ashy limestone.

Nannofossil chalk, white to very light gray, highly fractured by coring.

Calc. nannofossil zone NP24 (Secs. 1-3)

Radiolarian zone *Dorcadospyris ateuchus* (Secs. 1-3)

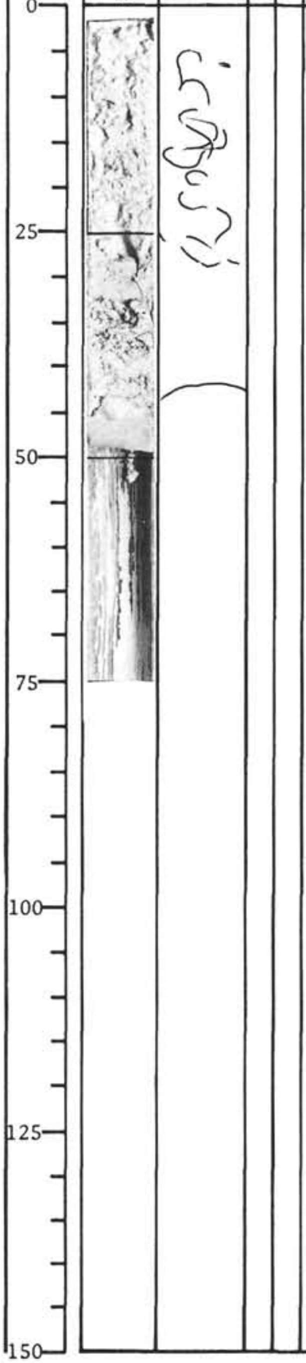
Lithology and biostratigraphy of Core 8, Hole 64.0.



Physical properties of Core 8, Hole 64.0.

Hole 64.0 Core 8
Section 1

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK

(and limestone fragments).

0-30cm:
Cavings? with a few hard pieces.

43-150cm: Void

White (N9) to very light gray (N8) chalk, highly fractured by coring process.

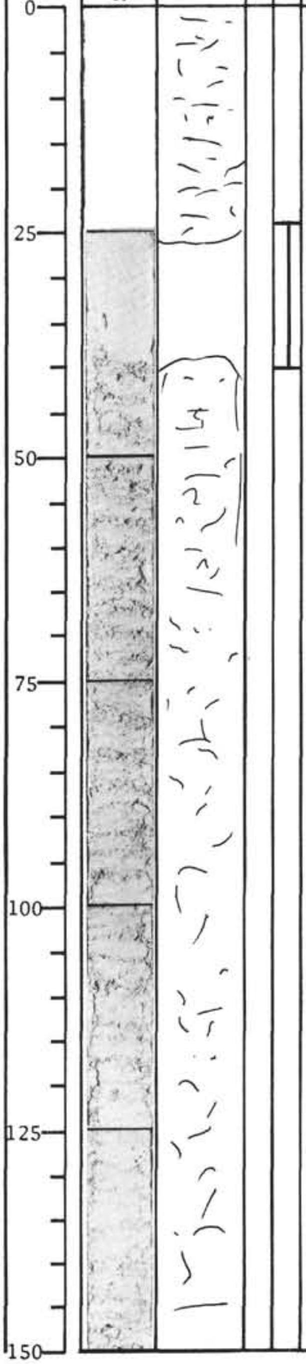
Smoothed surfaces of some fragments show bedding and mottles ("white on white") under a hand lens, but no megascopic structures.

* Note: in removing core liner from barrel all this section of core was shoved to the upper end of this section.

(Normally would expect to see it as 0-107 void and 107-150 rock).

Hole 64.0 Core 8
Section 2

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



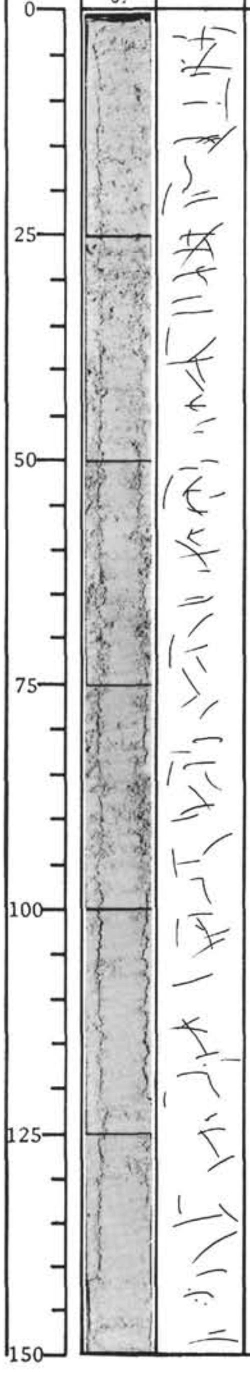
NANNOFOSSIL CHALK

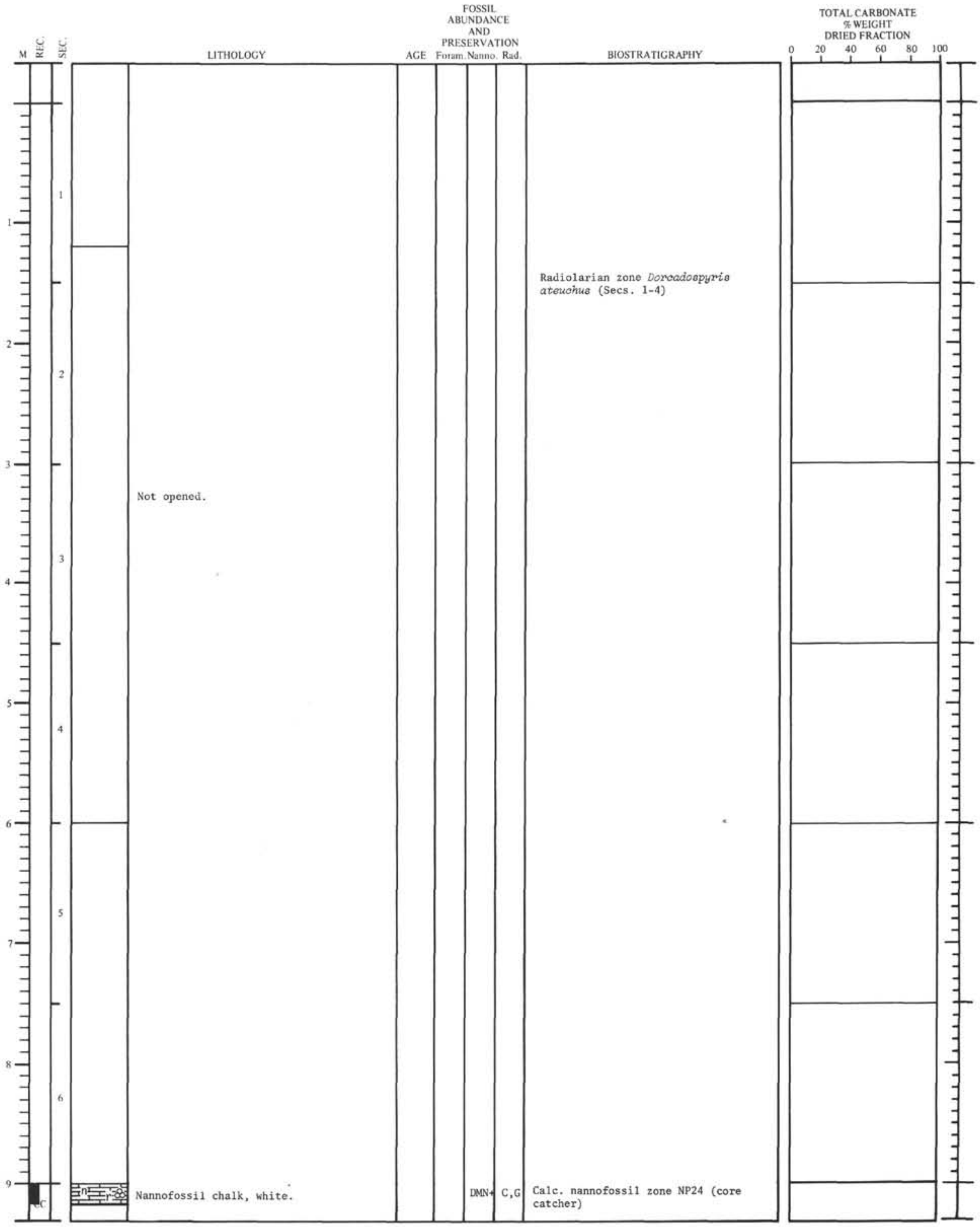
Highly fractured (by coring) white N9 to very light gray N8 chalk.

27-41cm:
Mud (same color) of chalk, formed during drilling and coring.

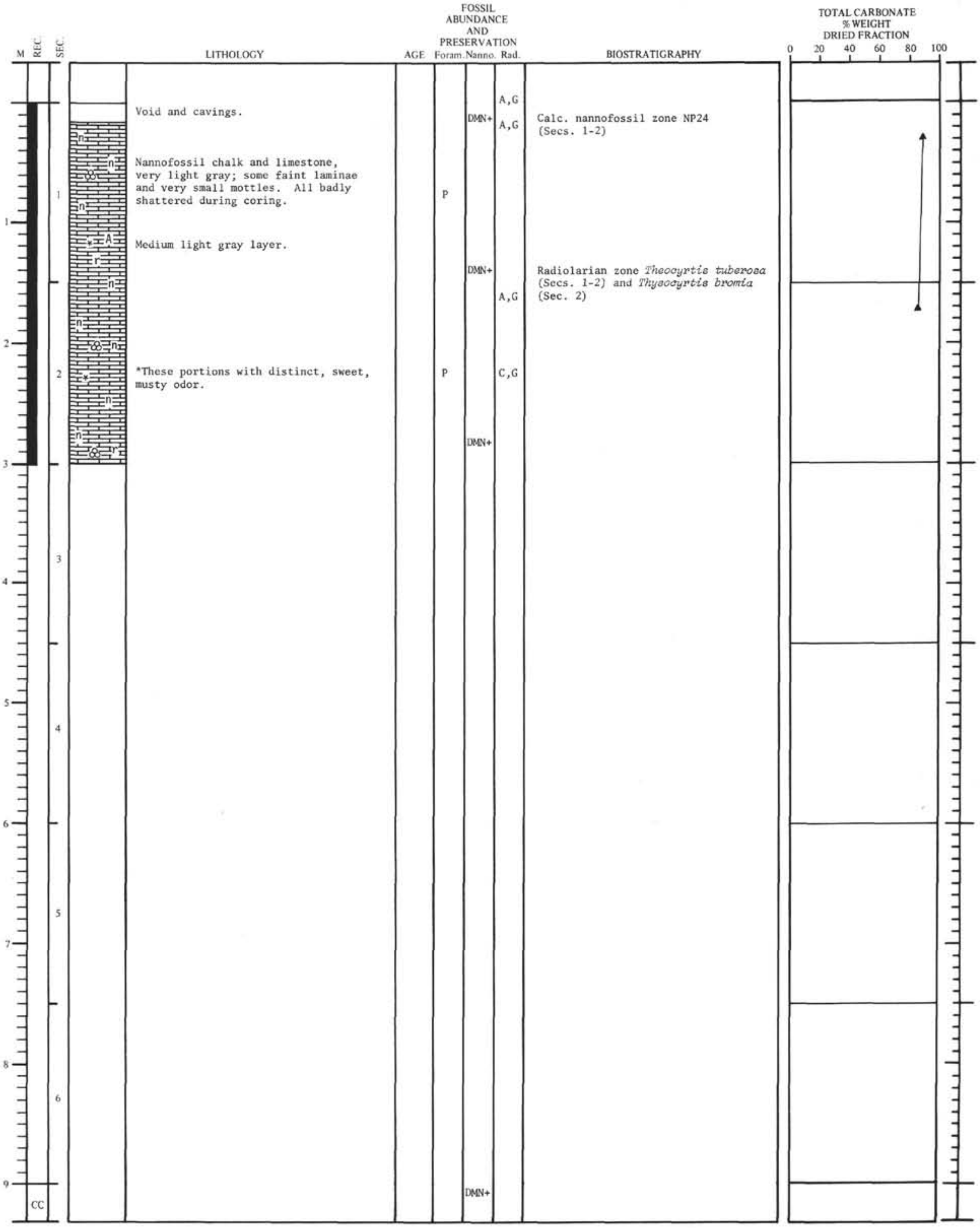
No photograph for part from 0-25cm.

Hole 64.0 Core 8
Section 3

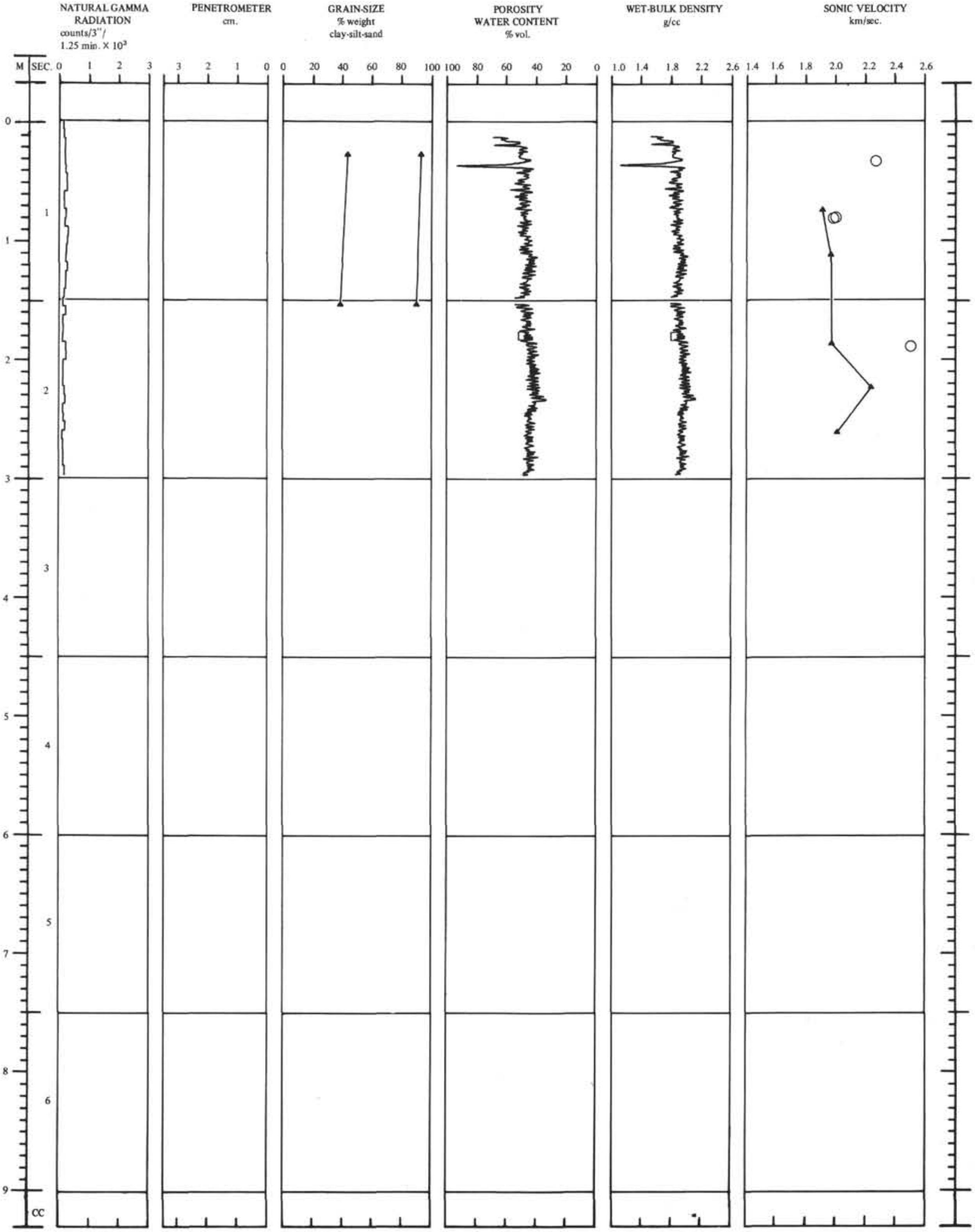
Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description
					NANNOFOSSIL CHALK Highly fractured (by coring) white (N9) to very light gray (N8) chalk. No apparent structures.



Lithology and biostratigraphy of Core 9, Hole 64.0.

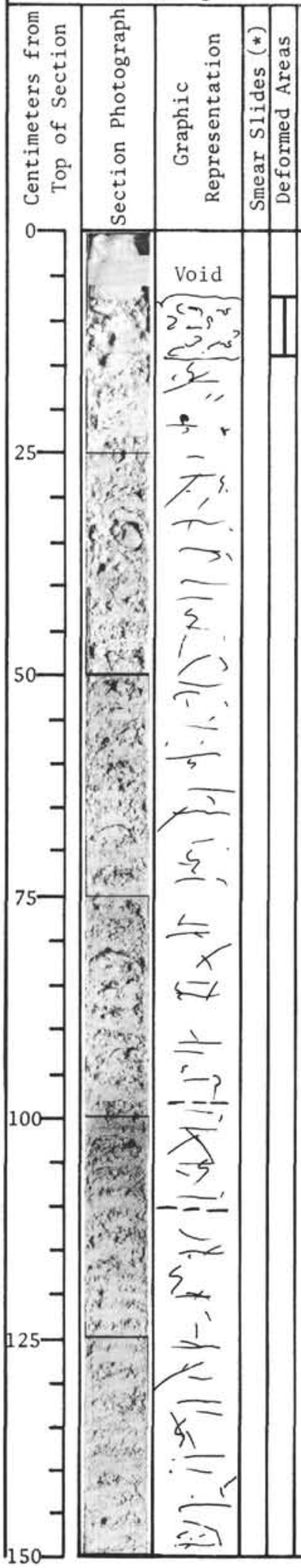


Lithology and biostratigraphy of Core 10, Hole 64.0.



Physical properties of Core 10, Hole 64.0.

Hole 64.0 Core 10
Section 1



Description

0-8cm: Void

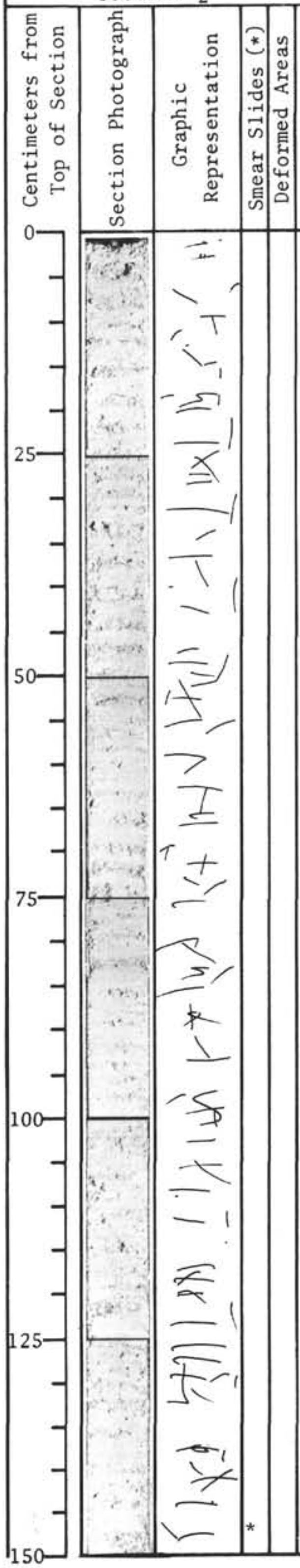
Wet, and probably contains cavings.

CHALK AND LIMESTONE

Fractured chalk, partly so indurated as to call it limestone. (Fracturing by coring process). Hard pieces when cut show faint parallel laminae and some very small (∿2-3 mm) mottles.

Rock is very light gray (N8), except slightly darker near 40cm, and distinctly darker (to medium light gray N6) between 99 and 109cm. This section has a distinct slightly sweetish odor when freshly fractured; odor not recognized by nine people who smelled it-is not H_2S, fractured pyrite, etc. Somewhat like a sweetish acetylene. (??what??), or potato peelings? musty fungus.

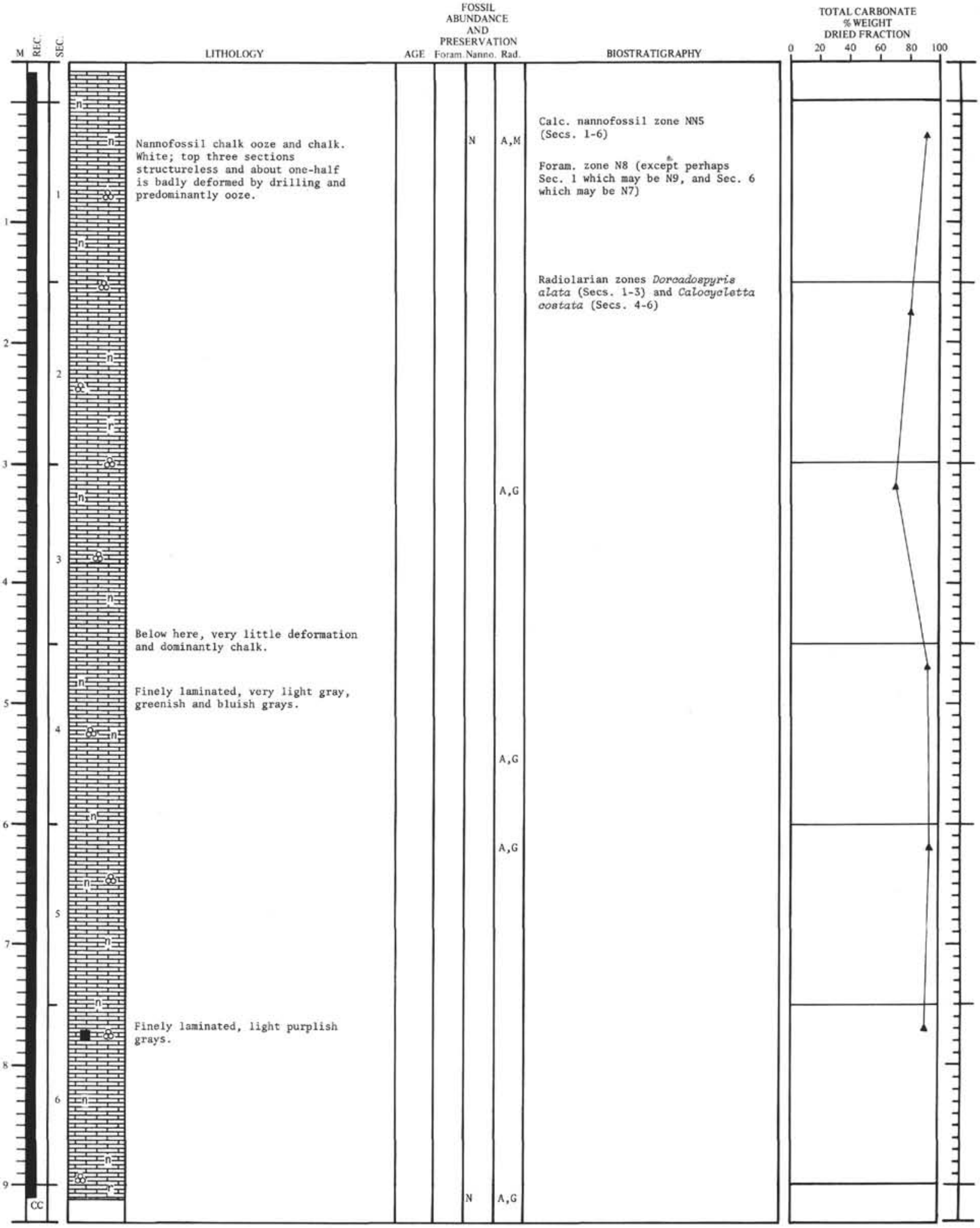
Hole 64.0 Core 10
Section 2



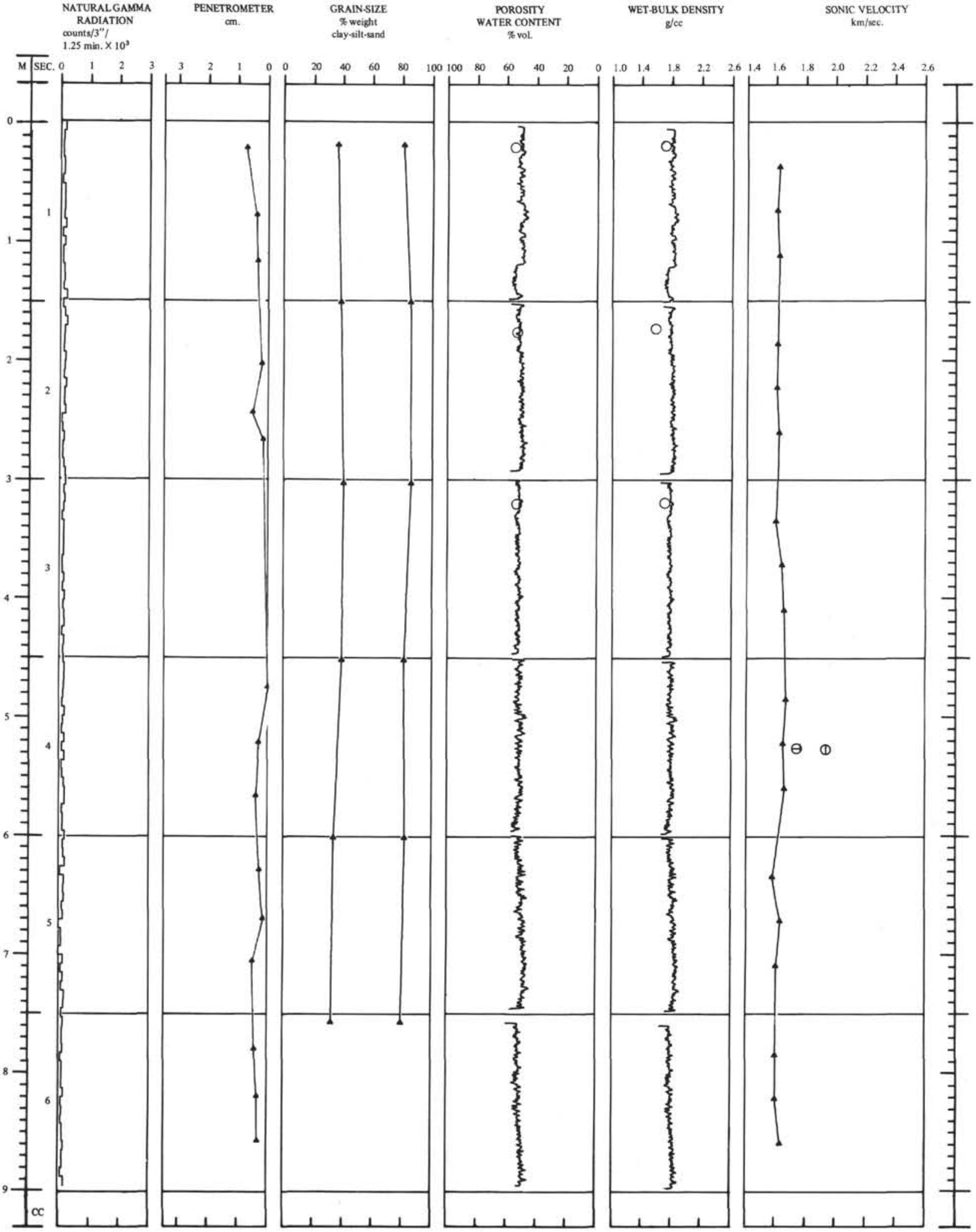
Description

NANNOFOSSIL CHALK AND LIMESTONE

Fractured chalk, partly so indurated as to be limestone (fractured by the coring process). As Core 10, Section 1 (very light gray N8) - the odor described for Section 1 is common near 83cm in this section, but this core isn't dark there.



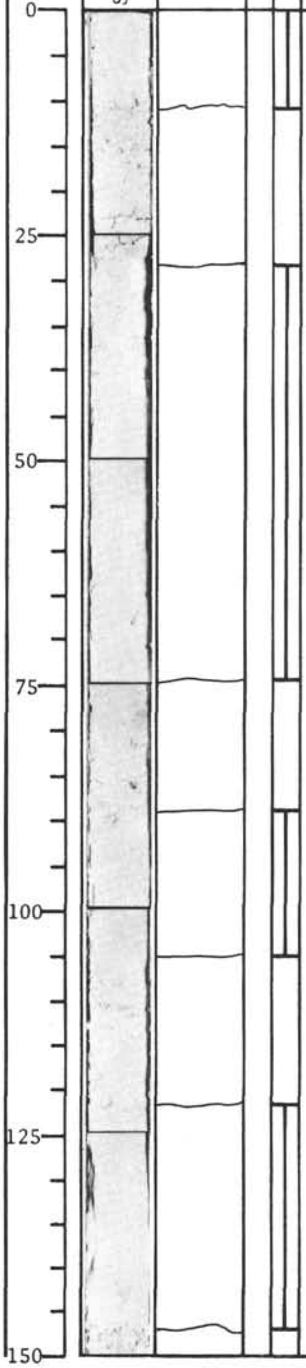
Lithology and biostratigraphy of Core 1, Hole 64.1.



Physical properties of Core 1, Hole 64.1.

Hole 64.1 Core 1
Section 1

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



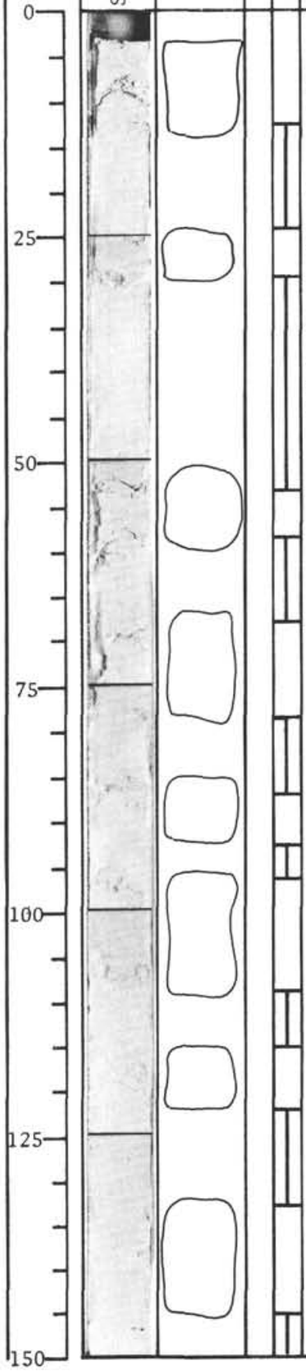
NANNOFOSSIL CHALK OOZE to CHALK

Firm to almost semi-consolidated shattered N9 white.

Separated by very soft material homogenized by drilling.

Hole 64.1 Core 1
Section 2

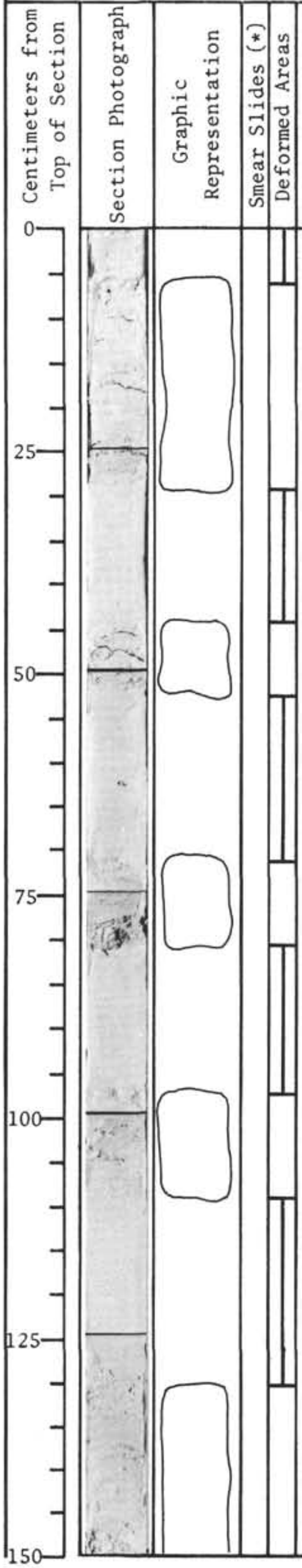
Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



NANNOFOSSIL CHALK OOZE to NANNOFOSSIL CHALK

As Core 1, Section 1 (firm ooze, to, in places e.g. 54cm) semi-consolidated chalk, shattered by drilling. Portions of white (N9) ooze/chalk are separated by soft mud made of ooze/chalk homogenized by coring.

Hole 64.1 Core 1
Section 3

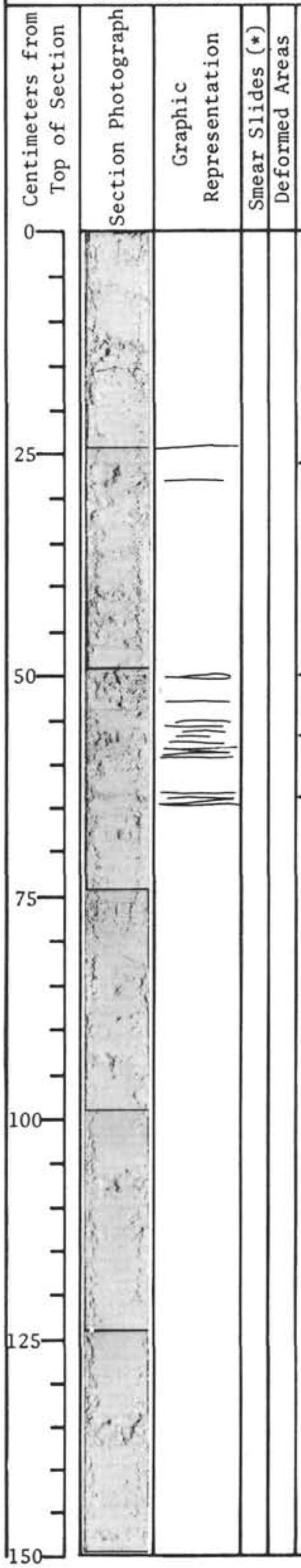


Description

NANNOFOSSIL CHALK OOZE to NANNOFOSSIL CHALK

As Core 1, Section 1. (Firm ooze to, in places, e.g. 46cm) semi-consolidated chalk, shattered by coring. Portions of white (N9) ooze/chalk are separated by soft mud made of ooze/chalk homogenized by coring.

Hole 64.1 Core 1
Section 4



Description

NANNOFOSSIL CHALK OOZE AND NANNOFOSSIL CHALK

← 1 Very light gray N8.

← 2 White (N9) and very light gray (N8).

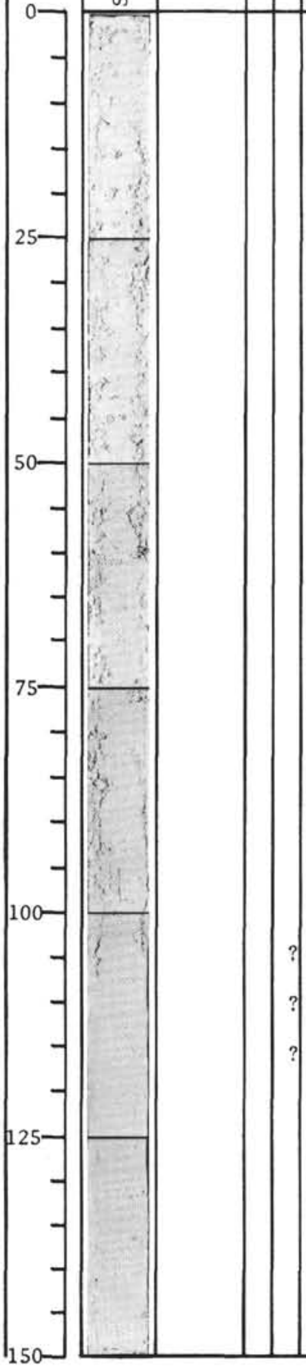
← 3 Light bluish gray 5BP7/1.

← 4 Greenish gray and very light gray (5G6/1 and N8).

White (N9), except 25-28cm and 50-65, firm nannofossil, chalk ooze (e.g. most of 87-130cm) to semi-indurated nannofossil, chalk, fractured by coring. The darker parts show faint parallel laminae. The core below ∿100cm has a slightly yellowish tint, perhaps between 5Y9/1 and N9. No muddy portions as in Sections 1, 2 and 3.

Hole 64.1 Core 1
Section 5

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description

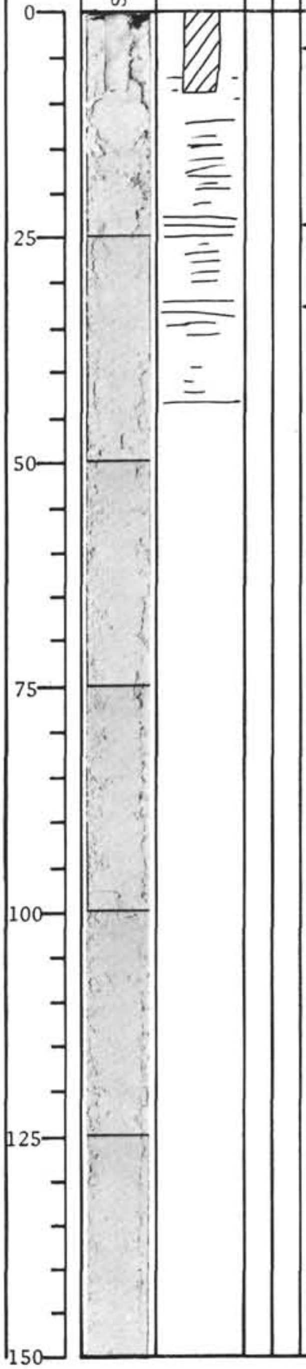


NANNOFOSSIL CHALK OOZE and NANNOFOSSIL CHALK

White (N9) firm nannofossil chalk ooze (especially below 100cm) and semi-consolidated chalk (especially most of 25-75cm), fractured by coring. No apparent structure.

Hole 64.1 Core 1
Section 6

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



← 1 Removed for water sample when core was sectioned, before sections were split.

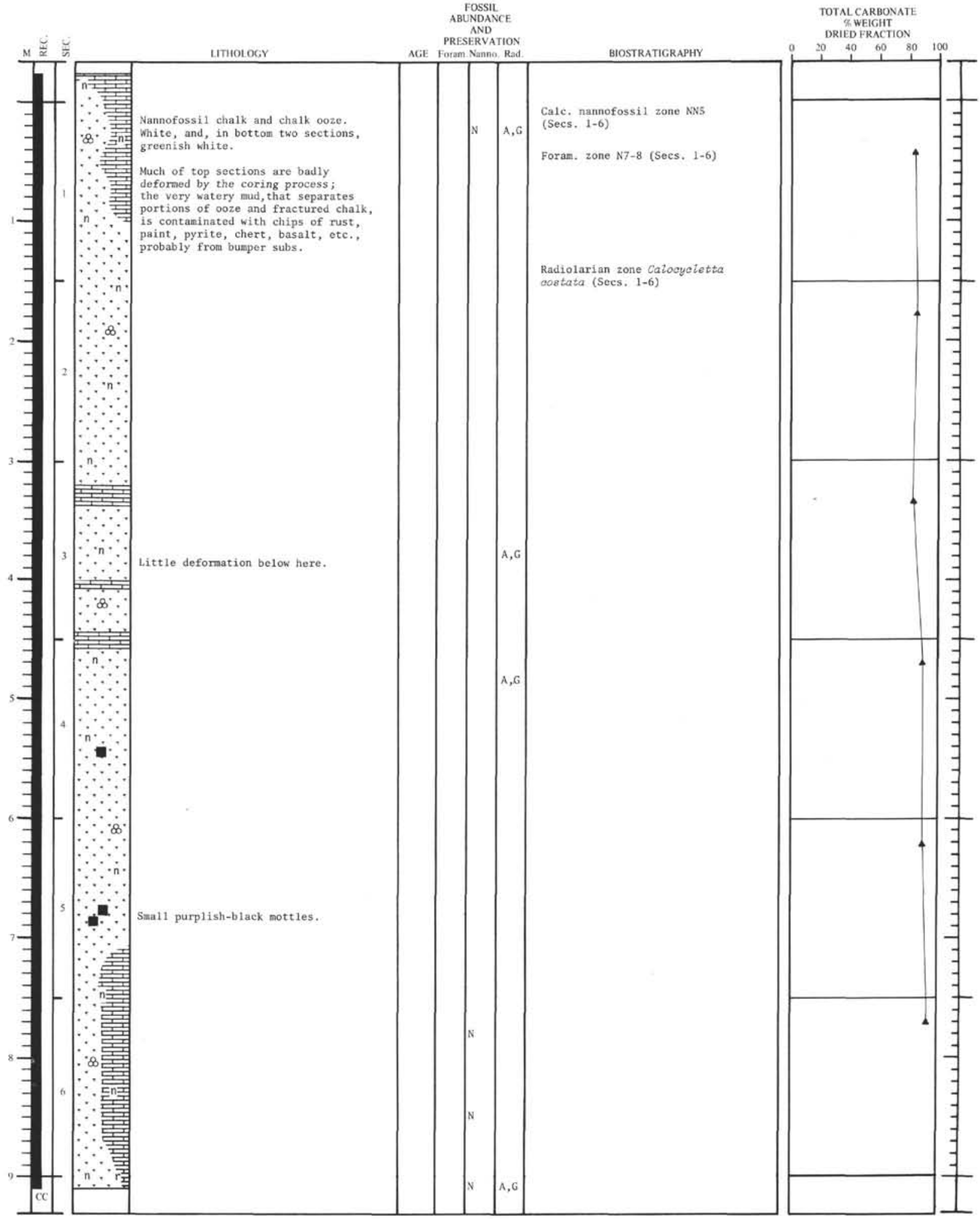
← 2 Light purplish gray (5P7/1) beds.

← 3 1cm white bed

NANNOFOSSIL CHALK AND MINOR NANNOFOSSIL CHALK OOZE

White (N9) (0-5 and 44-150cm), semi-indurated nannofossil chalk with minor firm nannofossil chalk ooze, fractured by coring.

5-44cm purplish white (5P9/1) except as noted at (2) above, parallel bedding. (Gradations between purplish whte and white).



Nannofossil chalk and chalk ooze. White, and, in bottom two sections, greenish white.

Much of top sections are badly deformed by the coring process; the very watery mud, that separates portions of ooze and fractured chalk, is contaminated with chips of rust, paint, pyrite, chert, basalt, etc., probably from bumper subs.

Little deformation below here.

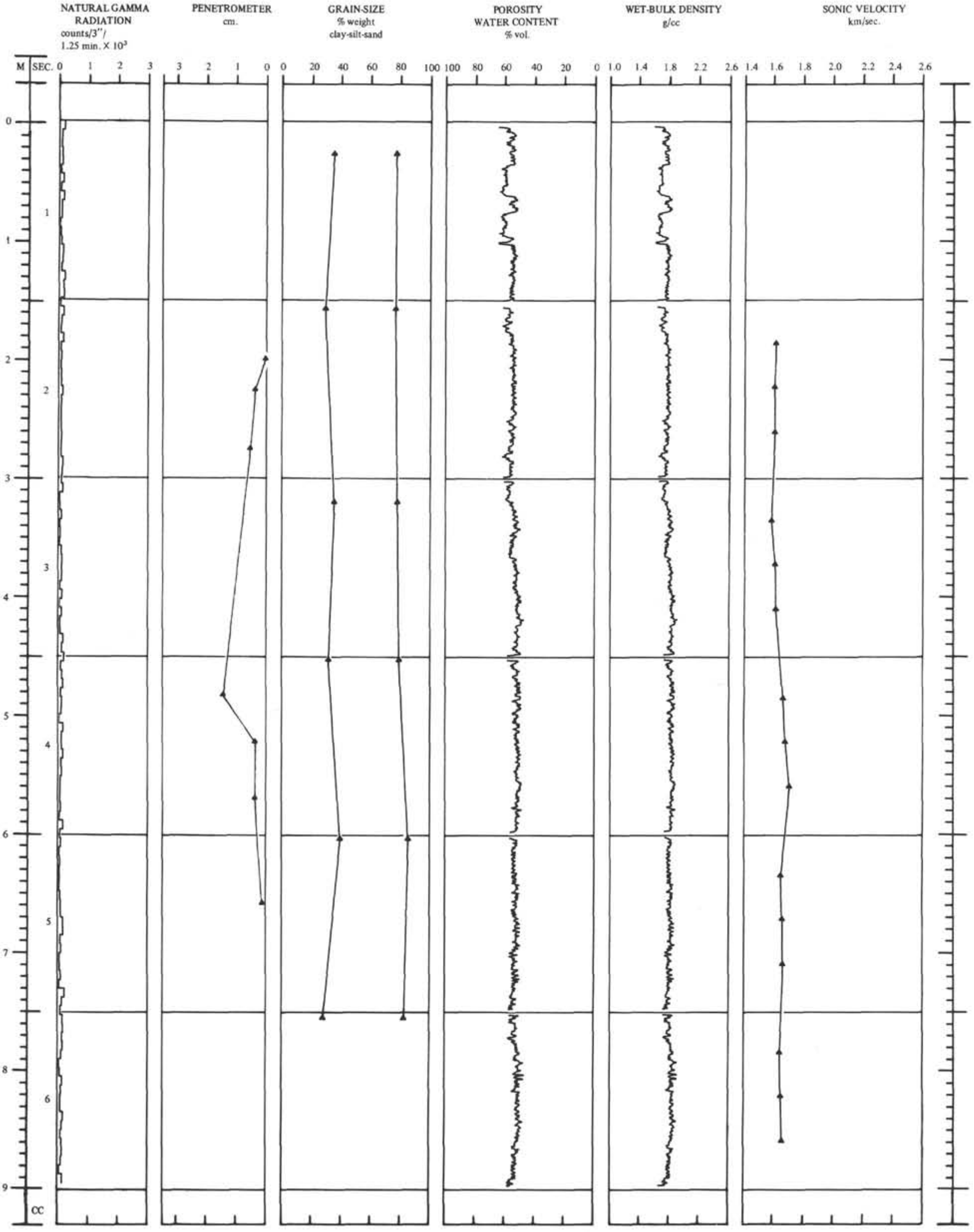
Small purplish-black mottles.

Calc. nannofossil zone NN5 (Secs. 1-6)

Foram. zone N7-8 (Secs. 1-6)

Radiolarian zone *Calocycletta costata* (Secs. 1-6)

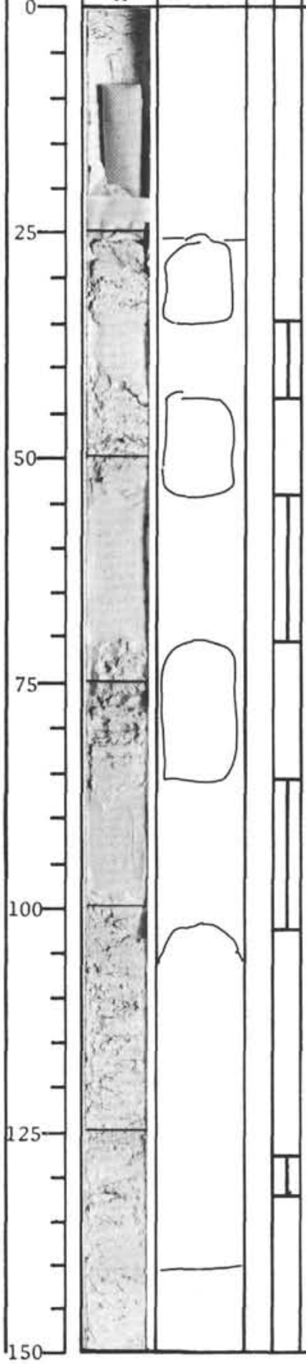
Lithology and biostratigraphy of Core 2, Hole 64.1.



Physical properties of Core 2, Hole 64.1.

Hole 64.1 Core 2
Section 1

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK OOZE and NANNOFOSSIL CHALK

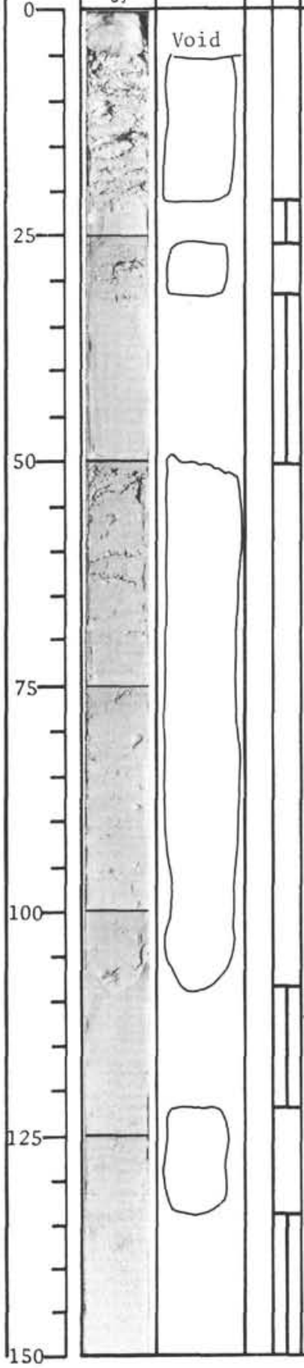
0-24cm: Void

White (N9), firm chalk ooze to partly indurated chalk, fractured by coring process.

Portions of the ooze/chalk alternate with portions of soft mud homogenized by the coring process. The mud of this section (e.g. 34-40, 52-58, and 86-98cm) is badly contaminated with chips of rust and paint; pyrite, chert, and basalt grains, from bumper subs.

Hole 64.1 Core 2
Section 2

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK OOZE AND NANNOFOSSIL CHALK

White (N9) (except near 107 and 133cm) firm chalk ooze to partly-indurated chalk. Chalk fractured by coring process. Portions of chalk/ooze separated by portions of soft mud homogenized from the chalk or ooze by the coring process.

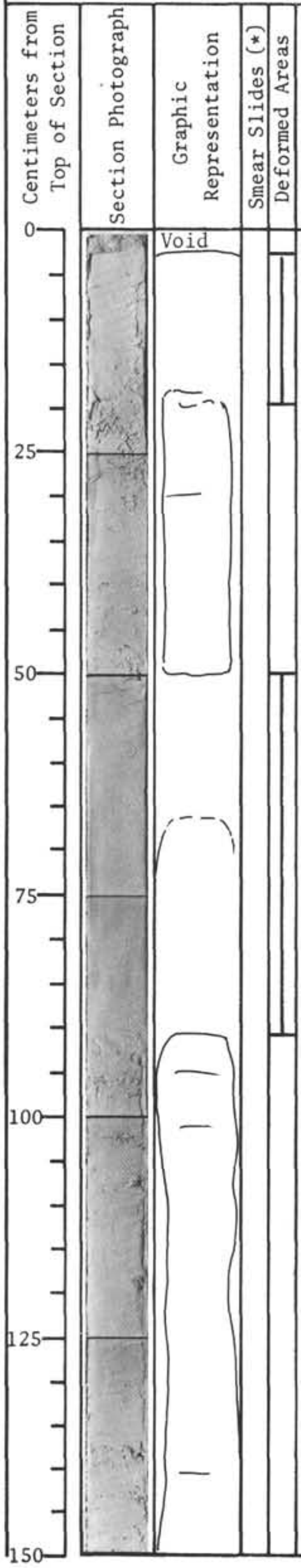
← 1

CONTAMINATION!!
NOTE: These two portions of soft mud are very light gray (N8) and contain small chips of rust, pyrite,

← 1

chert, paint, etc. and probably came out of the bumper subs.

Hole 64.1 Core 2
Section 3



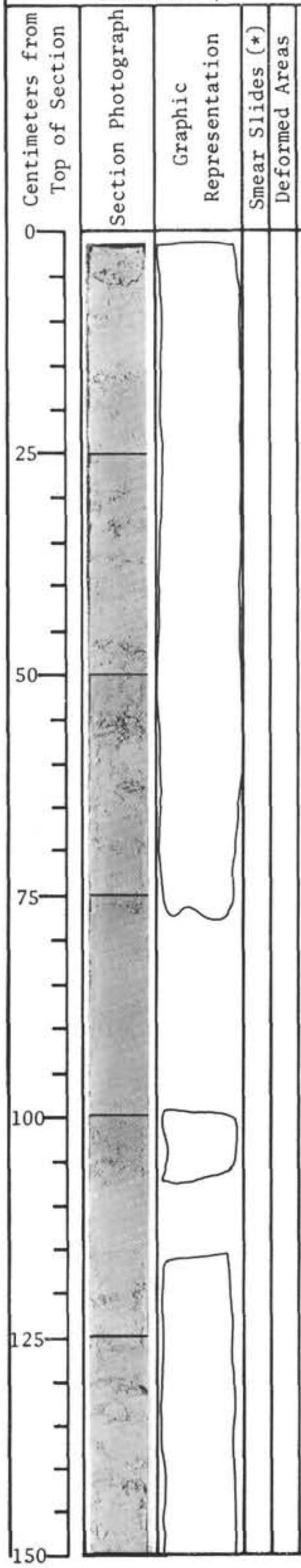
Description

NANNOFOSSIL CHALK OOZE AND CHALK

White (N9) except as *noted, firm chalk ooze to partly-indurated chalk. Chalk fractured by coring process. Portion of chalk and ooze separated by portions of soft mud homogenized by coring process.

*The mud below 50cm is very light gray N8, with chips of paint, etc. See note for Core 2, Section 2. CONTAMINATION!

Hole 64.1 Core 2
Section 4



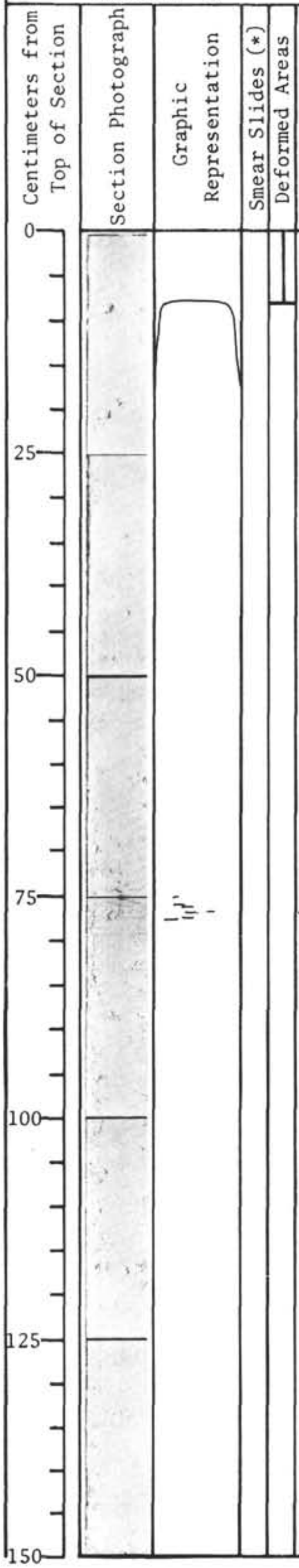
Description

NANNOFOSSIL CHALK OOZE and some NANNOFOSSIL CHALK

White (N9) nannofossil chalk ooze and nannofossil chalk, the latter fractured by coring.

Small mottle, dusky purple, 5P3/2 at 102cm.

Hole 64.1 Core 2
Section 5



Description

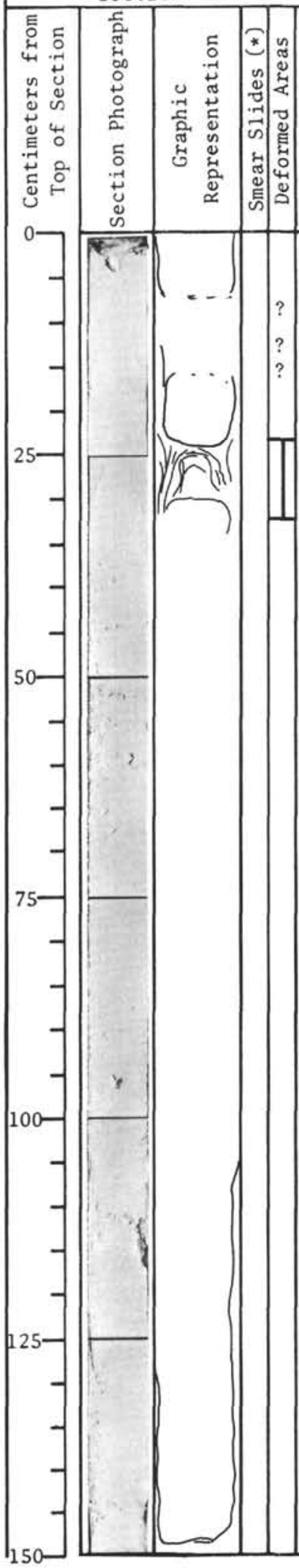
NANNOFOSSIL CHALK AND NANNOFOSSIL CHALK OOZE

Greenish white (5GY9/1) firm chalk ooze and semi-indurated chalk, fractured by the coring process.

Top 7cm the core contains some soft mud homogenized by the coring process.

← 1 Purplish black (5P2/1) mottles.

Hole 64.1 Core 2
Section 6



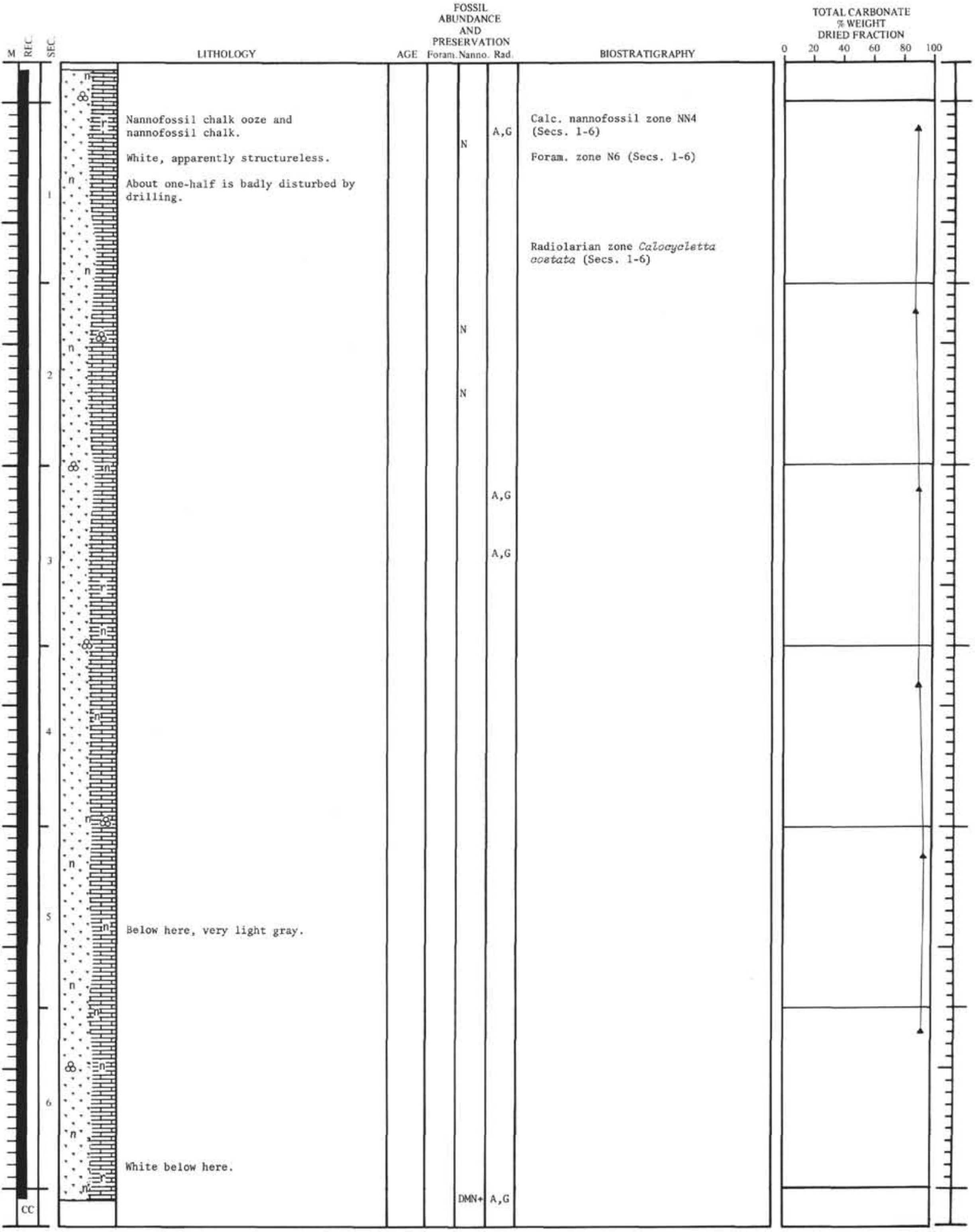
Description

NANNOFOSSIL CHALK OOZE and NANNOFOSSIL CHALK

White (N9) to greenish white (5GY9/1) chalk and chalk ooze, fragmented by coring.

Soft mud homogenized by coring process is strongly deformed near 25cm; streaks of N5 medium gray.

Small and faint purplish mottle at 78cm.



Nannofossil chalk ooze and nannofossil chalk.

White, apparently structureless.

About one-half is badly disturbed by drilling.

Below here, very light gray.

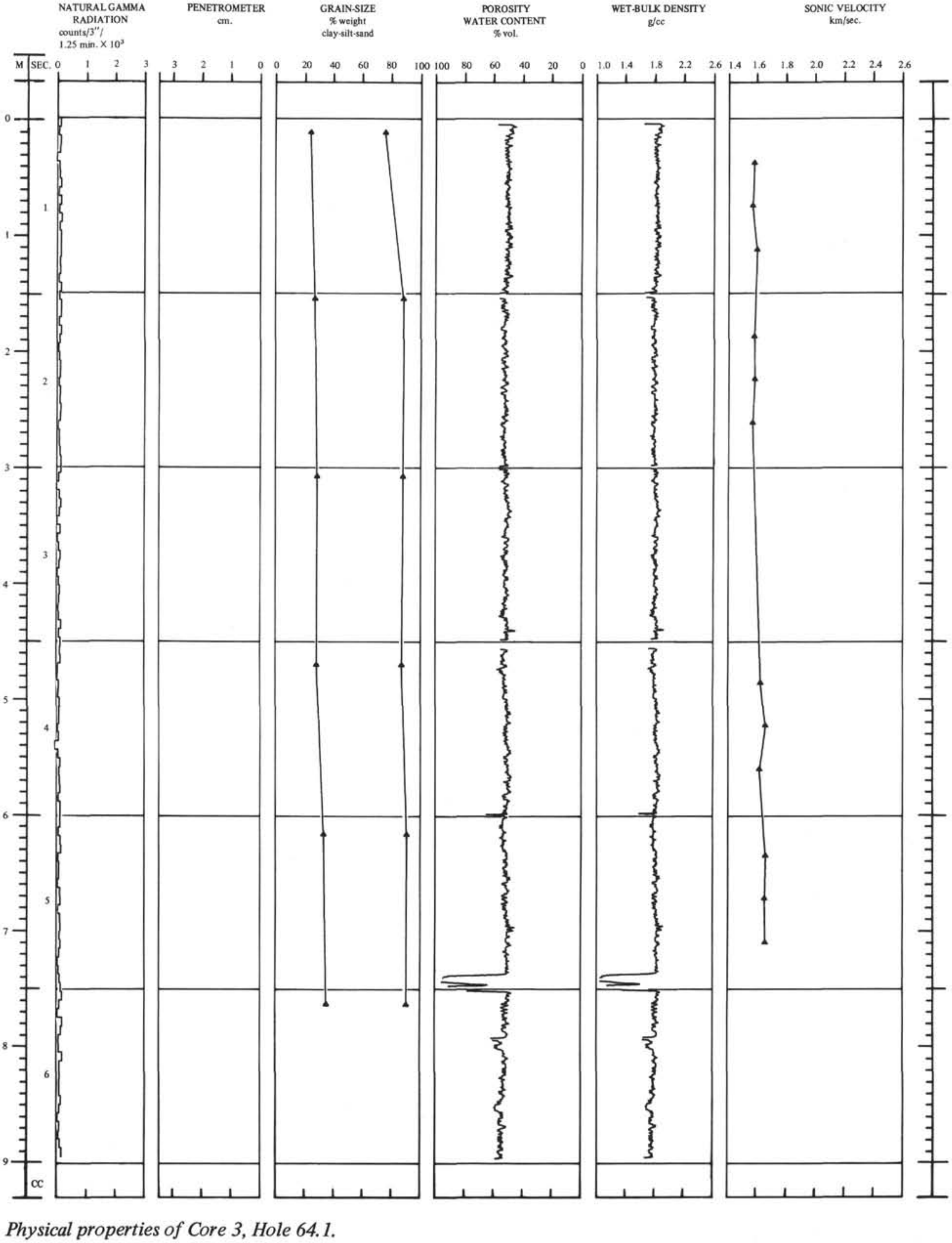
White below here.

Calc. nannofossil zone NN4 (Secs. 1-6)

Foram. zone N6 (Secs. 1-6)

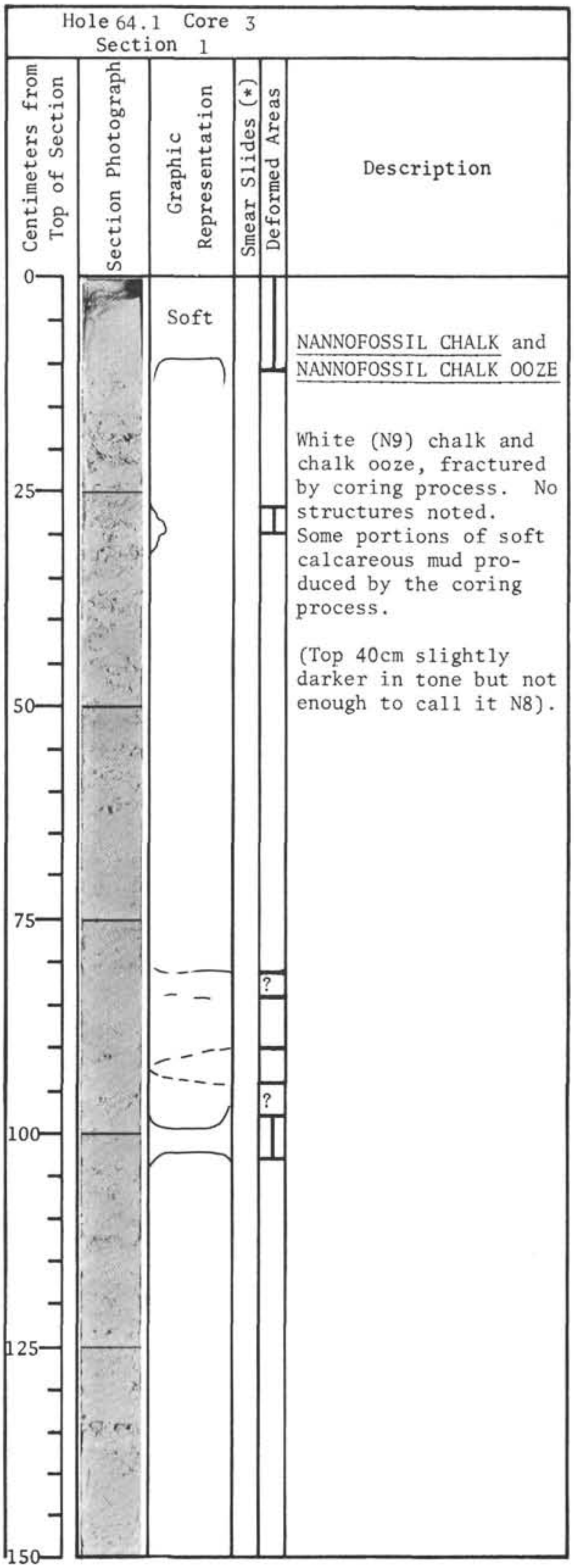
Radiolarian zone *Calocycletta costata* (Secs. 1-6)

Lithology and biostratigraphy of Core 3, Hole 64.1.



Physical properties of Core 3, Hole 64.1.

Hole 64.1 Core 3
Section 1

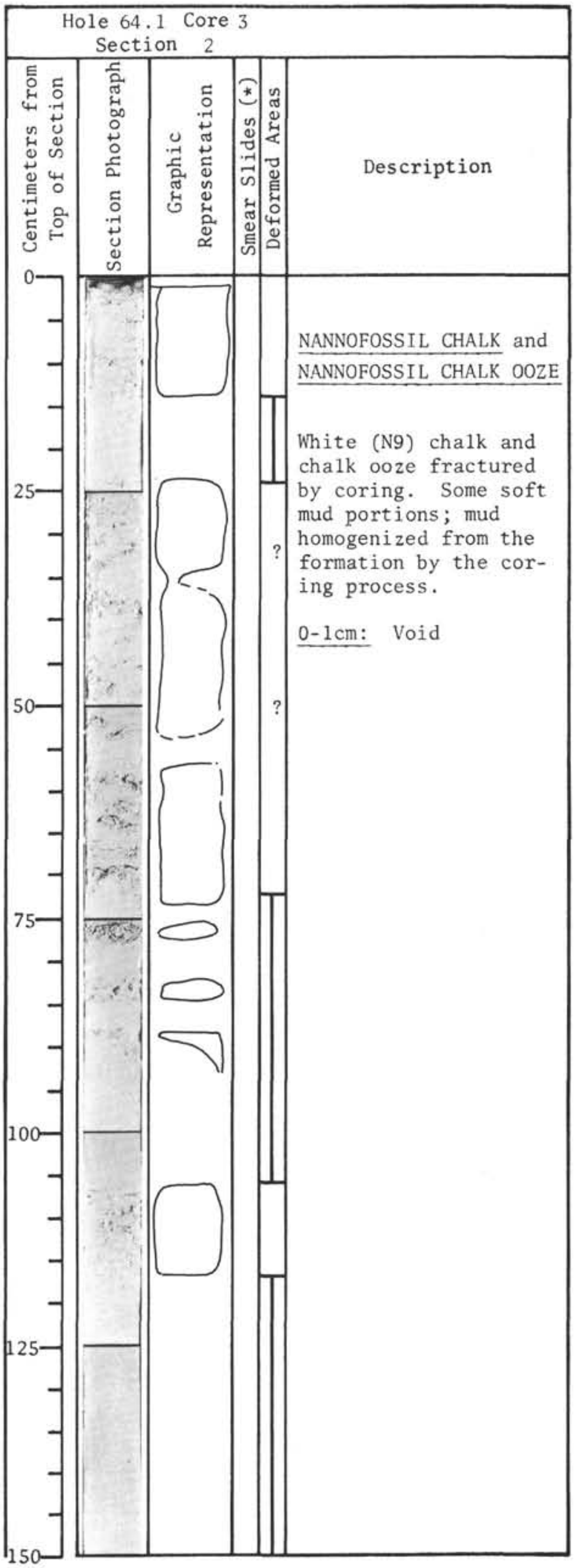


NANNOFOSSIL CHALK and NANNOFOSSIL CHALK OOZE

White (N9) chalk and chalk ooze, fractured by coring process. No structures noted. Some portions of soft calcareous mud produced by the coring process.

(Top 40cm slightly darker in tone but not enough to call it N8).

Hole 64.1 Core 3
Section 2

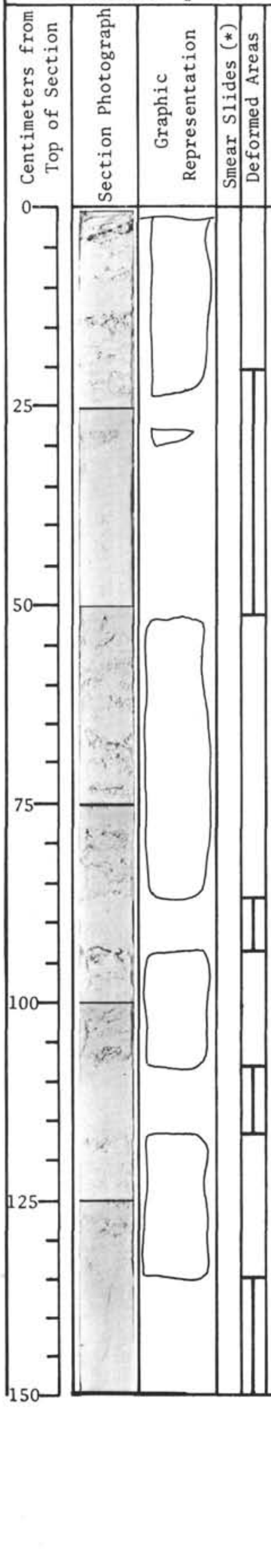


NANNOFOSSIL CHALK and NANNOFOSSIL CHALK OOZE

White (N9) chalk and chalk ooze fractured by coring. Some soft mud portions; mud homogenized from the formation by the coring process.

0-1cm: Void

Hole 64.1 Core 3
Section 3



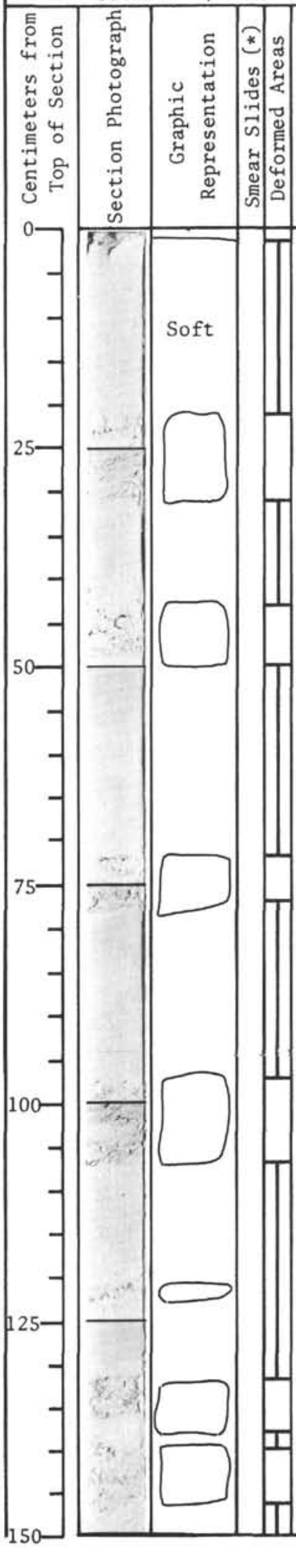
Description

NANNOFOSSIL CHALK and NANNOFOSSIL CHALK OOZE

White (N9) chalk ooze and chalk, fractured by the coring process, alternating with portions of soft mud, homogenized by the coring process.

0-2cm: Void

Hole 64.1 Core 3
Section 4



Description

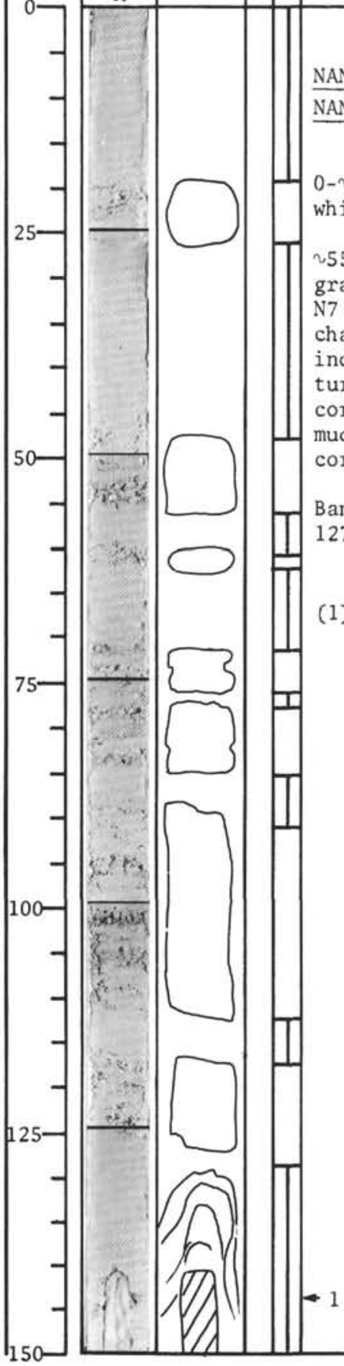
NANNOFOSSIL CHALK and NANNOFOSSIL CHALK OOZE

White (N9) chalk and chalk ooze, fractured by coring. Several portions of soft mud, homogenized by the coring process.

151cm long.

Hole 64.1 Core 3
Section 5

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK AND NANNOFOSSIL CHALK OOZE

0-~55 (gradational white N9).

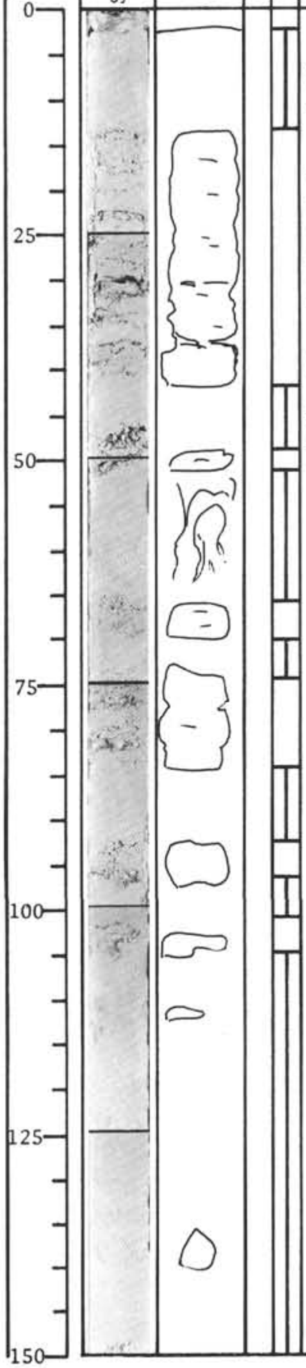
~55-150 very light gray (N8) darkens to N7 near 103cm. Firm chalk ooze to semi-indurated chalk, fractured and displaced by coring. Portions of mud homogenized by coring.

Banding in mud below 127cm.

(1) Removed for interstitial water analysis from end of section when core was sectioned prior to splitting.

Hole 64.1 Core 3
Section 6

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description

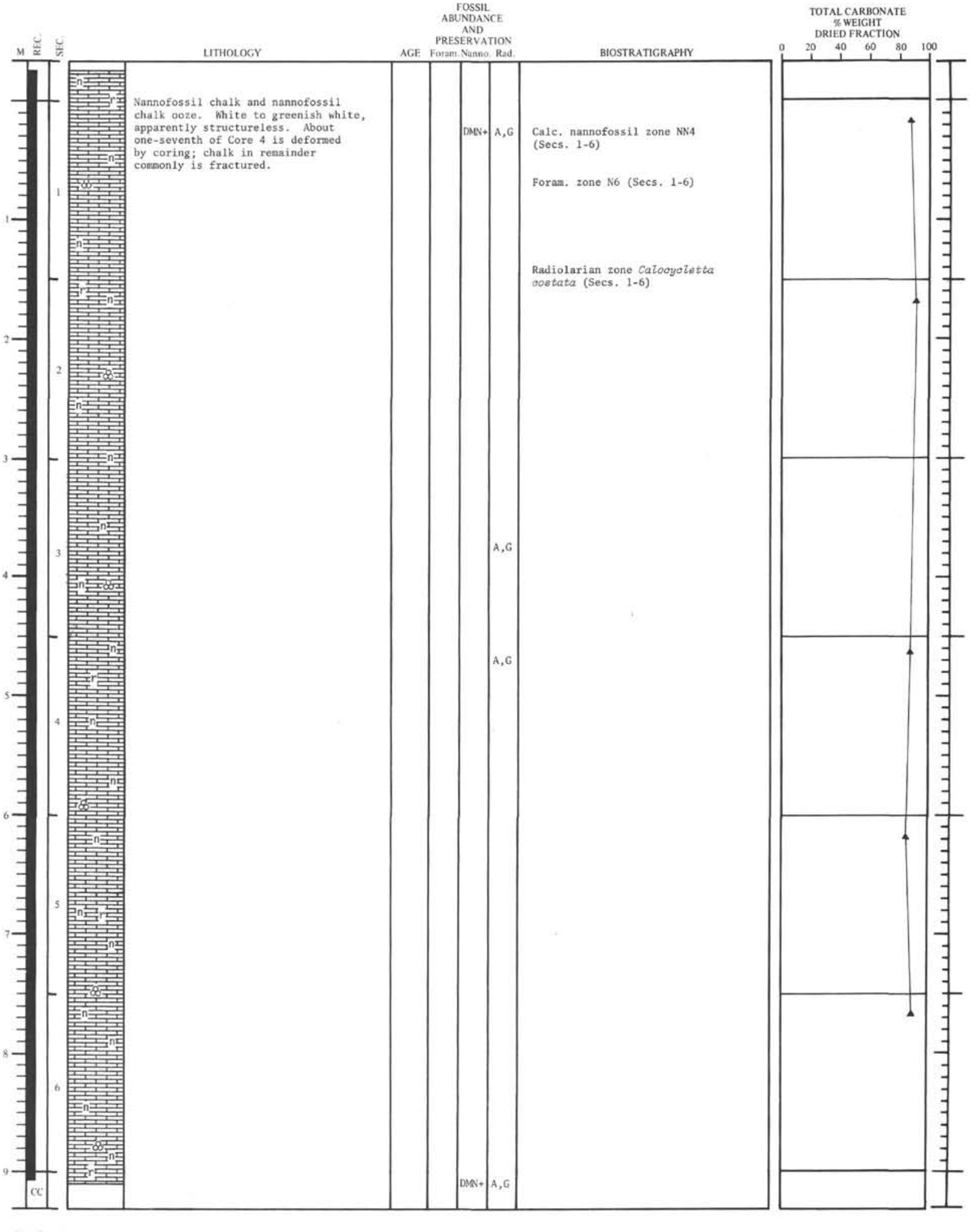


NANNOFOSSIL CHALK OOZE and NANNOFOSSIL CHALK

Very pale gray N8 fractured chalk, and chalk ooze, alternating with portions of mud, homogenized by the coring process.

0-2cm: Void

50-65cm:
White N9. Mainly white below ~130cm.



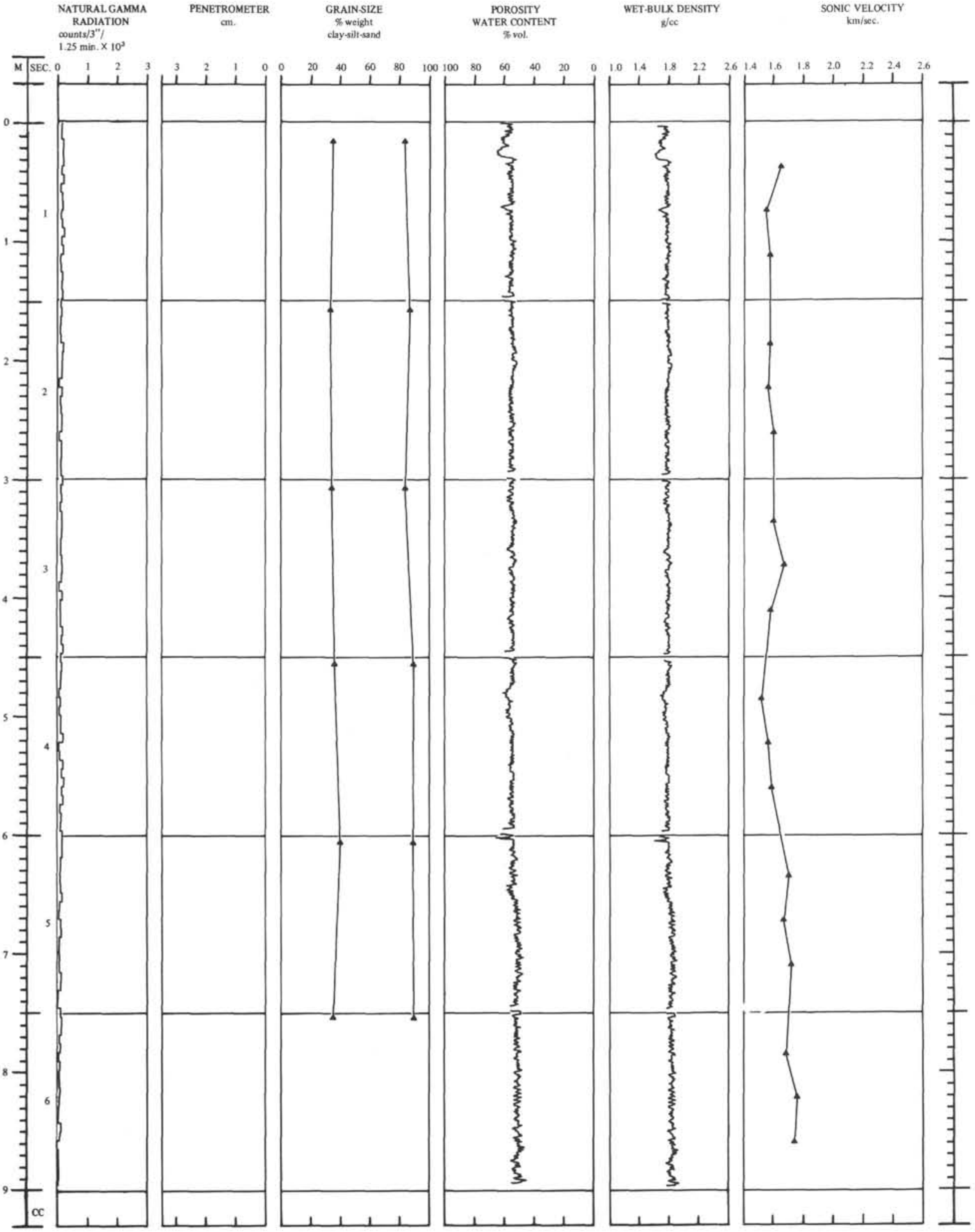
Nannofossil chalk and nannofossil chalk ooze. White to greenish white, apparently structureless. About one-seventh of Core 4 is deformed by coring; chalk in remainder commonly is fractured.

Calc. nannofossil zone NN4 (Secs. 1-6)

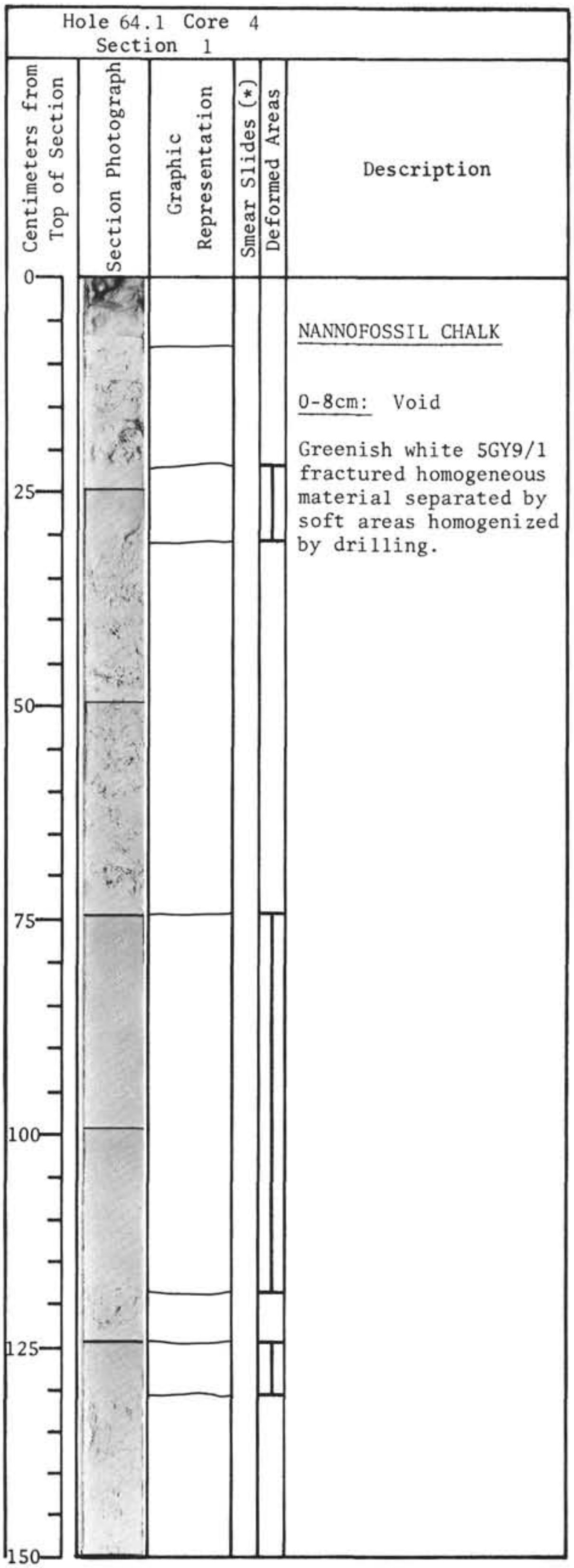
Foram. zone N6 (Secs. 1-6)

Radiolarian zone *Calocycletta costata* (Secs. 1-6)

Lithology and biostratigraphy of Core 4, Hole 64.1.



Physical properties of Core 4, Hole 64.1.

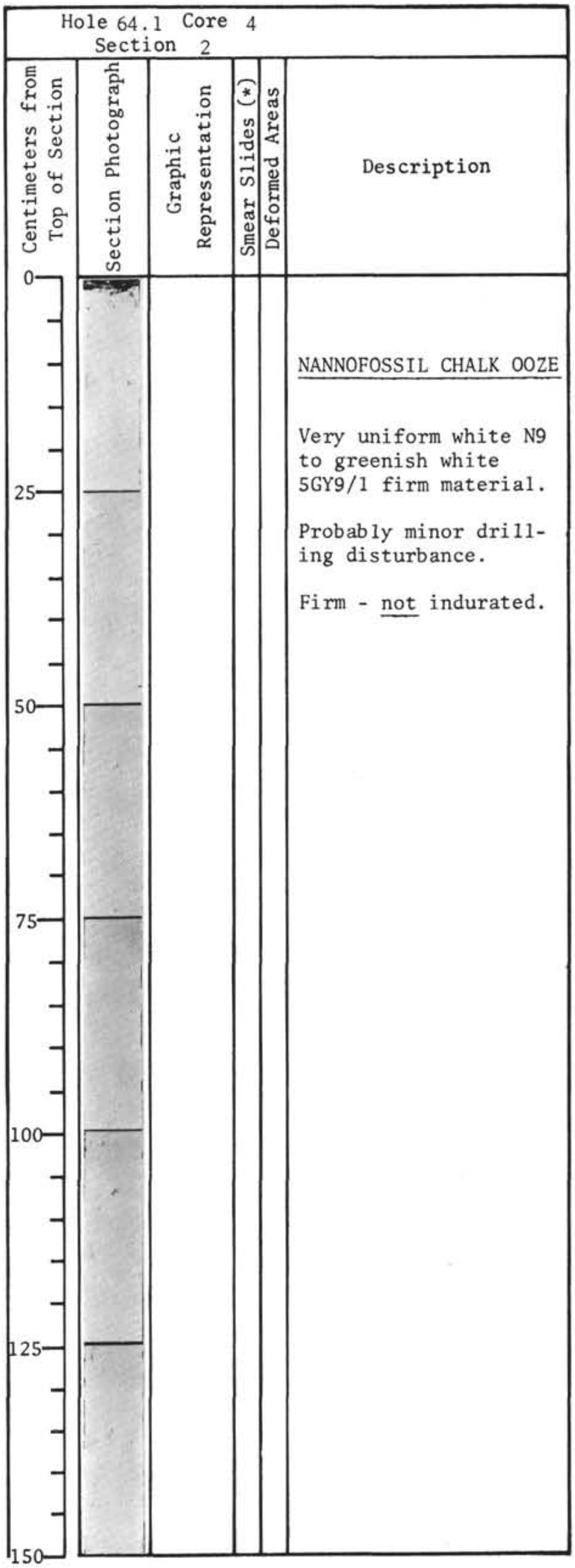


Hole 64.1 Core 4
Section 1

NANNOFOSSIL CHALK

0-8cm: Void

Greenish white 5GY9/1 fractured homogeneous material separated by soft areas homogenized by drilling.



Hole 64.1 Core 4
Section 2

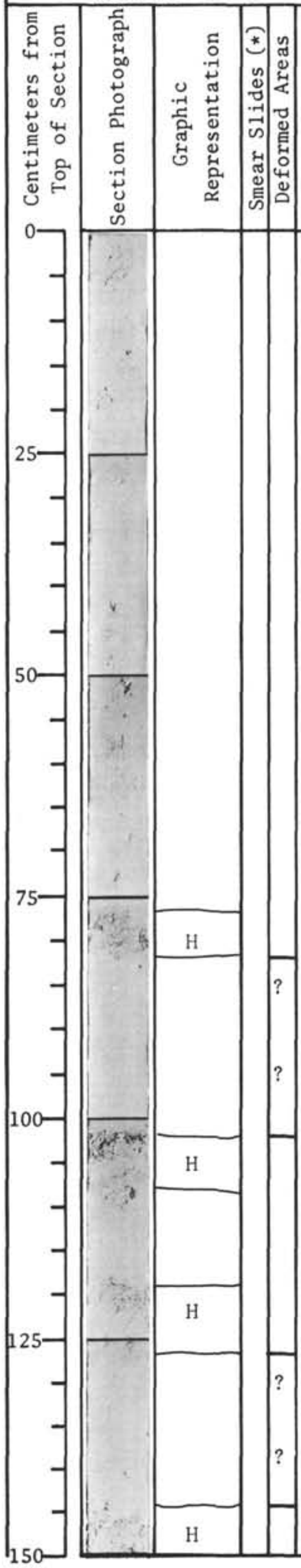
NANNOFOSSIL CHALK OOZE

Very uniform white N9 to greenish white 5GY9/1 firm material.

Probably minor drilling disturbance.

Firm - not indurated.

Hole 64.1 Core 4
Section 3



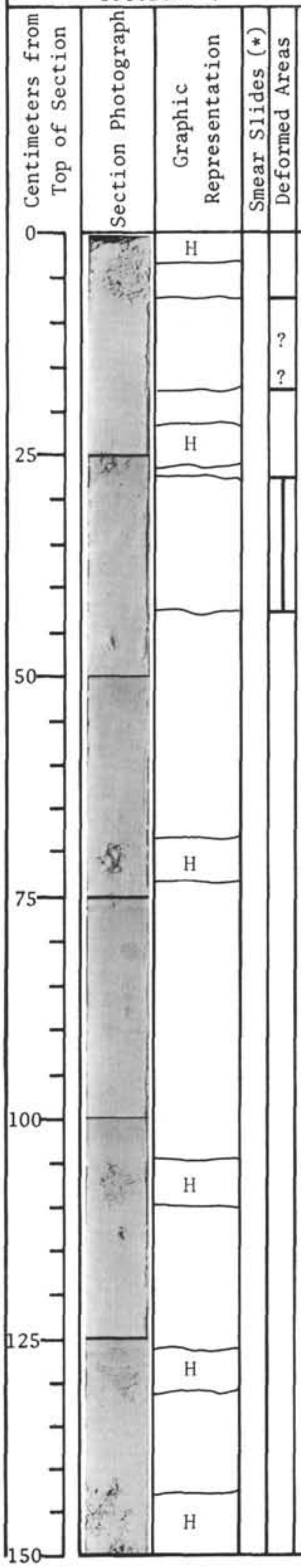
Description

NANNOFOSSIL CHALK OOZE and MINOR CHALK

Firm to rarely semi-indurated (H areas) featureless greenish white (5GY9/1) material.

Soft material may be disturbed by drilling.

Hole 64.1 Core 4
Section 4



Description

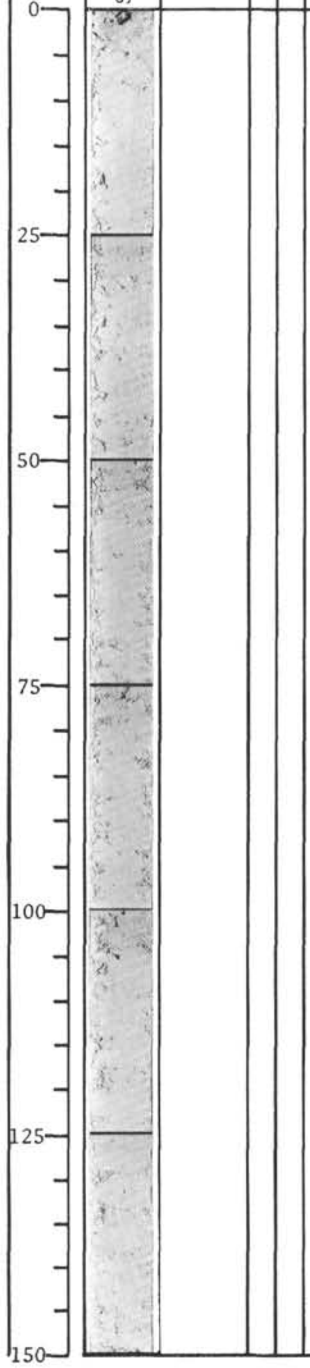
NANNOFOSSIL CHALK OOZE to CHALK

As Section 3.

Very soft area homogenized by drilling.

Hole 64.1 Core 4
Section 5

Centimeters from Top of Section
Section Photograph
Graphic Representation
Smear Slides (*)
Deformed Areas
Description



NANNOFOSSIL CHALK to CHALK OOZE

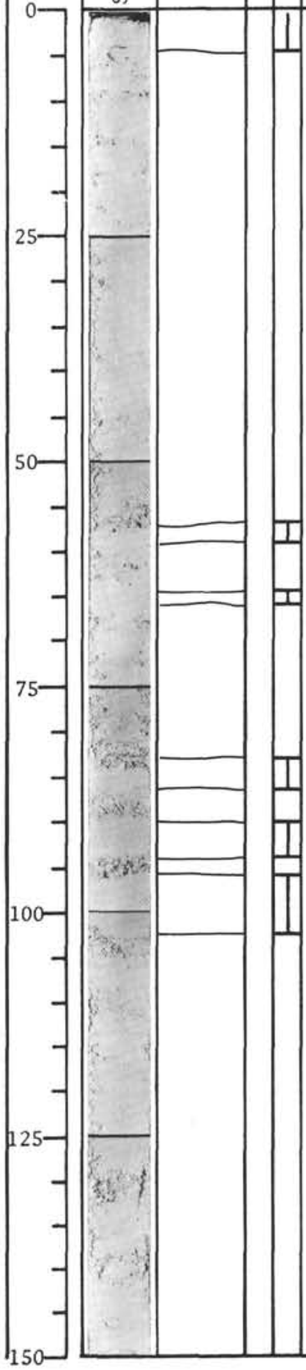
Very uniform featureless, fractured, very firm to semi-indurated material.

Little drilling disturbance, apart from shattering.

No structures.

Hole 64.1 Core 4
Section 6

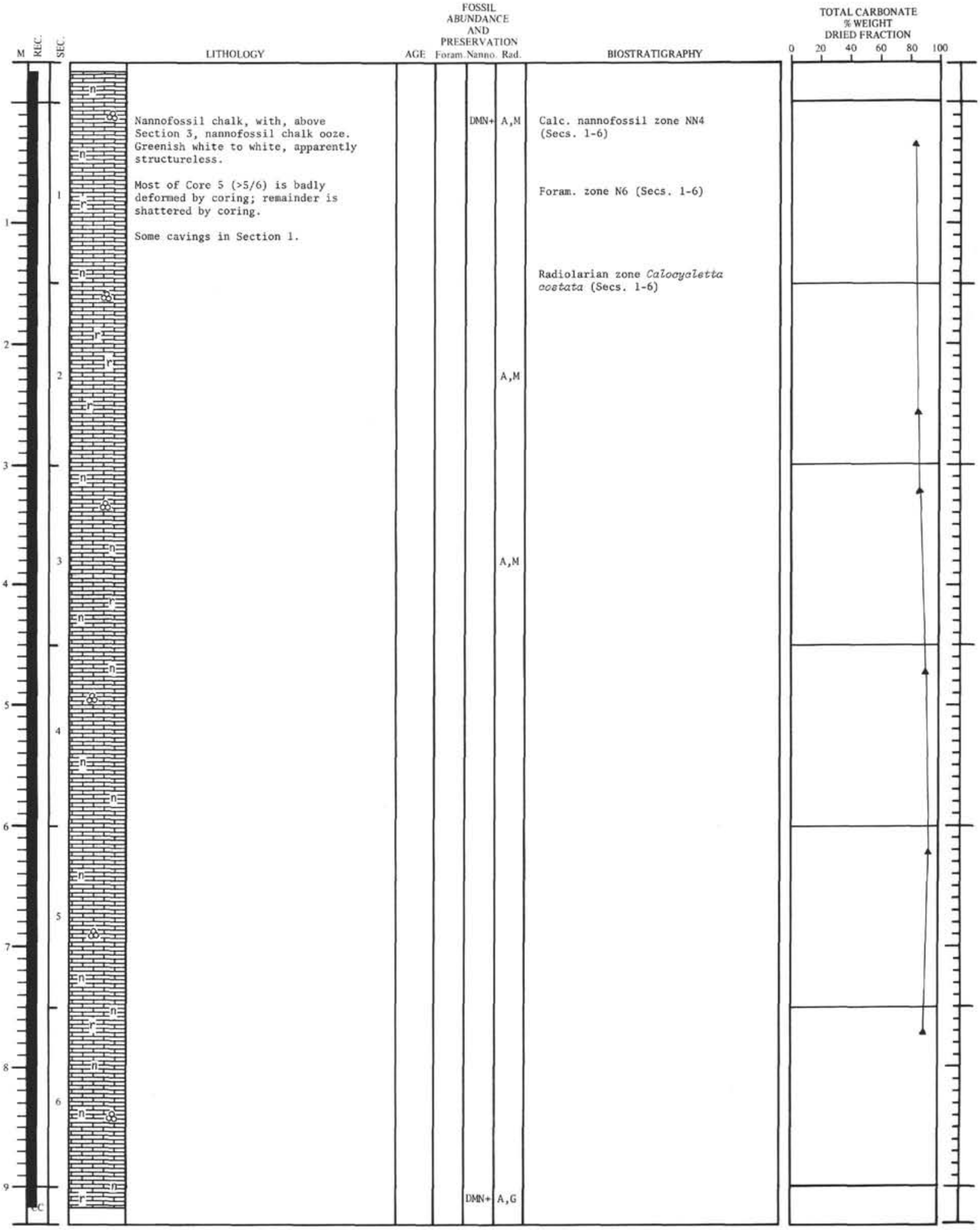
Centimeters from Top of Section
Section Photograph
Graphic Representation
Smear Slides (*)
Deformed Areas
Description



NANNOFOSSIL CHALK

Semi-indurated very uniform featureless 5GY9/1 greenish white. Shattered by drilling.

Soft patches created and homogenized by drilling.



Nannofossil chalk, with, above Section 3, nannofossil chalk ooze. Greenish white to white, apparently structureless.

Most of Core 5 (>5/6) is badly deformed by coring; remainder is shattered by coring.

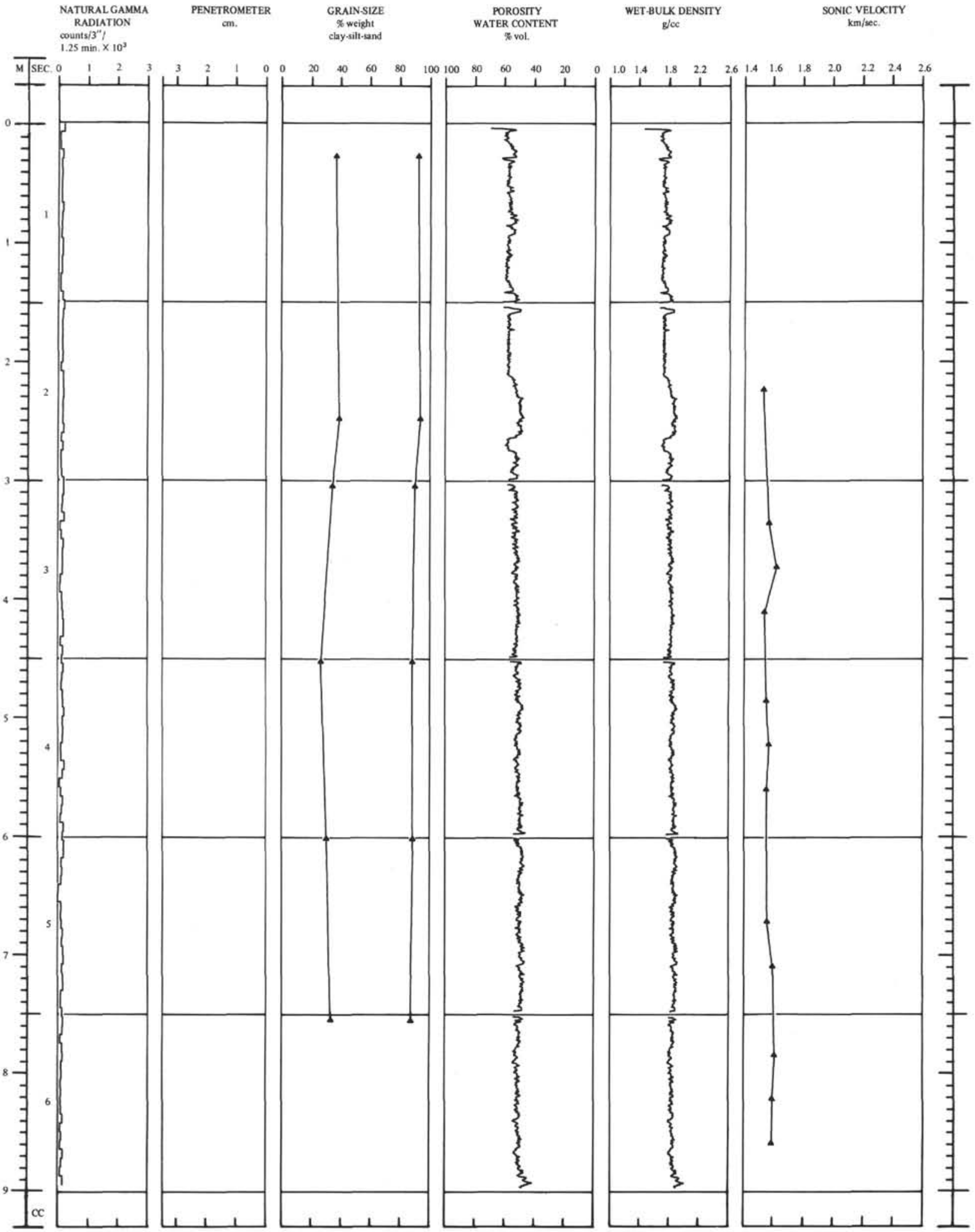
Some cavings in Section 1.

Calc. nannofossil zone NN4 (Secs. 1-6)

Foram. zone N6 (Secs. 1-6)

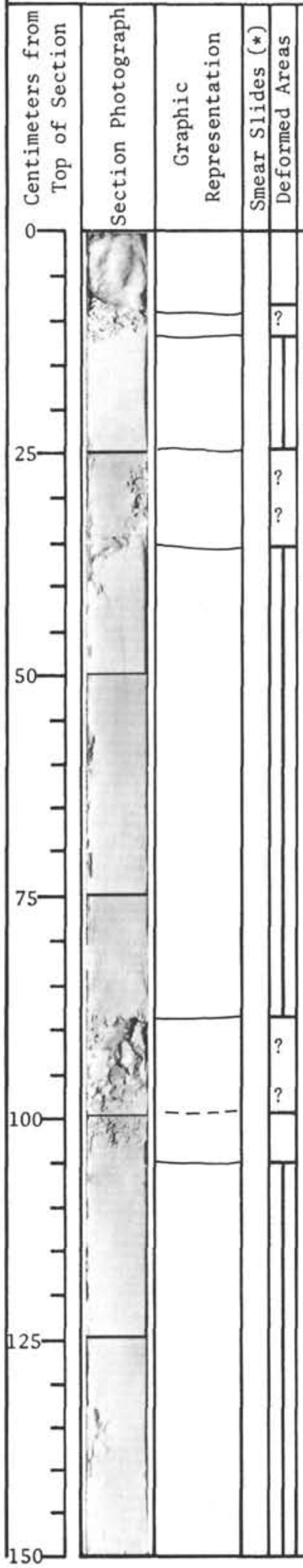
Radiolarian zone *Calocycletta costata* (Secs. 1-6)

Lithology and biostratigraphy of Core 5, Hole 64.1.



Physical properties of Core 5, Hole 64.1.

Hole 64.1 Core 5
Section 1



Description

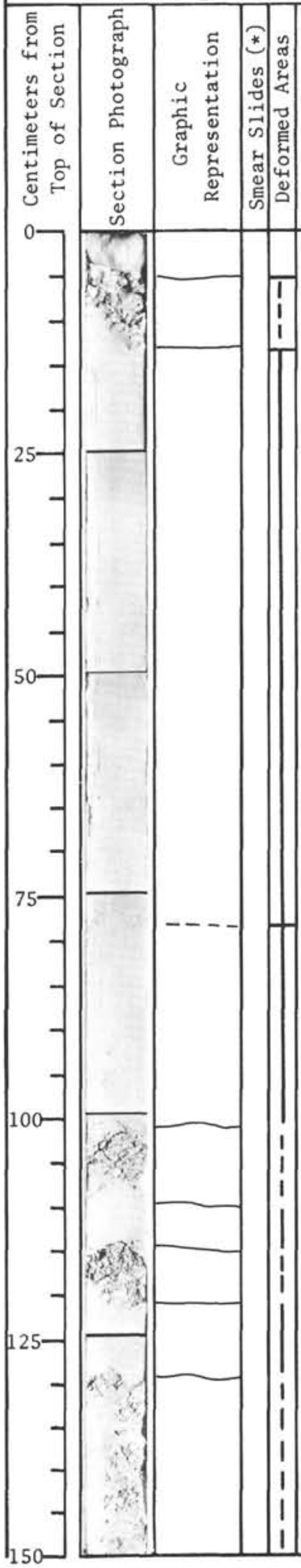
NANNOFOSSIL CHALK or CHALK OOZE

Mostly reduced to shaving cream consistency by drilling - also contains cavings.

Least disturbed material is very firm greenish white 5GY9/1. No visible structure.

0-8cm: Void

Hole 64.1 Core 5
Section 2



Description

NANNOFOSSIL CHALK or CHALK OOZE

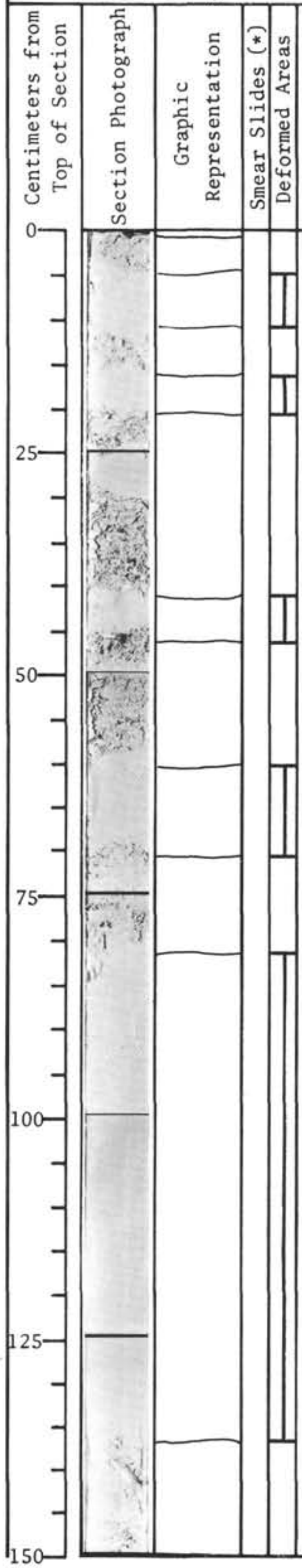
0-4cm: Void

Probably all disturbed by drilling to some extent.

Very watery and soft areas thoroughly homogenized by drilling.

Firmer areas: structureless firm greenish white 5GY9/1 shattered.

Hole 64.1 Core 5
Section 3



Description

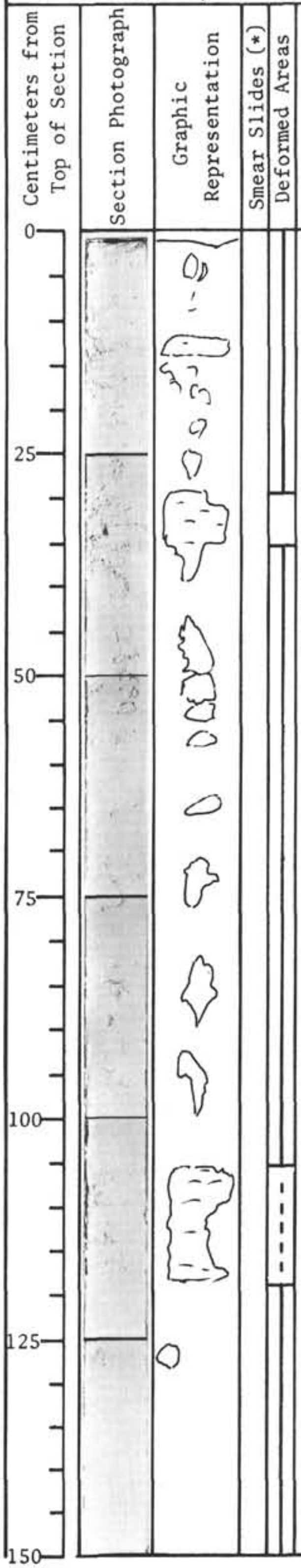
NANNOFOSSIL CHALK

Fragmented, very uniform structureless greenish white 5GY9/1.

Soft areas homogenized by drilling.

0-2cm: Void

Hole 64.1 Core 5
Section 4

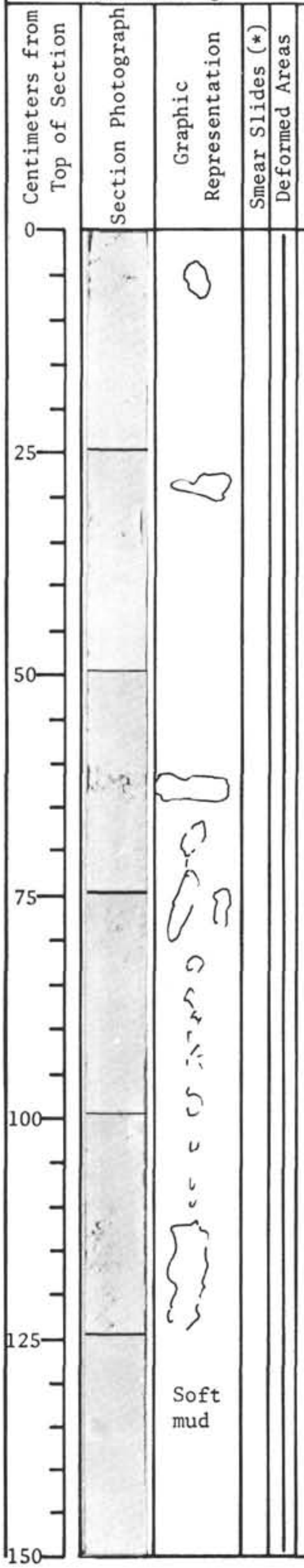


Description

NANNOFOSSIL CHALK

Greenish white (5GY9/1) to white (N9) chalk, very badly shattered by coring. The fragments are strung out in a matrix of mud homogenized from the rock by the coring process (and perhaps may contain some pieces of firm chalk ooze; this section too shattered to tell).

Hole 64.1 Core 5
Section 5

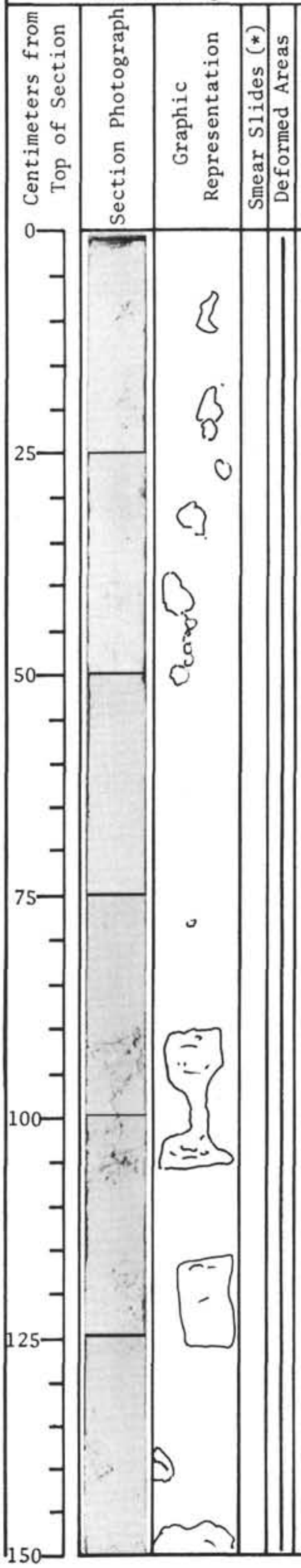


Description

NANNOFOSSIL CHALK

Nearly all of section is mud homogenized from the crushed chalk during coring. Some fragments of shattered chalk, white (N9), within the mud.

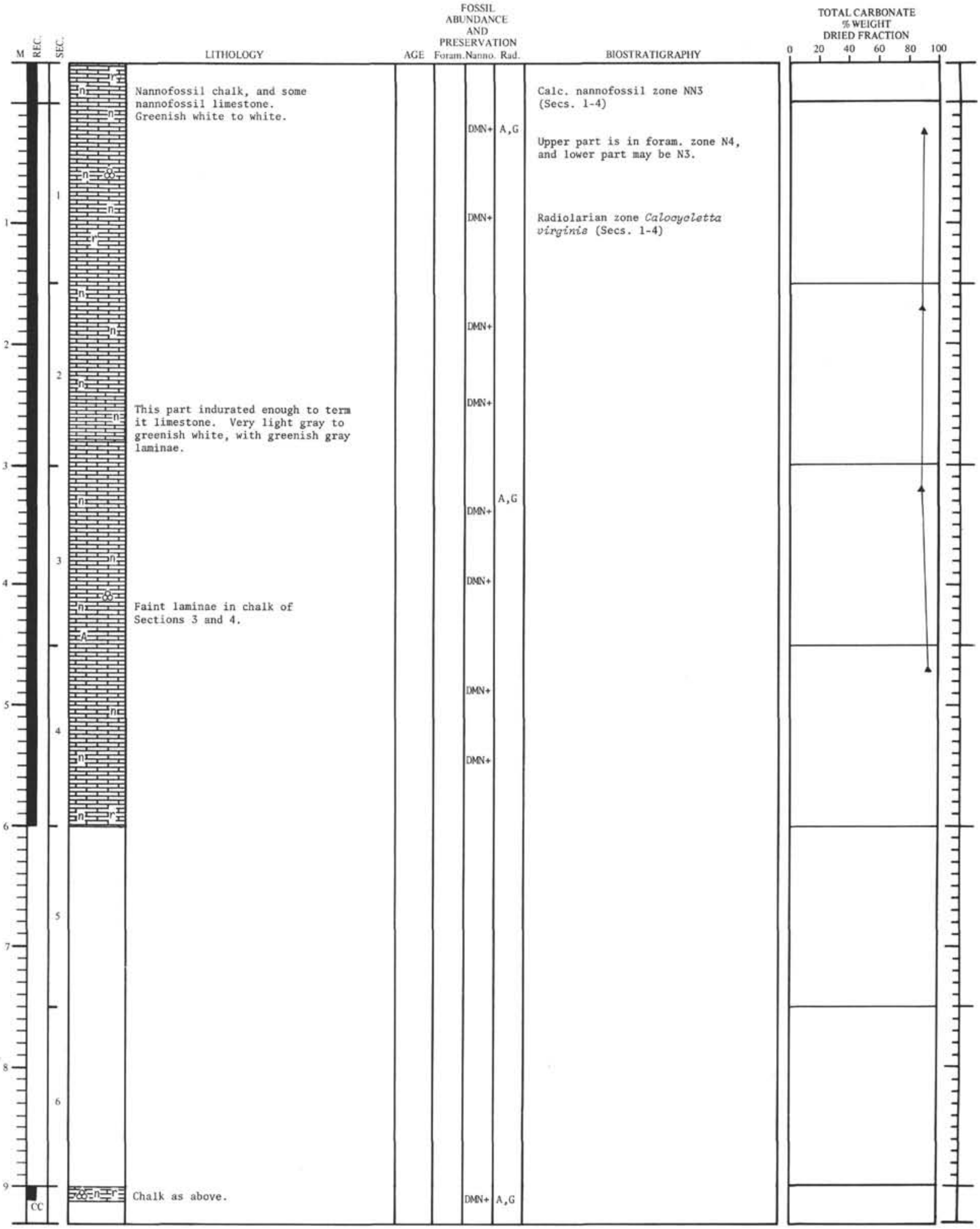
Hole 64.1 Core 5
Section 6



Description

NANNOFOSSIL CHALK

Nearly all of section is mud homogenized from crushed chalk during coring. Some fragments of shattered chalk, white (N9), with the mud.



Nannofossil chalk, and some nannofossil limestone. Greenish white to white.

This part indurated enough to term it limestone. Very light gray to greenish white, with greenish gray laminae.

Faint laminae in chalk of Sections 3 and 4.

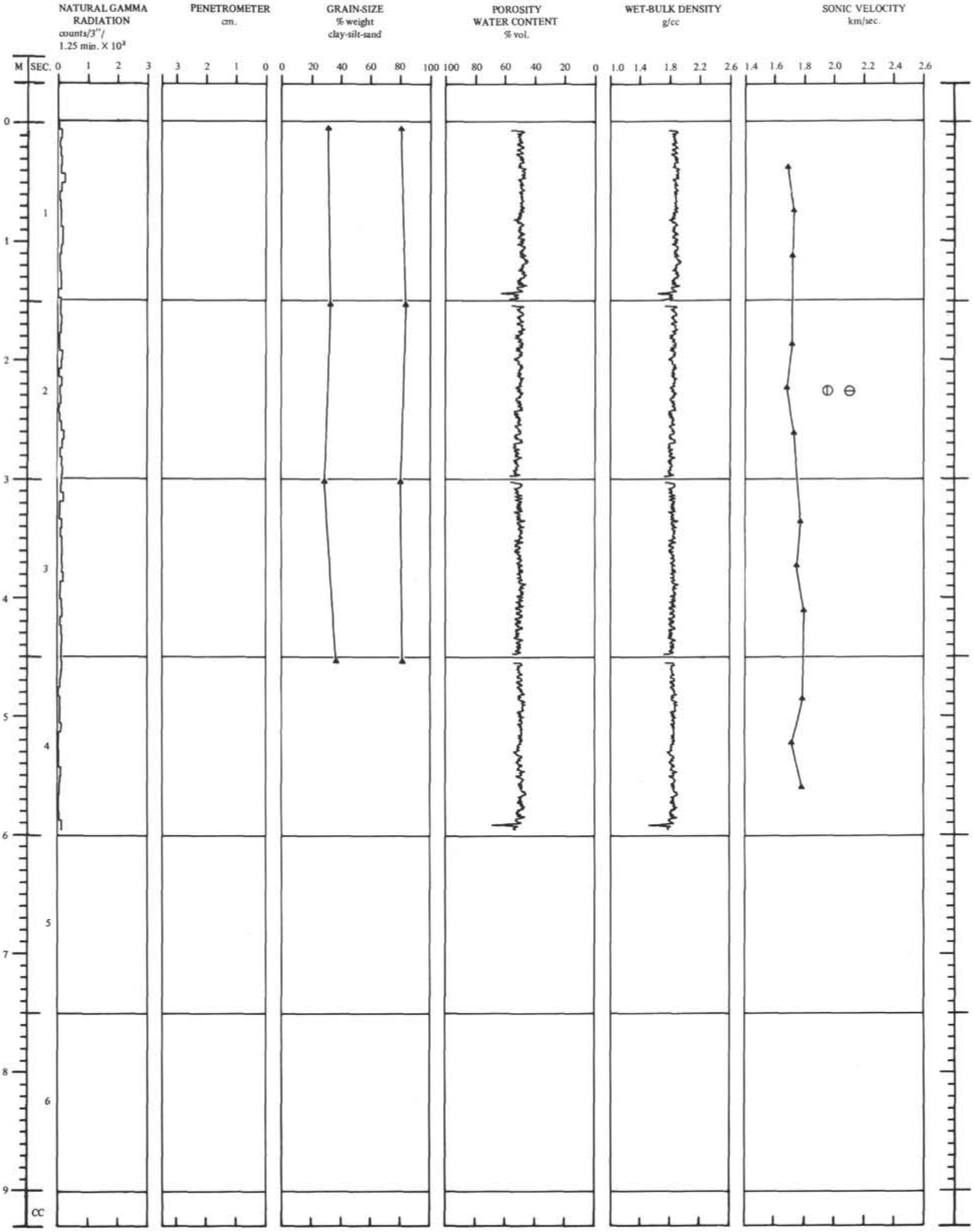
Chalk as above.

Calc. nannofossil zone NN3 (Secs. 1-4)

Upper part is in foram. zone N4, and lower part may be N3.

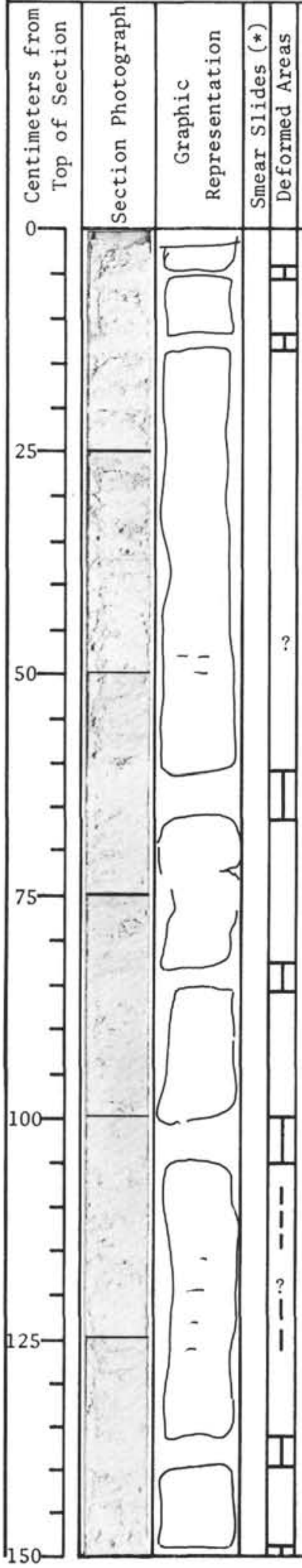
Radiolarian zone *Calocycletta virginis* (Secs. 1-4)

Lithology and biostratigraphy of Core 6, Hole 64.1.



Physical properties of Core 6, Hole 64.1.

Hole 64.1 Core 6
Section 1



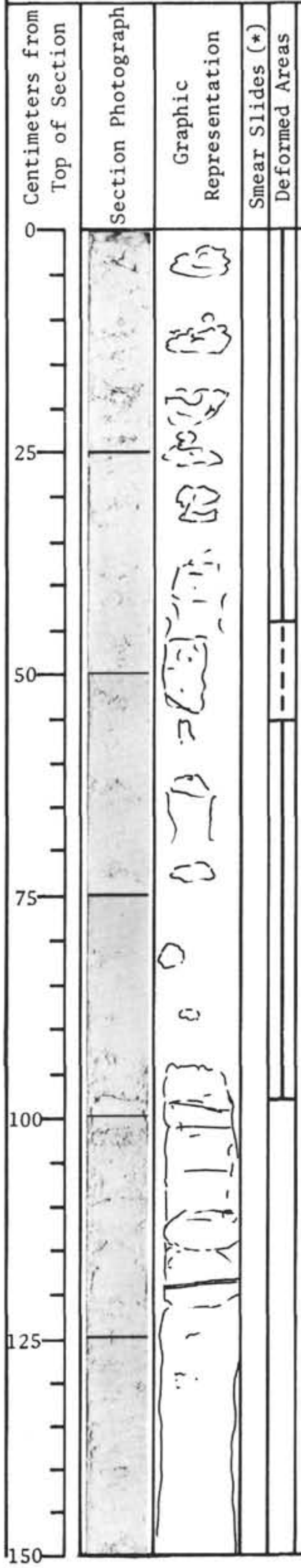
Description

NANNOFOSSIL CHALK

0-2cm: Void

Greenish white (5GY9/1) to white (N9) chalk, highly shattered by coring. Portions of mud, homogenized from the chalk by the coring process.

Hole 64.1 Core 6
Section 2



Description

NANNOFOSSIL CHALK and LIMESTONE

Top of core between white (N9) and very light gray (N8), grades to N8 in middle and to greenish white (5GY9/1) below ∿115cm.

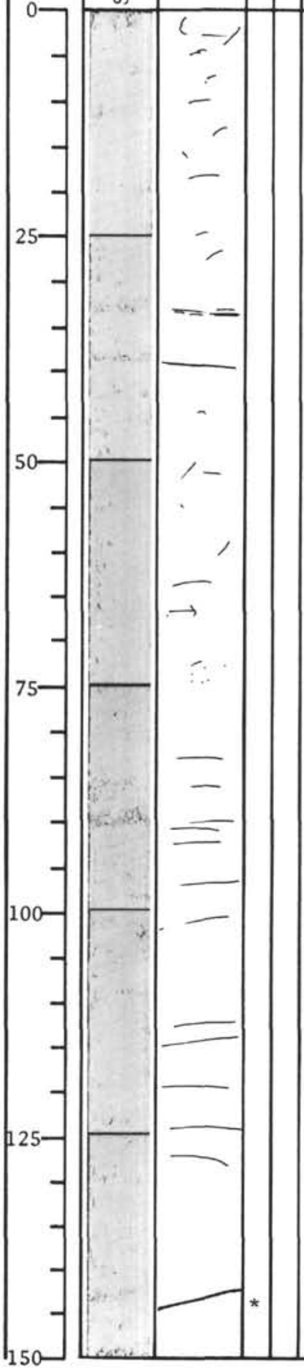
Rare dusky purple (5P2/2) mottles (near 130). Two greenish gray (5G6/1) laminae in limestone piece at 119cm.

Chalk fractured by coring process, and, between 98 and 120cm, carbonate rock hard enough to call limestone.

All in mud homogenized from chalk by coring process.

Hole 64.1 Core 6
Section 3

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



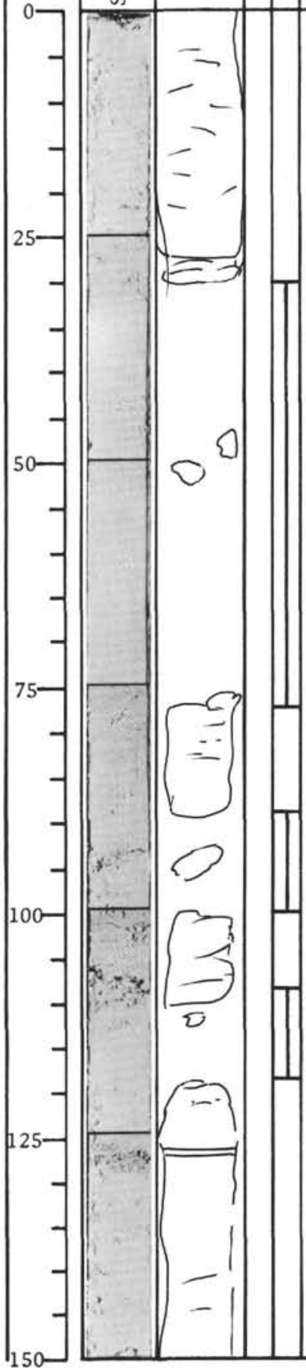
NANNOFOSSIL CHALK

Greenish white (5GY9/1) chalk, fractured by coring process, but not displaced stratigraphically.

Note: the thin laminae (~0.2mm thick) at about 40 and 144, that indicate those portions are nearly undeformed.

Hole 64.1 Core 6
Section 4

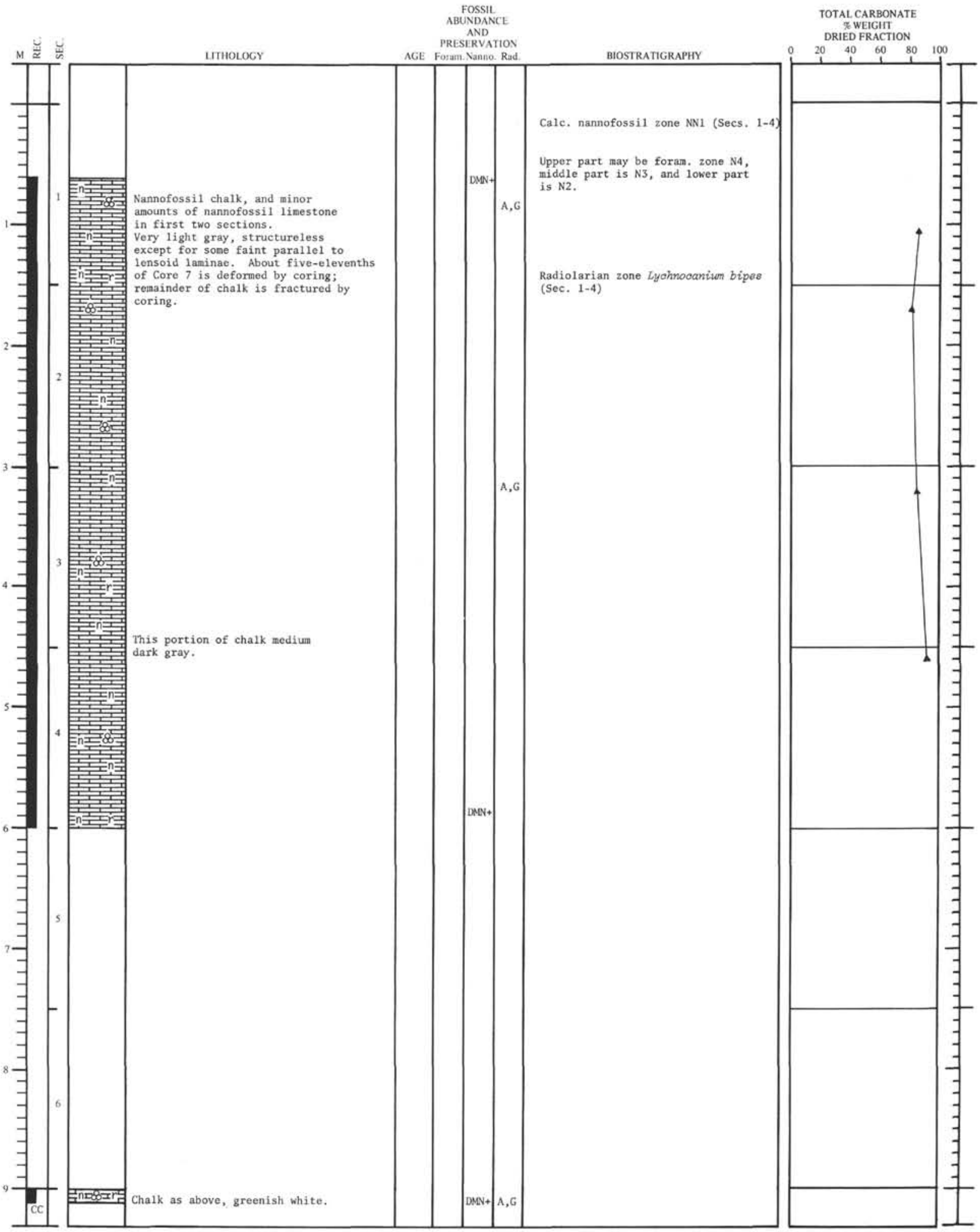
Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



NANNOFOSSIL CHALK

Greenish white (5GY9/1) chalk, fractured by coring process but apparently not displaced stratigraphically. Some portions of soft mud, homogenized from the chalk by the coring process.

Faint parallel laminae present in the greenish gray (5G6/1) bed at 126-127cm.



Nannofossil chalk, and minor amounts of nannofossil limestone in first two sections. Very light gray, structureless except for some faint parallel to lensoid laminae. About five-elevenths of Core 7 is deformed by coring; remainder of chalk is fractured by coring.

This portion of chalk medium dark gray.

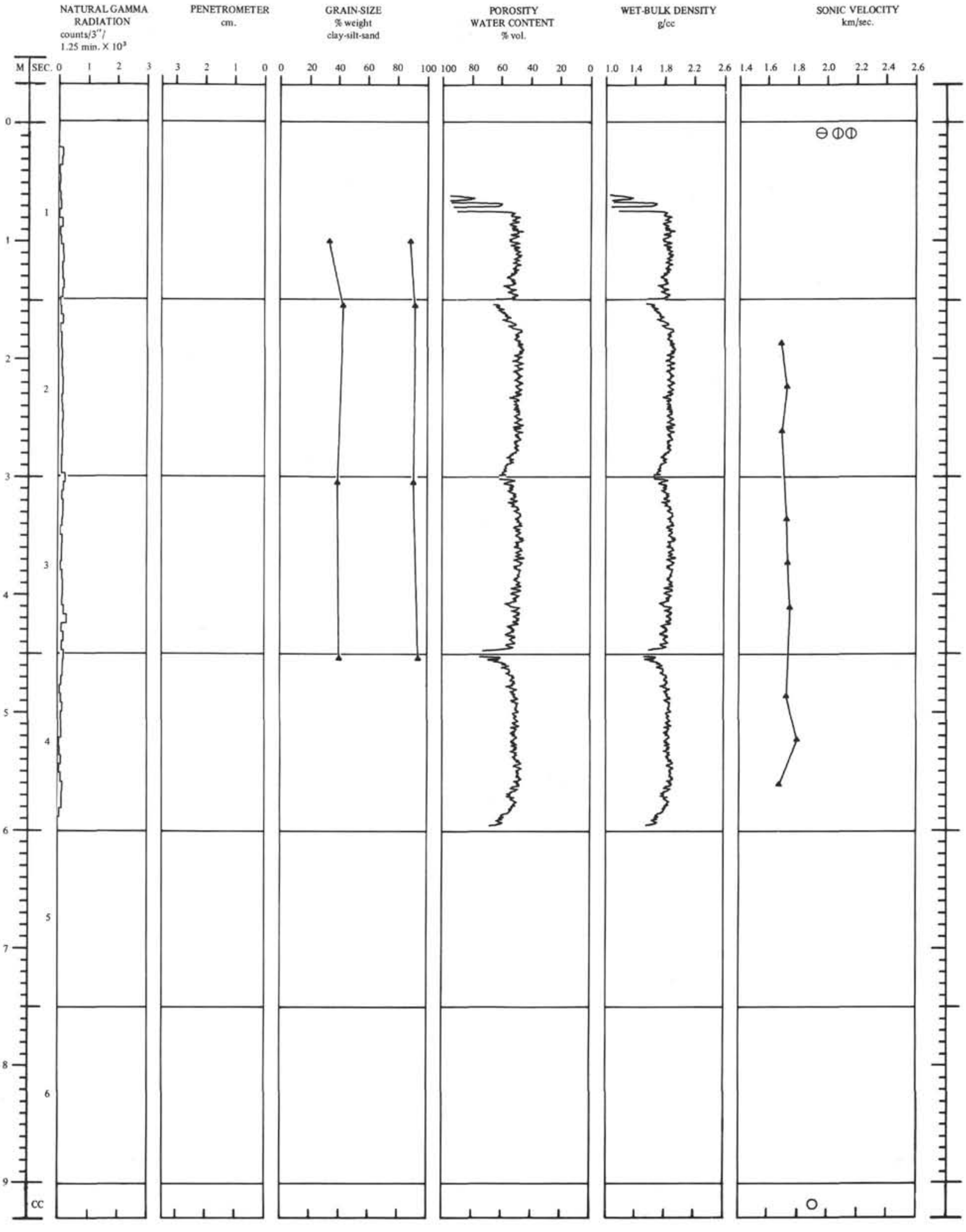
Chalk as above, greenish white.

Calc. nannofossil zone NN1 (Secs. 1-4)

Upper part may be foram. zone N4, middle part is N3, and lower part is N2.

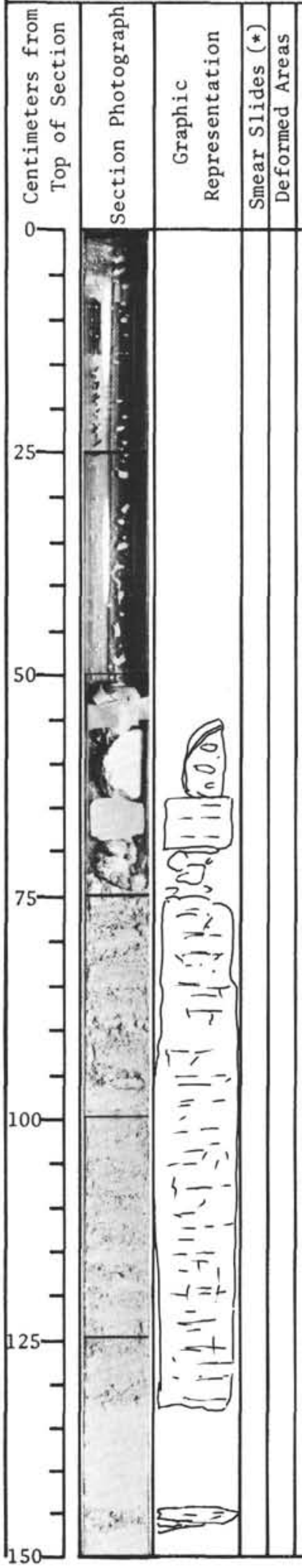
Radiolarian zone *Lychnocanium bipes* (Sec. 1-4)

Lithology and biostratigraphy of Core 7, Hole 64.1.



Physical properties of Core 7, Hole 64.1.

Hole 64.1 Core 7
Section 1



Description

NANNOFOSSIL CHALK and LIMESTONE

0-50cm: Void

55-66cm:
2 pieces of limestone, upper one may have turned over. Very light gray (N8); with white (N9) mottles 1 to 4mm diameter in upper piece. Both show faint, parallel to lensoid laminae.

66-74cm:
Fragments of limestone and chalk.

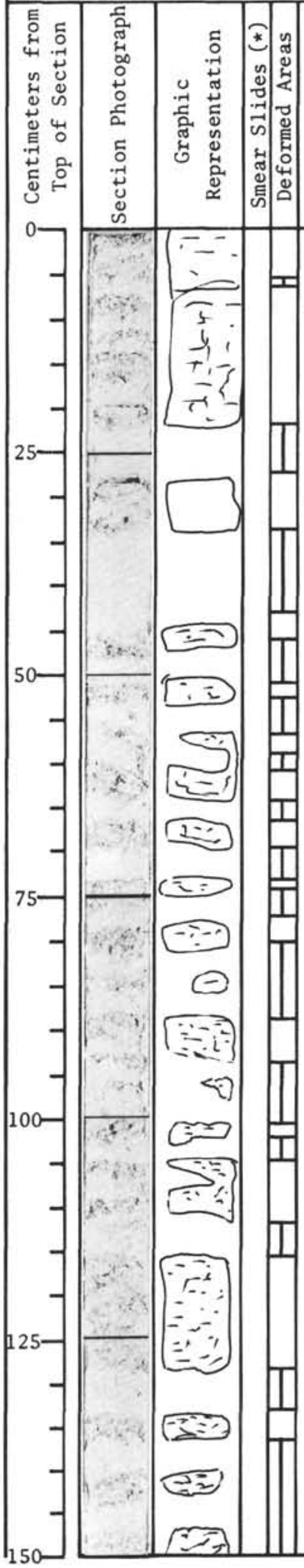
74-131cm:
Very light gray (N8) chalk, shattered by coring process.

131-143cm:
Very light gray (N8) mud, homogenized from chalk by the coring process.

143-145cm:
As 74-131cm (chalk).

145-150cm:
As 131-143cm (mud).

Hole 64.1 Core 7
Section 2



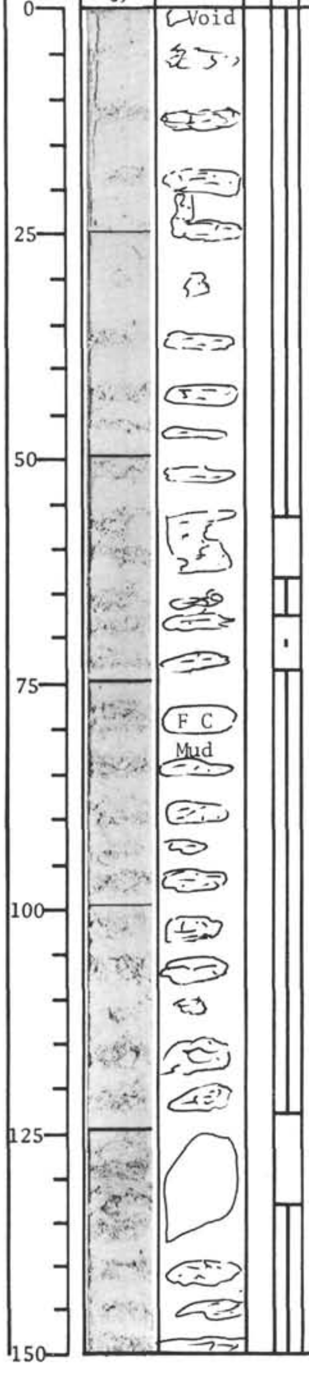
Description

NANNOFOSSIL CHALK and minor LIMESTONE

Fragments of chalk and some limestone of very light gray (N8) color, shattered by coring process. Alternates with sections of very light gray (N8) mud, homogenized by the coring process.

Hole 64.1 Core 7
Section 3

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



NANNOFOSSIL CHALK

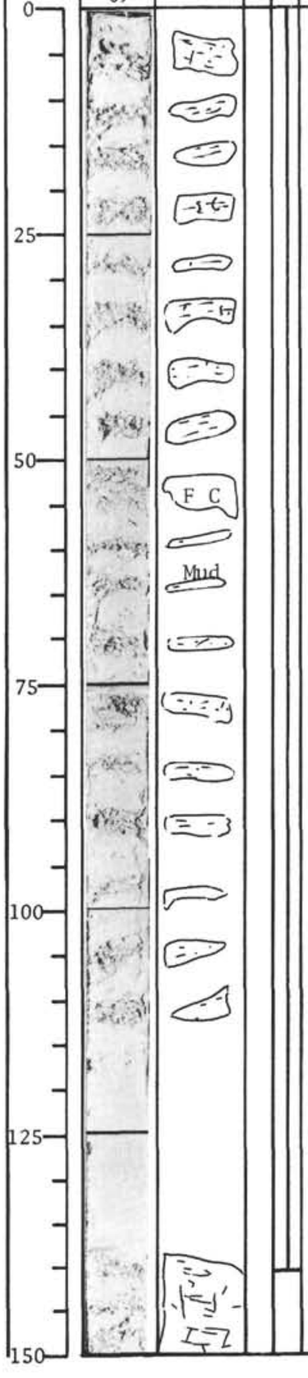
Portions of highly fragmented very light gray (N8) chalk alternate with portions of mud (the fracturing of the chalk, and the homogenizing of some of the chalk into mud, are due to the coring process).

125-135cm:
Block of chalk is darker, grading to a medium-dark gray (N4) in the middle.

F C = Fractured chalk

Hole 64.1 Core 7
Section 4

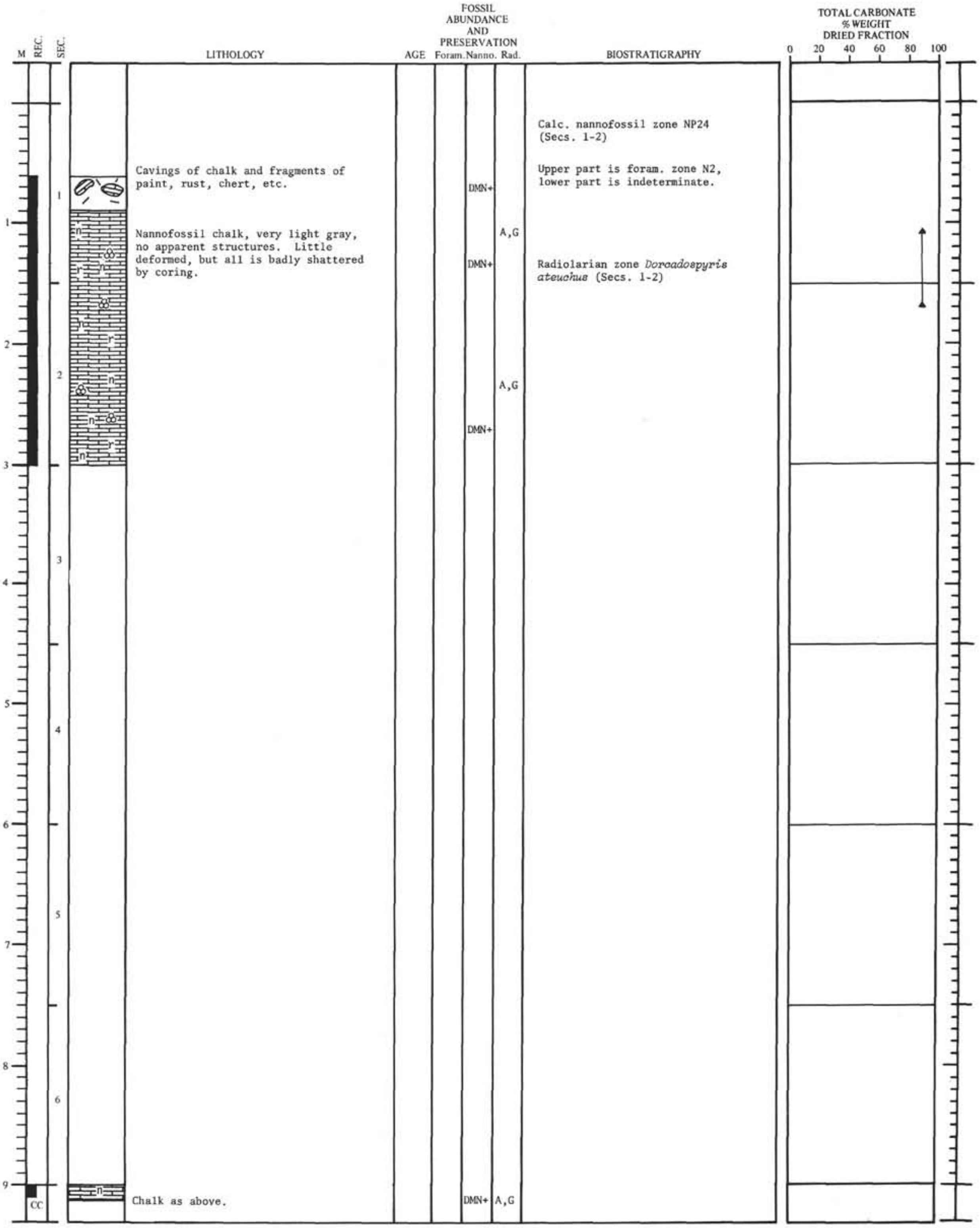
Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



NANNOFOSSIL CHALK

As Section 7-3 above. Very light gray (N8) chalk, highly fractured by the coring process, alternating with portions of mud, homogenized from the chalk by the coring process.

F C = Fractured chalk



Cavings of chalk and fragments of paint, rust, chert, etc.

Nannofossil chalk, very light gray, no apparent structures. Little deformed, but all is badly shattered by coring.

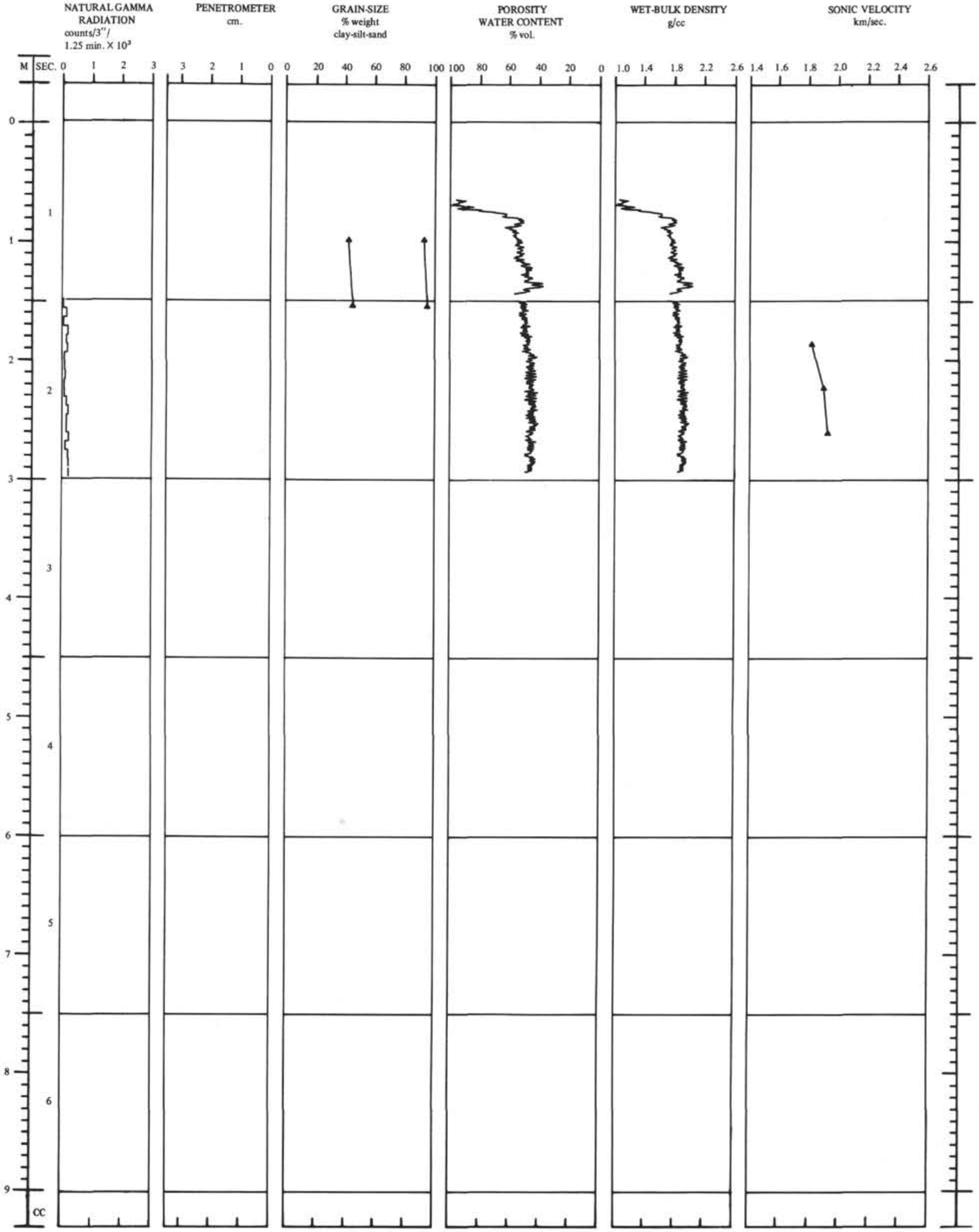
Chalk as above.

Calc. nannofossil zone NP24 (Secs. 1-2)

Upper part is foram. zone N2, lower part is indeterminate.

Radiolarian zone *Dorcadospyris ateuchus* (Secs. 1-2)

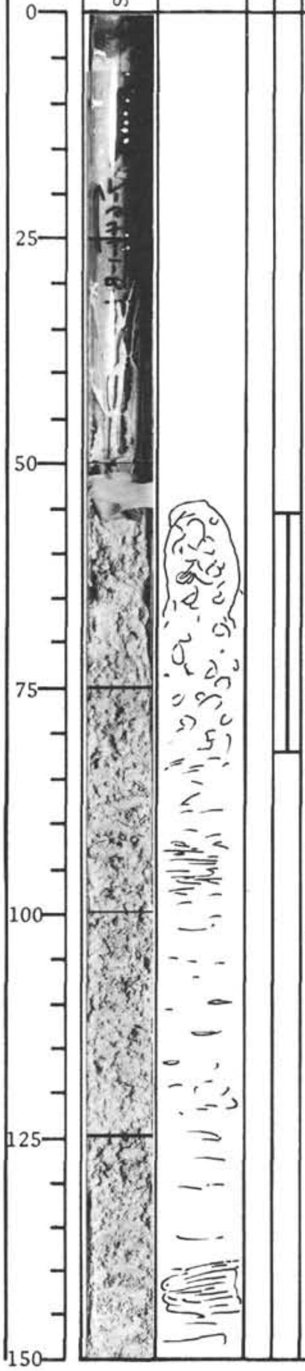
Lithology and biostratigraphy of Core 8, Hole 64.1.



Physical properties of Core 8, Hole 64.1.

Hole 64.1 Core 8
Section 1

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK

0-55cm: Void (top of Core 8).

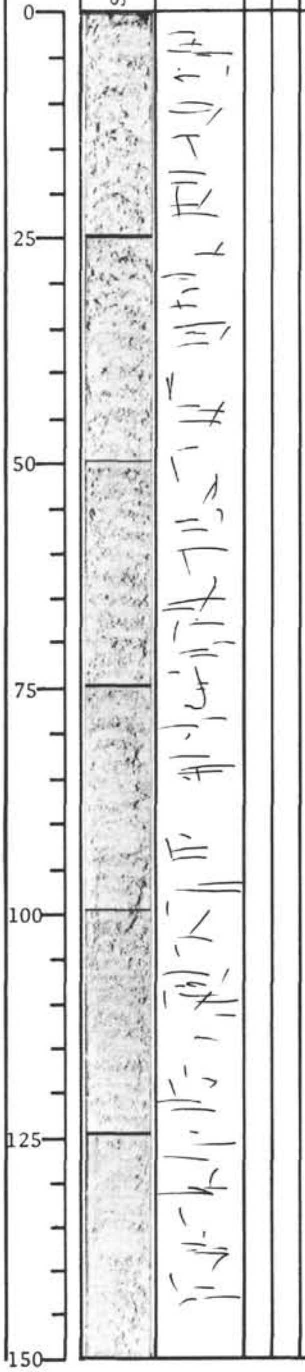
55- about 85cm:
A slurry of fragments of chalk, pyrite, chert, paint, rust, and chalk-mud; probably a large part is cavings and left overs from the bumper sub.

85-151cm:
Still largely fragments, but the attitude of most pieces is nearly horizontal, suggesting that although the chalk was shattered and displaced by coring, the relative stratigraphic positions of the pieces were not changed.

Chalk, mainly very light gray (N8), somewhat darker (to light gray, N7) at 91-97cm and 140-145cm, and tending toward greenish white (5GY9/1) near 108-130cm.

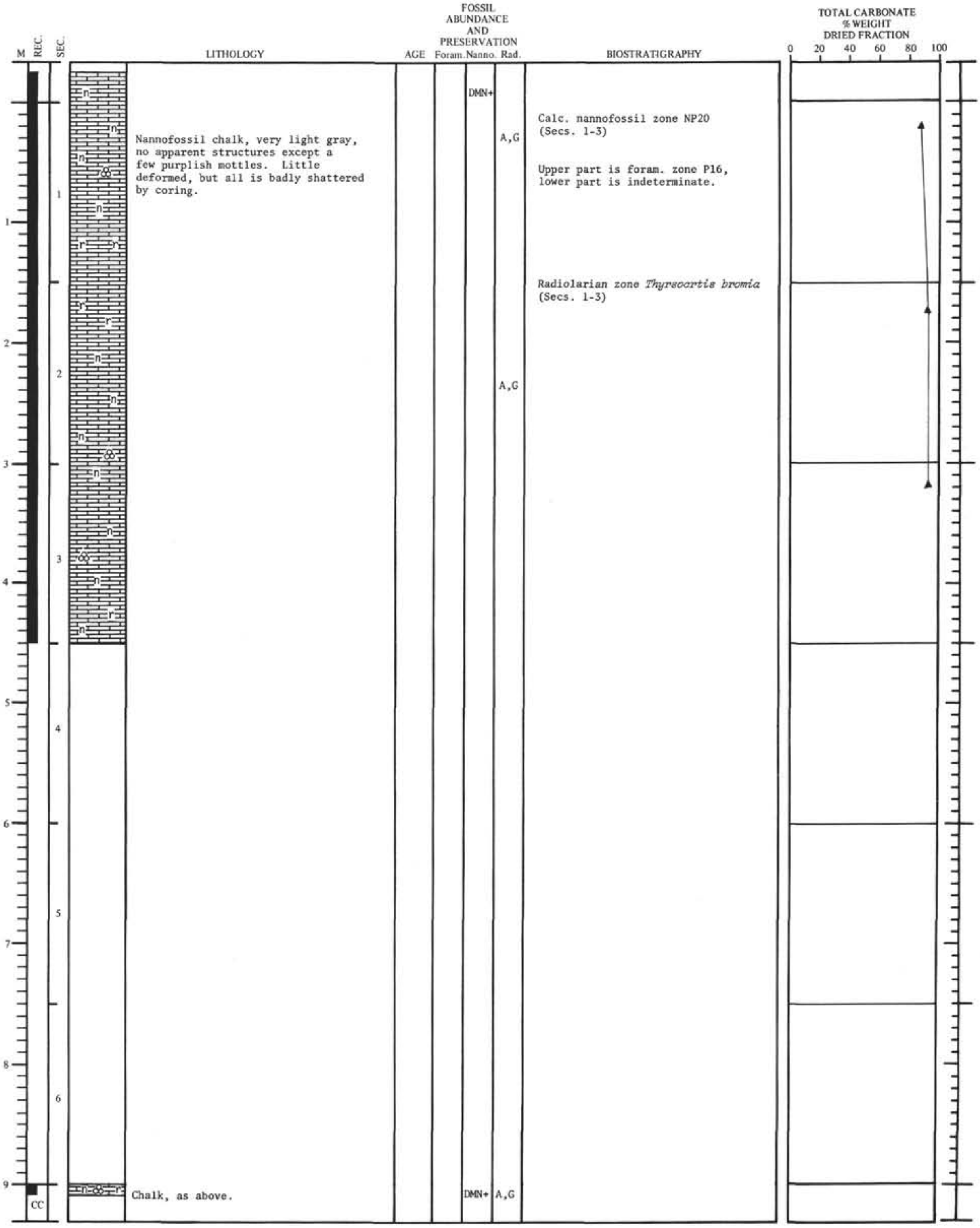
Hole 64.1 Core 8
Section 2

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK

Chalk, mainly very light gray (N8), badly shattered by coring as the lower part of Core 8 Section 1 above.



Nannofossil chalk, very light gray, no apparent structures except a few purplish mottles. Little deformed, but all is badly shattered by coring.

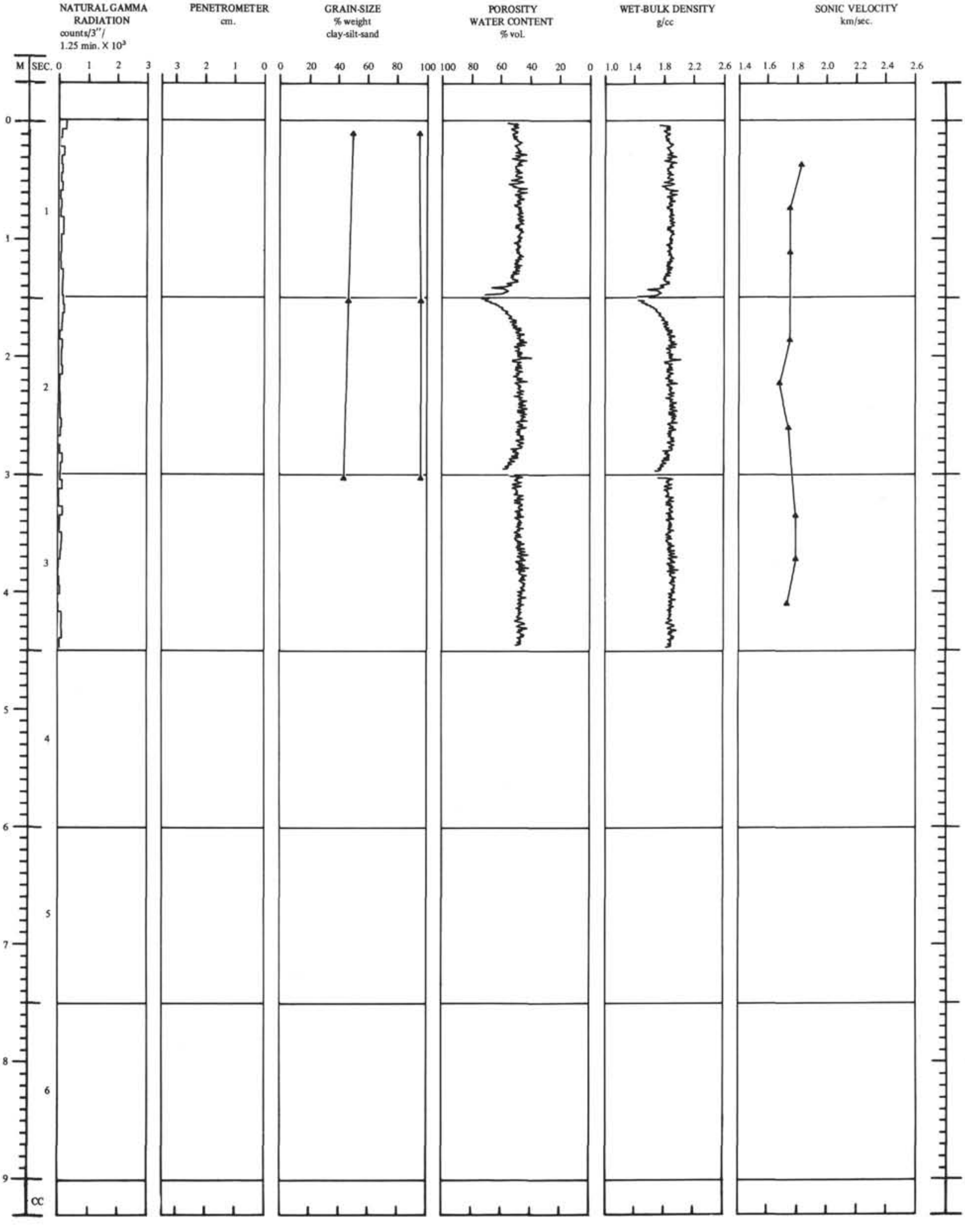
Calc. nannofossil zone NP20 (Secs. 1-3)

Upper part is foram. zone P16, lower part is indeterminate.

Radiolarian zone *Thyrsocortis bromia* (Secs. 1-3)

Chalk, as above.

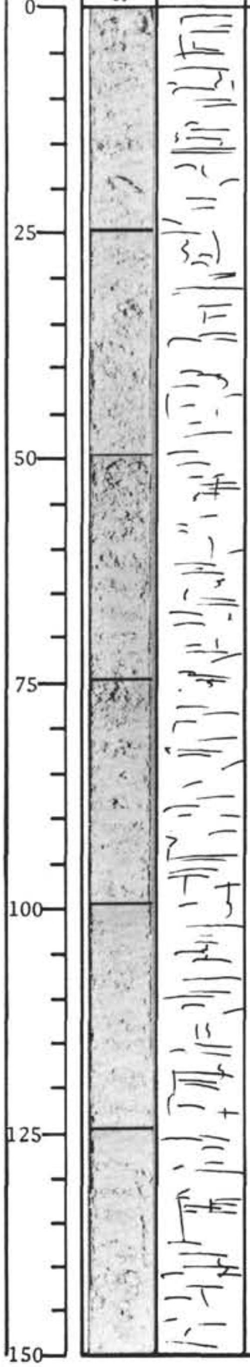
Lithology and biostratigraphy of Core 9, Hole 64.1.



Physical properties of Core 9, Hole 64.1.

Hole 64.1 Core 9
Section 1

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description

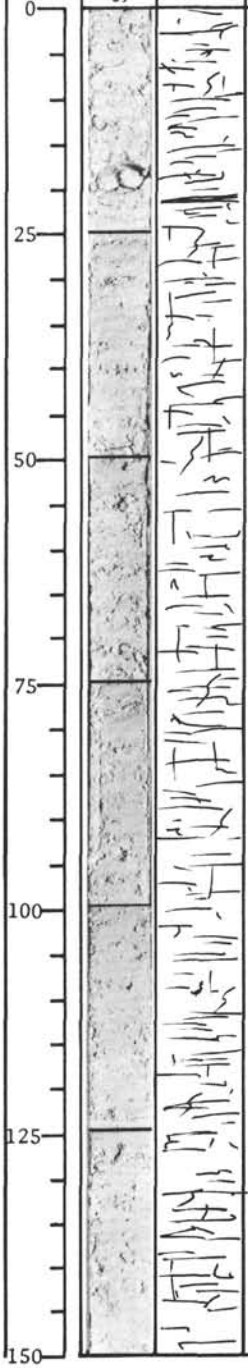


NANNOFOSSIL CHALK

Very light gray (N8) chalk, shattered by the coring operation, but apparently the fragments are still in correct stratigraphic order.

Hole 64.1 Core 9
Section 2

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description



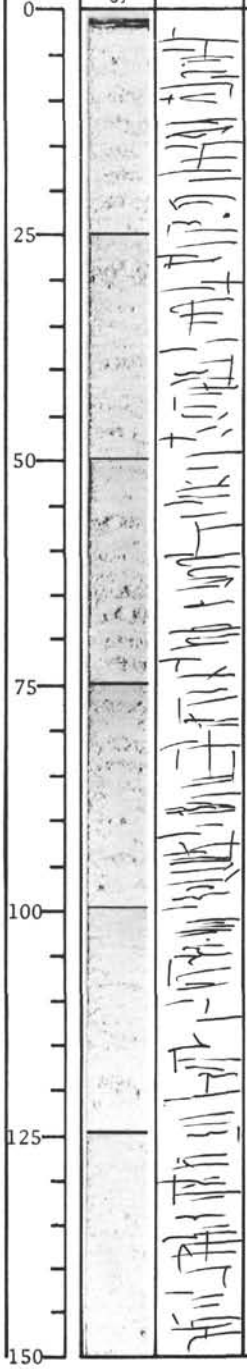
NANNOFOSSIL CHALK

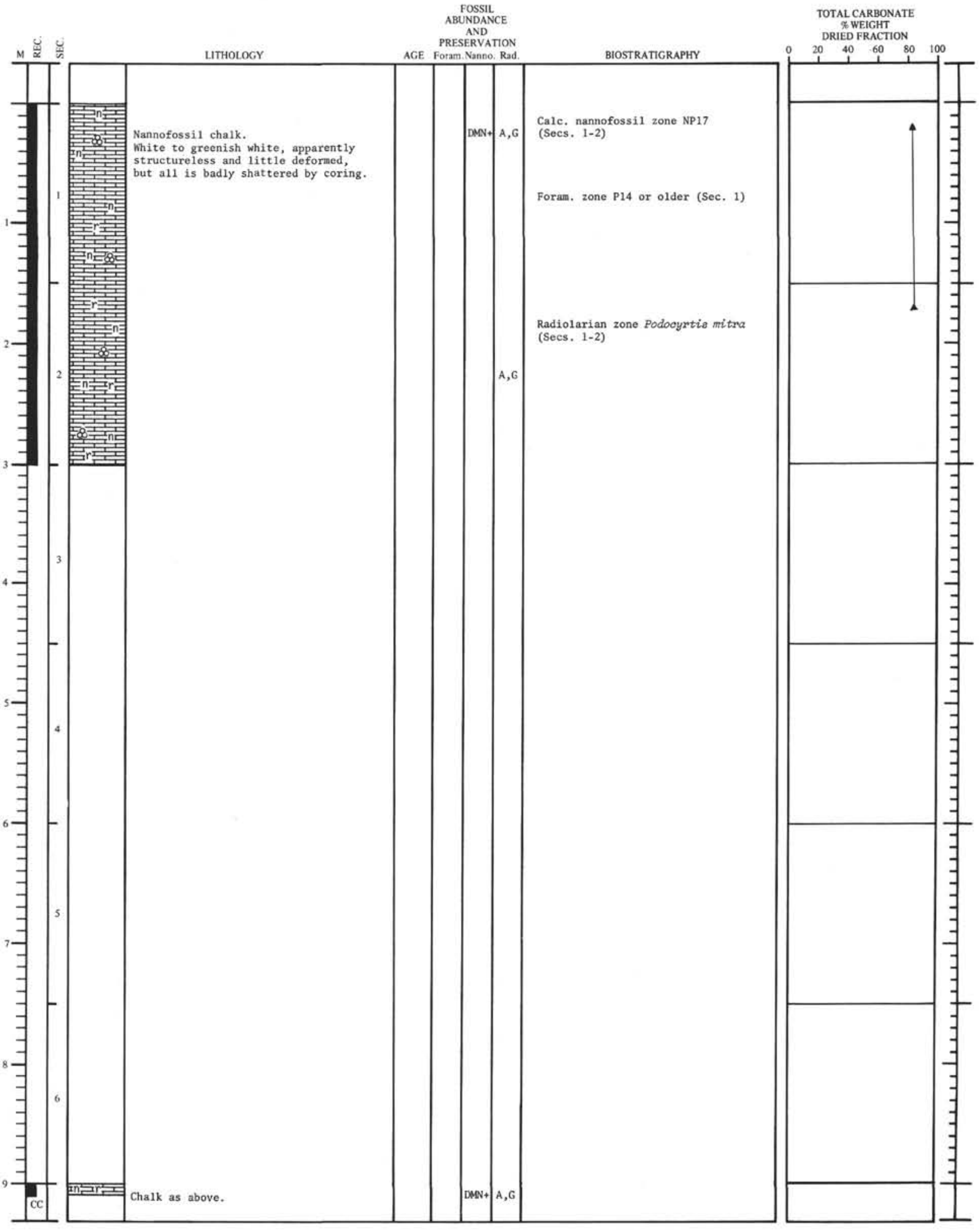
Very light gray (N8) chalk, shattered by the coring operation, but apparently the fragments are still in correct stratigraphic order.

At 21cm, a 2mm thick bed of greenish gray 5G6/1.

Purplish gray (5P5/2) mottle at 110cm.

Hole 64.1 Core 9
Section 3

Centimeters from Top of Section	Section Photograph	Graphic Representation	Smear Slides (*)	Deformed Areas	Description
					NANNOFOSSIL CHALK ◄ 1 A purplish black 5P2/1 mottle at 22cm. Very light gray (N8) to white (N9) chalk, shattered by the coring operations, but apparently the fragments are still in correct stratigraphic order.



Nannofossil chalk.
White to greenish white, apparently structureless and little deformed, but all is badly shattered by coring.

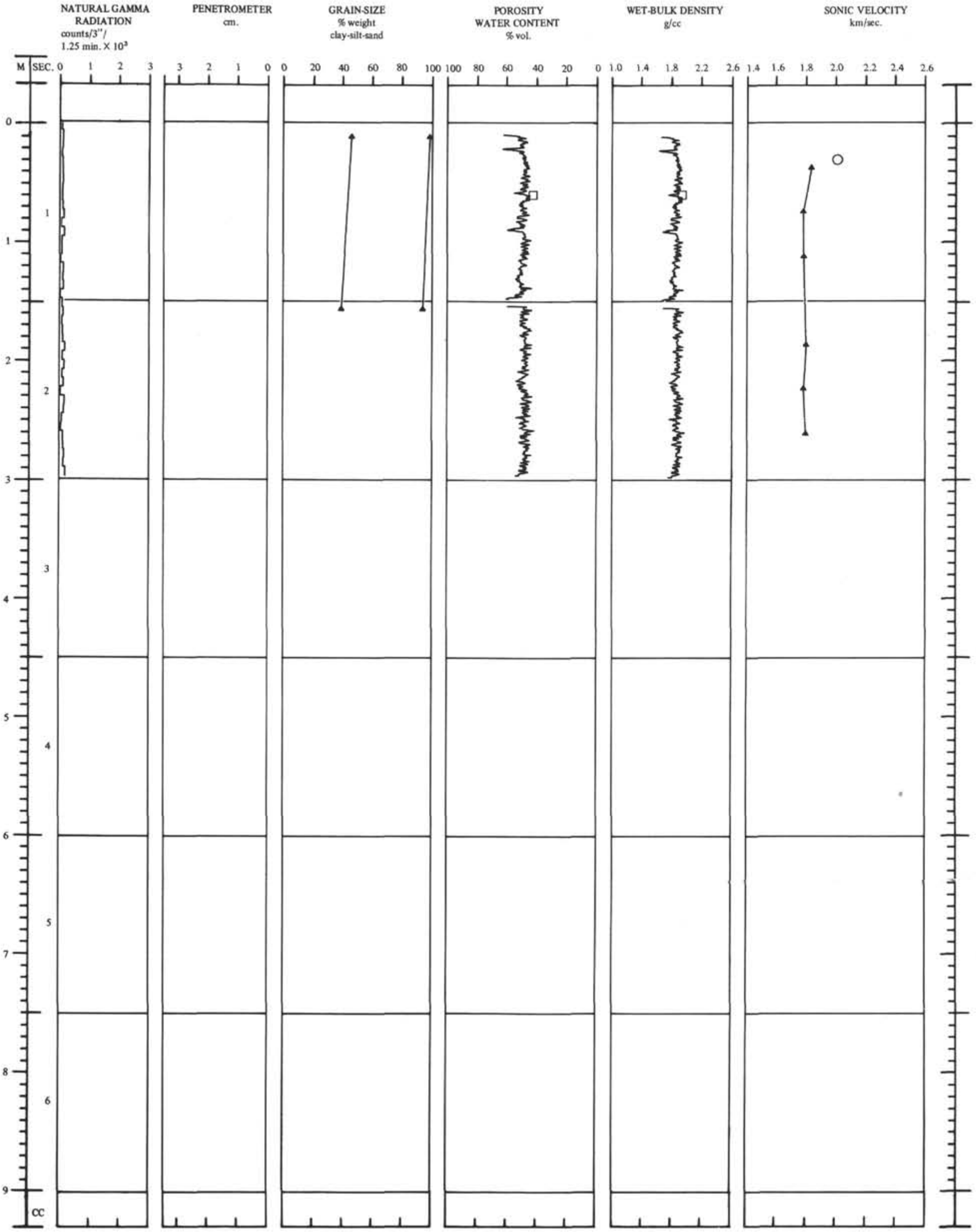
Chalk as above.

Calc. nannofossil zone NP17 (Secs. 1-2)

Foram. zone P14 or older (Sec. 1)

Radiolarian zone *Podocyrtis mitra* (Secs. 1-2)

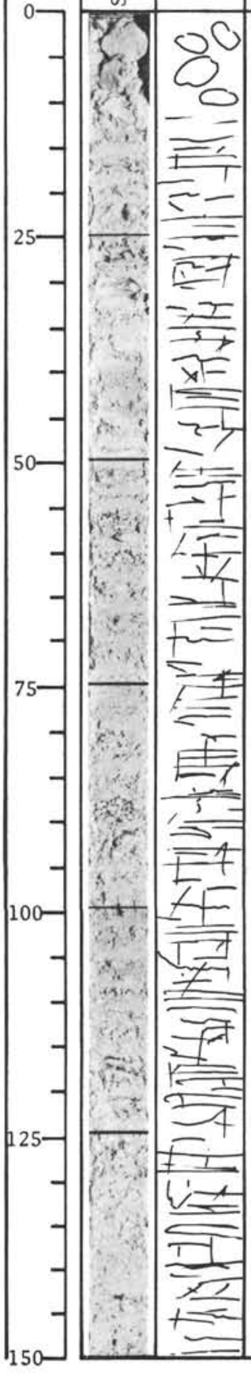
Lithology and biostratigraphy of Core 10, Hole 64.1.



Physical properties of Core 10, Hole 64.1.

Hole 64.1 Core 10
Section 1

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



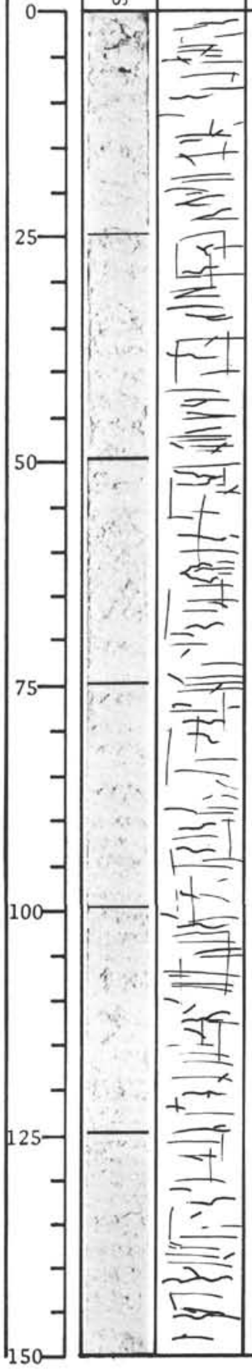
NANNOFOSSIL CHALK

White (N9) to greenish white (5GY9/1) chalk, fractured by coring process, but apparently the fragments are still in their correct stratigraphic order.

(Possible exception: 0-10cm has a few loose fragments of chalk - they probably have tumbled about.)

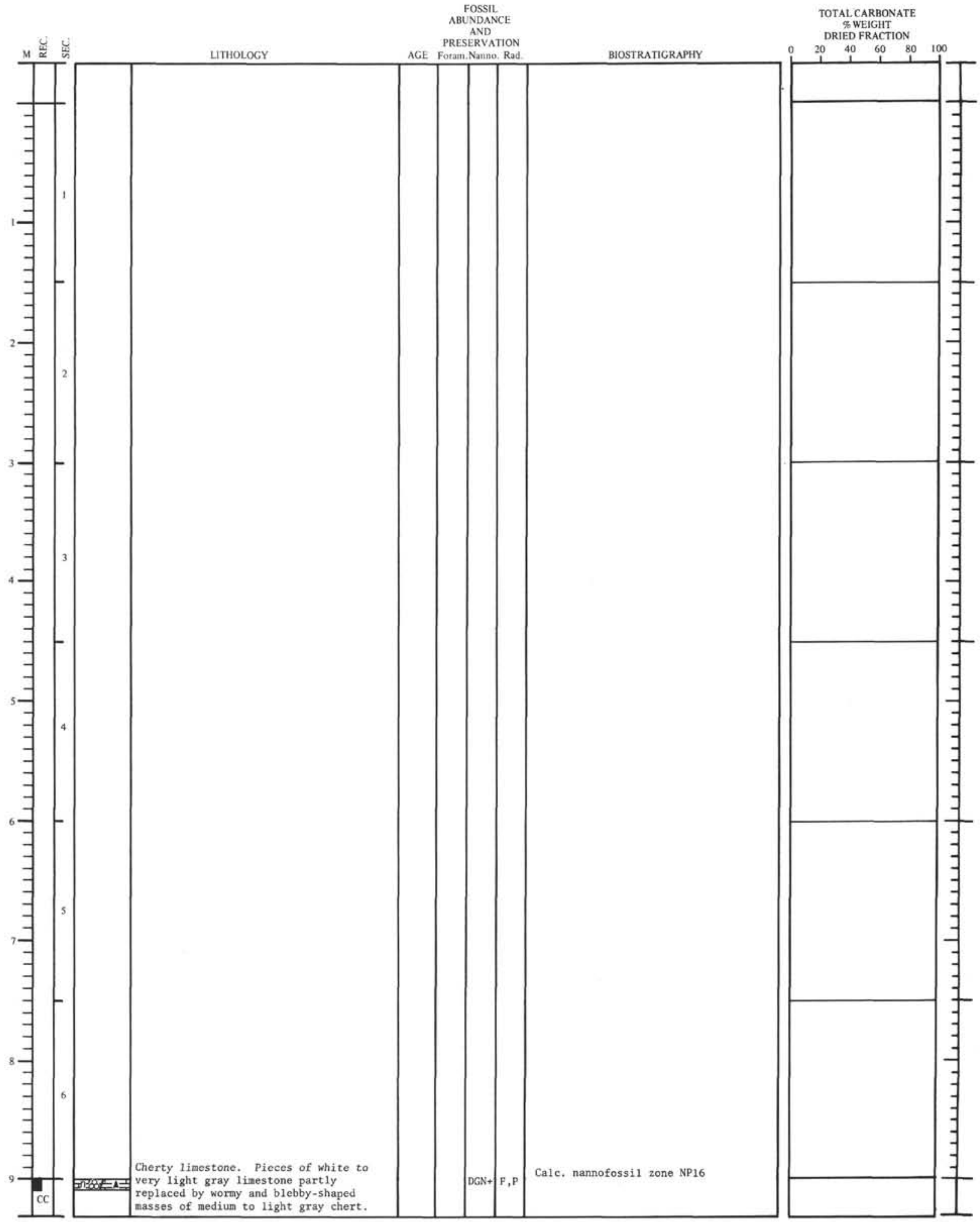
Hole 64.1 Core 10
Section 2

Centimeters from Top of Section | Section Photograph | Graphic Representation | Smear Slides (*) | Deformed Areas | Description



NANNOFOSSIL CHALK

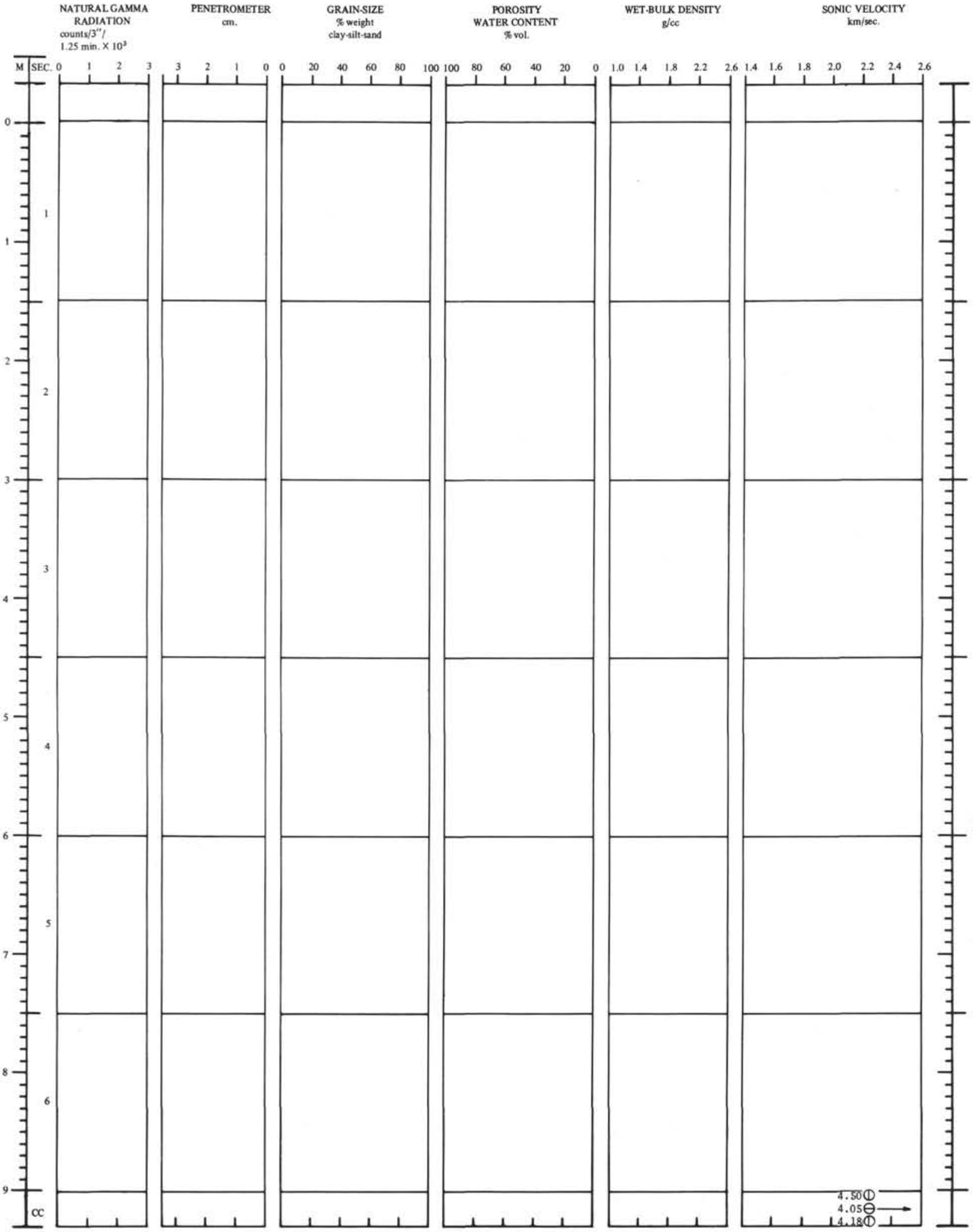
White (N9) to very light gray (N8) and greenish white (5GY9/1 chalk, fractured by coring process, but apparently the fragments are still in their correct stratigraphic order.



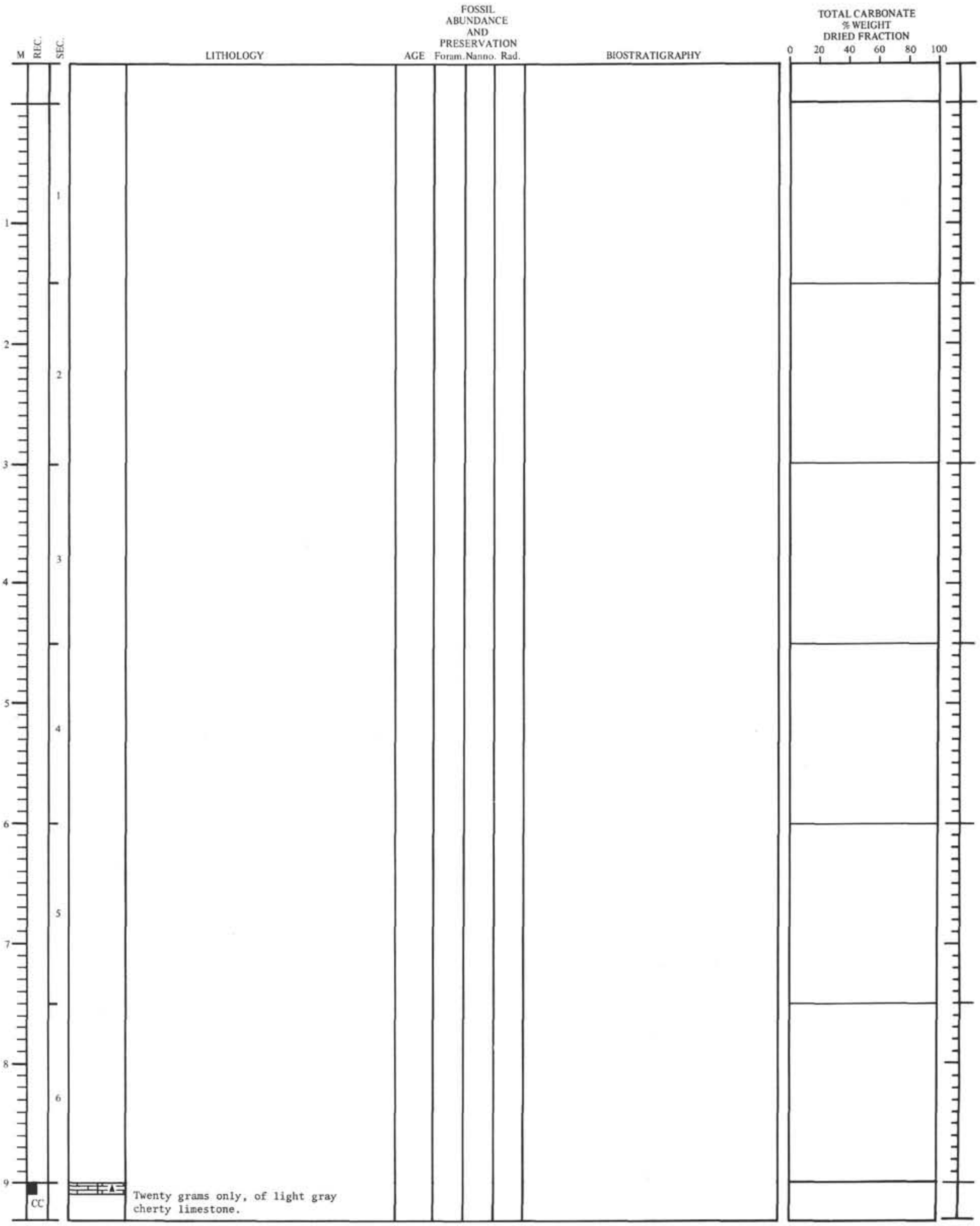
Cherty limestone. Pieces of white to very light gray limestone partly replaced by wormy and blebby-shaped masses of medium to light gray chert.

Calc. nannofossil zone NP16

Lithology and biostratigraphy of Core 11, Hole 64.1.



Physical properties of Core 11, Hole 64.1.



Twenty grams only, of light gray cherty limestone.

Lithology and biostratigraphy of Core 12, Hole 64.1.