14. SITE 56

Shipboard Scientific Party[1]

SITE DATA

Occupied: July 23-25, 1969.

Position: Caroline Ridge: Latitude: 8°22.4′N.
Longitude: 143°33.6′E.

Water Depth: 2508 meters.

Hole 56.0: No cores (lost beacon).

Hole 56.1: No cores (lost beacon).

Hole 56.2: Ten cores.

Total Depth: 270 meters, having penetrated upper Oligocene sediments and come to rest on very hard rock (the opaque reflector).

MAIN RESULTS

A Neogene section was cored much like that at Site 55, and below this an upper Oligocene sequence of chalks, which rests on the opaque seismic unit; the bit failed to cut this.

BACKGROUND

Background and objectives of Site 56 (Figure 1, see also Chapter 13, Figure 2) were the same as those at Site 55 from which the ship had been driven by the birth of typhoon Viola.

Bottom soundings in the area of Site 56 are given as Figure 2.

OPERATIONS

During the storm *Glomar Challenger* steamed slowly eastward and then northward, profiling. When seas and wind had moderated sufficiently, in the afternoon of July 23, a new site was chosen some 90 miles to the southeast of Site 55. The first beacon failed during its soaking period, and a second beacon was dropped at 2000 hours. Hole 56.0 was spudded, but reception of beacon signals became erratic forcing the pipe to be pulled up. The ship drifted and came into the beam of the beacon, which was evidently strongly tilted by a bottom current. A second hole was spudded, and had to be abandoned in turn for the same reason. A third hole, Hole 56.2, was started when the beam was picked up strongly after further drift, and here reception of the beacon continued satisfactorily.

Ten cores had been cut when hard rock, which would not yield to the bit, was encountered at 270 meters. Thus, the lightly set diamond bit which had cut basalt in Site 54 was retrieved in worn condition.

The second try on the Caroline Ridge had failed to meet the main objective. There was now a question of drilling yet another hole at this site with a fresh bit, or of moving off to another site with an investment of only a little more time and a new beacon. The second alternative was chosen, in order to gain more all-around information. Site 56 was abandoned at 0830 hours, July 25.

NATURE OF THE SEDIMENTS

After two beacon failures, eleven cores were attempted in Hole 56.2 between 73.2 and 233.5 meters below mudline; of these, the first ten were successful, but Core 11 had no recovery. The upper part of the sediment cored is white nannoplankton-foraminiferal chalk ooze (Core 1 through 5, top part of Core 6). This changes downward to pale brown to white nannoplankton-foraminiferal chalk ooze that contains volcanic glass, and thin layers of volcanic ash (bottom of Core 6, Cores 7, 8 and 9, top of Core 10). This in turn is underlain by very coherent, pale brown to white, silty foraminiferal-marl ooze with thin interlayers of volcanic ash (bottom of Core 10).

The nannoplankton-foraminiferal ooze of Cores 1 through 5 has dominant to abundant nannoplankton, particularly large, well-preserved discoasters. Planktonic foraminifera are common to abundant, and radiolarian tests, sponge spicules, clay minerals and volcanic glass are present in variable, generally small amounts. Also present are small amounts of anhedral calcite that may be finely abraded skeletal matter or authigenic calcite. Fragments of echinoderms are locally abundant in Section 6 of Core 2. Cores 1 and 2 contain ooze with an unusual "brilliant" white color that is whiter than anything on the standard color charts. All of the interval

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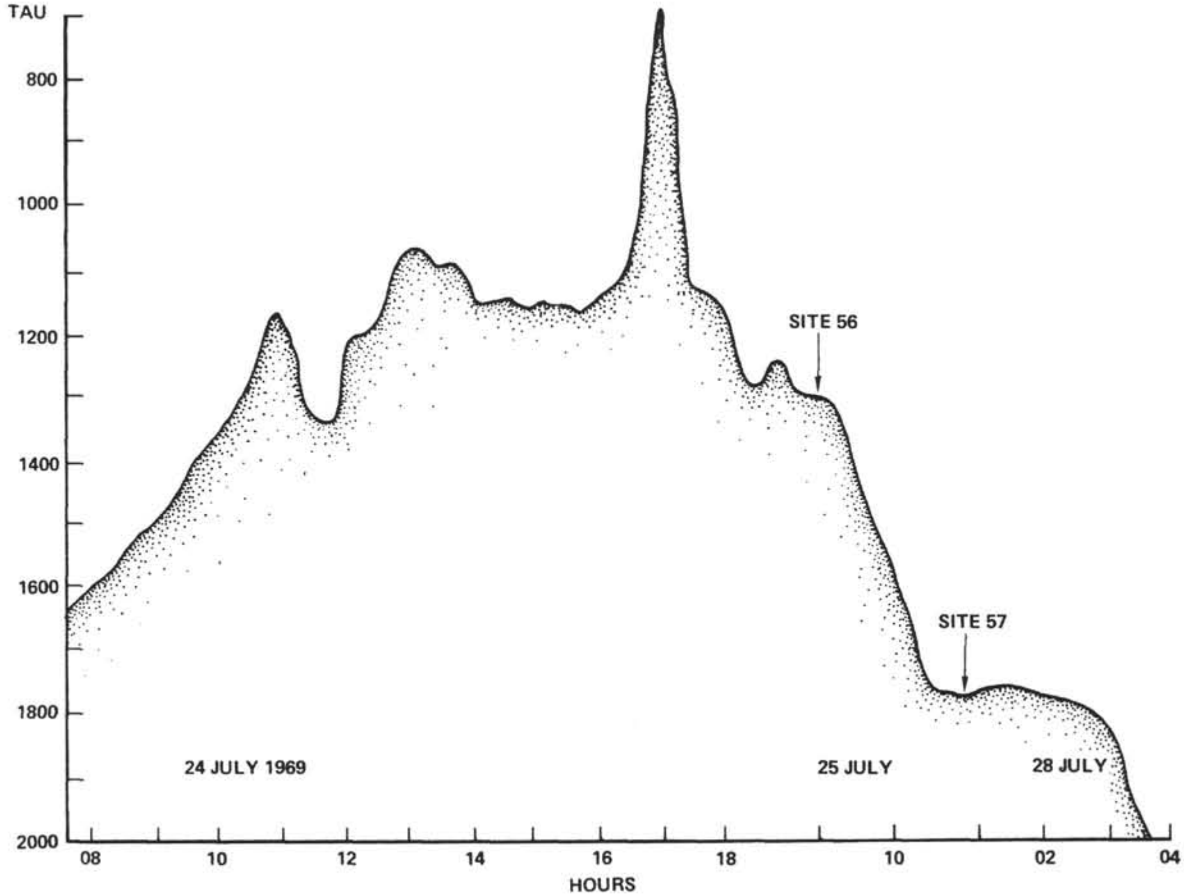

Figure 1. Challenger *bathymetric profile at Site 56.*

of Cores 1 through 5 has alternating layers of firm and very soft ooze; the firm layers are around 40 to 60 centimeters thick, the soft ones 10 to 15 centimeters. While this alternation may reflect real differences in cohesion, it may be only a drilling phenomenon.

The top six meters of Core 6 are mottled, white nannoplankton-foraminiferal chalk ooze, much like that described above except that discoasters are somewhat less abundant. Beginning at about 6.0 to 6.5 meters below the top of Core 6 is a color change to pale brown or brown nannoplankton-foraminiferal chalk ooze. Accompanying this color change is the appearance of 5 to 10 per cent of pale brown volcanic glass and altered glass. The lower 1.5 meters of Core 6 also contains thin layers of calcareous, sandy volcanic ash with fresh and altered glass, and up to 4 per cent of anhedral calcite that is either authigenic or finely abraded skeletal material, or a combination of both. The planktonic foraminifera in this lower part of Core 6 are typically much larger than in the ooze above.

Cores 7 through 9 and the top three sections of Core 10 are white to very pale brown nannoplankton-foraminiferal chalk ooze with dominant to abundant nannofossils, common to abundant planktonic foraminifera, and small amounts of sponge spicules and Radiolaria. Volcanic glass shards are abundant to absent; clay minerals, feldspar, and opaque iron oxides (?) are rare to common; anhedral calcite of authigenic or skeletal origin is rare to common. This interval also contains scattered pebbles of pumice and lumps of friable, calcareously cemented sediment that appears to be fine-grained altered glass.

Sections 4 to 6 of Core 10 are pale brown to gray, silty foraminiferal marl ooze with thin, dark gray interlayers of volcanic ash. The marl ooze has abundant large planktonic foraminifera; common to abundant volcanic glass that is partly unaltered brown glass and partly weakly birefringent altered glass; common anhedral calcite; and small amounts of Radiolaria, sponge spicules, and nannofossils. Many nannofossils in this interval have overgrowths of secondary calcite. Most of the sediment is very coherent and some intervals appear to be slightly cemented with calcite. The dark gray volcanic ash layers within this interval contain abundant large planktonic foraminifera and a mixture of black, reddish-brown, and brown to pale brown glass that is often vesicular.

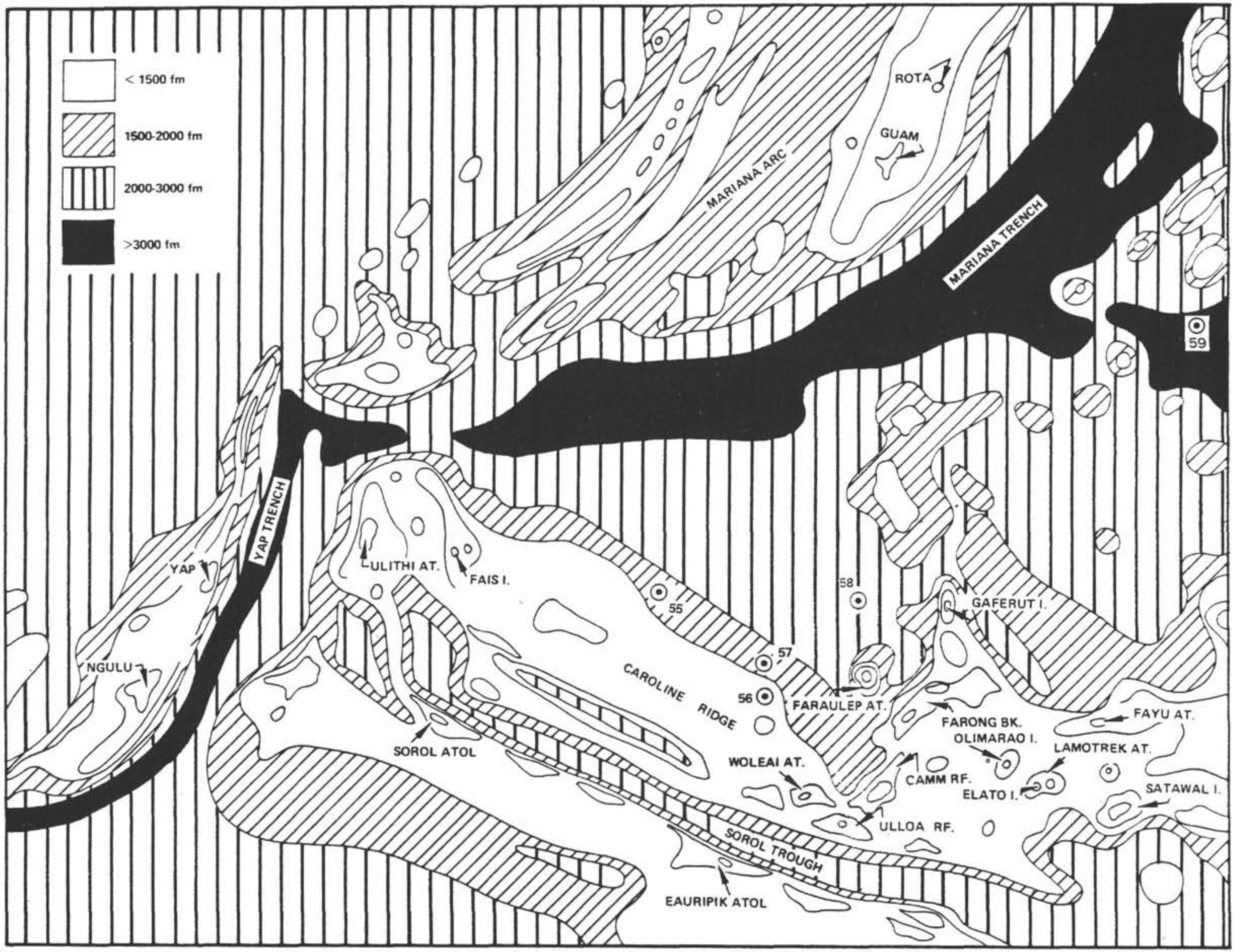

Figure 2. *Bottom soundings in area of Site 56.*

TABLE 1
Summary of Coring at Site 56

Core No.	Interval Cored (below mudline) (ft)	(m)	Recovery (ft)	(m)
56.2-1	240-270	73.2-82.2	30	9.1
56.2-2	270-300	82.2-91.4	30	9.1
56.2-3	300-330	91.4-100.6	30	9.1
56.2-4	330-360	100.6-109.7	30	9.1
56.2-5	360-390	109.7-118.9	30	9.1
56.2-6	613-643	186.8-196.0	30	9.1
56.2-7	643-673	196.0-205.1	30	9.1
56.2-8	673-703	205.1-214.3	21	6.4
56.2-9	703-733	214.3-223.4	30	9.1
56.2-10	733-766	223.4-233.5	28	8.5

Water Depth: 2507.9 meters (8228 feet)

PHYSICAL PROPERTIES

These measurements were taken on disturbed core samples and thus do not necessarily represent *in situ* conditions.

Natural Gamma Radiation

Natural gamma radiation from Miocene white nannoplankton-foraminiferal chalk ooze (73 to 193 meters), Oligocene pale brown to white nannoplankton ooze (193 to 230 meters), and Oligocene brown to white foraminiferal sand (230 to 234 meters) from Hole 56.2 was very low, showing only a slight increase near the bottom of the hole. From 73 to 214 meters, natural gamma radiation ranged from 0 to 250 counts with an average of 50 to 100 counts/7.6-cm core segment/1.25 minutes. Sediments from 214 to 233 meters had increasing gamma emissions with increasing depth, and averaged 300 counts to a core with a range from 100 to 600 counts. This increase in natural gamma radiation is attributed to the presence of volcanic glass in the chalk ooze, and thin volcanic ash interbeds in this part of the section.

Porosity, Wet-Bulk Density, and Water Content

Hole 56.2 penetrated Miocene to Oligocene foraminiferal nannoplankton and foraminiferal-nannoplankton chalk ooze, between 73 and 233 meters below the sediment surface. Porosities ranged from 45 to 85 per cent and wet-bulk densities from 1.25 to 1.84 g/cc. Water content ranged from 32 to 46 per cent with an average of 35 per cent. Porosity varied irregularly with increasing depth in the hole.

Sound Velocity

Miocene-Oligocene foraminiferal-nannoplankton chalk oozes were cored at 73 to 233 meters below mudline in Hole 56.2. Sediment sound velocities ranged from 1.51 to 1.83 km/sec, and averaged 1.61 km/sec. There was an irregular increase in velocity toward the bottom of the hole. From 73 to 196 meters core averaged sediment velocities ranged from 1.55 to 1.62 km/sec. Oligocene chalk ooze containing up to 20 per cent volcanic ash in places in Cores 7 and 9 (196 to 206 and 214 to 223 meters, respectively) had a higher average velocity of 1.65 km/sec. Core 8 (205 to 214 meters), however, contained only 0 to 3 per cent volcanic ash and had a lower velocity of 1.62 km/sec. Core 10 (224 to 233 meters) comprised chalk ooze of coarser grain size, because of greater amounts of foraminifera. It also contained about 5 to 15 per cent volcanic glass in addition to thin interbeds of ash with as much as 50 per cent volcanic glass. The average velocity for Core 10 was 1.72 km/sec; but, velocities as high as 1.83 km/sec were recorded in the ash beds, and as low as 1.65 km/sec in the chalk ooze. Increased velocity averages in Oligocene relative to the Miocene sediments did not appear to be purely associated with porosity-density changes, thus an increase in rigidity may have occurred via cementation or composition. The high sound velocities in Core 10 correlated with the low penetrometer values recorded for the same core.

Thermal Conductivity

One section of each of the ten cores of Miocene-Oligocene foraminiferal-nannoplankton oozes recovered from Hole 56.2 (73 to 234 meters) was measured for thermal conductivity. Results obtained ranged from 2.34 to 3.35×10^{-3} with an average for the hole of 2.83×10^{-3} cal-$°C^{-1}$ cm^{-1} sec^{-1}. There was no consistent variation in thermal conductivity with depth.

Penetrometer

Needle penetration into Miocene to Oligocene foraminiferal-nannoplankton oozes (73 to 234 meters) from this hole ranged from 4 to 207×10^{-1} millimeters. In a few places the penetrometer needle completely penetrated the sediment, but at these points the sediments may have been badly disturbed during coring. Penetrometer variations appeared to mainly relate to lithology, such as low penetration where volcanic ash was common. Core 10 (223 to 233 meters) had very low penetrometer readings, which were in part related to the volcanic ash present and possible compaction and cementation. There was an indirect variation between penetration values and sound velocity in Cores 8 to 10.

CONCLUSIONS

The Neogene stratigraphic sequence at Site 56 closely resembles that at Site 55, consisting of nannoplankton-foraminiferal oozes, with evidence of ash falls in the Early Miocene. The lower sequence, which was not penetrated at Site 55, consists of Upper Oligocene nannofossil oozes and chalks with Radiolaria, foraminifera and some ash. Some of the chalks are slightly cemented.

The massive reflector at the base of the sediments was too hard for the worn bit, and thus the main objective was not reached. Another hole could have been drilled at this site, but with no appreciable saving in time over a new location, and so the ship moved to Site 57.

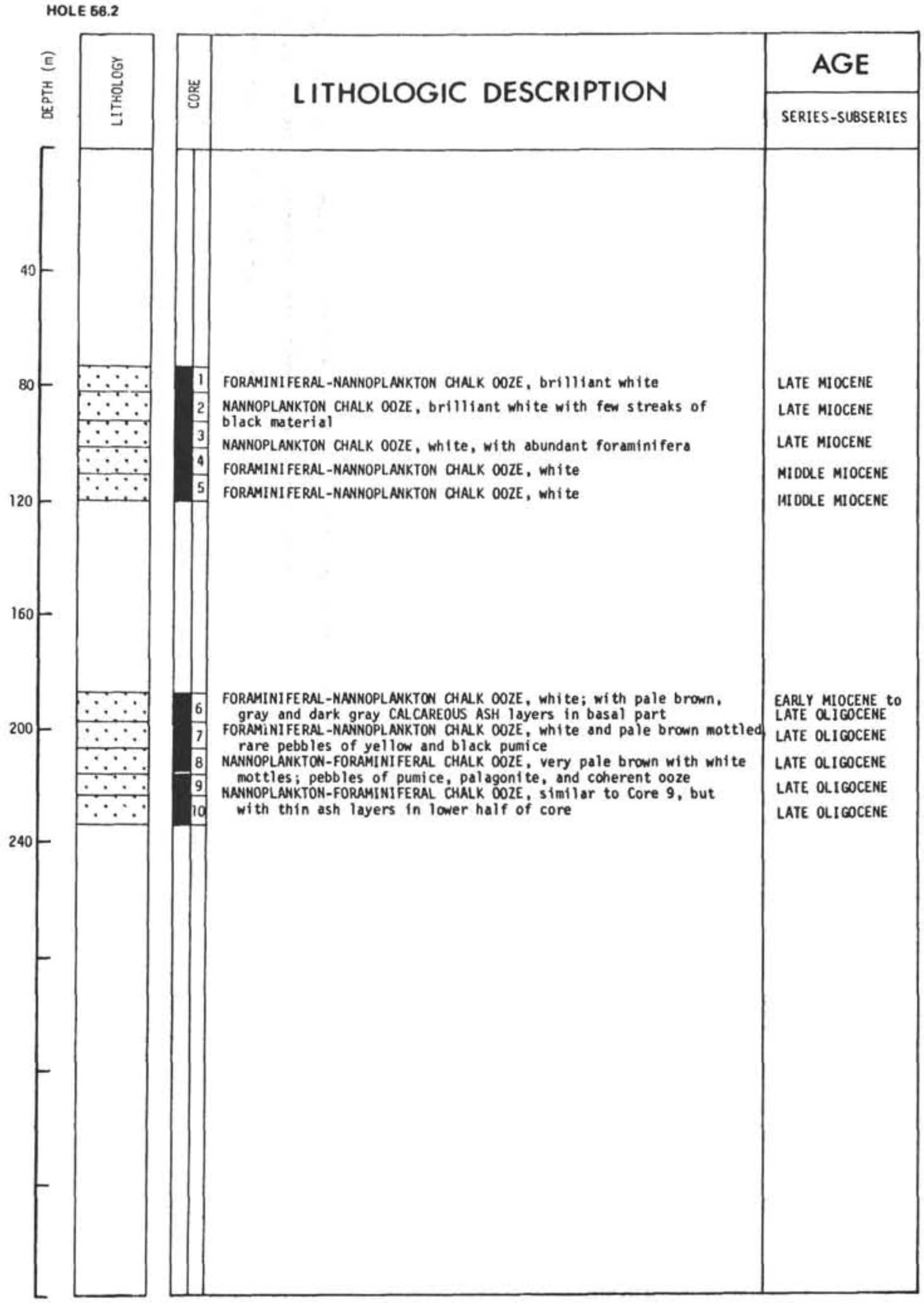

Figure 3. *Summary of lithology in Hole 56.2.*

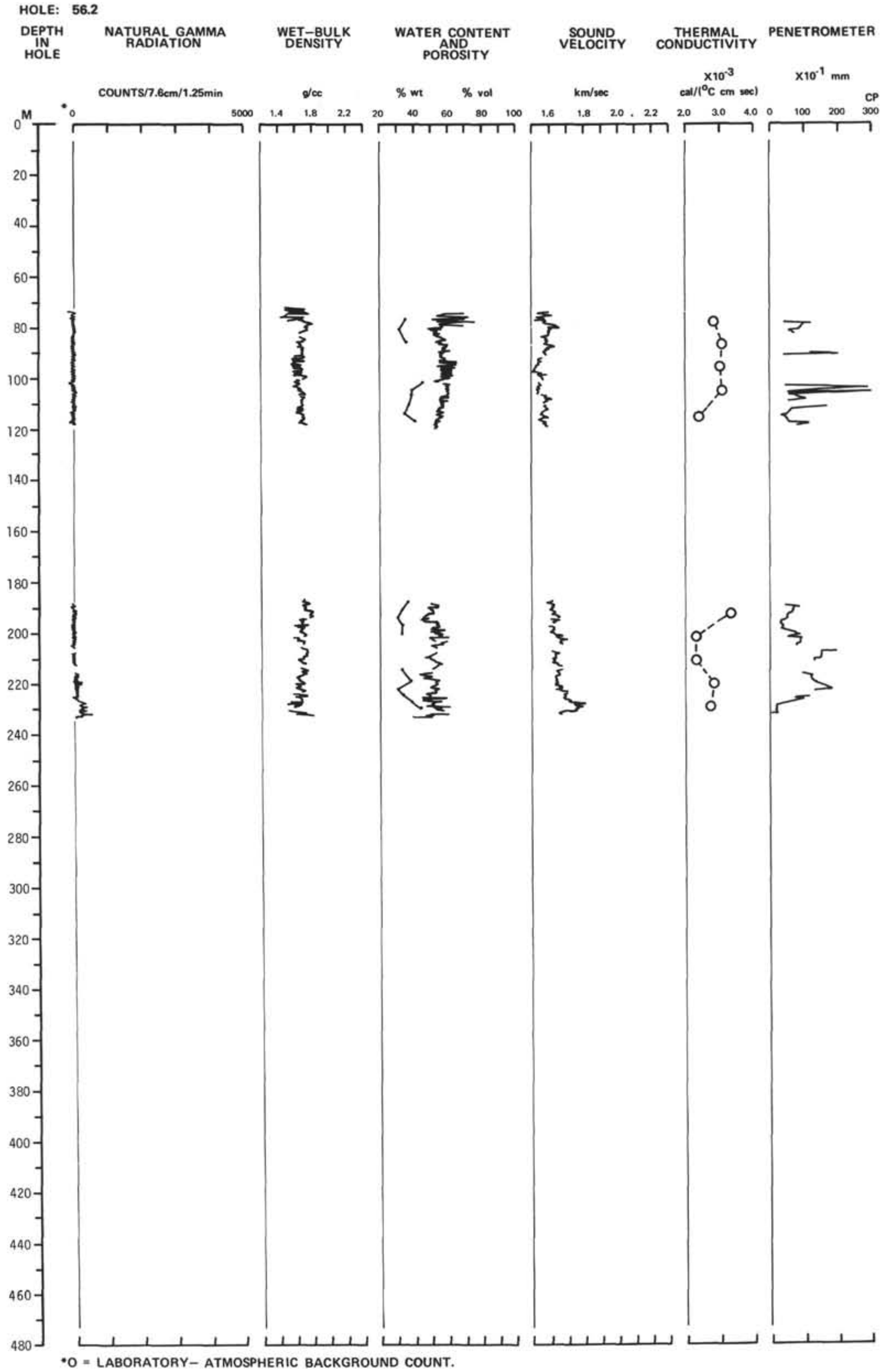

Figure 4. *Summary of physical properties in Hole 56.2.*

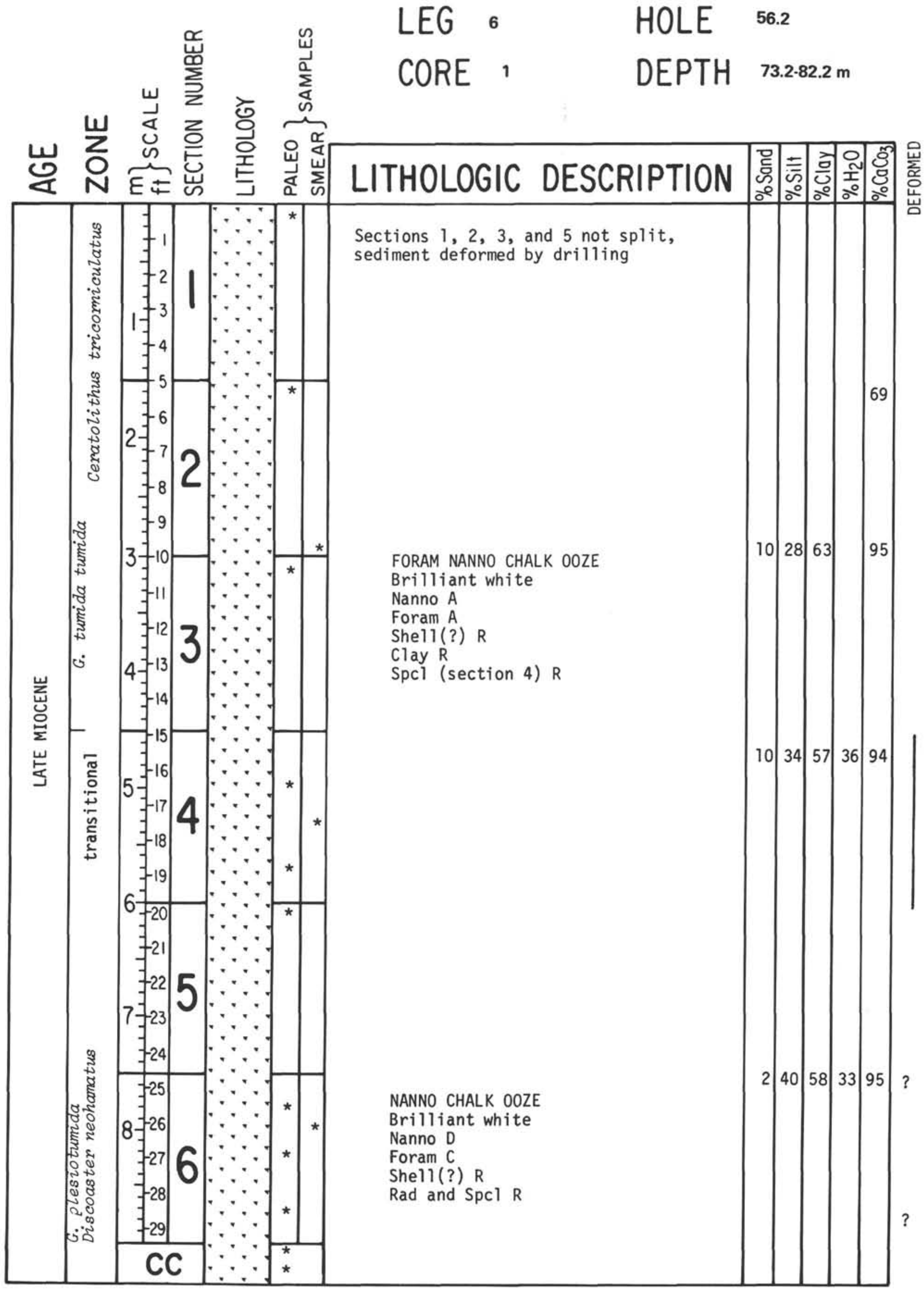

Figure 5. *Summary of lithology in Hole 56.2 Core 1.*

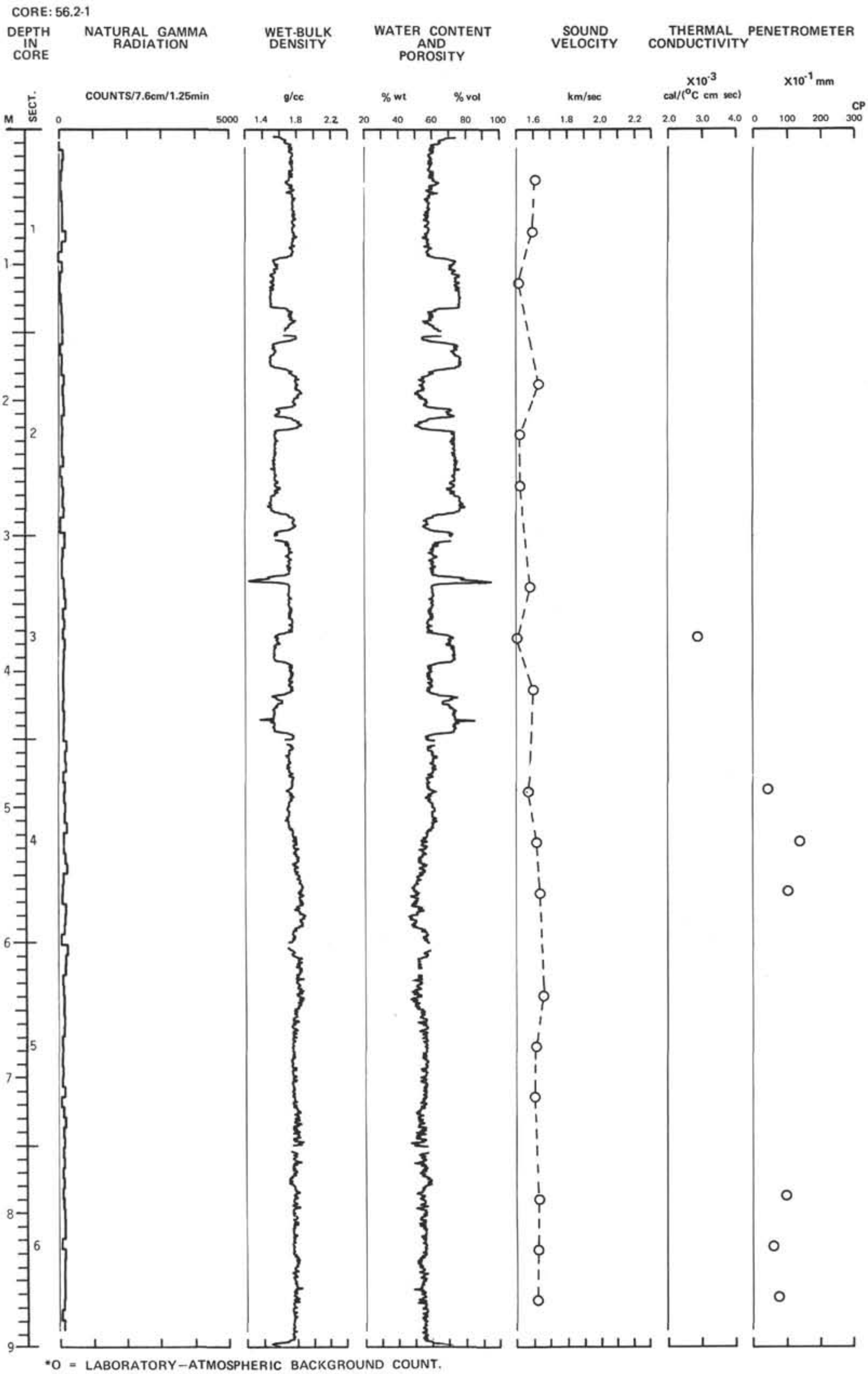

Figure 6. *Summary of physical properties in Hole 56.2 Core 1.*

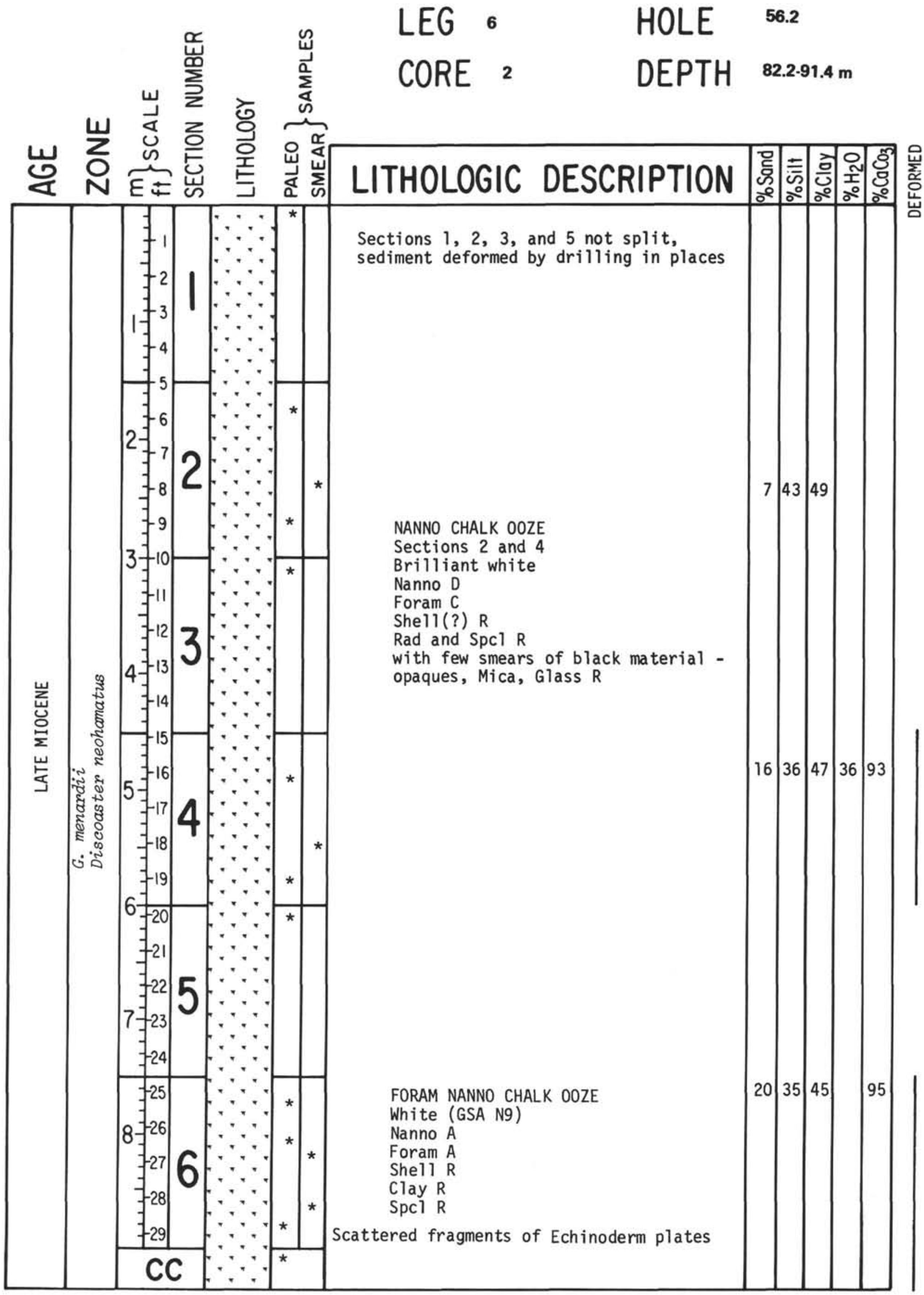

Figure 7. *Summary of lithology in Hole 56.2 Core 2.*

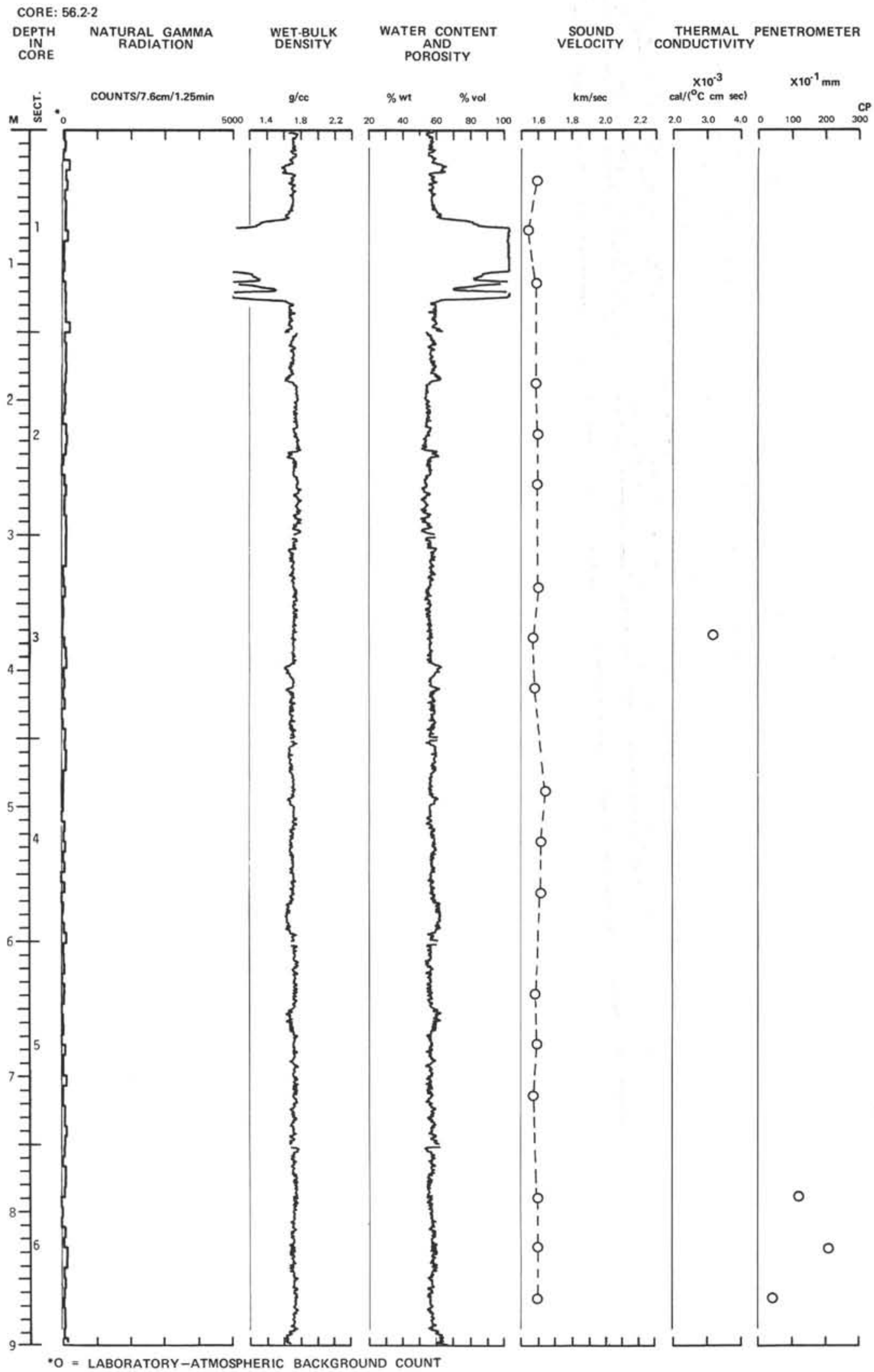

Figure 8. *Summary of physical properties in Hole 56.2 Core 2.*

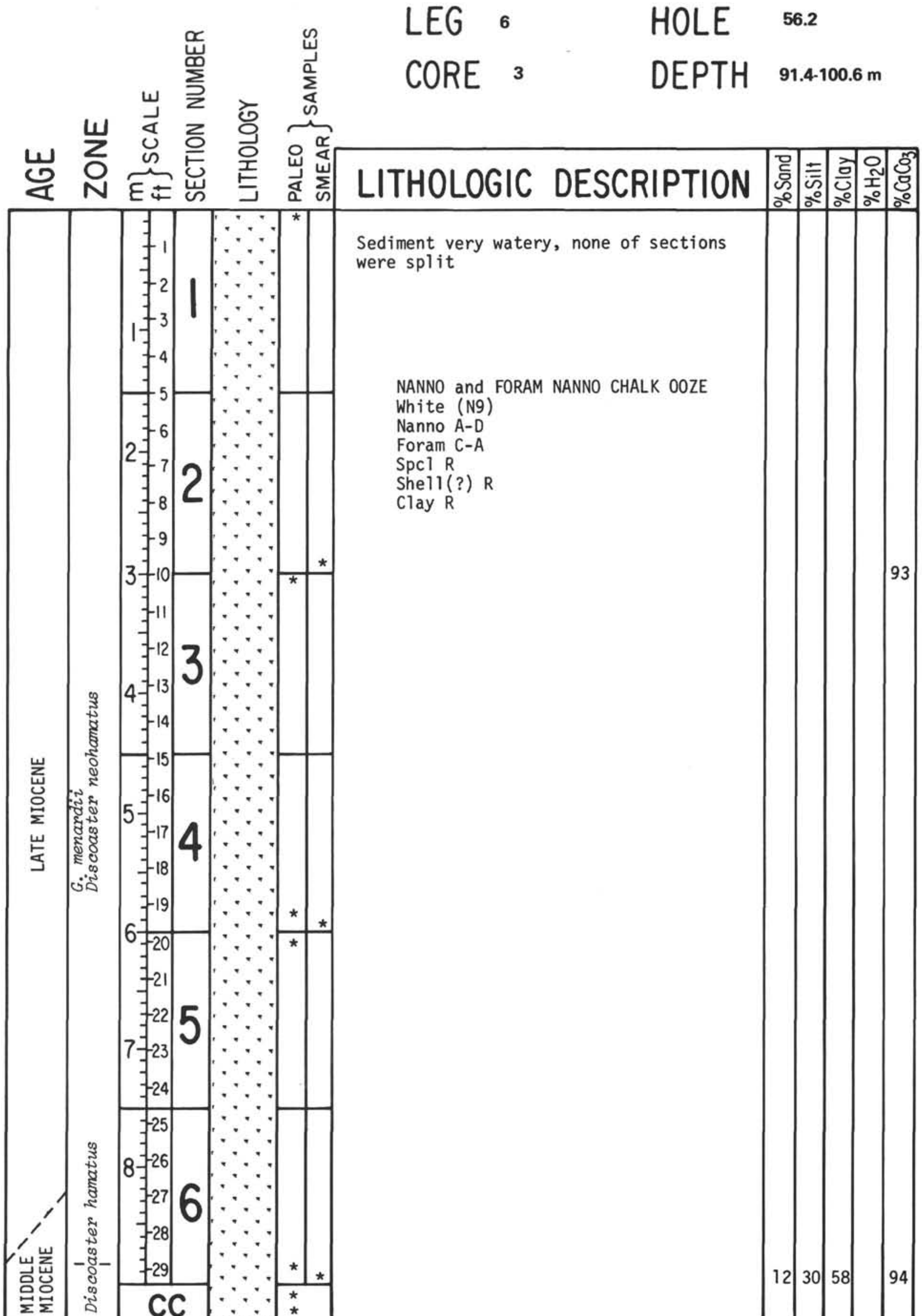

Figure 9. *Summary of lithology in Hole 56.2 Core 3.*

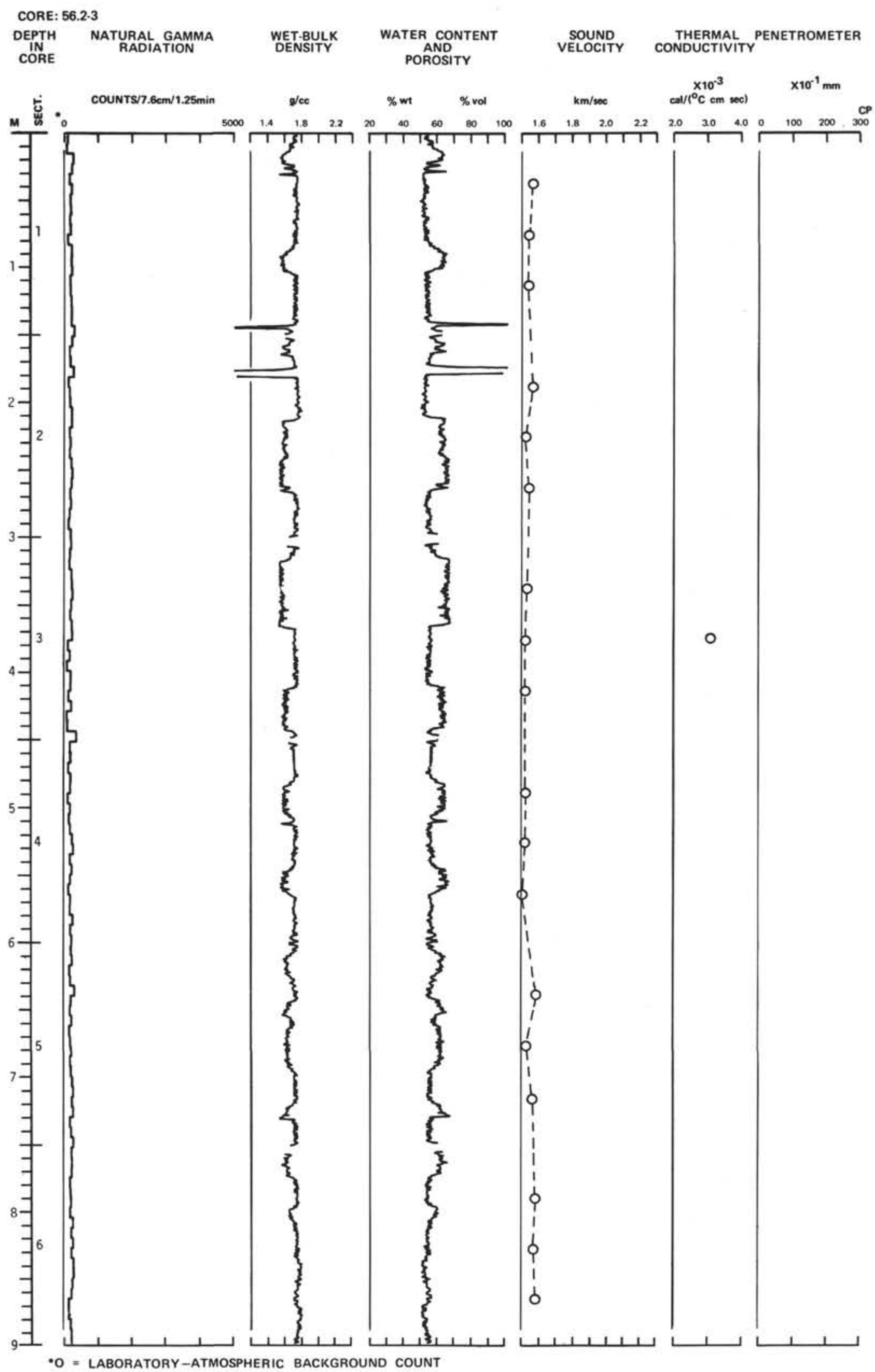

Figure 10. *Summary of physical properties in Hole 56.2 Core 3.*

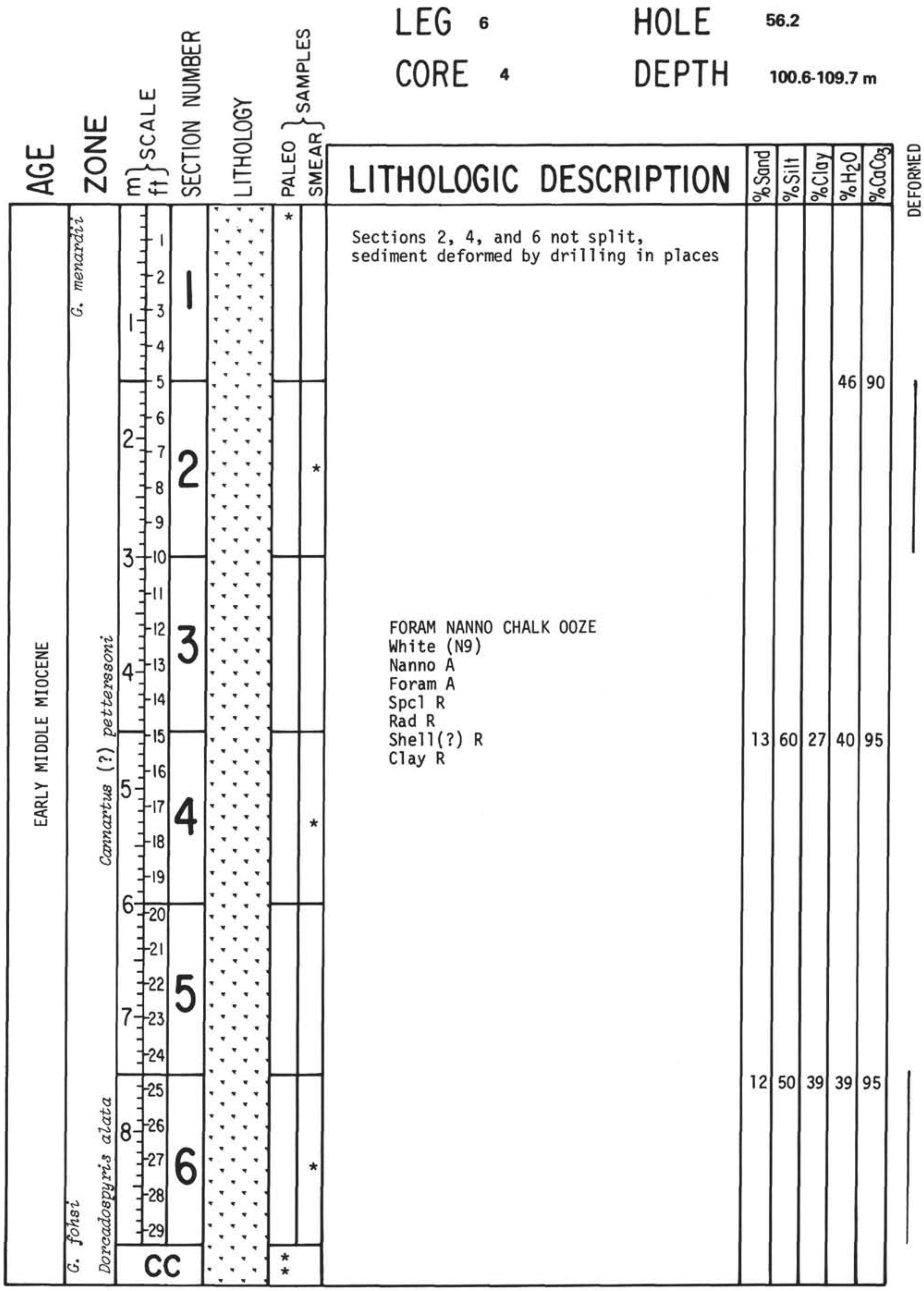

Figure 11. *Summary of lithology in Hole 56.2 Core 4.*

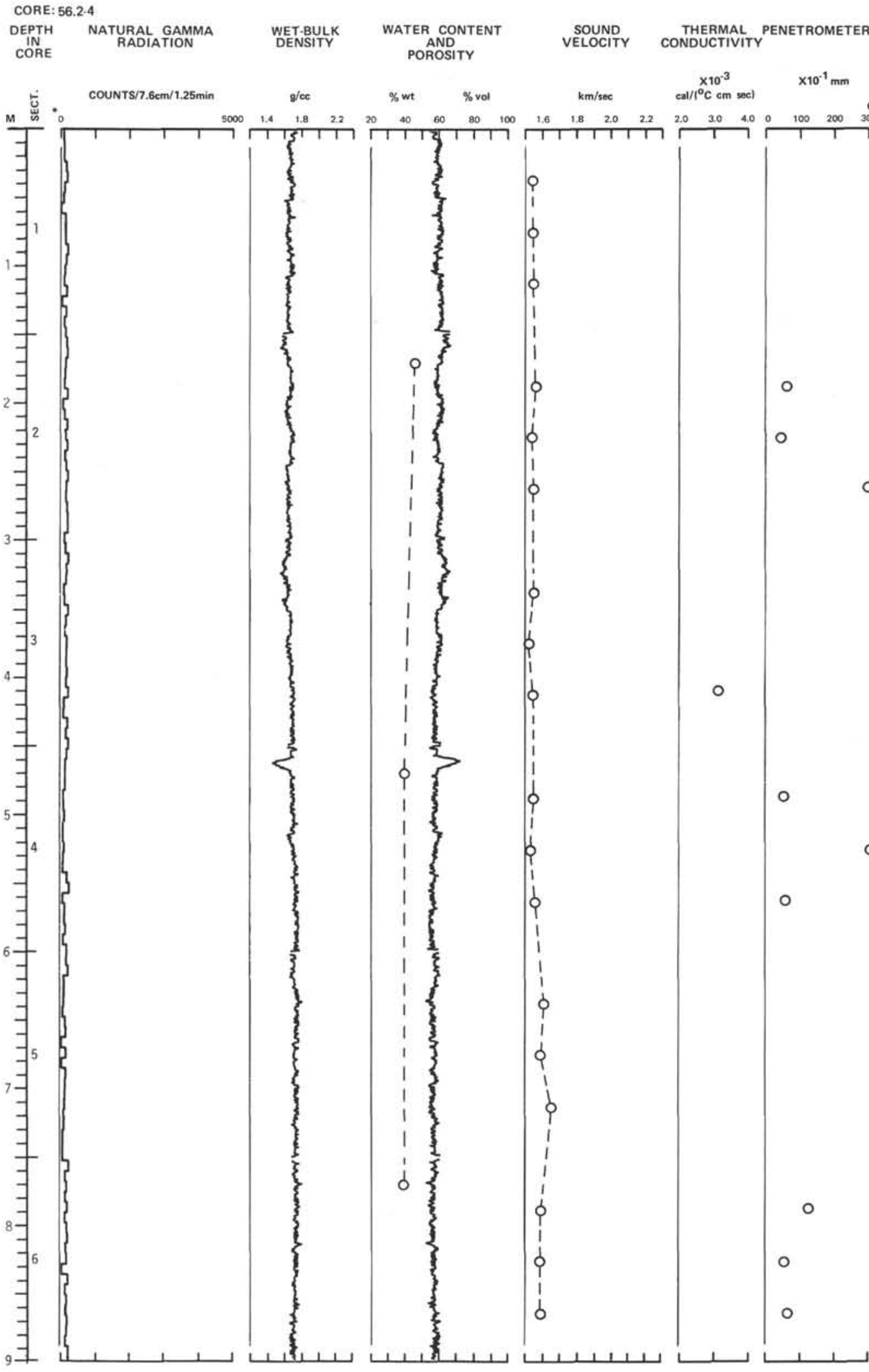

Figure 12. *Summary of physical properties in Hole 56.2 Core 4.*

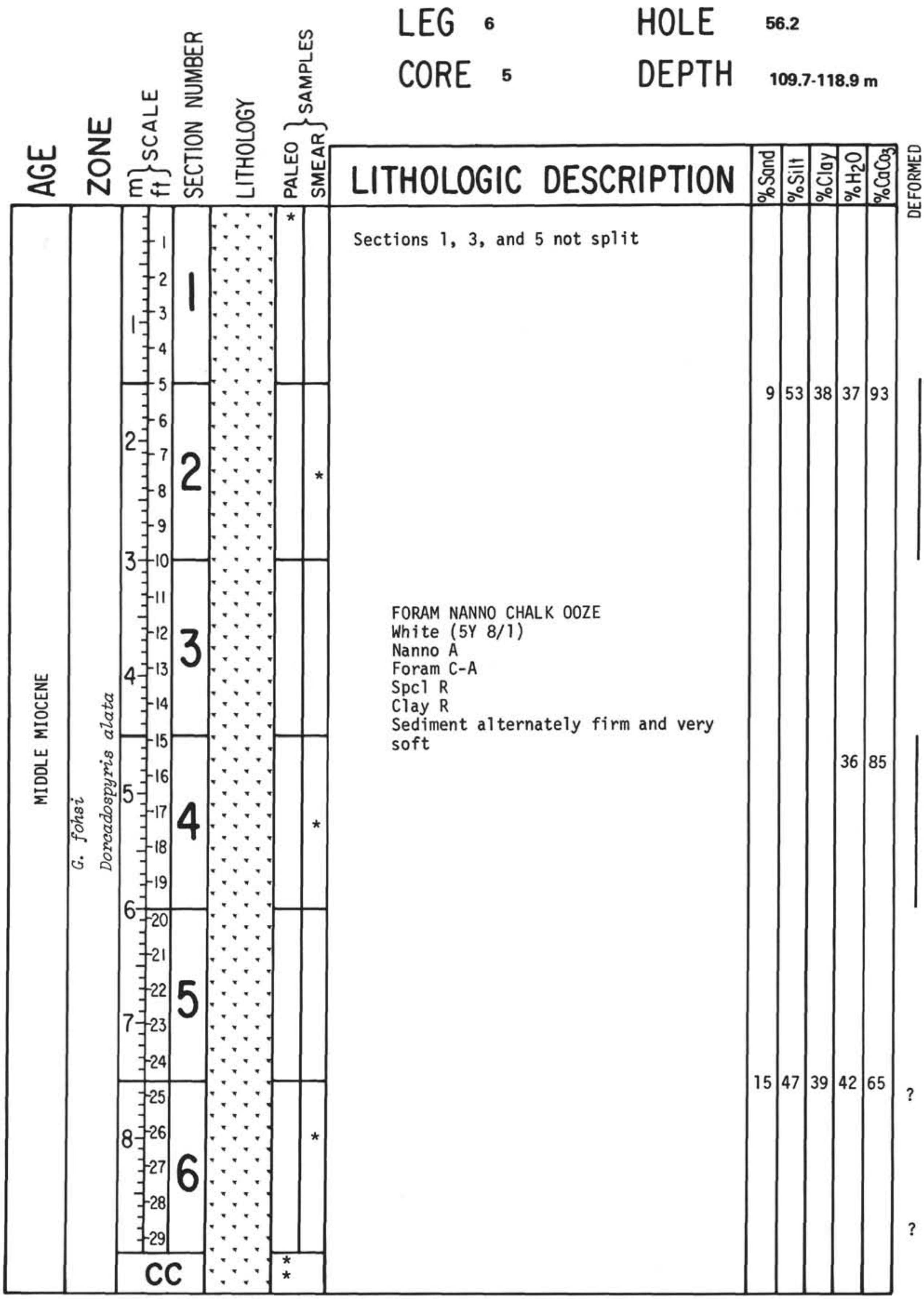

Figure 13. *Summary of lithology in Hole 56.2 Core 5.*

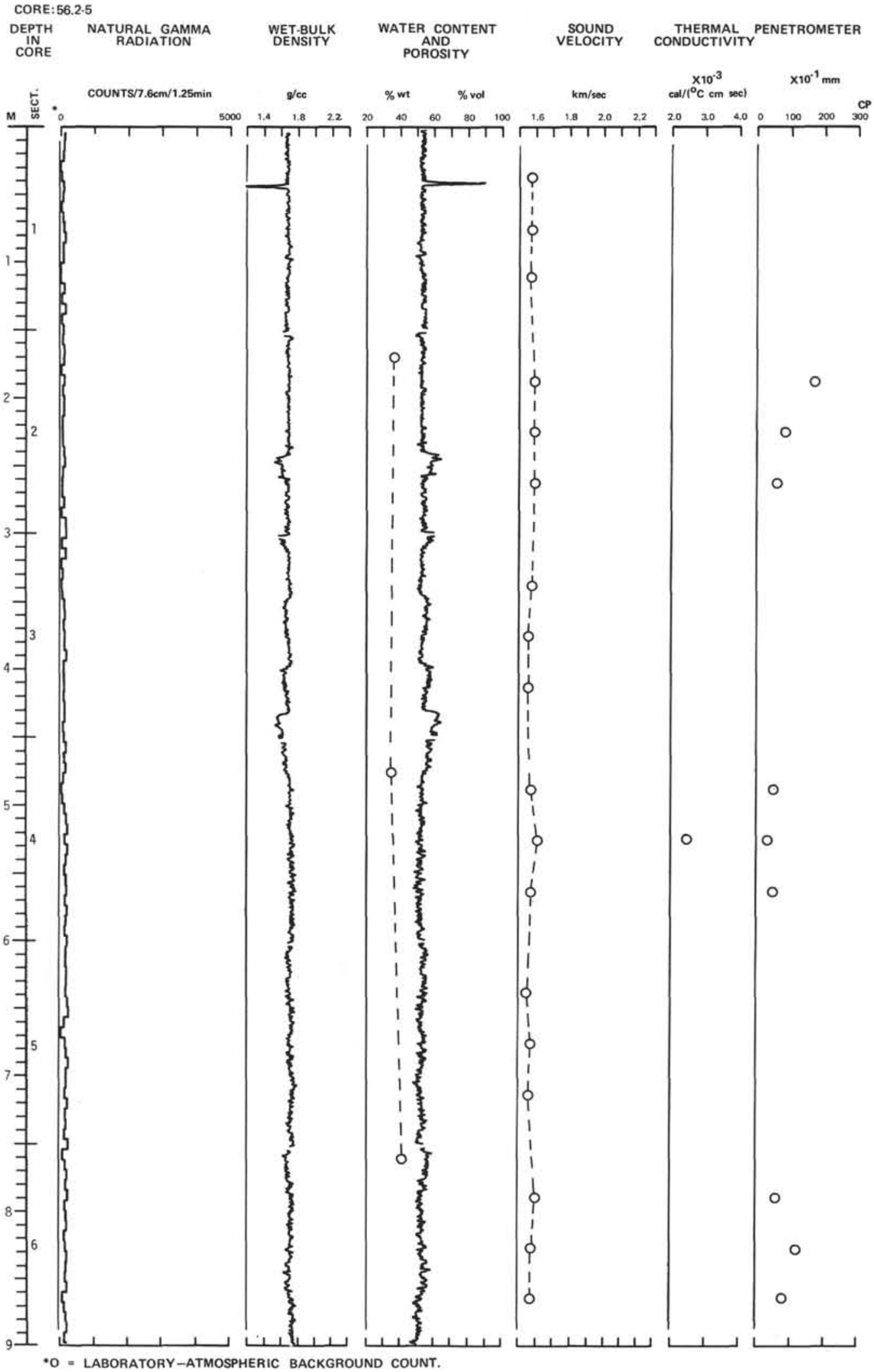

Figure 14. *Summary of physical properties in Hole 56.2 Core 5.*

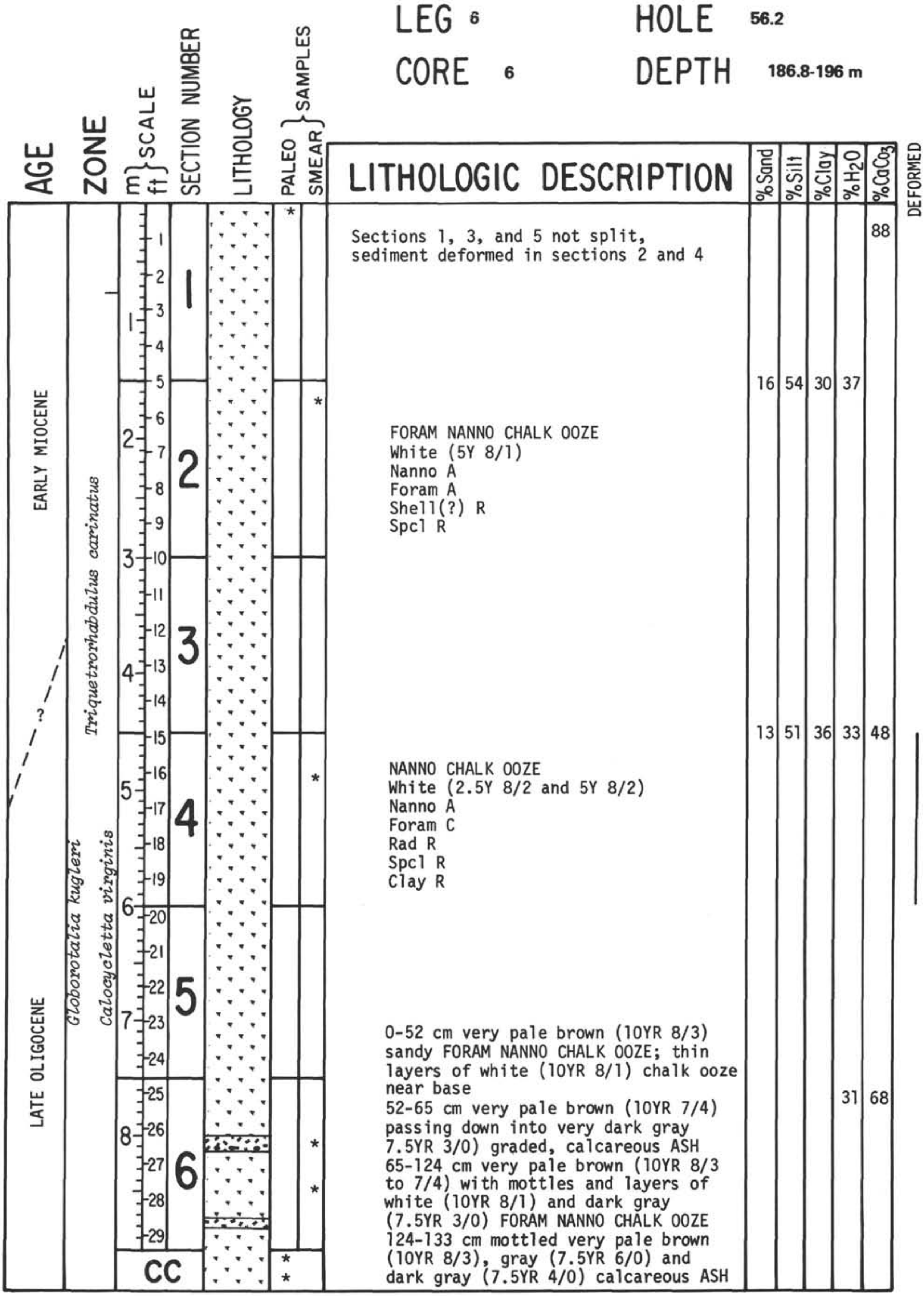

Figure 15. *Summary of lithology in Hole 56.2 Core 6.*

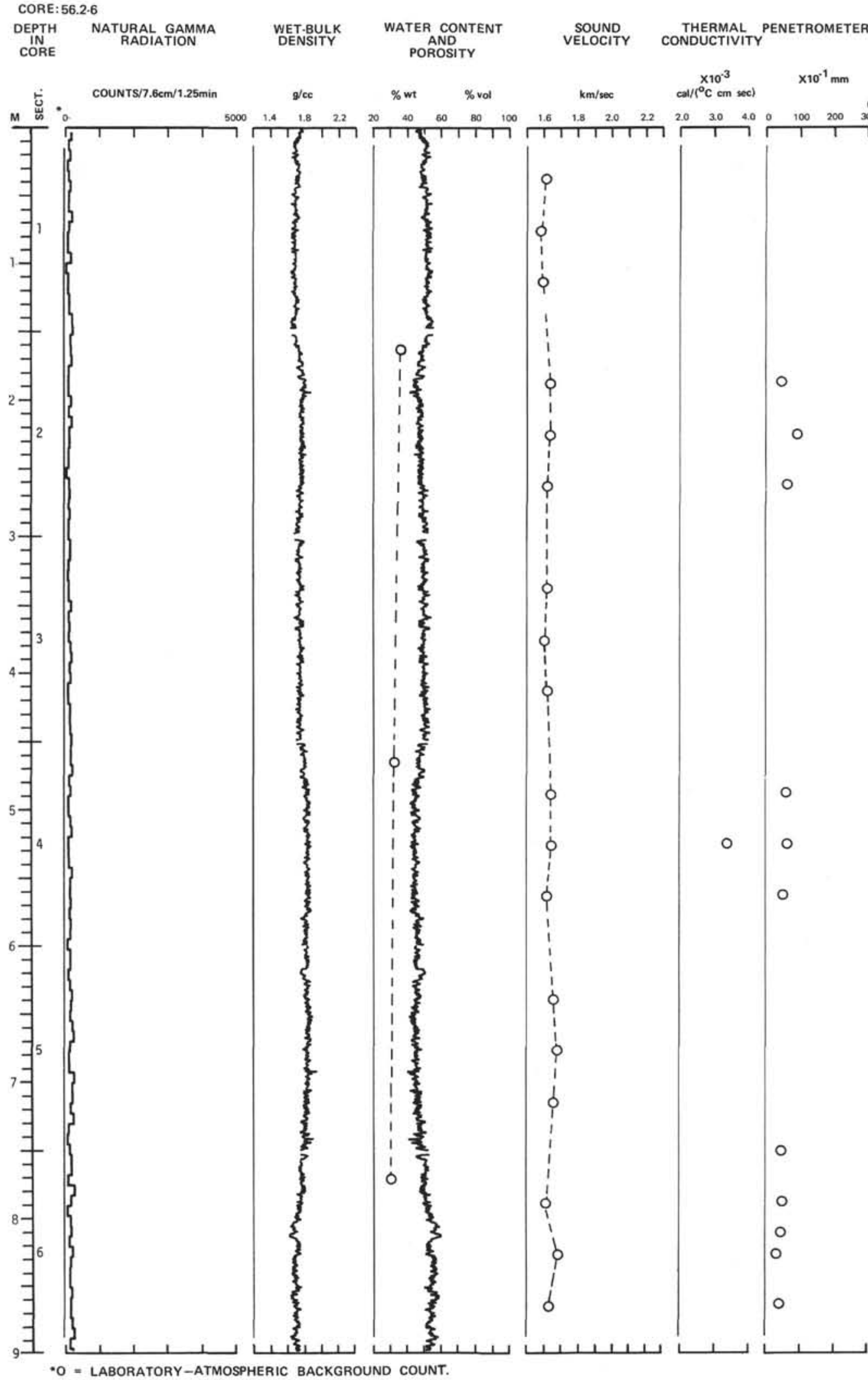

Figure 16. *Summary of physical properties in Hole 56.2 Core 6.*

LEG 6 HOLE 56.2

CORE 7 DEPTH 196-205.1 m

AGE: LATE OLIGOCENE

ZONE: *Globorotalia kugleri*, *Triquetrorhabdulus carinatus*, *Calocycletta virginis*

SECTION NUMBER	LITHOLOGIC DESCRIPTION	%Sand	%Silt	%Clay	%H_2O	%$CaCO_3$
1	Sections 1, 3, and 5 not split					
2	FORAM NANNO CHALK OOZE White (10YR 8/2) Nanno A Foram A Shell(?) C Spcl R Clay R	30	56	21	34	70
2	70-85 cm white (10YR 8/2) with light brown (10YR 6/2) mottles - volcanic glass and rad and spcl C-A, remaining 60% of sediment skeletal carbonate	22	47	31		
4	FORAM NANNO CHALK OOZE Very pale brown (10YR 8/3) with irregular mottles of white (10YR 8/2) and light yellow brown (10YR 6/4) Foram and nanno content approximately equal. Sediment firm with scattered lumps of consolidated ooze	22	50	31	34	
6	NANNO CHALK OOZE Mottled white (2.5Y 8/2 and 5Y 8/1) firm sediment, with rare pebbles of yellow and black pumice Nanno D Foram C Rad and Spcl R Glass R Shell(?) R	9	56	35		47
CC						

Figure 17. *Summary of lithology in Hole 56.2 Core 7.*

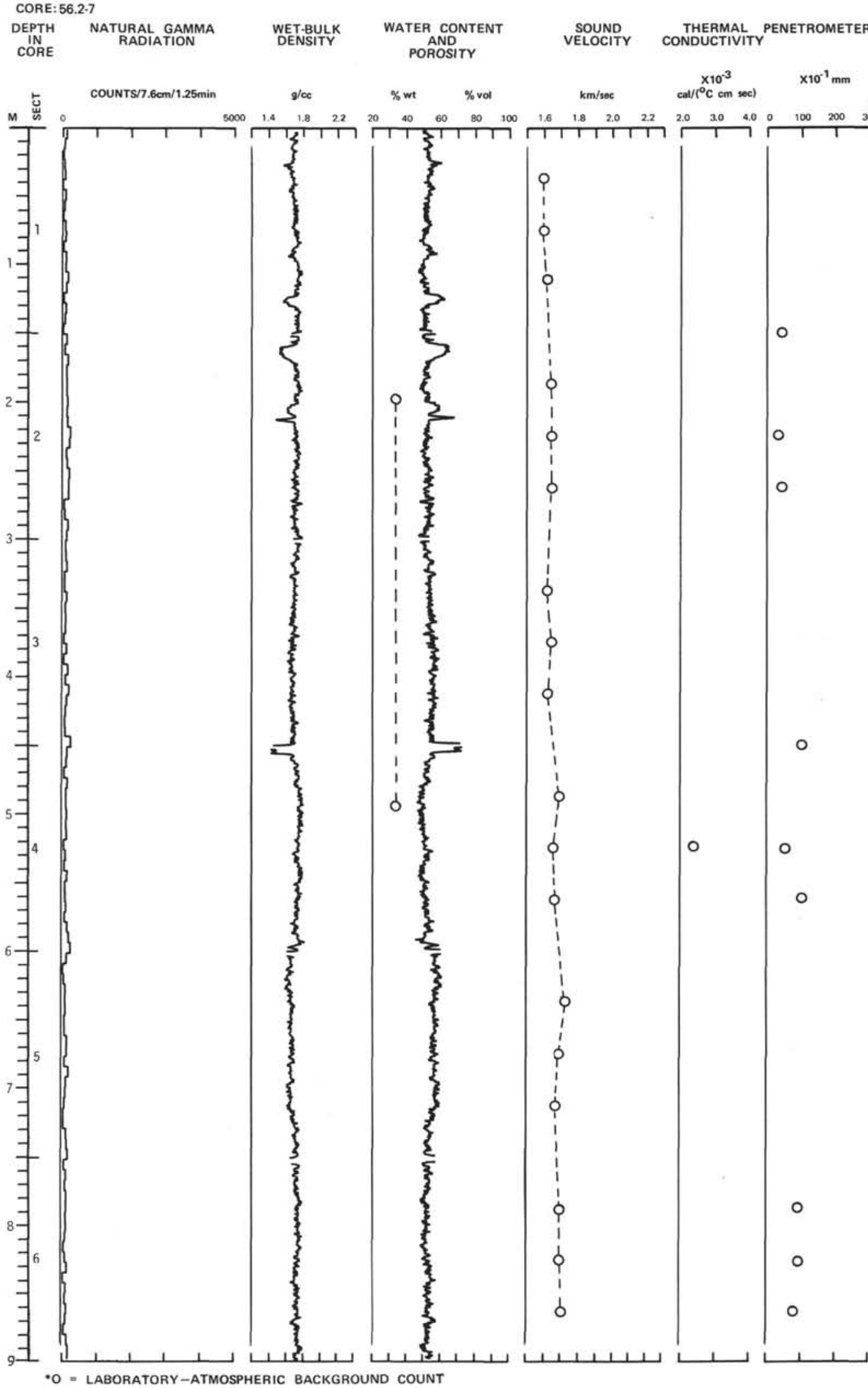

Figure 18. *Summary of physical properties in Hole 56.2 Core 7.*

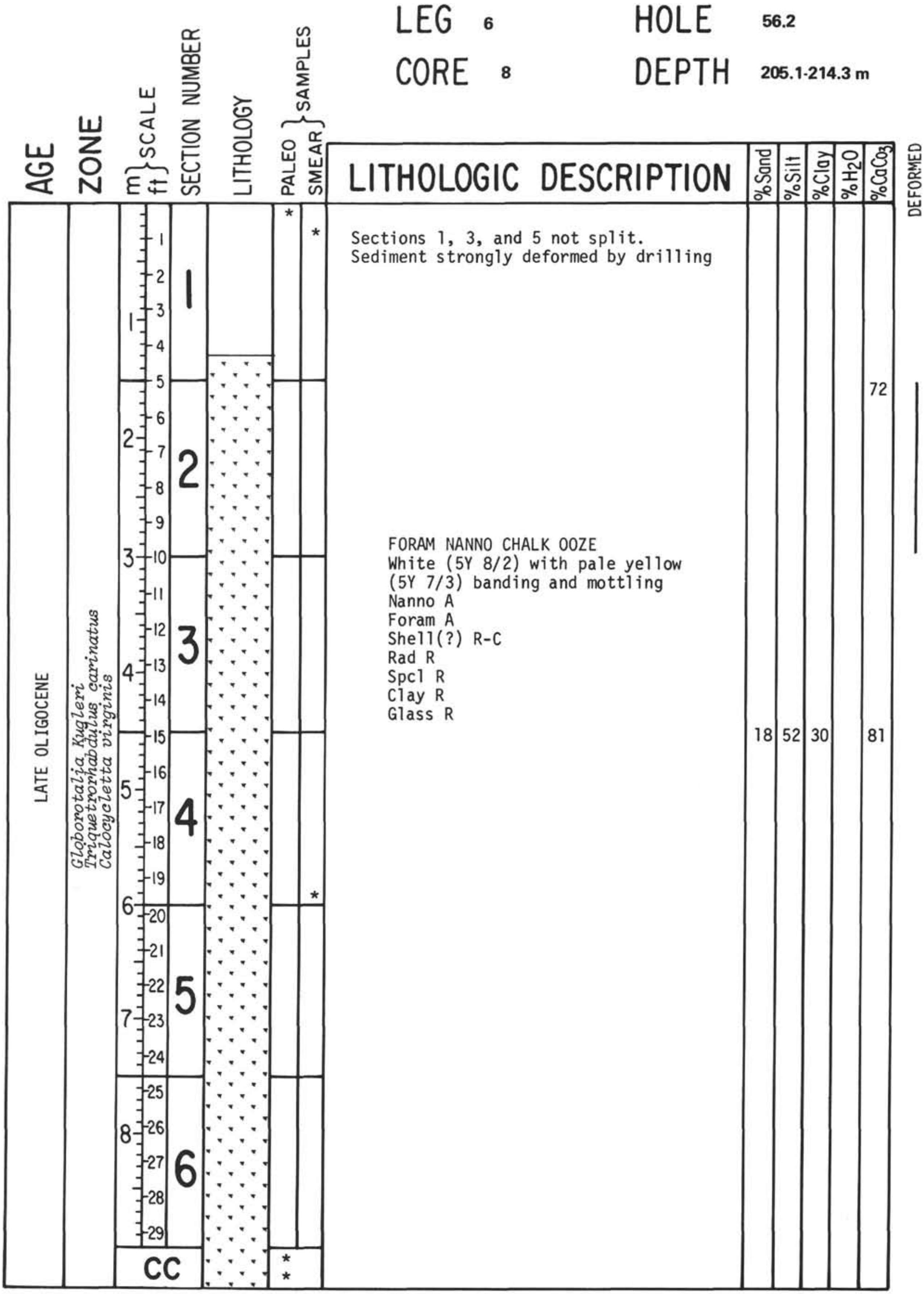

Figure 19. *Summary of lithology in Hole 56.2 Core 8.*

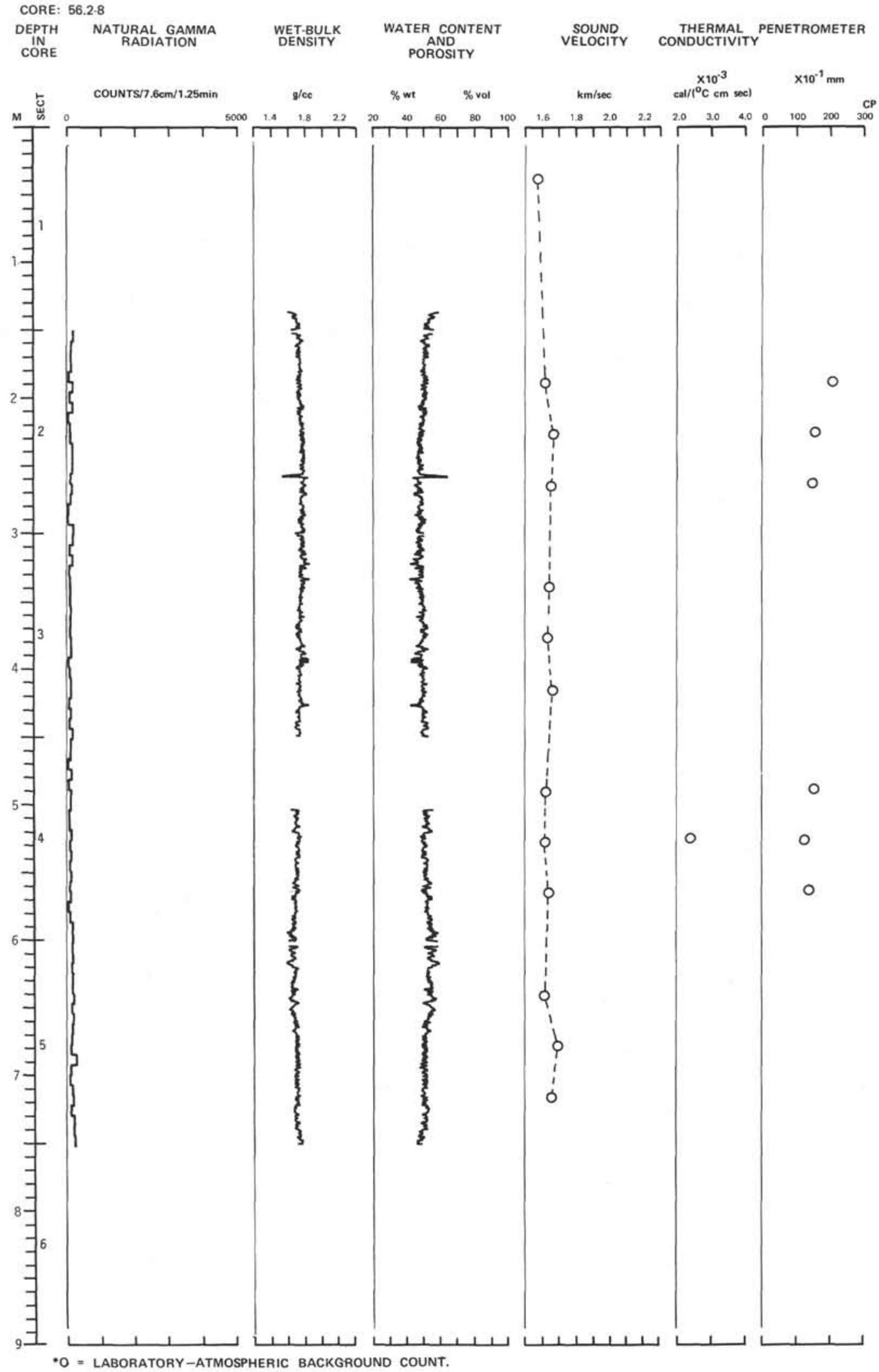

Figure 20. *Summary of physical properties in Hole 56.2 Core 8.*

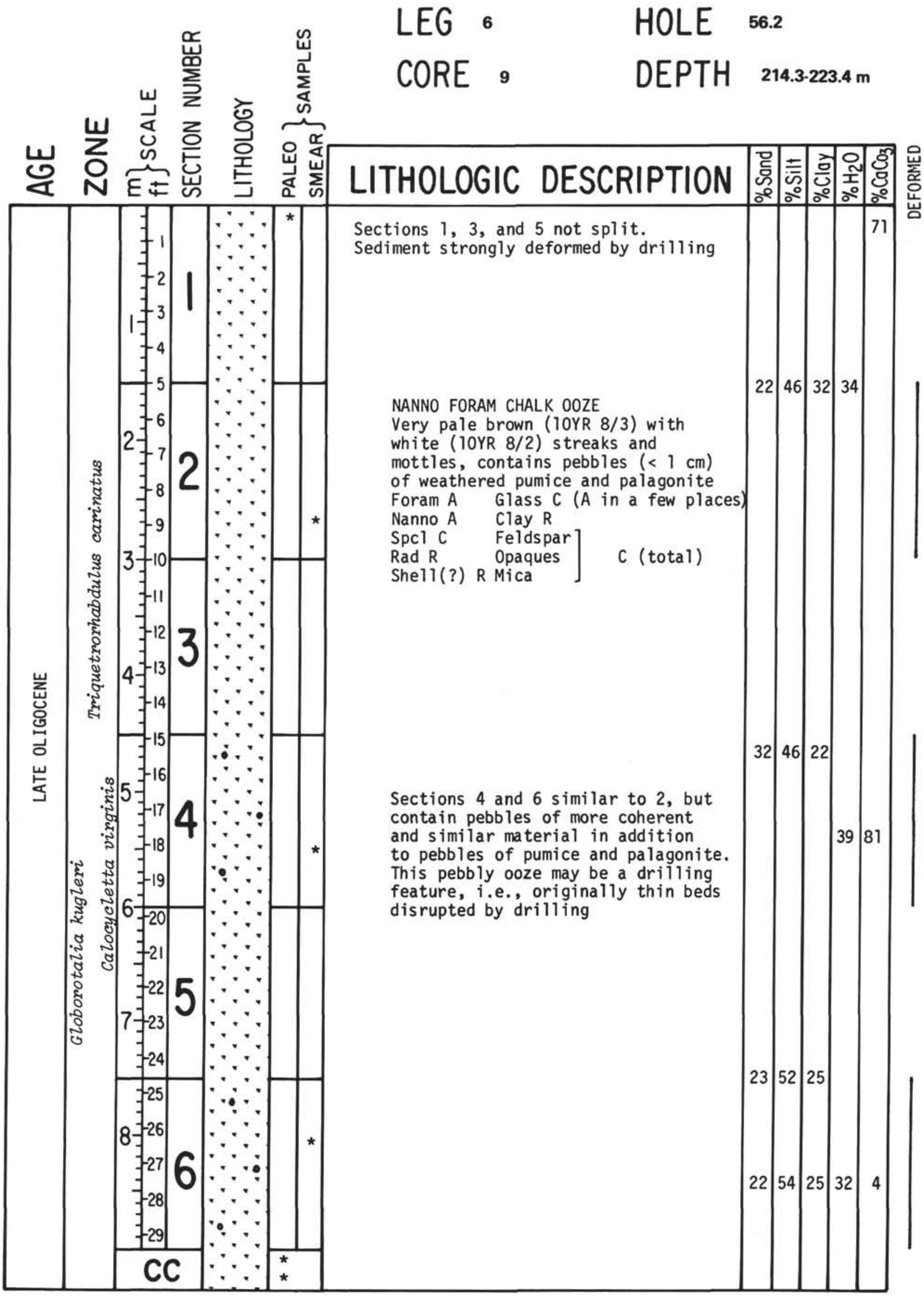

Figure 21. *Summary of lithology in Hole 56.2 Core 9.*

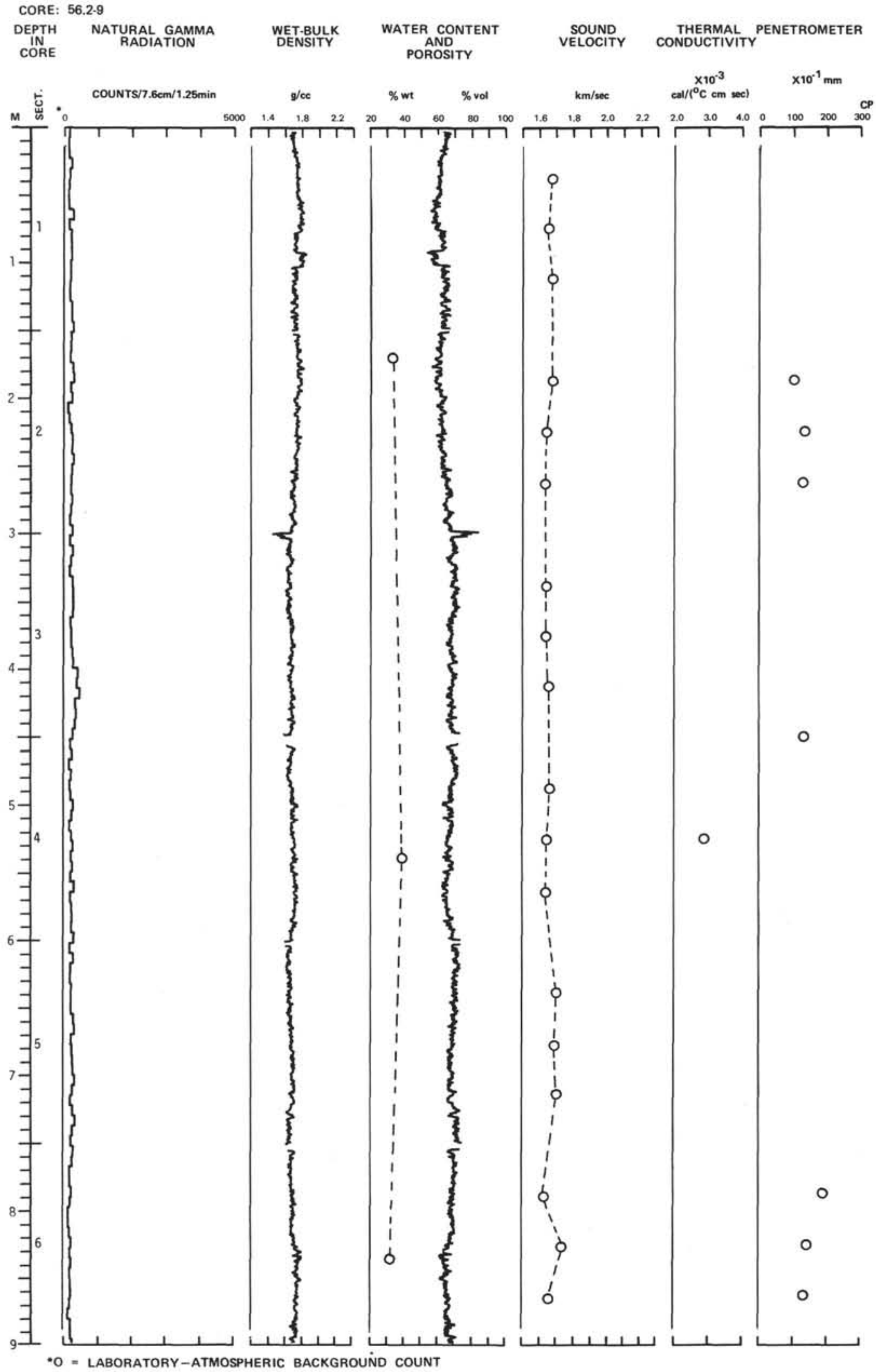

Figure 22. *Summary of physical properties in Hole 56.2 Core 9.*

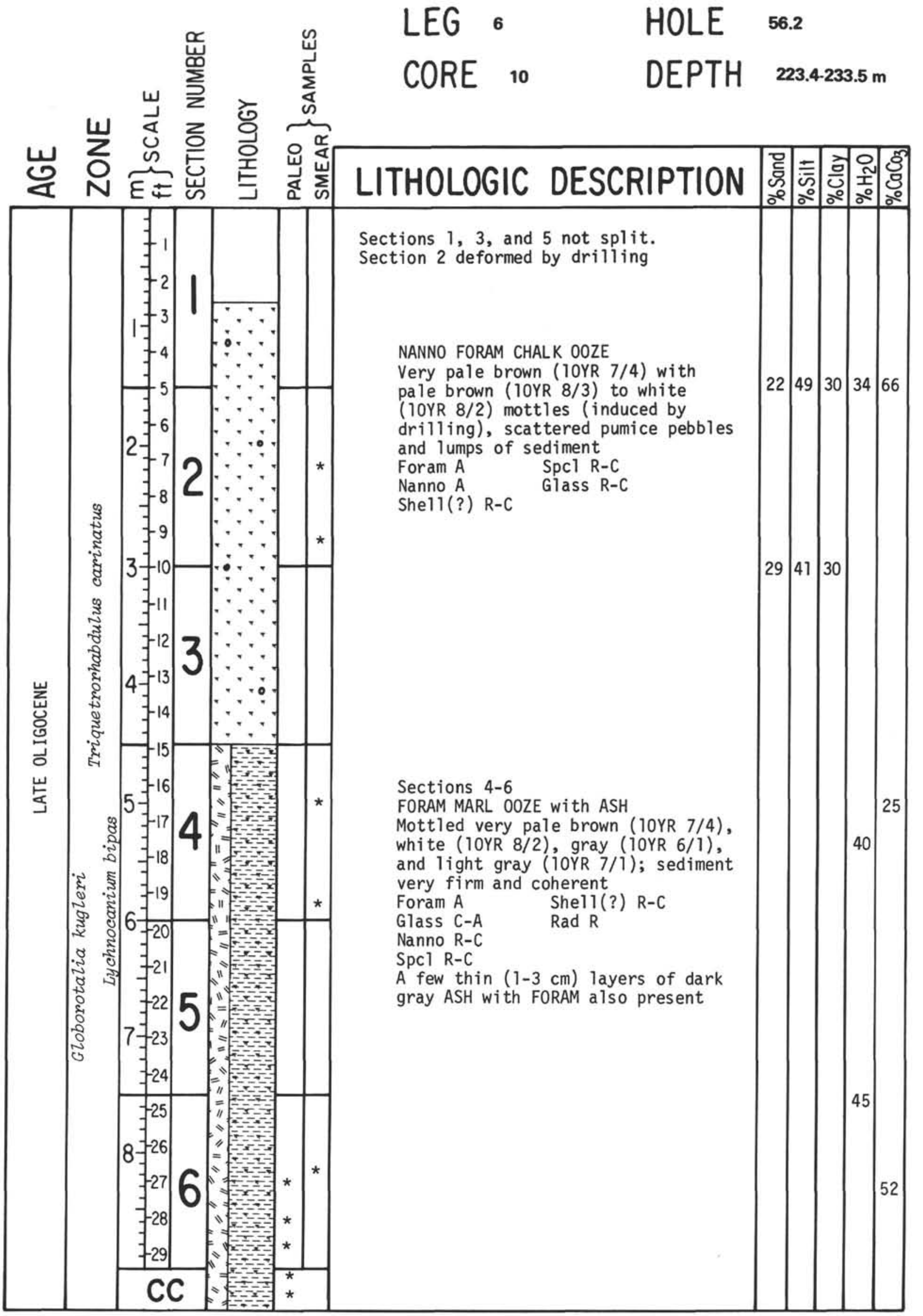

Figure 23. *Summary of lithology in Hole 56.2 Core 10.*

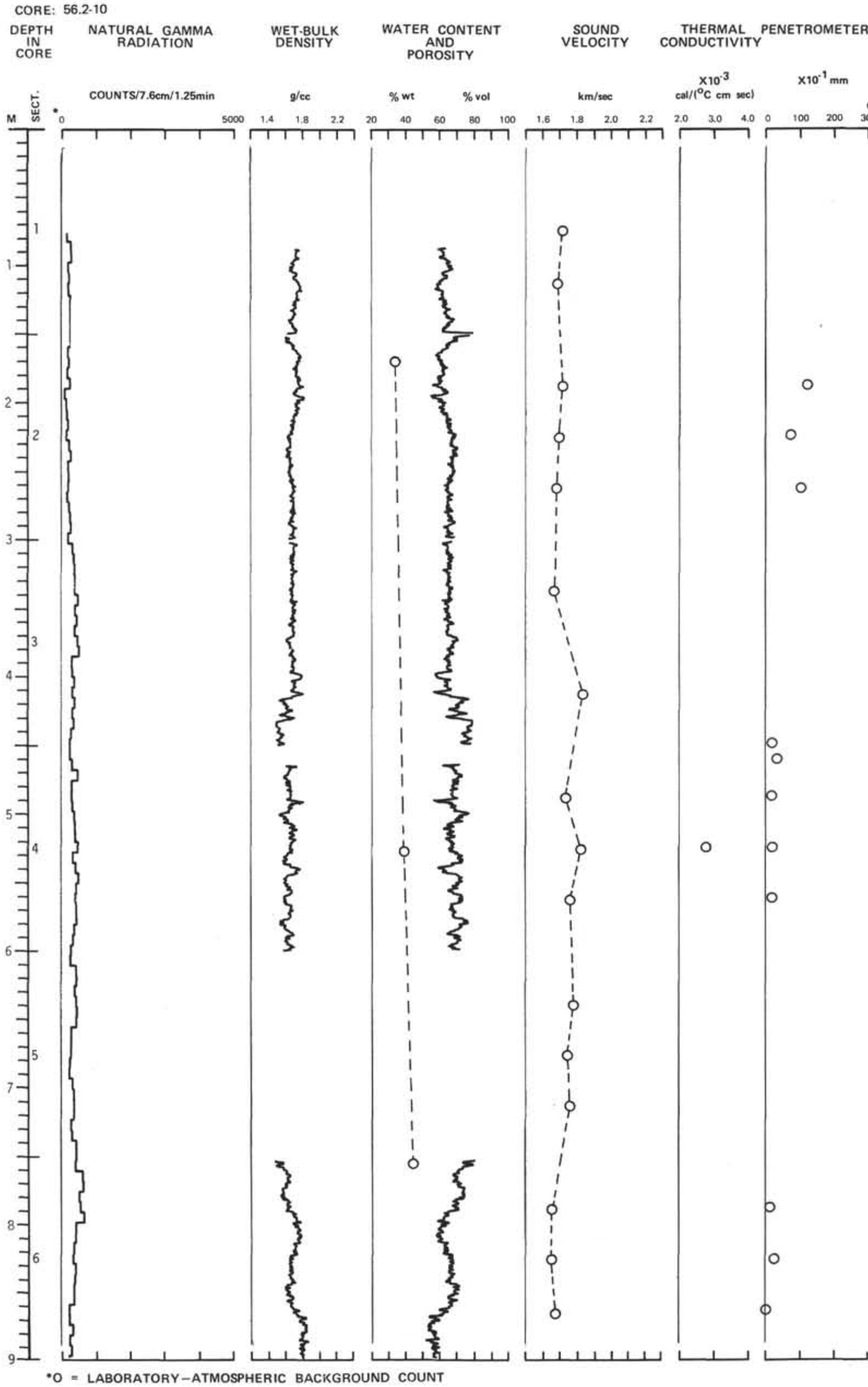

Figure 24. *Summary of physical properties in Hole 56.2 Core 10.*

LEG 6 HOLE 56.2

CORE 1 DEPTH 73.2-82.2 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
All assemblages present indicate the Upper Miocene (Messinian) age of sediments. Among planktonic foraminifers prevail *Globorotalia multicamerata, G. acostaensis acostaensis, G. acostaensis humerosa, Globigerinoides obliquus obliquus, G. obliquus extremus, G. aff. sacculifera, Sphaeroidinellopsis subdehiscens paenedehiscens, Globigerina nepenthes, Globoquadrina altispira.* To the common species belong *Globorotalia margaritae, G. miocaenica, G. menardii, Orbulina universa, Globigerina bulloides.* The lower part (sections 6-4) is characterized by numerous *Globorotalia tumida plesiotumida;* The upper part (sections 3 - 1) - by numerous *G. tumida tumida* and rare *Pulleniatina primalis.*	The boundary between upper upper and lower upper Miocene occurs in this core. Assemblages at the top are part of the upper upper Miocene (Messinian) *Ceratolithus tricorniculatus* Zone. At the bottom the assemblages are lower upper Miocene (Tortonian) *Discoaster neohamatus* Zone. Transitional assemblages are present within the core. TOP: *Ceratolithus tricorniculatus, Cyclococcolithina macintyrei, Discoaster quintatus,* and *D. surculus.* BOTTOM: *C. macintyrei, Discoaster neohamatus, D. quintatus,* and *D. surculus.*	Radiolaria are rare in this core. The few identifiable species are from the lower Miocene. Judging from upper Miocene ages based on calcareous microfossils and the lack of Radiolaria of intermediate age, the Radiolaria appear to have been contributed from a nearby outcrop. TOP: not examined. BOTTOM: *Stichocorys wolffii, Cyrtocapsella cornuta.*

Figure 25. *Summary of biostratigraphy in Hole 56.2 Core 1.*

LEG 6 **HOLE** 56.2

CORE 2 **DEPTH** 82.2-91.4 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Throughout the core very rich assemblages of planktonic Foraminifera belong to the upper part of the *Globorotalia menardii* Zone, upper Middle Miocene (Tortonian stage). The most numerous are *Globorotalia menardii*, *G. acostaensis*, *G. continuosa*, *G. merotumida*, *Orbulina universa*, *Globigerinoides obliquus*, *G. bollii*, *G.* aff. *sacculifera*, *Globigerina nepenthes*, *G. bulloides*, *G. parabulloides*, *G.* aff. *bradyi*, *G. concinna*, *Sphaeroidinellopsis grimsdalei*, *S. rutschi*, *S. Subdehiscens*, *Globoquadrina altispira*. Less distributed are *Globigerinoides elongatus*, *Globigerina apertura*, *G. microstoma*, *Globorotalia pseudopachyderma*. In the top sample were met rare *Globorotalia tumida plesiotumida*.	Lower upper Miocene assemblages representing the upper part of the *Discoaster neohamatus* Zone are present in this core. *Discoaster neohamatus* is the dominant discoaster only in the lower meter of the core, higher in the core *Discoaster quintatus* is much more important. The great abundance of *Sphenolithus abies* through this core is also notable. Other species characterizing the core include *Cyclococcolithina leptoporus*, *C. macintyrei*, *Discoaster challengeri*, *D. surculus*, *Helicopontosphaera kamptneri*, and *Triquetrorhabdulus rugosus*.	Radiolarians are rare throughout this core. The few identifiable species are from the lower Miocene. Judging from upper Miocene ages on the basis of calcareous microfossils and the absence of Radiolaria of intermediate age, it appears that the Radiolaria in this core were contributed from a nearby outcrop. TOP: not examined. BOTTOM: *Stichocorys wolffii*, *Cannartus sp.*

Figure 26. *Summary of biostratigraphy in Hole 56.2 Core 2.*

LEG 6 HOLE 56.2

CORE 3 DEPTH 91.4-100.6 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
All samples examined indicate the *Globorotalia menardii* Zone, upper Middle Miocene (Tortonian stage). Very rich assemblages of planktonic Foraminifera consist of *Globorotalia menardii*, *G. mayeri*, *Sphaeroidinellopsis grinsdalei*, *S. rutschi*, *S. subdehiscens*, *Orbulina universa*, *Globigerina nepenthes*, *G. bulbosa*, *G. bulloides*, *G. parabulloides*, *G. microstoma*, *Globigerinoides bollii*, *G. elongatus*, *G. obliquus*, *Globigerinita glutinata*, *Globoquadrina altispira*, *G. larmeui obesa*.	The transition from upper to middle Miocene occurs in the lower part of this core. The upper part of the core contains assemblages of the lower upper Miocene *Discoaster neohamatus* Zone characterized by the presence of *Cyclococcolithina leptoporus*, *C. macintyrei*, *Discoaster challengeri*, *D. neohamatus* [overwhelming abundance], *D. pentaradiatus*, and *Triquetrorhabdulus rugosus*. At the bottom of the core a few specimens of *Catinaster* sp. cf. *C. calyculus* and *Discoaster hamatus* occur and these suggest a transition to the *Discoaster hamatus* Zone which is generally considered upper middle Miocene.	Radiolaria are rare in this core. The identifiable species are from the lower Miocene. Judging from upper Miocene ages on the basis of calcareous microfossils and the absence of Radiolaria of intermediate age, the Radiolaria in this core appear to have been contributed from a nearby outcrop. TOP: not examined. BOTTOM: *Stichocorys wolffii*, *S. delmontense*, *Calocycletta constata*, and *Dorcadospyris* sp.

Figure 27. *Summary of biostratigraphy in Hole 56.2 Core 3.*

LEG 6 **HOLE** 56.2

CORE 4 **DEPTH** 100.6-109.7 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
The core-catcher sample contains planktonic Foraminifera of the *Globorotalia fohsi* Zone, lower Middle Miocene; in the top sample foraminifers of the *Globorotalia menardii* Zone, upper Middle Miocene, were found. BOTTOM: *Candorbulina universa, Biorbulina bilobata, Globorotalia fohsi, G. praemenardii, G. mayeri, Sphaeroidinellopsis grimsdalei, S. rutschi, Globoquadrina altispira.* TOP: *Orbulina universa, Globorotalia menardii, G. scitula, G. mayeri, Globigerinoides obliquus, Globigerina nepenthes, G. bulloides, G. decoraperta, Sphaeroidinellopsis grimsdalei, Globoquadrina larmeui.*	Specimens from this core have inflated or irregular outlines owing to excess calcification. The assemblages present are upper middle Miocene at the top of the core and middle middle Miocene at the bottom. Species present include, at the top, *Catinaster* sp. aff. *C. calyculus, C. coalitus, Discoaster brouweri s.l., D. challengeri,* and *Triquetrorhabdulus rugosus.* At the bottom, *D. brouweri s.l., D. challengeri, D. perplexus,* and *T. rugosus* are present.	Radiolaria are abundant in this core. The species present represent the lower middle Miocene *Dorcadospyris alata* Zone. TOP: see shore lab report. BOTTOM: *Cannartus laticonus, Stichocorys wolffii, S. delmontense, Dorcadospyris alata,* and *Cyrtocapsella cornuta.*

Figure 28. *Summary of biostratigraphy in Hole 56.2 Core 4.*

LEG 6 **HOLE** 56.2

CORE 5 **DEPTH** 109.7-118.9m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Samples from the bottom and top of this core are characterized by planktonic Foraminifera of the *Globorotalia fohsi* Zone, lower Middle Miocene. The assemblages include *Sphaeroidinellopsis grimsdalei, S. rutschi, Candorbulina universa, Globorotalia fohsi, G. praemenardii, G. obesa, G. peripheroronda, G. mayeri, Globoquadrina altispira, G. dehiscens, Globigerinoides trilobus, G. subquadratus, Globigerina concinna, G. foliata, Globorotalia peripheroacuta.*	Samples from the top and bottom of this core both contain middle middle Miocene assemblages. Discoaster specimens are particularly irregular in form owing to excess calcification. Species present include *Cyclococcolithina leptoporus, Discoaster brouweri s.l., D. challengeri s.l., Discolithina* sp., and *Triquetrorhabdulus rugosus.*	The abundant Radiolaria in this core are of the lower middle Miocene *Dorcadospyris alata* Zone. TOP: not examined. BOTTOM: *Cannartus laticonus, Cyrtocapsella cornuta, Dorcadospyris alata, Stichocorys wolffii,* and *S. delmontense.*

Figure 29. *Summary of biostratigraphy in Hole 56.2 Core 5.*

LEG 6 HOLE 56.2

CORE 6 DEPTH 186.8-196 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
The age of sediments at the top and bottom of this core is the *Globorotalia kugleri* Zone of the lower Lower Miocene (or upper Upper Oligocene of Bolli's zonal scale, 1957). Assemblages include *Globorotalia kugleri, G. siakensis, G. brevispira, Globigerina bradyi, G. juvenilis, G. venezuelana, G. angustiumbilicata, G. woodi, Globoquadrina praedehiscens, Cassigerinella chipolensis,* and rare *Globigerinoides trilobus primordius, Globigerinita dissimilis.* Quantity of *G. venezuelana, G. praedehiscens, G. dissimilis* increases near the top, indicating transition to the *Globigerinita dissimilis* Zone.	The transition from lower Miocene to upper Oligocene assemblages occurs in this core. The *Triquetrorhabdulus carinatus* Zone is present at the top of the core with *Cyclococcolithina neogammation, Discoaster deflandrei, Triquetrorhabdulus carinatus,* and *Sphenolithus moriformis* present. At the bottom of the core the assemblage is that of the upper upper Oligocene or lower *T. carinatus* Zone with *Coccolithus* sp. aff. *C. bisectus, Cyclococcolithina neogammation, Discoaster deflandrei,* and *Sphenolithus* sp. aff. *S. belemnos,* dominating.	This core contains radiolarian assemblages of the lower lower Miocene *Calocycletta virginis* Zone. TOP: see shore lab report. BOTTOM: *Calocycletta virginis, Cyrtocapsella cornuta, Lychnocanium bipes, Dorcadospyris ateuchus, Cannartus prismaticus, Cyrtocapsella tetrapera.*

Figure 30. *Summary of biostratigraphy in Hole 56.2 Core 6.*

LEG 6 HOLE 56.2

CORE 7 DEPTH 196-205.1 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Assemblages of planktonic Foraminifera at the top and bottom of this core belong to the *Globorotalia kugleri* Zone, lower Lower Miocene (or upper Upper Oligocene of Bolli's zonal scale, 1957). The following species should be mentioned: *Globorotalia kugleri, G. siakensis, G. brevispira, Globigerina bradyi, G. juvenilis, G. angustiumbilicata, G. venezuelana, Globoquadrina praedehiscens* and rare *Globigerinoides trilobus primordius, Globigerinita dissimilis, G. stainforthi.*	Assemblages at both the top and bottom of the core are upper upper Oligocene *Triquetrorhabdulus carinatus* Zone. Species present include *Coccolithus* sp. aff. *C. bisectus, Cyclococcolithina neogammation, Discoaster deflandrei, Helicopontosphaera* sp. aff. *H. lophota, Sphenolithus* sp. aff. *S. belemnos, S. moriformis,* and *Triquetrorhabdulus carinatus.*	This core contains Radiolaria of the lower lower Miocene *Calocycletta virginis* Zone. TOP: not examined. BOTTOM: *Calocycletta virginis Cyrtocapsella cornuta, Cannartus prismaticus, Dorcadospyris ateuchus, Lychnocanium bipes,* and *Cyrtocapsella tetrapera.*

Figure 31. *Summary of biostratigraphy in Hole 56.2 Core 7.*

LEG 6 **HOLE** 56.2

CORE 8 **DEPTH** 205.1-214.3 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
The assemblages of the *Globorotalia kugleri* Zone, lower Lower Miocene (or upper Upper Oligocene of Bolli's zonal scale, 1957), were found at the top and bottom of this core. Among the most common species are *Globorotalia kugleri*, *Globigerina juvenilis*, *G. bradyi*, *G. angustiumbilicata*, less frequent *Cassigerinella chipolensis*, *Globigerina woodi*, *G. venezuelana*, *Globorotalia siakensis*, *Globoquadrina praedehiscens* and very rare *Globigerinoides trilobus primordius* and *Globigerinita dissimilis*.	An assemblage of the lower *Triquetrorhabdulus carinatus* Zone or upper upper Oligocene is present at both the top and bottom of this core. Dominant species include *Coccolithus* sp. aff. *C. bisectus*, *Cyclococcolithina neogammation*, *Discoaster deflandrei*, and *Sphenolithus* sp. aff. *S. belemnos*.	This core contains radiolarian species belonging to the lower lower Miocene *Calocycletta virginis* Zone. TOP: not examined. BOTTOM: *Calocycletta virginis*, *Cannartus prismaticus*, *Cyrtocapsella cornuta*, *Dorcadospyris ateuchus*, *Lychnocanium bipes*, and *Cyrtocapsella tetrapera*.

Figure 32. *Summary of biostratigraphy in Hole 56.2 Core 8.*

LEG 6 HOLE 56.2

CORE 9 DEPTH 214.3-223.4 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Planktonic Foraminifera of the *Globorotalia kugleri* Zone, lower Lower Miocene (or upper Upper Oligocene of Bolli's zonal scale, 1957), occur throughout the core. Their assemblages are represented by *Globorotalia kugleri, G. pseudokugleri, G. siakensis, G. brevispira, Globigerina juvenilis, G. bradyi, G. woodi, G. venezuelana, Cassigerinella chipolensis, Globoquadrina praedehiscens* and rare *Globigerinoides trilobus primordius, G. trilobus altiapertura.*	This core contains assemblages of the lower *Triquetrorhabdulus carinatus* Zone. Species present include *Coccolithus* sp. aff. *C. bisectus, Cyclococcolithina neogammation, Discoaster deflandrei, Helicopontosphaera* sp. aff. *H. lophota, Sphenolithus* sp. aff. *S. belemnos, S. moriformis,* and *Triquetrorhabdulus carinatus.*	The radiolarian species contained in this core represent the lower lower Miocene *Calocycletta virginis* Zone. Fragments of an upper Oligocene species suggests some reworking. TOP: see shore lab report. BOTTOM: *Calocycletta firginis, Cannartus prismaticus,* and *Cyrtocapsella cornuta.*

Figure 33. *Summary of biostratigraphy in Hole 56.2 Core 9.*

LEG 6 HOLE 56.2

CORE 10 DEPTH 223.4-233.5 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Very rich assemblages of the *Globorotalia kugleri* Zone, lower Lower Miocene (or upper Upper Oligocene of Bolli's zonal scale, 1957), were traced from the bottom to top of this core. They consist of dominant *Globorotalia kugleri*, *G. pseudokugleri*, *G. siakensis*, *Globigerina bradyi*, *G. juvenilis*, *G. angustiumbilicata*, subordinate *Cassigerinella chipolensis*, *Globigerina woodi*, *G. venezuelana*, *Globoquadrina praedehiscens* and rare *Globigerinoides trilobus primordius*.	This core contains assemblages of the lower *Triquetrorhabdulus carinatus* Zone, upper upper Oligocene. Species present include *Coccolithus* sp. aff. *C. bisectus*, *Cyclococcolithina neogammation*, *Discoaster deflandrei*, *Helicopontosphaera parallela*, *Sphenolithus* sp. aff. *S. belemnos*, *S. moriformis*, and *Triquetrorhabdulus carinatus*.	This core contains the boundary between the lower lower Miocene *Calocycletta virginis* Zone and the approximately upper Oligocene *Lychnocanium bipes* Zone. TOP: see shore lab report. BOTTOM: *Theocyrtis annosa*, *Dorcadospyris ateuchus*, *Lychnocanium bipes*, and *Cannartus prismaticus*.

Figure 34. *Summary of biostratigraphy in Hole 56.2 Core 10.*

LEG 6 HOLE 56.2
CORE CENTER BIT DEPTH 233.5-270m.

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
Center-bit sample can be attributed to the top of the *Globigerina ciperoensis* Zone (Upper Oligocene). The assemblage of planktonic Foraminifera includes numerous *Globigerina ouachitaensis*, *G. angustiumbilicata*, less frequent *Globigerina angulisuturalis*, *G. praebulloides*, *Globorotalia pseudokugleri*, *G. brevispira* and rare *Globigerina ciperoensis*, *G. pseudoedita*, *G. woodi*.	The assemblage in the center-bit sample is like that of the *Triquetrorhabdulus carinatus* Zone, but contains *Sphenolithus ciperoensis* and is, therefore, considered to represent the uppermost *Sphenolithus ciperoensis* Zone, upper Oligocene.	The center bit sample retreived before attempting core 11 contains a radiolarian assemblage of the Upper Oligocene *Lychnocanium bipes* Zone. CENTER BIT 10/11: *Theocyrtis annosa*, *Dorcadospyris ateuchus*, *Lychnocanium bipes*, *Cannartus prismaticus*, and *Cyrtocapsella cornuta*.

Figure 35. *Summary of biostratigraphy in Hole 56.2 center bit.*

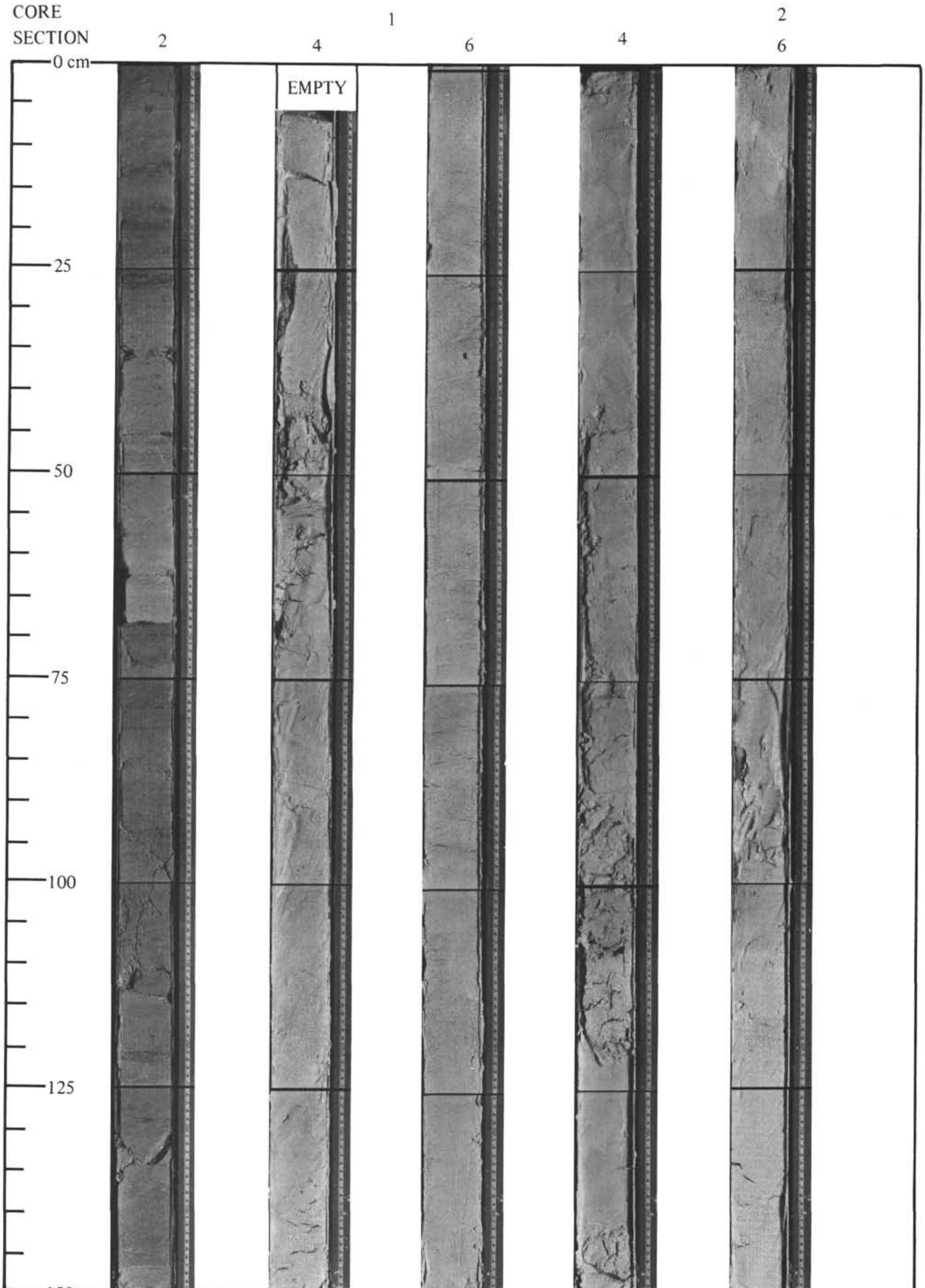

Plate 1. *Photographs of Hole 56.2 Cores 1 and 2.*

Plate 2. *Photographs of Hole 56.2 Cores 4 and 5.*

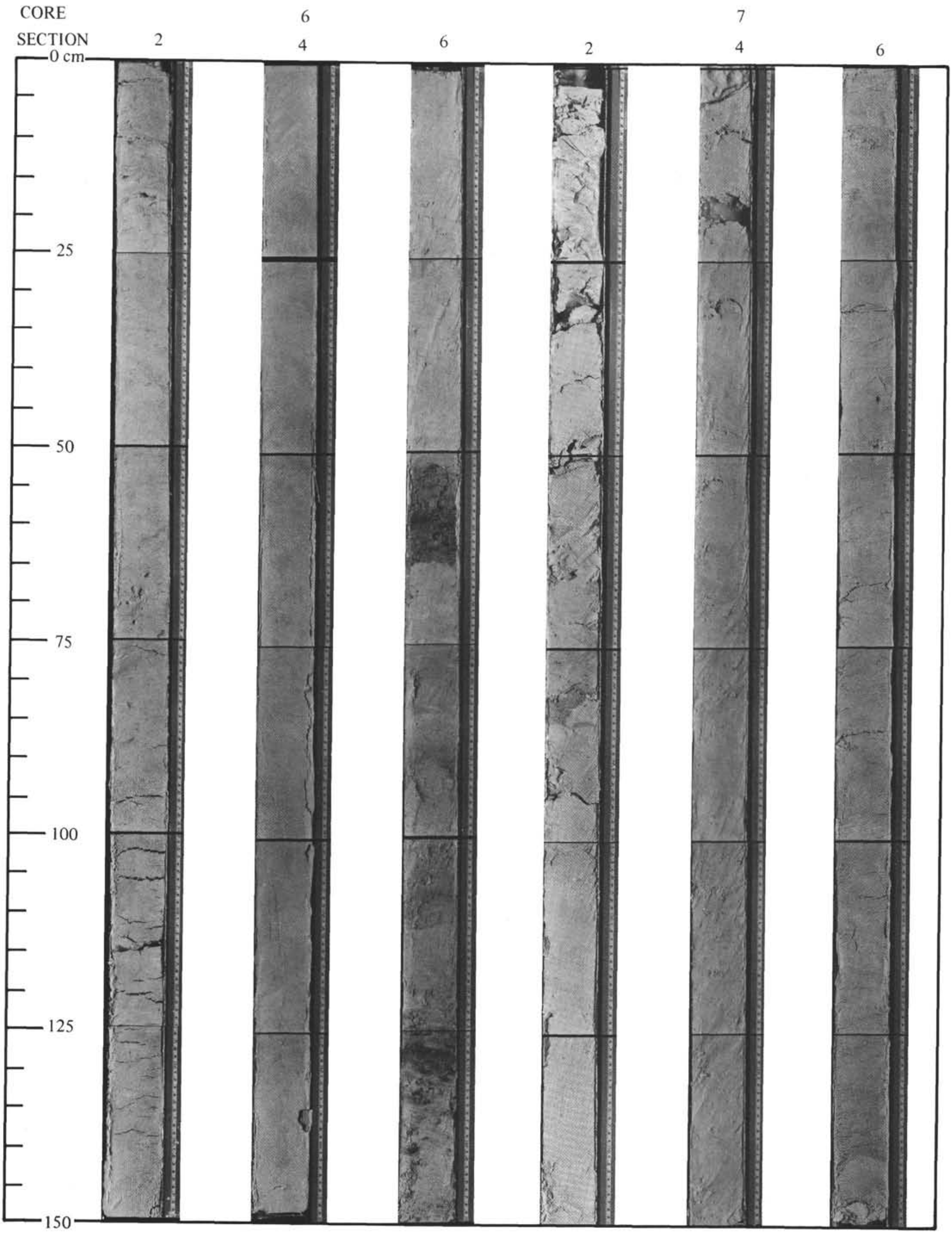

Plate 3. *Photographs of Hole 56.2 Cores 6 and 7.*

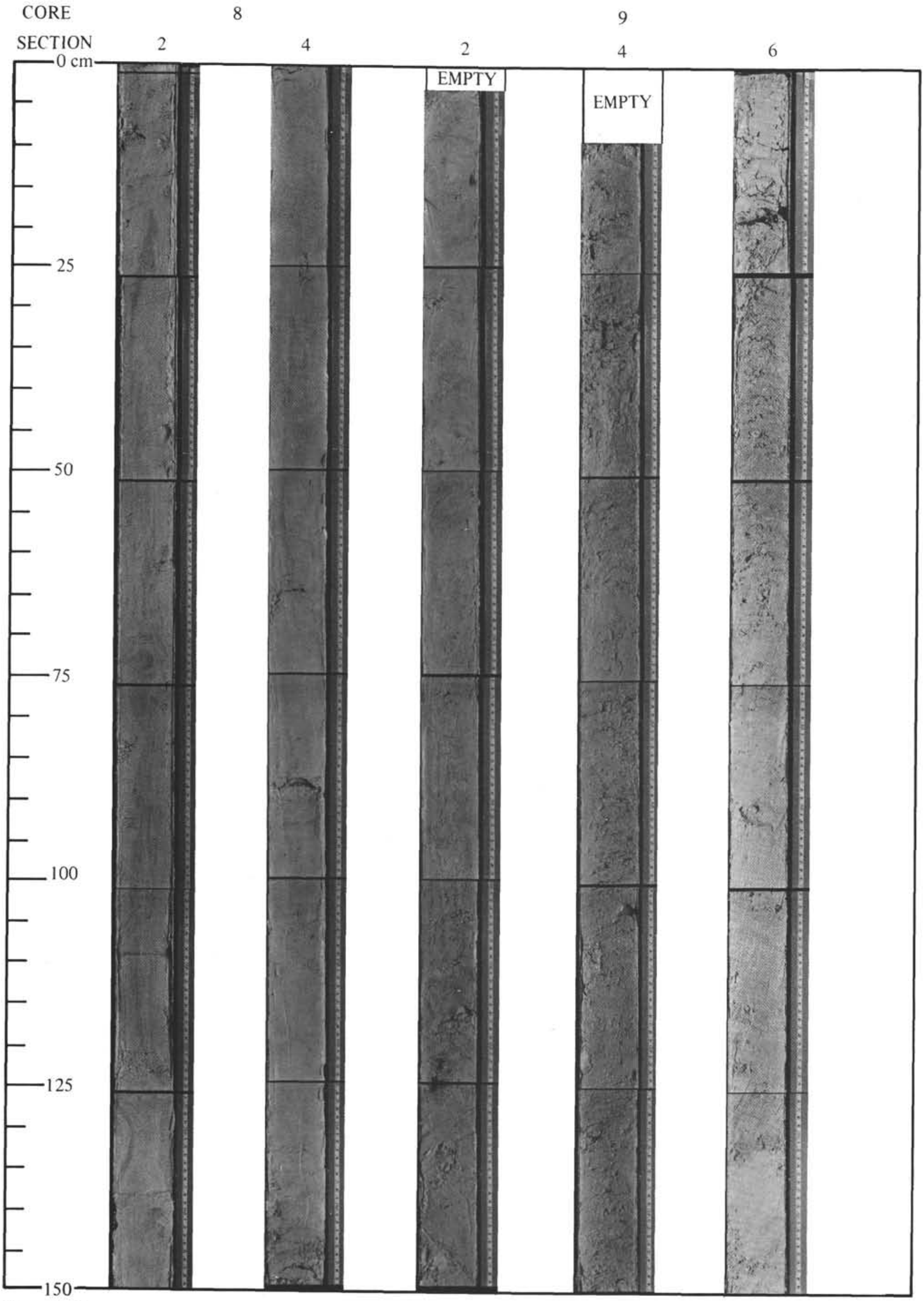

Plate 4. *Photographs of Hole 56.2 Cores 8 and 9.*

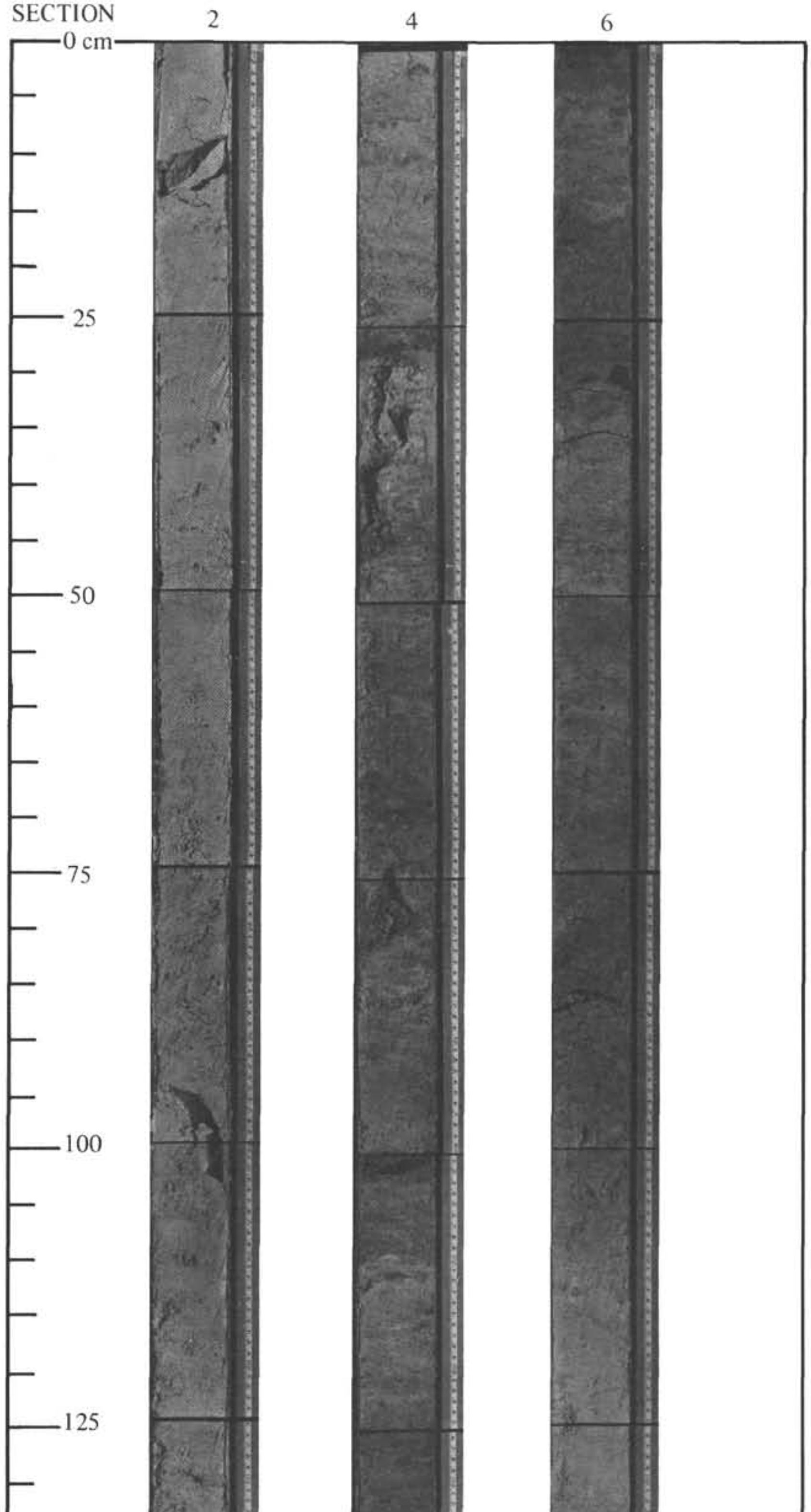

Plate 5. *Photographs of Hole 56.2 Core 10.*