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Heavy Mineral Concentrations In Sediments Of The Virginia Inner Continental Shelf

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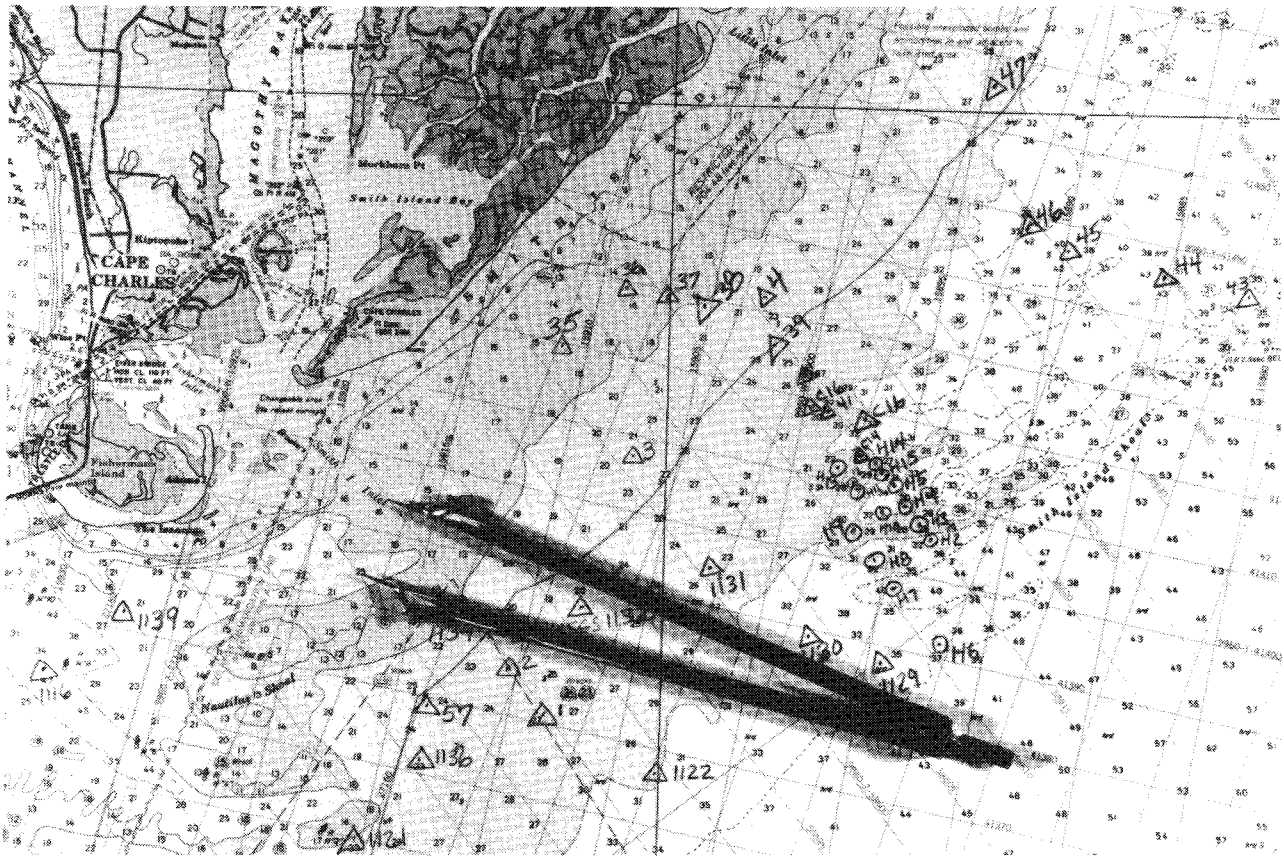
VIRGINIA DIVISION OF MINERAL RESOURCES

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HEAVY-MINERAL STUDIES — VIRGINIA INNER CONTINENTAL SHELF

C.R. Berquist, Jr., Editor



COMMONWEALTH OF VIRGINIA

DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINERAL RESOURCES
Robert C. Milici, State Geologist

CHARLOTTESVILLE, VIRGINIA
1990

HEAVY-MINERAL CONCENTRATIONS IN SEDIMENTS OF THE VIRGINIA INNER CONTINENTAL SHELF

C.R. Berquist, Jr.¹, C.T. Fischler², L.J. Calliari³, S.M. Dydak², H. Ozalpasan², and S.A. Skrabal⁴

CONTENTS

	Page
Abstract	32
Introduction	32
Mineral analysis	32
Database	35
Results	35
Sample composition	35
Economic potential	35
Conclusions	38
Acknowledgments	38
References cited	39
Appendices	39
I: Location of samples	39
II: General characteristics of samples	47
a: Core samples	47
b: Grab samples	50
III: Mineral composition of samples	52
a: Core samples	52
b: Grab samples	60
IV: Summary composition statistics for all samples	63
V: Selected mineral composition with respect to the entire sample	64
VI: Samples sorted by decreasing abundance of selected minerals	67
VII: Core descriptions	68

FIGURES

Figure	
1. Map showing the location of cores	33
2. Map showing the location of grab samples	34
3. Map showing the location of samples with economic potential	37
4. Graphic presentation of selected samples	38
5. Map showing the location of cores and grab samples off the Eastern Shore and index map of sample locations south of the Eastern Shore	40
6. Insert A: map showing the location of samples at northern part of entrance to Chesapeake Bay	41
7. Insert B: map showing the location of samples at southern part of entrance to Chesapeake Bay and off Virginia Beach	42
8. Insert C: map showing the location of samples off Virginia Beach to North Carolina	43
9. Map showing the location of cores taken during the summer of 1987, northern area	44
10. Map showing the location of cores taken during the summer of 1987, southern area	45

TABLES

1. Average concentrations of selected minerals	36
2. Maximum concentrations of selected minerals	36
3. Several samples indicating economic potential	36

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ABSTRACT

The Virginia Division of Mineral Resources and the Virginia Institute of Marine Science investigated the occurrence of heavy minerals in the offshore sediments of Virginia. We began the project because earlier reconnaissance studies reported high heavy-mineral concentrations from several samples collected off the Eastern Shore of Virginia. Our work confirms the previously reported mineral values and locates additional high concentrations up to 20 nautical miles offshore. Furthermore, we show that potentially economic mineral values are not restricted to surficial sediments, but also are found in the upper 15 to 20 feet of inner continental shelf sediments.

Several core samples indicate that potential economic values of heavy minerals are clustered offshore of Hog Island, Smith Island, Virginia Beach, and False Cape. These areas are likely targets for resource assessment studies of heavy minerals and construction or beach nourishment sand. The high heavy-mineral concentrations suggest that further investigations are warranted. The current effort to investigate resources offshore has only begun, because our area of study comprises only 3 percent of the Exclusive Economic Zone off Virginia.

Sample sites are located along the entire Atlantic coastline of Virginia and nearly all are within 5 nautical miles of land. Three-hundred and ninety large-volume samples were analyzed, 290 of which came from vibracores; over three tons of sediment were processed. The total heavy-mineral concentration of 78 samples is equal to or exceeds 5 percent. Fifty-two samples have concentrations of one or more economic minerals equal to or greater than threshold values for land-based deposits (ilmenite 45%, leucoxene 5%, rutile 2%, zircon 5%, monazite 1%, and total heavy mineral concentration 5%; Garnar, 1978). The total heavy mineral concentration for all samples averaged 3.3 percent and the highest value was 14.7 percent.

Offshore sediments sampled by vibracores average about 5 meters in thickness and are probably Holocene in age. Core penetration into underlying Pleistocene or Tertiary sediments is suspected based on oxidized sediment at depth in cores. Microfauna were not studied.

The U.S. Minerals Management Service and the Subaqueous Minerals and Materials Study Commission, Commonwealth of Virginia also provided funding for the study. This report describes the mineral compositions and other characteristics we derived from offshore sediments from 1986 through 1988.

INTRODUCTION

The Virginia Division of Mineral Resources (VDMR) and the Virginia Institute of Marine Science (VIMS) collected and analyzed core and grab samples, and made side-scan sonar and subbottom profile surveys from April 1986 through September 1988 on the inner continental shelf of Virginia. The project was funded in part by the U.S. Minerals Management Service (MMS) and the Commonwealth of Virginia. Work performed with funding from the U.S. Minerals Man-

agement Service emphasized research in the Exclusive Economic Zone (EEZ) seaward of 3 miles from land; work done with funding from the Commonwealth of Virginia's Subaqueous Minerals and Materials Study Commission emphasized evaluation of resources within the Commonwealth's territorial waters. This report combines the results obtained over the past few years in describing the heavy-mineral occurrences offshore of Virginia.

A limited study by Berquist and Hobbs (1986) verified earlier reports of high concentrations of heavy minerals in surficial shelf sediments (Nichols, 1972; Goodwin and Thomas, 1973; Grosz and Escowitz, 1983). We acquired cores in April 1986 at Smith Island Shoal, within the Chesapeake Bay mouth, and east of Virginia Beach. In July 1986, sediments were analyzed from existing cores and from 100 new grab and box-core samples taken off the Virginia coast. The U.S. Geological Survey contributed 35 cores that were located at the Chesapeake Bay entrance. A report described the results of our efforts completed through the summer of 1987 (Berquist and Hobbs, 1988a). Fifty new vibracores were taken during the summer of 1987 from offshore Assateague Island to North Carolina. The selection of core sites was guided by the results of the previous years' efforts. We also made geophysical surveys (side-scan sonar and high-resolution shallow seismic) during these projects and some of the results are described elsewhere in this publication. Berquist and Hobbs (1988b) reported on work completed from 1986 through 1988. Figures 1 and 2 show the locations of samples used in this study. Appendix I gives location coordinates for all vibracores and grab samples.

MINERAL ANALYSIS

We used a box corer and a Smith-MacIntyre sampler to take grab samples and a 4-inch diameter vibracorer to take core samples. In most sandy areas of the ocean floor, penetration by these devices, including the vibracorer, was limited greatly because of very compact sands. Grab sampling rarely exceeded 6 to 8 inches of depth in sediments. We acquired vibracores up to 20 feet in length by jetting and coring (Appendix VII). Without multiple attempts, vibracores usually penetrated about nine feet before refusal. Appendix II gives general characteristics of core and grab samples; core descriptions are found in Appendix VII.

The procedures for sample preparation and determination of mineral abundance are intricate and have been described by A. E. Grosz of the U.S. Geological Survey. Although a complete discussion of the process is found elsewhere in this publication, a brief explanation follows: The average weight of samples was large (20 pounds). Samples from the vibracores were derived by processing 6-foot (average) sections. Heavy minerals were concentrated from the samples with a three-turn spiral followed by use of tetrabromoethane. The heavy-mineral concentrate is magnetically subdivided into six fractions (labeled "203" through "208", from most magnetic to non-magnetic). The mineral composition of each fraction is estimated by using transmitted- and reflected-light microscopes. The heavy-mineral composition of the sample is determined by combining the compositions of

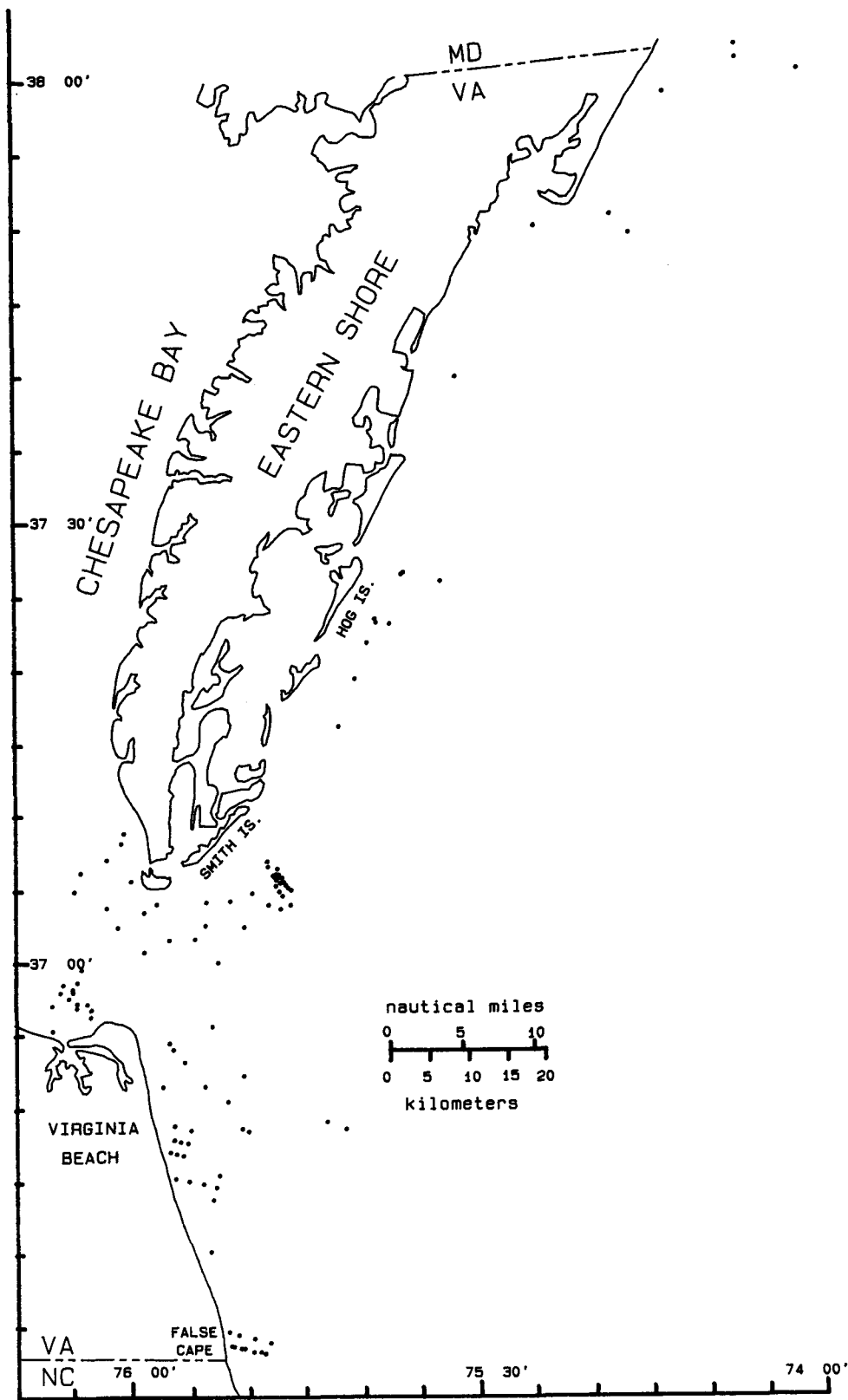


Figure 1. Map showing the location of cores.

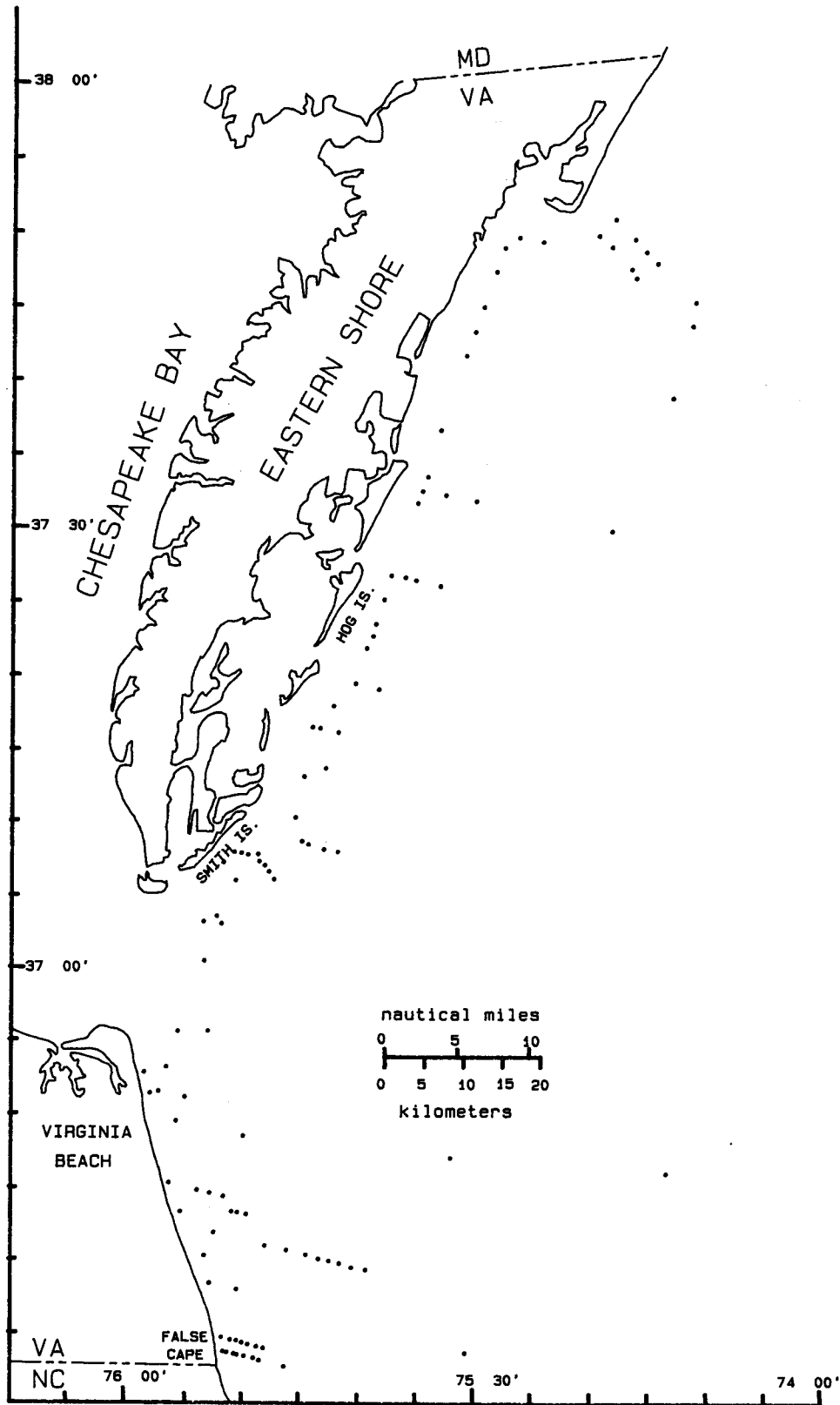


Figure 2. Map showing the location of grab samples.

the six fractions by using a computer spread-sheet program. Out of approximately 436 samples, 390 were examined for heavy-mineral content. Of the remaining 46 samples, one was lost by contamination and the others did not contain enough heavy minerals to allow for satisfactory processing.

Without the complete discussion of the analysis procedures, some additional explanation is needed to interpret the compiled mineral data. Because this is a reconnaissance study, only commonly occurring and selected economic minerals are identified. The economic minerals found in abundance offshore of Virginia are those containing titanium (ilmenite, leucoxene, and rutile) and rare-earth elements (monazite and zircon). The sum of these minerals plus the sillimanite/ kyanite (refractory minerals) fraction forms the "ECON" (economic interest) group of heavy minerals. The amphibole and pyroxene groups minerals together are more common than any other minerals. Their abundance is grouped under the name "pyrobole." Recovered heavy minerals (RHM) is the amount of heavy minerals recovered from the sample and available for analysis. Total heavy minerals (THM) is an abundance determined by adding to RHM the calculated amount of heavy minerals lost during the spiral concentration.

Minerals identified as "magnetite" in the most magnetic (labeled "203") fraction are not all solely magnetite. X-ray fluorescence of the most magnetic (203) fraction of two samples indicated excessive titanium for magnetite; this excess could be explained if approximately 40 percent of the sample was titanomagnetite (O. Fordham, personal communication). Because optical identification of different opaque minerals in the 203 fraction is difficult and inconsistent among observers, the entire fraction is labeled "magnetite"; users of the data should remember this factor when interpreting the compositional data.

The three least magnetic (206, 207, and 208) fractions were also examined under high-intensity short-wave length ultraviolet light enabling identification of monazite, by its green "fluorescence" or internal reflectance, zircon (yellow to orange fluorescence), and quartz contamination in the non-magnetic (208) fraction. Pink and light-brown (metamict) zircons are commonly observed, and although they are not fluorescent, their abundance is included in the reported zircon concentrations.

Because quartz is commonly found in the 208 fraction, its weight is included in the heavy-mineral fraction rather than the light fraction. It is commonly observed that quartz makes up at least 90 percent of the 208 "other" fraction. A correction is made to the weight percent of the total heavy minerals by subtracting the weight of quartz contamination. The correction is used in the calculation of data under column headings "WT % THM" in the appendices. The decrease ranged from 2 percent to 18 percent of the uncorrected value and averaged 2.6 percent.

DATABASE

All data entry and calculations were made on the Virginia Institute of Marine Science PRIME computer, using the 20/20 spreadsheet modeling program. For each step in the preparation of samples for mineral identification, the sample and its

many fractions are weighed. We used the spreadsheet program to store and calculate weights and other characteristics throughout the analysis.

The completed database contains about 70,000 cells of information. Copies of the database are not included in this report but are available for inspection at the Virginia Division of Mineral Resources and at the Virginia Institute of Marine Science; Appendices III through VI contain the resultant sample compositions.

RESULTS

SAMPLE COMPOSITION

Mineral composition data are subdivided into two groups: cores and grab samples (Appendix III). Because the usefulness of relying upon surface grab samples in predicting economic mineral potential is questioned (A. E. Grosz, personal communication), the grab sample data are separated from core data. Appendix III includes separate statistics for each group. Appendix IV shows statistics for all samples combined.

Another way of characterizing mineral abundance is to calculate mineral composition relative to the entire sample rather than to the heavy-mineral fraction. This is shown in Appendix V. The data is "weighted" by the total heavy-mineral concentration so that mineral abundance per ton of bulk sediment, for example, may be estimated.

Tables 1 and 2 show average and highest values for certain economic minerals by core, grab, and all samples. The total heavy-mineral (THM) concentration (average and highest value) of "grabs" is approximately 50 percent greater than for cores, and these differences between the THM averages are significant at the 99.9 percent level of confidence. Average mineral concentrations, however, were nearly the same for cores and grab samples, with the exception of zircon and monazite. Therefore, based on the data, grab samples may be useful in predicting mineral composition at depth in offshore sediments, but the grab samples do not appear to be good indicators of total heavy-mineral concentration. At this time, the economic potential of sediments can only be established reliably by core analysis.

As an aid to further assessment of the economic potential of the area, Appendix V presents the weight percent of selected minerals with respect to the total sample. Garnar's values (or any other standard) can likewise be converted by multiplying by an economic threshold THM concentration (5 percent), resulting in the following mineral concentrations: ilmenite 2.25 percent, leucoxene and zircon 0.25 percent, rutile 0.1 percent, monazite 0.05 percent. Data presented in this way gives absolute (composition with respect to the bulk sample) rather than relative abundance and comparisons between samples or to an industrial standard are meaningful.

ECONOMIC POTENTIAL

The average values for the mineral concentrations shown of these and other samples are summarized in Table 3. The

TABLE 1. Average concentrations of selected minerals as a percentage by weight of the heavy-mineral fraction; 100 grab samples, 290 core samples = 390 total.

	WT % THM	WT % ILMENITE	WT % LEUCOXENE	WT % RUTILE	WT % ZIRCON	WT % MONAZITE
cores	2.9	24.0	1.7	1.4	3.8	0.1
grabs	4.4	28.6	1.8	1.2	2.8	0.3
all samples	3.3	25.2	1.8	1.3	3.6	0.1

TABLE 2. Maximum concentrations of selected minerals as a percentage by weight of the heavy-mineral fraction.

	WT % THM	WT % ILMENITE	WT % LEUCOXENE	WT % RUTILE	WT % ZIRCON	WT % MONAZITE
cores	9.1	60.3	7.9	3.2	9.2	2.5
grabs	14.7	58.8	8.2	2.8	5.4	1.8

TABLE 3. Several samples indicating economic potential are selected from Appendix III. Composition is relative to the heavy mineral fraction. See Appendix III for additional explanation of tabulated data.

Sample	WT % THM	WT % ILMENITE	WT % RUTILE	WT % LEUCOXENE	WT % MONAZITE	WT % ZIRCON	WT % ECON
H01-3	5.5	17.4	2.7	0.3	1.4	7.6	32.2
V1-4	0.8	56.2	1.7	3.3	0.3	3.8	66.1
4	9.3	21.4	1.4	3.0	0.2	3.3	30.8
33	5.1	58.8	0.8	0.6	0.1	4.1	65.8
54	14.7	29.0	1.1	0.2	0.4	4.9	35.9
59	11.0	34.9	1.5	0.6	0.1	4.3	42.4
85	10.8	54.9	2.4	1.8	0.1	3.8	63.1
1134-1	8.8	34.0	1.8	0.3	0.2	4.6	41.1
1136-1	9.0	28.7	1.1	1.0	P	3.5	34.7
C27-3	2.7	44.4	2.0	3.0	P	3.9	56.1
C42-4	3.2	49.4	2.0	2.0	0.2	6.7	62.2

in this study are lower than industry standards for mining on land (Table 1). The maximum values in Table 2 are in excess of those standards. Although market conditions may alter the following values, the concentrations of the heavy-mineral fraction of a hypothetical economic land deposit may be: ilmenite 45 percent, leucoxene 5 percent, rutile 2 percent, zircon 5 percent, staurolite 20 percent, monazite 1 percent, garnet/epidote 15 percent, kyanite/sillimanite 7 percent, and a total heavy mineral concentration of 4 or 5 percent (Garnar, 1978). Because there is no offshore production of a similar suite of heavy minerals within U.S. waters, an economic comparison to Virginia's offshore mineral potential cannot be made. Offshore concentrations may need to have twice the value of economic land deposits in order for development to proceed (U.S. Congress, 1987). Additionally, several factors

make it difficult to assess the commercial potential of marine minerals; the erratic performance of domestic and global mineral economies and changing technologies affecting both demand and production being but two factors (U.S. Congress, 1987). There is also a lack of a detailed geologic analysis of an offshore site, an environmental and resource assessment, and a feasibility study. The economic potential of the heavy minerals offshore of Virginia may also depend on the volume of other co-existing marketable material (including sand and gravel) present in the deposit.

We have identified over 52 samples with concentrations of one or more of the "ECON" minerals equal to or greater than Garnar's threshold values, assuming a THM of 5 percent. These samples are marked by underlining in Appendix V and their offshore location is shown on Figure 3. Eleven

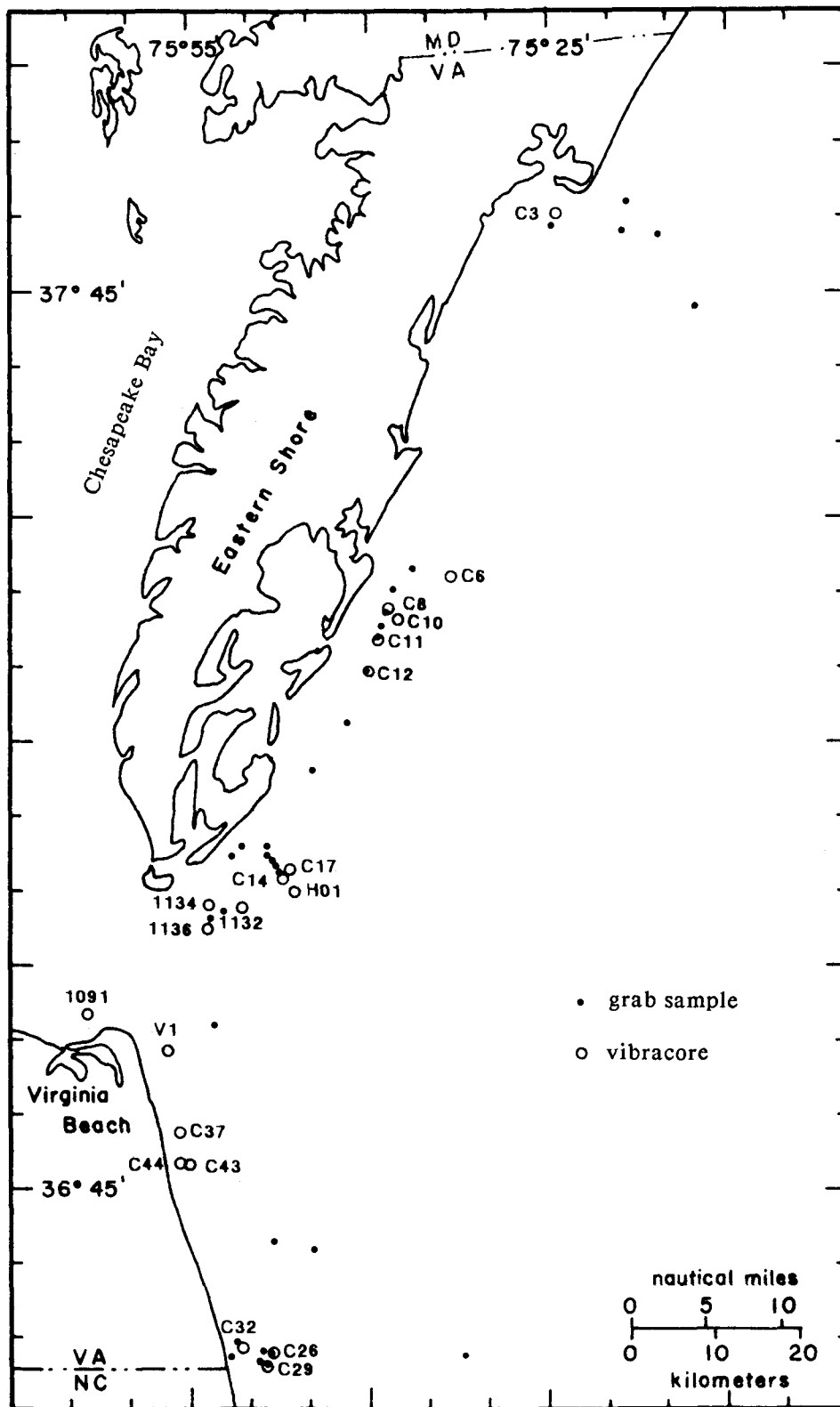


Figure 3. Map showing the location of samples with economic potential.

of these and other samples are summarized in Table 3. The compositions of two samples are graphically described in Figure 4. Although total heavy-mineral concentration may be low in some samples, an exceptional abundance of an individual mineral, or minerals may encourage further investigation.

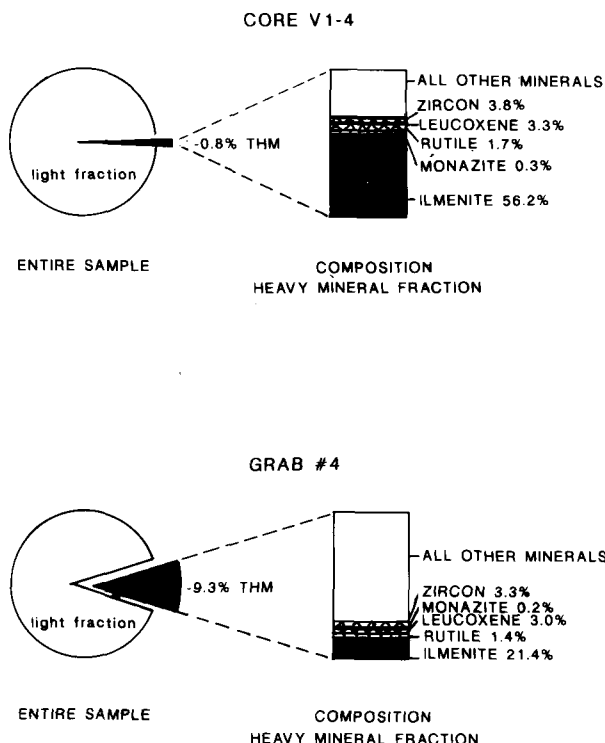


Figure 4. Graphic presentation of selected samples.

The decision of which samples to include in Table 3 is based on several criteria. For economic land deposits, the average THM concentration should be at least 3 percent. THM exceeds this in several samples, even though the individual mineral abundance may be less than the threshold values suggested by Garnar (1978). These are included because the same volume of a mineral may be present at twice the THM concentration but half the abundance of the heavy-mineral fraction (THM of 5 percent and ilmenite of 60 percent would yield a THM of 10 percent and ilmenite of 30 percent). Also included in Table 3 are samples with THM values less than 4 percent where certain ECON minerals are in great abundance, because these samples may have been deposited in an environment indicating selective enrichment and nearby higher-grade sediments.

CONCLUSIONS

Analyses indicate that sediments offshore of Virginia contain occurrences of potentially economic heavy minerals. High total heavy-mineral (THM) concentrations coupled with high concentrations of ilmenite, zircon, and to a lesser extent monazite and rutile, are encouraging and justify further investigation.

Economic potential is currently determined by acquiring mineral concentrations from cores. Mineral data from surface grab samples were used as a guide for locating nearly all vibracore sites. Surficial mineral data may be misleading because the relationship between surface and subsurface concentrations is not clear. This means that areas characterized by low surficial mineral concentrations remain as potential sites for coring.

Mineral concentrations are only part of the information needed to plan for economic recovery of the resource. National need, market conditions, advanced technological requirements, and mining costs are other factors to be considered. Evaluation of offshore mining potential should assess all materials; it may be possible to dredge sand for construction or beach nourishment and extract heavy minerals as a part of the same operation.

We planned this study as a reconnaissance survey and therefore did not attempt to precisely define economic mineral deposits. An appropriate exploration program would require many closely spaced seismic lines and deep cores. Most of our samples are located within 5 miles of the shoreline and the most wide-spread coverage of the offshore is based only on grab samples. Although ridge-fields may be the locus of high mineral concentrations, too little is known to ignore other regions of the continental shelf. The shelf seaward of Commonwealth jurisdiction is largely unexplored. Based on the high concentrations of minerals revealed in this report (STA054 and STA094, Appendix III), we recommend additional surveys further offshore in the Exclusive Economic Zone.

Finally, more work could be done within 5 miles of the coast. From a research perspective, a natural process responsible for concentrating the offshore heavy minerals has not been identified. With a greater understanding of the processes concentrating heavy minerals, areas of high mineral content could be located more readily. New geophysical techniques, such as induced polarization, are available and their use may diminish the need for numerous deep cores. The effects of dredging on biological resources must also be determined. If sediments are removed from offshore, the effect of the changed bathymetry on waves reaching the shoreline must be evaluated. To date, no government heavy-mineral economic resource assessment (tonnage and grade) or feasibility study has been made for the Exclusive Economic Zone offshore of Virginia. There are several sites off Virginia (Smith Island Shoal, Hog Island, Virginia Beach, and False Cape) each with a number of cores having high concentrations of minerals; those sites are candidates for more detailed analysis.

ACKNOWLEDGMENTS

Timely completion of the combined projects required the cooperation and effort of many individuals. Dr. A. E. Grosz (USGS) loaned equipment and guided us in establishing analytical procedures; he also assisted in mineral identification procedures and in the design of the database. With some modifications, we used many of his suggestions and methods. W. J. Swann of the U.S. Army Corps of Engineers loaned equipment and provided access to vibracores.

From the Virginia Institute of Marine Science, H.D. Evans helped cut and log cores and process samples; J. K. Dame and C. H. Hobbs helped process cores; C. H. Hobbs and R. A. Gammisch assisted in sample collection and participated in relevant discussions throughout the projects; Captains C. E. Machen and L. D. Ward, and Mate S. H. George from vessel operations provided expertise in data collection aboard the R/V Langley, R/V Bay Eagle, and R/V Captain John Smith. Many of the surface grab samples were collected from the chartered vessel Anthony Anne with the help of Captain J. A. Penello. Vibracoring was accomplished on the R/V Atlantic Twin by contract with Alpine Ocean Seismic Survey, Inc. Dr. G. P. Burbank of Hampton University performed the heavy-liquid separations and some magnetic separations under contract from the Virginia Institute of Marine Science.

REFERENCES CITED

- Berquist, C. R., Jr., and Hobbs, C. H., III, 1986, Assessment of economic heavy minerals of the Virginia inner continental shelf: Virginia Division of Mineral Resources Open-File Report 86-1, 17 p.
- Berquist, C. R., Jr., and Hobbs, C. H., III, 1988a, Reconnaissance of economic heavy minerals of the Virginia inner continental shelf: Virginia Division of Mineral Resources Open-File Report 88-1, 74 p.
- Berquist, C. R., Jr., and Hobbs, C. H., III, 1988b, Study of economic heavy minerals of the Virginia inner continental shelf: Virginia Division of Mineral Resources Open-File Report 88-4, 149 p.
- Gamar, T.E., Jr., 1978, Geological classification and evaluation of heavy mineral deposits: Georgia Geological Survey Information Circular 49, p. 25-36.
- Goodwin, B. K., and Thomas, J. B., 1973, Inner shelf sediments off Chesapeake Bay: III: Heavy minerals: Special Scientific Report No. 68, Virginia Institute of Marine Science, Gloucester Point, 34 p.
- Grosz, A. E., and Escowitz, E. C., 1983, Economic heavy minerals of the U. S. Atlantic continental shelf, in Tanner, W. F., (ed.), Proceedings of the sixth symposium on coastal sedimentology: Florida State University, Tallahassee, p. 231-242.
- Luepke, G., and Grosz, A.E., 1986, Distribution of economic heavy minerals in sediments of Saco Bay, Maine: U.S. Geological Survey Bulletin 1681, 12 p.
- Meisburger, E.P., 1972, Geomorphology and sediments of the Chesapeake Bay entrance: Coastal Engineering Research Center Technical Memo 38, 61 p.
- Nichols, M. M., 1972, Inner shelf sediments off Chesapeake Bay: I: General lithology and composition: Special Scientific Report No. 64, Virginia Institute of Marine Science, Gloucester Point, 20 p.
- Subaqueous Minerals and Materials Study Commission, 1987, Report to the Governor and the General Assembly of Virginia: Richmond, Senate Document No. 26, Commonwealth of Virginia, 17 p.
- U.S. Congress, Office of Technology Assessment, 1987, Marine minerals: Exploring our new ocean frontier: Washington, D. C., OTA-O-342, U. S. Government Printing Office, 349 p.

APPENDIX I

LOCATION OF SAMPLES

Loran coordinates are slaves of the 9960 chain. Latitude and longitude were obtained from automatic conversion of loran coordinates by the shipboard loran receiver-processor. Data not available are noted by "*". Locations shown on Figures 5, 6, 7, 8, 9, and 10.

VIBRACORE SAMPLES

CORE WATER ID	DEPTH (FT)	LORAN C COORDINATES		LATITUDE		LONGITUDE	
		Y	X	deg	min	deg	min
H01	38	41405.1	27132.7	37 05.00	75 45.99		
H02	38	41406.1	27133.8	37 05.12	75 46.19		
H03	37	41408.0	27134.9	37 05.31	75 46.37		
H04	38	41409.8	27136.1	37 05.50	75 46.58		
H05	34	41412.2	27137.2	37 05.74	75 46.74		
H06	37	41392.9	27131.0	37 03.94	75 46.03		
H07	36	41398.8	27134.9	37 04.56	75 46.70		
H08	30	41402.0	27136.7	37 04.89	75 46.98		
H09	32	41405.3	27138.6	37 05.22	75 47.29		
H010	35	41408.5	27137.4	37 05.44	75 46.90		
H011	30	41410.7	27139.3	37 05.69	75 47.25		
H012	29	41411.5	27139.7	37 05.77	75 47.31		
H013	38	41412.8	27140.9	37 05.92	75 47.54		
H014	38	41414.6	27138.8	37 05.99	75 47.01		
H015	30	41413.6	27138.3	37 05.89	75 46.93		
B01	25	41399.5	27202.9	37 07.03	76 01.97		
B02	22	41415.2	27200.0	37 08.20	76 00.74		
B03	15	41423.1	27200.1	37 08.84	76 00.47		
B04	35	41385.3	27210.2	37 06.13	76 04.17		
B05	25	41369.8	27210.1	37 04.87	76 04.71		
V1	48	*	*	36 54.53	75 56.56		
V2	46	*	*	36 53.15	75 55.29		
V3	49	*	*	36 51.80	75 53.84		
V4	52	*	*	36 50.51	75 51.55		
V5	*	*	*	36 54.04	75 56.39		
V6	47	*	*	36 52.41	75 50.41		
1090	*	*	*	36 56.25	76 03.32		
1091	*	*	*	36 56.76	76 03.27		
1092	*	*	*	36 57.20	76 03.60		
1093	*	*	*	36 56.88	76 04.45		
1094	*	*	*	36 57.20	76 04.40		
1095	*	*	*	36 57.55	76 05.20		
1096	*	*	*	36 57.98	76 05.92		
1097	*	*	*	36 58.50	76 05.60		
1098	*	*	*	36 57.98	76 04.80		
1099	*	*	*	36 58.18	76 04.80		
1100	*	*	*	36 58.63	76 04.42		
1103	*	*	*	37 00.55	76 03.35		
1106	*	*	*	37 00.72	75 58.70		
1107	*	*	*	37 02.34	76 01.00		
1109	*	*	*	37 03.75	76 02.00		
1111	*	*	*	37 05.62	75 59.80		

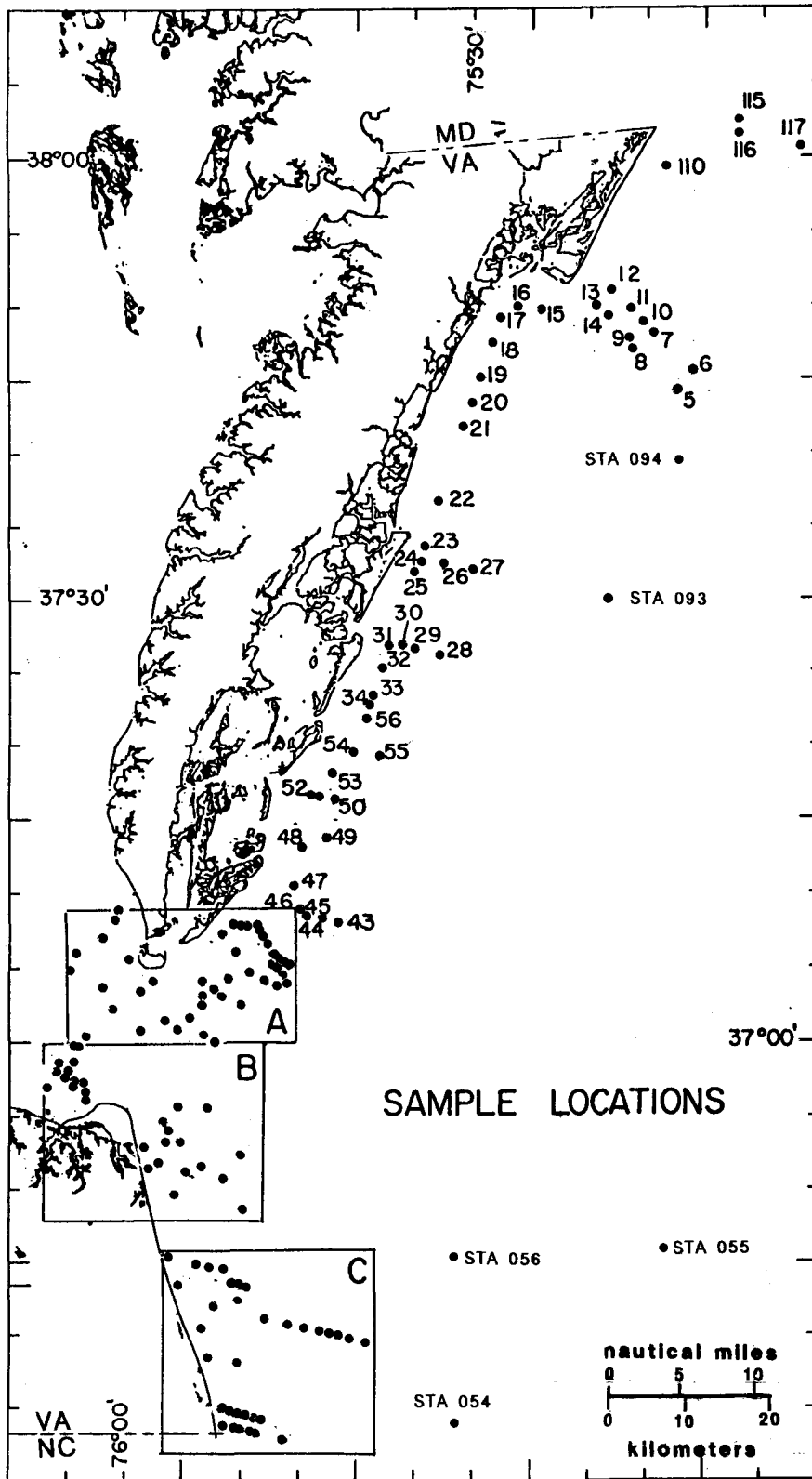


Figure 5. Map showing the location of cores and grab samples off Eastern Shore and index map of sample locations south of the Eastern Shore.

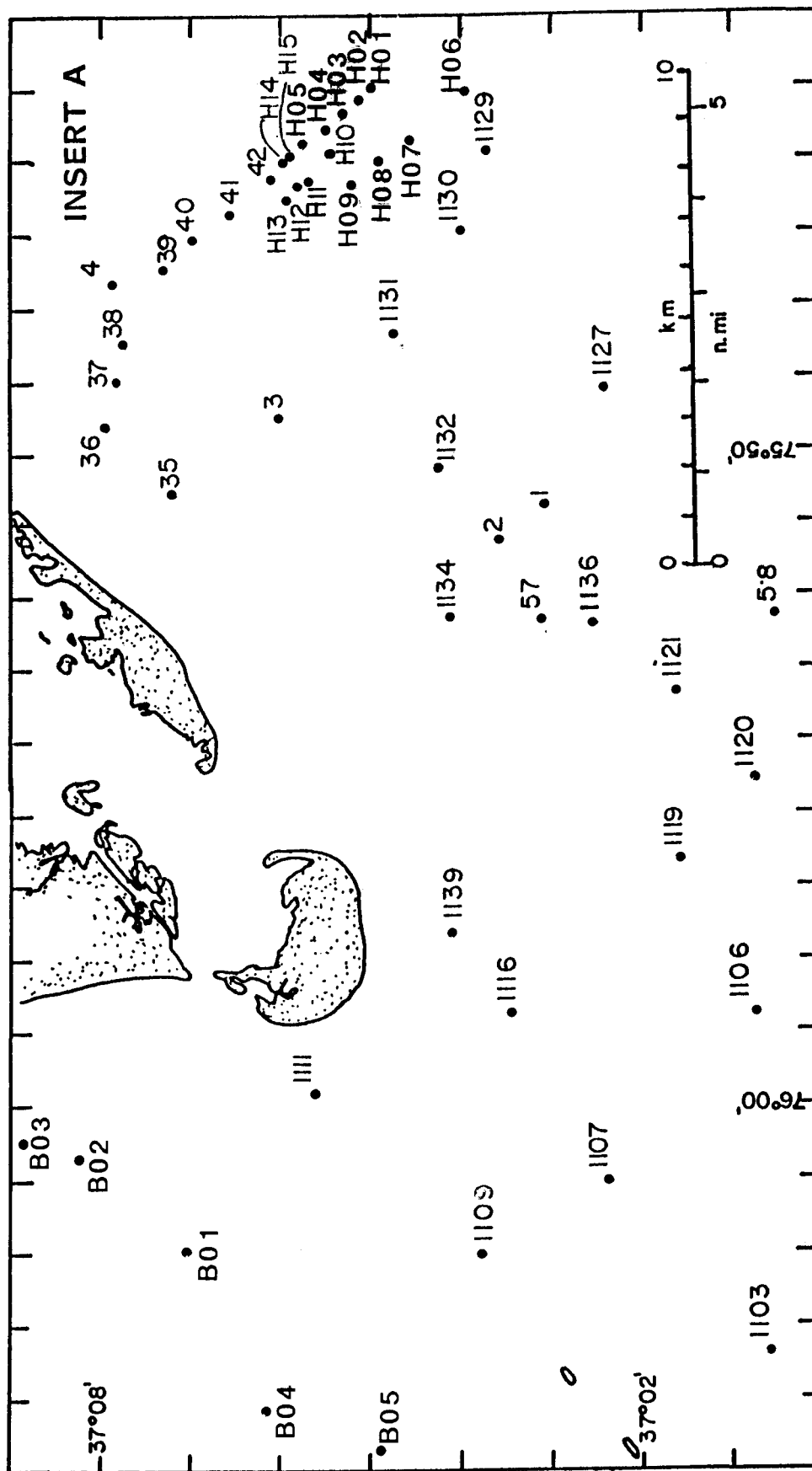


Figure 6. Insert A: map showing the location of samples at northern part of entrance to Chesapeake Bay.

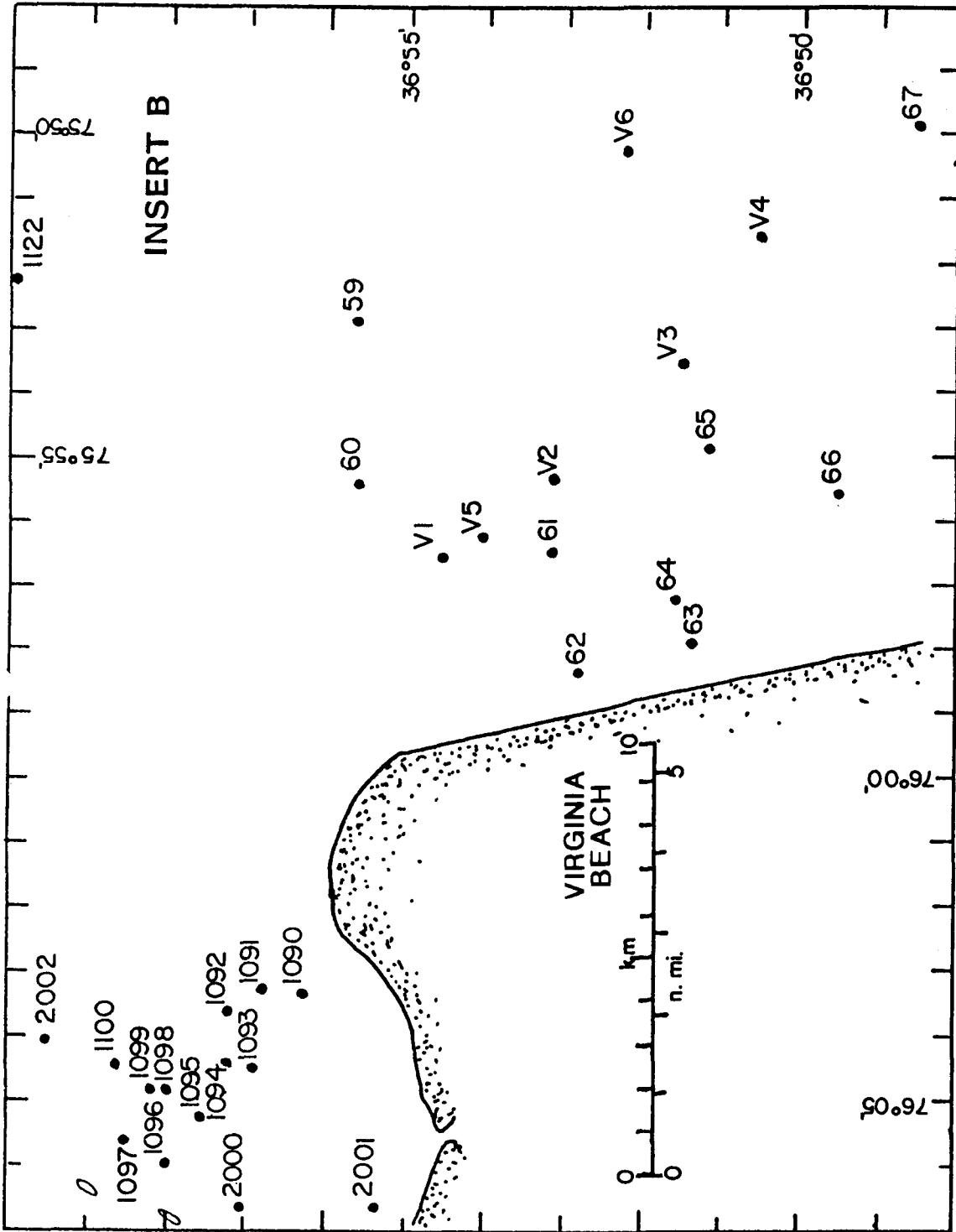


Figure 7. Insert B: map showing the location of samples at the southern part of entrance to Chesapeake Bay and off Virginia Beach.

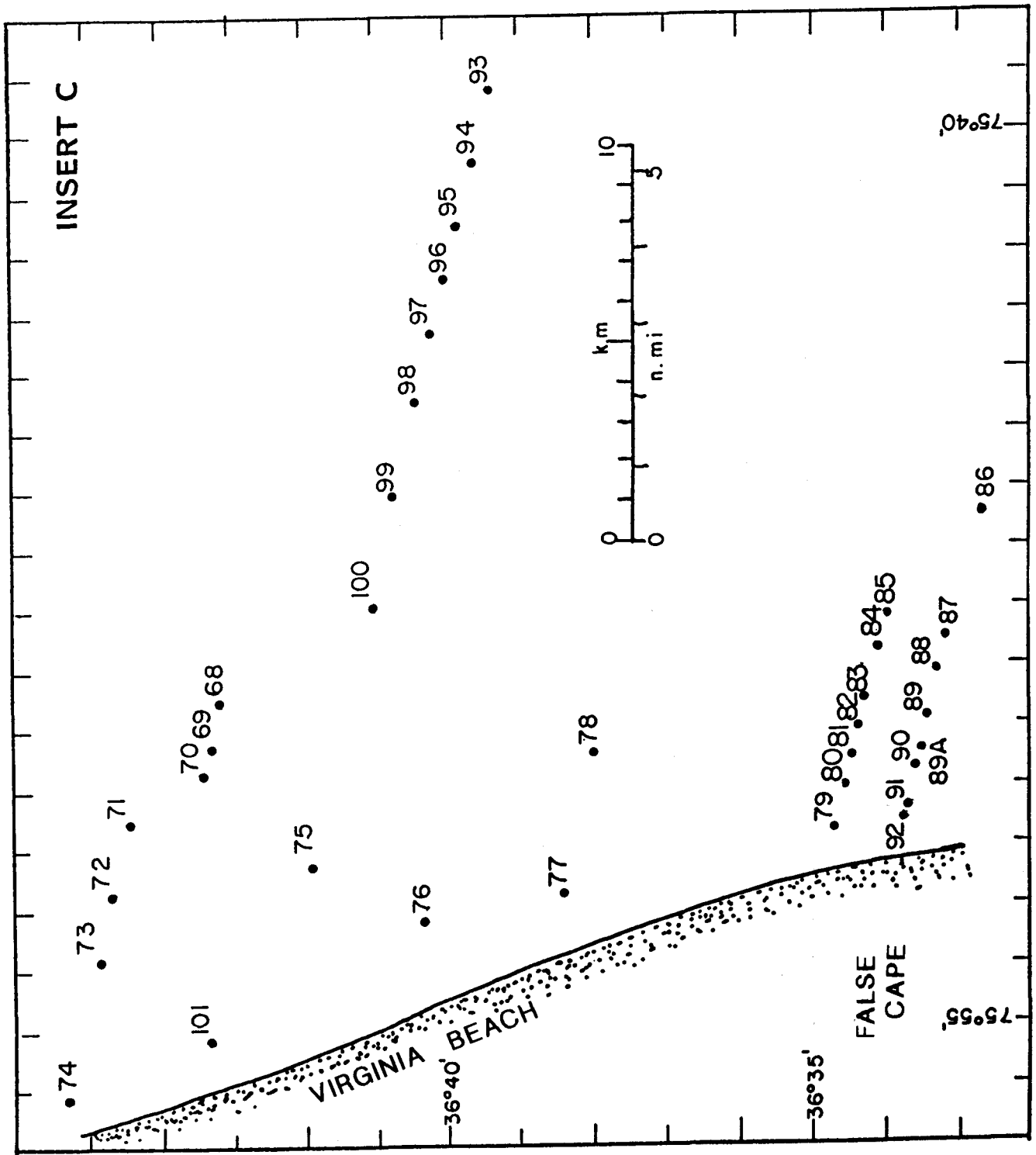


Figure 8. Insert C: map showing the location of samples off Virginia Beach to North Carolina.

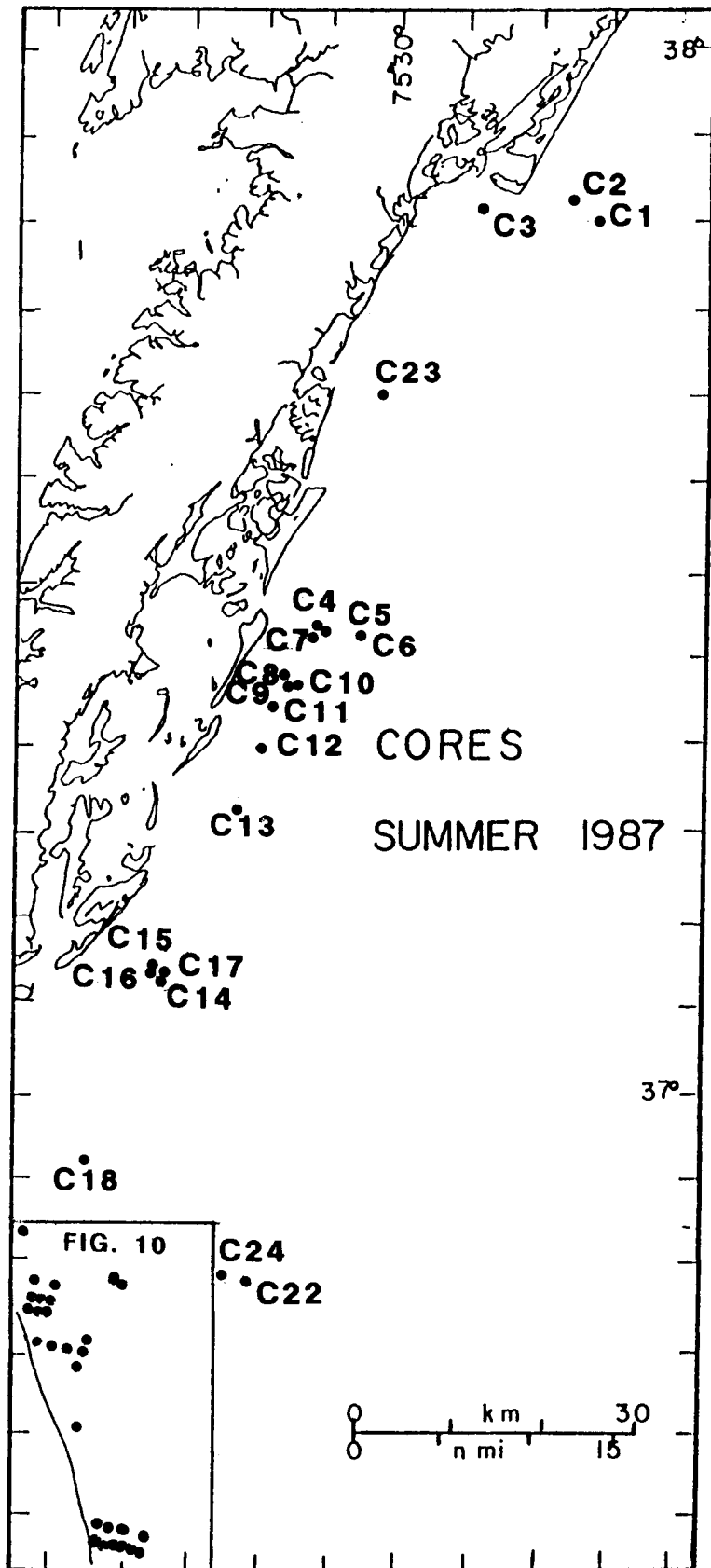


Figure 9. Map showing the location of cores taken during the summer of 1987, northern area.

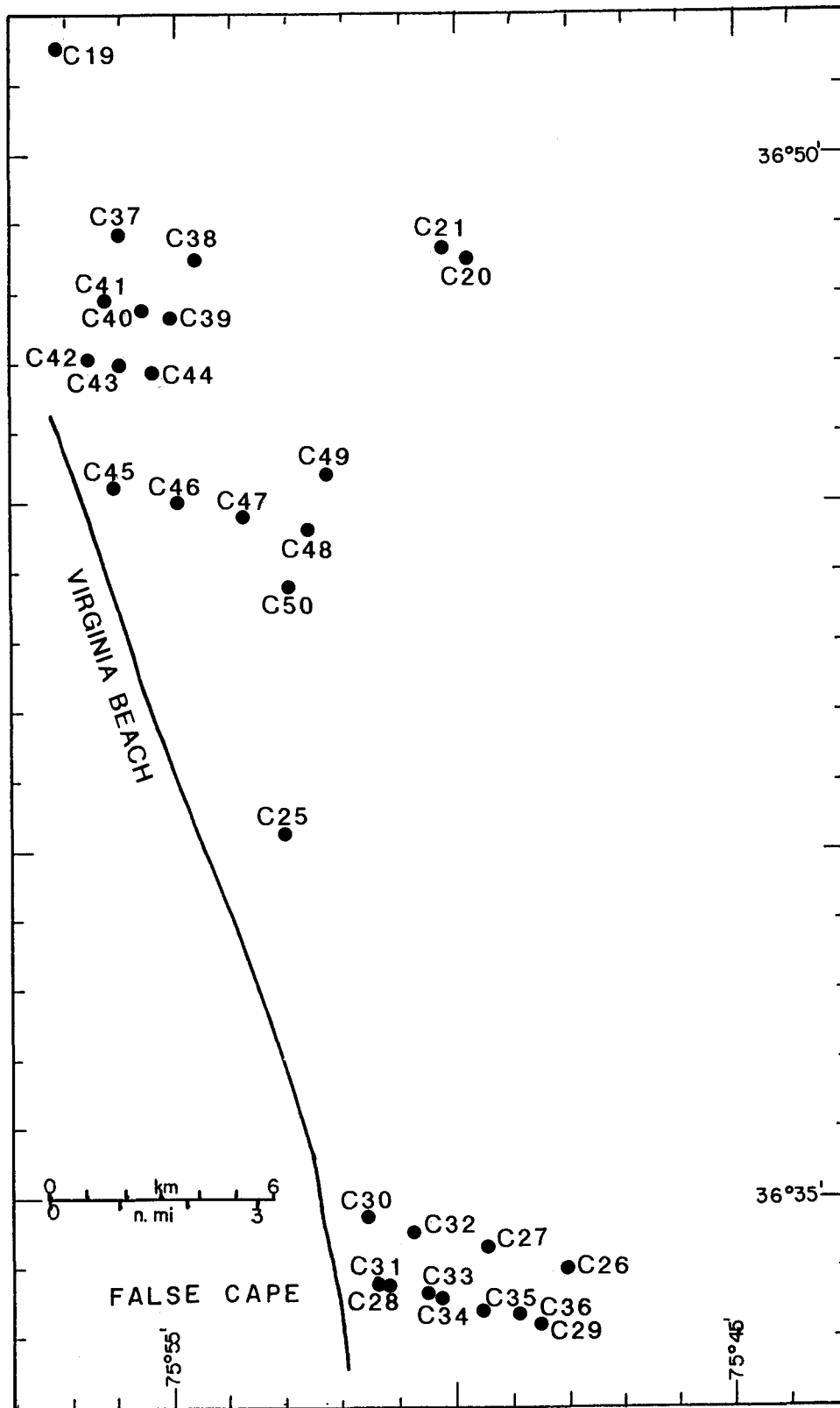


Figure 10. Map showing the location of cores taken during the summer of 1987, southern area.

VIRGINIA DIVISION OF MINERAL RESOURCES

CORE WATER LORAN C LATITUDE LONGITUDE					CORE WATER LORAN C LATITUDE LONGITUDE										
ID	DEPTH	COORDINATES		deg	min	deg	min	ID	DEPTH	COORDINATES		deg	min	deg	min
	(FT)	Y	X						(FT)	Y	X				
1116	*	*	*	37	03.42	75	58.69	C37	29	27146.0	41201.1	36	48.83	75	56.09
1119	*	*	*	37	01.55	75	56.58	C38	34	27140.0	41200.0	36	48.50	75	54.74
1120	*	*	*	37	00.70	75	55.48	C39	34	27140.0	41189.8	36	47.67	75	55.10
1121	*	*	*	37	01.60	75	54.30	C40	30	27142.5	41190.0	36	47.78	75	55.67
1122	*	*	*	36	59.95	75	52.25	C41	29	27145.1	41190.2	36	47.91	75	56.26
1127	*	*	*	37	02.40	75	50.05	C42	30	27145.0	41179.9	36	47.06	75	56.60
1129	*	*	*	37	03.70	75	46.85	C43	32	27142.6	41180.0	36	46.97	75	56.04
1130	*	*	*	37	04.00	75	47.91	C44	33	27140.0	41180.0	36	46.87	75	55.44
1131	*	*	*	37	04.75	75	49.32	C45	32	27140.0	41160.0	36	45.24	75	56.13
1132	*	*	*	37	04.24	75	51.18	C46	36	27135.1	41159.9	36	45.03	75	55.00
1134	*	*	*	37	04.12	75	53.28	C47	41	27130.0	41159.9	36	44.81	75	53.82
1136	*	*	*	37	02.50	75	53.40	C48	29	27125.0	41160.0	36	44.61	75	52.66
1139	*	*	*	37	04.10	75	57.60	C49	35	27125.1	41170.0	36	45.43	75	52.35
2000	*	*	*	36	57.05	76	06.62	C50	39	27125.0	41150.0	36	43.79	75	53.01
2001	*	*	*	36	55.35	76	06.62	WB063	12	27248.9	41305.6	37	01.10	76	16.02
2002	*	*	*	36	59.52	76	04.02								
110	*	*	*	37	59.25	75	13.34								
115	*	*	*	38	02.38	75	07.15								
116	*	*	*	38	01.44	75	07.08								
117	*	*	*	38	00.59	75	01.80								
C1	50	27082.8	41961.6	37	49.72	75	16.37								
C2	45	27093.2	41974.0	37	51.00	75	18.02								
C3	35	27047.9	41974.9	37	50.02	75	09.01								
C4	36	27129.7	41669.5	37	26.61	75	36.08								
C5	36	27130.0	41670.0	37	26.68	75	36.12								
C6	36	27130.0	41668.0	37	26.51	75	36.19								
C7	56	27114.8	41668.1	37	26.07	75	32.97								
C8	32	27134.5	41629.2	37	23.45	75	68.51								
C9	34	27133.5	41626.6	37	23.21	75	38.39								
C10	32	27128.6	41628.0	37	23.17	75	37.29								
C11	32	27134.9	41610.0	37	21.88	75	39.27								
C12	28	27134.9	41580.1	37	19.43	75	40.32								
C13	31	27134.8	41539.8	37	16.11	75	41.72								
C14	32	27139.9	41415.1	37	06.06	75	47.21								
C15	28	27144.9	41423.9	37	06.96	75	48.01								
C16	29	27144.0	41420.0	37	06.61	75	47.95								
C17	33	27140.5	41420.0	37	06.48	76	47.17								
C18	37	27144.7	41284.9	36	55.61	75	52.85								
C19	27	27155.0	41229.9	36	51.53	75	57.15								
C20	53	27120.0	41210.0	36	48.50	75	49.81								
C21	50	27122.0	41210.9	36	48.66	75	50.24								
C22	60	27088.0	41229.9	36	48.61	75	41.26								
C23	44	27135.0	41830.0	37	40.03	75	31.52								
C24	60	27092.5	41230.6	36	49.07	75	42.85								
C25	33	27119.8	41109.6	36	40.26	75	53.18								
C26	47	27089.6	41049.9	36	33.97	75	48.14								
C27	45	27095.7	41050.0	36	34.26	75	49.56								
C28	8	27102.2	41039.9	36	33.73	75	51.41								
C29	37	27090.3	41040.0	36	33.18	75	48.62								
C30	33	27105.0	41050.1	36	34.70	75	51.73								
C31	25	27102.7	41040.0	36	33.76	75	51.52								
C32	35	27101.4	41049.9	36	34.52	75	50.89								
C33	37	27099.0	41040.0	36	33.59	75	50.66								
C34	31	27098.0	41039.8	36	33.52	75	50.43								
C35	41	27094.8	41039.9	36	33.38	75	49.68								
C36	25	27092.2	41040.5	36	33.31	75	49.05								

113 core samples

GRAB SAMPLES

GRAB ID	DEPTH (FEET)	LORAN C COORDINATES		LATITUDE LONGITUDE	
		Y	X	deg	min
1	33.0	41372.0	27153.0	37	03.03
2	27.0	41377.0	27156.0	37	03.55
3	27.0	41408.2	27153.4	37	05.99
4	24.0	41432.9	27149.1	37	07.85
5	78.0	41901.9	27048.0	37	43.78
6	82.2	41920.7	27049.7	37	45.43
7	75.0	41945.3	27070.3	37	48.03
8	60.0	41931.1	27076.8	37	47.00
9	57.6	41937.5	27079.9	37	47.62
10	59.4	41953.0	27076.4	37	48.83
11	51.6	41961.6	27082.8	37	49.71
12	46.2	41974.0	27093.2	37	51.01
13	44.4	41959.5	27097.8	37	49.90
14	36.0	41952.5	27090.9	37	49.15
15	36.0	41947.9	27119.8	37	49.49
16	30.0	41949.0	27130.0	37	49.82
17	30.0	41939.2	27135.0	37	49.12
18	36.0	41918.9	27134.8	37	47.43
19	44.4	41890.6	27135.0	37	45.08
20	48.0	41869.5	27134.9	37	43.33
21	47.4	41850.0	27135.1	37	41.72
22	30.0	41789.2	27135.1	37	36.69
23	36.0	41751.2	27134.0	37	33.52
24	36.0	41739.4	27134.2	37	32.55
25	30.0	41729.8	27134.6	37	31.77
26	52.2	41740.0	27124.6	37	32.32
27	24.0	41739.6	27112.0	37	31.92
28	58.2	41668.1	27114.8	37	26.07
29	36.0	41669.3	27125.2	37	26.49

GRABDEPTH ID	LORANC (FEET)	LATITUDE COORDINATES		LONGITUDE	
		Y	X	deg min	deg min
30	36.0	41669.5	27129.7	37 26.64	75 36.13
31	30.0	41669.4	27135.1	37 26.80	75 37.28
32	30.0	41650.1	27134.7	37 25.19	75 37.88
33	30.0	41629.2	27134.5	37 23.45	75 38.55
34	30.0	41619.5	27134.3	37 22.64	75 38.84
35	*	41420.4	27160.1	37 07.22	75 51.55
36	*	41429.9	27157.5	37 07.90	75 50.64
37	*	41430.2	27154.9	37 07.83	75 50.04
38	*	41430.0	27152.4	37 07.73	75 49.49
39	*	41426.9	27147.4	37 07.30	75 48.49
40	*	41423.9	27144.9	37 06.97	75 48.04
41	*	41419.8	27142.7	37 06.56	75 47.70
42	*	41415.1	27139.9	37 06.07	75 47.23
43	*	41446.8	27120.0	37 07.97	75 41.73
44	*	41447.0	27125.5	37 08.18	75 42.94
45	*	41447.7	27131.9	37 08.46	75 44.32
46	*	41449.6	27134.9	37 08.71	75 44.91
47	*	41466.8	27140.0	37 10.31	75 45.44
48	*	41500.0	27142.0	37 13.09	75 44.71
49	*	41510.1	27134.9	37 13.68	75 42.81
50	*	41539.9	27134.9	37 16.12	75 41.76
51	*	41540.1	27142.0	37 16.37	75 43.30
52	*	41540.1	27145.0	37 16.47	75 43.96
53	*	41560.1	27139.9	37 17.95	75 42.15
54	*	41580.1	27134.9	37 19.42	75 40.35
55	*	41579.9	27125.0	37 19.09	75 38.23
56	*	41610.0	27134.9	37 21.88	75 39.30
57	*	41369.8	27159.9	37 03.10	75 53.31
58	*	41339.9	27154.8	37 00.49	75 53.23
59	*	41284.9	27144.7	36 55.63	75 52.89
60	*	41279.7	27154.9	36 55.60	75 55.39
61	*	41249.6	27154.9	36 53.16	75 56.46
62	*	41241.9	27162.0	36 52.81	75 58.36
63	*	41226.7	27157.4	36 51.40	75 57.84
64	*	41229.9	27155.0	36 51.56	75 57.18
65	*	41229.9	27144.9	36 51.15	75 54.85
66	*	41209.8	27144.9	36 49.52	75 55.56
67	*	41209.9	27120.0	36 48.51	75 49.83
68	*	41149.9	27109.9	36 43.16	75 49.55
69	*	41149.7	27113.0	36 43.28	75 50.27
70	*	41149.9	27115.1	36 43.38	75 50.74
71	*	41159.9	27119.9	36 44.41	75 51.51
72	*	41159.9	27125.1	36 44.64	75 52.72
73	*	41159.7	27129.9	36 44.82	75 53.83
74	*	41160.0	27140.0	36 45.26	75 56.16
75	*	41129.5	27119.0	36 41.88	75 52.33
76	*	41109.9	27119.9	36 40.31	75 53.22
77	*	41089.5	27115.0	36 38.42	75 52.75
78	*	41089.8	27104.9	36 37.99	75 50.39
79	*	41050.1	27105.0	36 34.72	75 51.73
80	*	41049.9	27101.8	36 34.55	75 50.99
81	*	41049.9	27099.8	36 34.46	75 50.52
82	*	41049.8	27097.8	36 34.36	75 50.05
83	*	41050.0	27095.6	36 34.27	75 49.53
84	*	41049.9	27092.3	36 34.10	75 48.76
85	*	41049.9	27089.9	36 33.99	75 48.20

GRABDEPTH ID	LORANC (FEET)	LATITUDE COORDINATES		LONGITUDE	
		Y	X	deg min	deg min
86	*	41039.6	27080.7	36 32.70	75 46.39
87	*	41039.9	27090.0	36 33.17	75 48.56
88	*	41039.9	27092.3	36 33.28	75 49.10
89	*	41039.9	27095.5	36 33.42	75 49.84
89A	*	41039.7	27098.0	36 33.53	75 50.44
90	*	41039.9	27099.0	36 33.59	75 50.66
91	*	41039.8	27102.0	36 33.72	75 51.37
92	*	41039.8	27103.0	36 33.78	75 51.60
93	*	41129.9	27067.5	36 39.38	75 39.29
94	*	41129.7	27067.6	36 39.59	75 40.48
95	*	41129.9	27072.3	36 39.82	75 41.54
96	*	41129.9	27076.1	36 40.00	75 42.42
97	*	41129.9	27080.0	36 40.18	75 43.32
98	*	41129.9	27085.0	36 40.41	75 44.47
99	*	41130.0	27092.1	36 40.73	75 46.10
100	*	41129.6	27100.0	36 41.05	75 47.94
101	*	41139.8	27132.9	36 43.32	75 55.21
51-1	*	*	*	36 23.00	75 49.36
51-2	*	*	*	36 22.00	75 49.30
51-3	*	*	*	36 10.55	75 45.52
51-4	*	*	*	35 50.21	75 33.38
STA054	*	*	*	36 33.70	75 30.80
STA055	*	*	*	36 46.00	75 13.50
STA056	*	*	*	36 47.10	75 32.00
STA093	*	*	*	37 29.90	75 18.30
STA094	*	*	*	37 38.90	75 13.20

111 grab samples

APPENDIX II

A. GENERAL CHARACTERISTICS OF SAMPLES

Data not available are noted by "*"; total heavy minerals = "THM"; gravel (particle size >2mm) = "GRAV". Dry sample weight is in grams. The sum of sample core lengths may be less than described length (Appendix VII) because not all core samples provided enough heavy minerals for analysis. Abbreviations: AVG - average, STD - standard deviation, MAX - maximum value, MIN - minimum value.

CORE SAMPLES

SAMPLE NAME	SAMPLED CORE LENGTH (CM)	DRY SAMPLE WT	SAND			SAND	
			% SAND	% MUD	% GRAV	PHI MEAN	WT% THM
B01-1	140	5530	94	6	0	*	3.91
B01-2	130	6247	93	7	0	*	2.88
B02-1	137	5447	98	2	0	*	2.42
B02-2	131	6222	97	3	0	*	3.88
B03-1	122	5036	97	3	0	*	3.20
B03-2	122	6038	96	3	0	*	3.33
B03-3	113	5147	95	5	0	*	3.26

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	SAMPLED CORE DRY SAND						SAND PHI WT%	SAMPLE NAME	SAMPLED CORE DRY SAND						SAND PHI WT%
	LENGTH (CM)	SAMPLE WT	%	%	%	PHI			LENGTH (CM)	SAMPLE WT	%	%	%	PHI	
B04-1	289	7882	94	6	0	*	2.53	1091-1	150	10348	85	15	0	*	2.36
B05-1	261	7522	94	6	0	*	1.86	1091-2	150	11148	85	15	0	*	1.71
B05-2	146	6888	95	5	0	*	1.82	1091-3	170	13447	78	22	0	*	1.61
H01-1	128	6329	98	0	2	*	3.86	1092-1	236	14850	91	2	7	*	1.70
H01-2	137	8475	96	1	3	*	5.10	1092-2	242	10450	89	2	9	*	1.03
H01-3	111	6371	89	3	8	*	5.48	1094-1	158	14049	92	8	0	*	1.15
H02-1	86	3000	96	3	1	*	2.32	1094-2	179	13151	76	24	0	*	1.01
H02-2	154	5826	59	41	0	*	1.09	1095-1	160	12648	87	13	0	*	2.51
H02-3	142	9853	73	27	0	*	1.34	1095-2	150	12949	91	9	0	*	2.30
H03-1	130	6272	95	1	4	*	2.14	1096-1	150	11850	87	12	0	*	1.84
H04-1	133	6099	84	16	0	*	3.06	1096-2	150	13049	73	26	1	*	2.23
H04-2	158	7882	70	30	0	*	1.37	1097-1	200	17950	93	7	0	*	2.60
H04-3	151	4773	80	19	1	*	1.57	1097-2	180	16951	76	19	6	*	1.39
H05-1	185	7031	92	5	3	*	3.67	1097-3	146	13450	75	22	3	*	1.26
H06-1	167	6525	85	15	0	*	3.13	1098-1	191	14849	75	0	25	*	1.78
H06-2	145	6569	81	19	0	*	1.70	1098-2	190	14051	65	33	2	*	0.58
H06-3	152	6278	75	25	0	*	1.49	1099-1	257	15550	73	24	3	*	1.18
H06-4	140	5228	66	34	0	*	0.74	1099-2	200	15849	78	5	17	*	1.78
H07-1	112	3607	78	22	1	*	3.75	1100-1	162	12651	94	6	0	*	2.64
H07-2	128	4222	54	27	19	*	1.87	1100-2	180	16249	88	11	1	*	2.51
H07-3	132	5433	79	21	0	*	1.54	1103-1	160	7851	84	12	5	*	1.80
H08-1	134	5799	97	2	1	*	5.52	1103-2	125	4651	69	22	8	*	1.62
H08-2	144	7567	88	12	0	*	2.85	1103-3	215	12851	93	6	2	*	1.74
H09-1	131	5675	82	18	0	*	3.62	1106-1	145	13450	99	1	0	*	3.59
H10-1	165	6524	87	13	0	*	2.74	1106-2	151	14148	99	1	0	*	2.63
H10-2	174	7300	83	17	0	*	3.21	1107-1	165	15450	99	1	0	*	4.35
H11-1	189	8912	91	6	3	*	4.00	1107-2	167	15048	98	2	1	*	1.83
H12-1	107	5749	98	1	1	*	6.88	1109-1	238	11050	91	9	0	*	3.08
H12-2	121	5809	95	2	3	*	5.34	1111-1	148	11450	92	8	0	*	2.76
H13-1	204	8324	93	5	3	*	2.23	1111-2	186	15110	90	10	0	*	3.20
H14-1	148	5771	*	*	*	*	0.52	1116-1	193	10850	88	12	0	*	4.39
H14-2	142	5942	81	16	4	*	1.49	1116-2	217	15751	83	14	2	*	4.00
V1-1	149	7513	*	*	*	*	1.17	1119-1	205	19051	99	1	0	*	2.43
V1-2	151	7267	*	*	*	*	0.82	1119-2	123	19666	96	4	0	*	2.39
V1-3	152	4400	*	*	*	*	0.61	1120-1	160	12650	98	2	0	*	1.95
V1-4	148	5245	*	*	*	*	0.83	1120-2	175	15449	95	4	0	*	3.05
V2-1	113	4272	*	*	*	*	2.72	1121-1	236	19649	96	4	0	*	3.44
V2-2	152	5530	*	*	*	*	1.67	1122-1	145	12251	92	7	1	*	5.67
V2-3	156	6910	*	*	*	*	3.90	1127-1	140	11348	92	8	0	*	5.51
V2-4	139	6593	*	*	*	*	2.12	1127-2	138	11850	82	18	0	*	2.70
V4-1	190	4721	*	*	*	*	1.77	1129-1	145	1648	95	5	0	*	7.65
V4-2	134	7979	*	*	*	*	1.06	1129-2	145	12849	86	14	0	*	6.11
V4-3	163	4606	*	*	*	*	1.39	1130-1	125	10848	91	6	3	*	7.17
V4-4	153	3766	*	*	*	*	1.35	1130-2	128	9448	66	34	0	*	1.96
V3-1	152	7305	93	5	2	*	1.42	1131-1	182	15648	85	11	4	*	5.92
V3-2	143	6432	64	34	2	*	0.50	1132-1	164	14450	93	6	1	*	6.32
V5-1	108	2317	88	12	0	*	1.95	1134-1	181	16649	97	3	0	*	8.79
V5-3	155	5565	95	5	0	*	1.26	1134-2	169	15997	94	6	0	*	6.82
V5-4	110	3610	94	5	1	*	1.20	1136-1	150	12650	95	4	0	*	9.01
V5-5	128	6424	90	3	7	*	1.44	1136-2	150	12448	94	5	0	*	6.42
V6-1	147	5843	94	6	0	*	2.48	1136-3	185	15850	91	8	0	*	3.34
V6-2	148	7051	91	7	2	*	1.71	1139-1	184	13950	99	1	0	*	2.44
1090-1	165	8649	83	17	0	*	2.46	2000-1	160	6050	78	22	0	*	2.00
1090-2	189	15448	86	14	0	*	1.91	2000-2	160	9748	64	36	0	*	2.39

SAMPLED								SAMPLED							
CORE		DRY		SAND				CORE		DRY		SAND			
LENGTH	SAMPLE	%	%	%	PHI	WT%	LENGTH	SAMPLE	%	%	%	PHI	WT%		
(CM)	WT	SAND	MUD	GRAV	MEAN	THM	(CM)	WT	SAND	MUD	GRAV	MEAN	THM		
SAMPLE	NAME	NAME	NAME	NAME	NAME	NAME	SAMPLE	NAME	NAME	NAME	NAME	NAME	NAME		
2001-1	164	10048	73	27	0	*	2.02	C11-3	159	5919	37.9	62.0	0.0	3.20	3.53
2002-1	177	9750	95	5	0	*	3.75	C11-4	157	4455	56.3	43.7	0.0	3.20	3.08
2002-2	162	11051	88	12	0	*	3.01	C12-1	155	6746	89.5	10.2	0.3	2.93	5.62
110-1	215	7850	84	16	0	*	2.60	C12-2	142	5474	60.7	39.3	0.0	3.15	5.32
110-2	161	3950	88	11	1	*	2.21	C12-3	126	2801	76.0	24.0	0.0	3.19	9.12
110-3	156	3950	73	26	2	*	1.41	C12-4	123	5713	83.3	14.9	1.8	3.15	7.40
115-1	184	5348	58	42	0	*	0.74	C13-1	223	10455	89.5	7.3	3.3	2.35	3.21
116-1	85	3450	97	0	3	*	0.58	C13-2	191	9619	86.8	13.2	0.0	*	2.64
116-2	275	9251	61	38	1	*	0.54	C13-3	171	7196	89.0	11.0	0.0	*	1.73
116-3	190	6848	96	2	2	*	2.17	C14-1	143	6350	81.2	18.4	0.4	3.04	4.47
116-4	176	6450	97	1	2	*	0.92	C14-2	131	4084	33.2	66.8	0.0	*	1.99
116-5	94	1948	99	1	0	*	1.66	C14-3	220	8595	56.7	43.3	0.0	3.35	5.95
117-1	150	5649	92	3	6	*	1.26	C14-4	185	6625	61.3	38.7	0.0	3.40	5.61
117-2	140	6351	79	3	18	*	3.87	C15-1	188	6711	78.0	22.0	0.0	3.06	5.70
117-3	145	5050	89	2	9	*	3.95	C15-2	210	9208	77.8	22.2	0.0	3.27	6.57
117-4	150	5251	98	1	1	*	2.84	C16-1	169	7624	85.7	13.2	1.1	3.02	6.91
C1-1	154	6661	94.5	2.1	3.4	*	2.18	C16-2	96	3937	70.1	29.9	0.0	3.19	5.36
C1-2	155	6332	93.0	6.2	0.8	2.31	3.18	C17-1	155	6583	88.1	11.9	0.0	2.97	3.80
C1-3	155	6516	93.9	5.8	0.2	*	2.09	C17-2	130	5722	70.1	29.8	0.1	3.21	4.26
C1-4	157	7682	81.3	18.7	0.0	*	1.95	C17-3	89	3211	50.8	49.0	0.2	3.25	4.03
C2-1	145	6579	67.0	32.1	0.9	2.69	4.12	C17-4	100	3223	79.5	20.5	0.0	3.20	5.27
C2-2	155	6186	34.9	65.1	0.0	*	1.80	C17-5	150	5281	58.1	41.9	0.0	3.36	5.72
C2-3	145	5802	49.8	50.1	0.1	*	2.65	C18-1	209	8689	90.3	9.6	0.1	2.67	2.92
C2-4	115	3712	64.9	34.3	0.8	*	1.41	C18-2	50	5757	87.4	12.2	0.4	2.84	3.50
C3-1	154	4543	55.3	44.5	0.3	3.25	3.99	C19-1	190	7996	79.8	12.9	7.3	2.97	4.06
C3-2	129	4244	76.3	23.6	0.1	3.14	4.21	C19-2	155	6435	87.0	12.3	0.7	*	2.05
C3-3	155	5087	54.6	45.2	0.2	3.24	3.54	C19-3	208	8423	90.0	9.8	0.2	*	2.08
C3-4	189	7341	53.4	46.4	0.1	3.09	3.36	C20-1	258	12131	41.9	56.3	1.7	*	1.29
C4-1	156	4863	50.4	47.9	1.7	*	2.65	C20-2	150	5957	57.5	25.2	17.3	*	1.75
C4-2	154	5783	78.3	21.3	0.4	*	2.40	C20-3	151	6511	18.9	81.1	0.0	*	0.97
C4-3	142	7339	94.0	6.0	0.0	*	2.66	C20-4	210	7489	28.9	71.1	0.0	*	1.93
C5-1	151	6692	87.3	7.6	5.1	*	2.03	C21-1	220	8954	31.7	60.4	8.0	*	1.11
C5-2	155	7526	74.4	25.3	0.4	*	2.91	C22-1	150	6886	93.5	4.4	2.2	*	1.54
C5-3	155	7033	75.8	23.9	0.3	2.61	3.51	C22-2	155	6157	93.9	5.4	0.7	*	1.76
C5-4	149	6290	65.5	30.6	4.0	2.77	3.31	C22-3	115	4660	84.5	15.2	0.3	*	2.38
C6-1	155	4727	51.5	46.8	1.7	2.76	4.38	C22-4	125	5913	87.8	10.4	1.8	*	1.22
C6-2	154	3391	18.1	81.9	0.0	*	2.55	C23-2	151	7368	47.8	52.2	0.0	*	1.43
C6-3	176	5643	58.7	40.8	0.5	3.19	5.78	C23-3	155	7505	76.4	19.0	4.6	*	1.59
C7-1	152	5787	73.1	24.5	2.4	3.05	3.14	C23-4	155	8563	86.9	5.8	7.3	*	0.95
C7-2	110	4759	65.2	32.5	2.3	*	1.45	C24-1	160	5552	89.2	3.9	6.9	*	1.05
C7-3	111	4291	60.2	39.4	0.4	*	2.35	C24-2	155	7354	93.3	6.4	0.4	*	1.49
C8-1	72	2669	83.0	5.3	11.6	2.08	3.45	C25-1	155	7111	57.7	34.5	7.8	*	0.41
C8-2	177	6820	88.8	11.2	0.0	3.02	6.75	C25-2	136	6072	80.8	16.5	2.7	*	1.39
C8-3	153	5747	45.9	54.0	0.1	2.99	3.65	C25-3	137	7887	70.7	20.4	8.9	*	1.77
C8-4	131	5615	71.3	28.3	0.4	3.13	3.56	C26-1	171	8910	92.4	7.1	0.5	2.39	3.53
C9-1	155	6388	80.2	14.2	5.6	2.76	4.63	C26-2	173	6898	57.0	41.3	1.8	*	2.60
C9-2	152	6099	85.8	14.2	0.0	2.92	3.84	C26-3	164	7093	24.3	72.8	2.9	3.25	5.11
C9-3	173	5206	75.1	24.6	0.3	2.74	3.16	C27-1	173	5973	44.7	52.8	2.5	*	2.28
C10-1	147	4808	57.9	40.6	1.5	2.47	3.22	C27-3	183	7626	46.2	41.2	12.6	*	2.66
C10-2	160	8318	69.8	29.4	0.8	3.06	4.07	C28-1	159	5817	98.7	1.3	0.0	1.98	1.88
C10-3	139	6195	79.7	19.6	0.7	3.08	4.98	C28-2	151	7552	93.6	6.4	0.1	2.44	3.27
C10-4	143	5815	58.9	40.6	0.5	3.18	4.53	C28-3	154	6419	90.3	9.2	0.6	2.56	3.08
C11-1	118	5641	88.4	5.5	6.2	*	1.88	C28-4	149	6537	79.3	20.6	0.1	*	2.40
C11-2	114	4900	94.5	4.7	0.9	*	1.81	C29-1	193	8102	93.9	3.7	2.4	2.26	4.53

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	SAMPLED CORE		DRY SAMPLE		SAND		
	LENGTH (CM)	WT	% SAND	% MUD	% GRAV	PHI MEAN	WT% THM
C29-2	170	6691	27.0	72.9	0.2	*	1.29
C30-1	177	5162	52.1	47.5	0.5	*	2.96
C31-1	140	5757	97.8	1.9	0.3	1.56	0.72
C31-2	165	6361	97.1	2.5	0.5	2.07	1.52
C31-3	135	5290	85.6	14.1	0.3	2.86	3.14
C31-4	150	5327	71.4	28.0	0.5	2.93	3.99
C32-1	156	6304	86.7	12.3	1.0	*	2.71
C32-2	154	5486	56.0	42.8	1.1	*	2.73
C32-3	144	11583	62.1	36.9	1.0	2.80	3.39
C33-1	154	6265	77.5	22.4	0.0	*	1.95
C33-2	155	7031	62.2	32.5	5.3	*	2.50
C33-3	154	5604	54.0	45.5	0.5	*	2.42
C33-4	156	5610	21.3	29.3	49.4	*	1.24
C34-1	171	6675	97.7	2.0	0.3	1.72	1.08
C34-2	153	8136	93.8	5.9	0.3	2.24	3.77
C34-3	153	7062	81.1	16.5	2.4	*	2.14
C35-1	156	6198	16.6	83.4	0.1	*	1.78
C35-4	142	6189	61.0	38.9	0.0	*	1.31
C36-1	125	7861	93.2	1.9	4.9	1.11	0.62
C36-2	138	6703	96.7	2.0	1.3	1.51	0.73
C36-3	136	3207	95.8	3.7	0.5	*	0.86
C36-4	100	5024	96.5	2.2	1.3	2.06	0.80
C37-1	173	9625	88.6	11.0	0.4	3.05	4.40
C37-2	173	9367	86.6	11.8	1.6	*	2.22
C37-3	150	7881	84.6	15.3	0.1	2.42	2.16
C38-1	156	7625	84.7	14.9	0.5	*	1.99
C38-2	154	5232	39.5	50.3	10.2	*	2.32
C39-1	181	8642	91.7	8.2	0.1	3.09	4.40
C39-2	182	11016	87.3	10.1	2.6	2.45	4.13
C39-3	180	6805	88.3	9.8	1.9	2.51	2.60
C40-1	145	5965	91.4	8.4	0.1	3.13	4.56
C40-2	153	5942	83.9	15.2	0.9	2.82	4.18
C40-3	148	4916	89.0	10.9	0.1	2.67	2.75
C41-1	136	5733	91.0	8.5	0.6	3.07	3.86
C41-2	127	4435	62.0	34.8	3.2	*	1.83
C41-3	139	6148	96.6	3.4	0.0	2.07	2.65
C42-1	157	6202	71.2	22.1	6.7	2.29	3.56
C42-2	154	7423	78.7	20.9	0.5	2.29	4.35
C42-3	152	6223	59.4	40.6	0.0	2.88	*
C42-4	149	5803	48.6	51.2	0.2	*	3.17
C43-1	177	7165	89.1	8.5	2.4	2.79	6.38
C43-2	173	4961	90.8	8.7	0.4	2.50	3.55
C43-3	167	6385	78.1	21.9	0.0	3.07	6.72
C44-1	177	7886	86.6	13.3	0.1	3.09	6.49
C44-2	175	5891	93.8	6.2	0.0	2.44	3.50
C44-3	172	4742	84.2	15.4	0.4	*	1.74
C45-1	145	4886	28.9	70.0	1.0	2.08	3.01
C45-2	145	5272	86.0	11.0	3.1	*	2.63
C45-3	131	8007	83.5	5.4	11.1	*	2.85
C46-1	155	7107	77.2	21.6	1.2	2.43	3.36
C46-2	155	7049	72.4	26.3	1.3	*	2.20
C46-3	152	5843	47.1	52.5	0.4	2.01	2.19
C46-4	151	7186	83.6	16.0	0.4	1.95	3.04
C47-1	195	8006	37.9	61.3	0.8	2.43	4.47

SAMPLE NAME	SAMPLED CORE		DRY SAMPLE		SAND		
	LENGTH (CM)	WT	% SAND	% MUD	% GRAV	PHI MEAN	WT% THM
C47-2	160	6466	64.4	24.4	11.1	*	1.62
C48-1	188	8141	96.5	1.5	2.0	*	0.89
C48-2	202	7573	97.9	1.9	0.3	1.64	0.91
C48-3	195	9661	96.2	2.5	1.4	1.48	0.74
C48-4	118	3750	93.8	2.4	3.8	*	1.79
C49-1	161	8588	98.8	1.2	0.0	1.46	1.00
C49-2	154	8152	92.3	4.5	3.2	1.57	0.82
C49-3	142	6892	89.7	6.3	4.0	*	1.66
C49-4	117	4366	70.5	22.6	6.9	1.99	4.14
C50-1	154	4832	36.8	63.2	0.0	*	2.66
WB063-1	105	4867	92.0	7.9	0.1	*	2.07
WB063-2	152	5720	87.3	12.7	0.0	*	2.13
WB063-3	153	5667	78.8	21.1	0.1	*	2.53
SUM	45430	2232476					
AVG	157	7698.19	79.07	18.99	1.94	2.67	2.87
STD	31	3407.28	18.30	17.96	4.43	0.54	1.66
MAX	289	19666.46	99.13	83.36	49.36	3.40	9.12
MIN	50	1948.00	16.58	0.30	0.00	1.11	0.41

B. GRAB SAMPLES

SAMPLE NAME	DRY SAMPLE WT	WT% THM
1	5139	7.28
2	8707	6.08
3	3681	5.29
4	4224	9.30
5	5219	7.62
6	5754	2.29
7	4819	2.10
8	7372	1.67
9	6865	1.74
10	4550	7.68
11	7128	1.53
12	2436	8.13
13	2323	3.01
14	5399	5.51
15	3551	5.94
22	1760	4.53
23	1892	1.99
24	2226	3.78
25	3025	5.64
27	3369	0.73
28	915	2.69
29	2016	4.33
30	3967	7.00
31	1986	3.03
32	3291	8.06

SAMPLE NAME	DRY SAMPLE WT	WT% THM	SAMPLE NAME	DRY SAMPLE WT	WT% THM
33	2160	5.12	93	6291	0.97
34	2135	7.70	94	8021	0.82
35	2443	7.12	95	7902	0.42
36	7242	9.07	96	6542	0.79
39	4873	8.35	97	6502	1.12
40	4037	5.25	98	7250	6.25
41	4940	8.62	100	5395	4.48
42	4807	11.06	101	4760	3.47
43	6902	2.94			
44	4871	4.12			
45	3058	2.35			
46	5008	6.80			
47	5440	6.18			
48	7457	9.39			
49	4147	6.32			
50	5221	6.30			
51	7310	6.49			
52	6758	5.90			
53	4421	7.79			
54	8332	14.66			
55	5705	7.87			
56	4445	7.95			
57	5197	7.79			
58	4521	5.44			
59	4225	11.02			
60	3268	4.51			
61	4354	6.08			
62	6037	2.93			
63	5352	3.65			
64	4969	5.32			
65	7957	1.53			
66	4451	6.79			
67	9247	2.55			
68	7737	1.14			
69	3984	0.83			
70	8017	0.65			
71	5209	1.19			
72	5858	1.94			
73	3682	4.92			
74	3265	4.40			
75	6309	0.55			
76	9407	0.48			
77	3685	1.51			
78	10006	1.04			
79	9230	0.14			
80	5224	4.74			
81	3607	4.39			
82	7652	1.31			
83	7693	0.70			
84	6450	0.51			
85	5742	10.75			
86	5499	1.31			
87	4884	4.16			
88	4114	0.44			
89	4047	5.22			
89A	7306	4.38			
90	11051	0.80			
91	6650	4.52			

SAMPLE NAME	DRY SAMPLE WT	SAND			PHI MEAN	WT% THM
		% SAND	% MUD	% GRAV		
STA054	5074	97.1	2.8	0.1	2.20	5.12
STA055	5806	98.0	1.4	0.6	*	0.50
STA056	6034	98.3	1.4	0.3	*	0.83
STA093	6635	94.1	5.9	0.0	2.80	5.64
STA094	6323	96.8	3.0	0.2	2.47	7.45
51-1	19715	*	*	*	*	0.79
51-2	14692	*	*	*	*	0.09
51-3	19892	*	*	*	*	0.08
51-4	17330	*	*	*	*	9.99
SUM	583373					
AVG	5833	96.8	2.9	0.3	2.49	4.43
STD	3210	1.7	1.8	0.2	0.30	3.14
MAX	19892	98.3	5.9	0.6	2.80	14.66
MIN	915	94.1	1.4	0.0	2.20	0.08

**EXPLANATION OF MINERAL COMPOSITION
DATA for Appendices III, IV, and V**

"P" means several grains of the mineral were observed, that is, the mineral was present in the sample.

Mineral names not spelled completely in column headings have been abbreviated as follows: IL = ilmenite, MAG = magnetite and an undetermined amount of titanomagnetite, GAR = garnet, EP = epidote, STAUR = staurolite, PYROBOLE = pyroxene and amphibole minerals combined, SILL/KY = sillimanite and kyanite, TOURM = tourmaline, LEUC = leucosene, MONA = monazite.

"ECON" is the sum of the weight percents of ilmenite, rutile, leucosene, sillimanite/kyanite, monazite, and zircon.

"RHM" indicates recovered heavy minerals.

"THM" indicates total heavy minerals.

"*" indicates data not available.

"<0.01" indicates less than 0.01%.

"STD" is the standard deviation.

"AVG" is the average.

APPENDIX III

MINERAL COMPOSITION OF SAMPLES

CORE SAMPLES

SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
B01-1	9.36	14.30	15.01	9.42	0.28	27.57
B01-2	7.06	14.70	20.42	8.84	4.33	24.67
B02-1	5.44	19.96	25.41	5.87	3.37	19.36
B02-2	5.40	20.09	15.99	8.14	0.21	30.10
B03-1	4.70	16.71	11.37	11.91	0.10	34.23
B03-2	7.01	13.69	18.71	9.06	0.25	30.45
B03-3	4.95	15.23	14.38	7.08	0.39	22.14
B04-1	5.25	12.60	14.80	8.10	0.56	30.74
B05-1	4.83	21.03	17.06	8.37	6.14	21.62
B05-2	5.05	25.54	12.42	7.51	4.86	18.66
H01-1	3.15	29.89	22.02	8.10	2.77	11.70
H01-2	9.26	17.22	17.52	4.73	0.06	26.12
H01-3	11.00	17.39	9.32	3.80	2.54	9.65
H02-1	3.96	15.86	12.14	6.39	0.37	26.30
H02-2	9.28	20.44	8.89	7.50	P	27.77
H02-3	4.00	13.39	11.76	4.63	0.27	23.92
H03-1	4.37	17.15	12.49	5.46	0.73	31.75
H04-1	7.74	15.32	16.07	8.58	0.07	26.94
H04-2	10.82	13.24	8.52	3.91	6.72	34.81
H04-3	13.11	14.84	11.60	7.62	0.71	23.98
H05-1	8.67	15.89	5.02	6.43	0.34	27.76
H06-1	6.45	14.35	9.44	6.91	0.06	31.64
H06-2	3.36	20.23	19.09	7.82	4.52	18.63
H06-3	2.40	15.31	14.20	6.65	0.03	27.99
H06-4	5.25	10.02	11.81	7.45	0.29	28.39
H07-1	8.04	19.23	17.29	7.60	0.35	27.12
H07-2	3.33	13.19	18.54	4.33	2.94	32.81

SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
H07-3	12.80	9.92	12.22	6.93	0.03	32.10
H08-1	7.28	20.72	14.97	6.47	0.07	29.19
H08-2	9.09	14.52	16.64	7.80	0.07	28.64
H09-1	17.07	7.65	14.76	5.20	0.31	20.35
H10-1	17.56	9.36	12.73	7.74	0.11	22.97
H10-2	18.03	8.76	15.05	6.24	0.44	19.17
H11-1	10.78	15.48	19.57	7.61	0.01	28.73
H12-1	6.68	20.71	15.84	5.41	0.27	24.34
H12-2	8.09	12.69	11.58	4.88	0.22	20.59
H13-1	9.35	20.24	6.75	2.22	2.30	20.94
H14-1	4.20	14.59	20.26	8.96	3.27	22.22
H14-2	12.36	9.25	11.34	4.83	2.82	17.86
V1-1	2.69	19.44	17.81	8.49	0.19	33.27
V1-2	1.42	50.71	6.69	12.80	2.34	11.45
V1-3	1.44	45.72	2.54	12.81	3.81	17.42
V1-4	1.68	56.22	6.29	6.12	1.86	9.13
V2-1	4.07	23.85	15.24	7.40	0.95	28.45
V2-2	3.09	45.22	9.76	9.11	0.63	10.55
V2-3	0.51	37.16	14.73	15.08	1.95	13.53
V2-4	1.68	50.09	4.82	7.51	0.85	11.62
V4-1	5.72	23.83	12.95	4.96	1.23	31.79
V4-2	0.85	38.30	9.62	9.92	2.48	22.49
V4-3	2.21	32.38	10.96	17.14	1.35	18.03
V4-4	2.21	45.16	8.87	13.37	1.17	11.21
V3-1	2.34	32.51	12.71	7.18	2.52	19.32
V3-2	0.81	36.21	3.37	15.10	2.59	22.50
V5-1	3.03	18.17	15.98	8.77	2.19	23.85
V5-3	1.55	42.75	6.65	12.18	2.97	17.57
V5-4	3.10	44.27	5.72	13.65	1.81	13.28
V5-5	8.86	45.79	9.50	3.69	2.81	10.54
V6-1	6.92	24.09	18.17	4.01	0.35	22.81
V6-2	4.28	24.97	14.86	7.81	1.44	22.39
1090-1	8.30	26.15	14.81	9.05	0.39	23.17
1090-2	5.13	25.84	16.38	9.67	0.79	22.06
1091-1	3.67	24.11	15.31	8.10	0.52	25.00
1091-2	2.57	30.41	14.36	8.63	0.38	17.26
1091-3	6.14	37.86	10.46	6.19	0.90	15.72
1092-1	0.85	45.28	9.81	13.01	1.48	13.12
1092-2	0.76	46.82	3.69	14.91	1.23	11.84
1094-1	3.24	36.10	13.20	7.20	1.13	19.94
1094-2	1.36	47.67	9.06	10.53	0.62	11.02
1095-1	10.29	23.13	18.31	6.16	0.81	20.61
1095-2	1.15	46.39	4.67	16.89	2.29	9.85
1096-1	5.82	25.74	13.69	10.06	0.77	26.12
1096-2	2.83	39.03	8.67	18.06	1.25	14.07
1097-1	5.62	30.25	14.61	9.00	0.80	21.33
1097-2	1.15	46.66	5.15	17.61	1.41	10.96
1097-3	1.25	53.25	8.56	4.52	0.76	14.22
1098-1	0.75	49.89	5.39	15.01	2.63	12.70
1098-2	1.43	60.33	2.01	6.96	1.34	12.44
1099-1	6.62	34.19	12.61	8.61	0.76	17.69
1099-2	1.40	51.02	6.31	11.53	1.48	10.79
1100-1	10.58	24.72	13.15	5.16	0.58	27.44
1100-2	2.78	45.03	7.06	10.58	1.64	16.47
1103-1	2.55	38.64	14.57	6.16	0.77	23.49
1103-2	1.37	40.50	12.30	7.54	0.51	17.34
1103-3	12.07	21.50	18.01	7.39	0.66	22.52

SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE	SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
1106-1	3.78	37.70	22.82	7.69	0.05	16.22	C3-3	7.56	19.59	17.74	7.80	0.81	10.55
1106-2	4.67	29.36	20.27	7.10	1.19	24.50	C3-4	2.48	29.90	16.26	5.51	0.19	13.63
1107-1	4.00	30.76	17.18	6.55	1.03	24.53	C4-1	5.00	17.34	23.45	4.99	2.07	29.73
1107-2	5.07	19.67	19.91	6.98	0.60	31.65	C4-2	2.11	14.76	14.73	8.89	1.84	38.22
1109-1	7.27	22.70	15.94	10.86	0.88	25.25	C4-3	1.66	18.43	20.78	6.01	0.15	23.40
1111-1	12.52	24.43	17.48	6.26	0.13	22.92	C5-1	1.64	29.47	18.19	7.81	4.87	19.83
1111-2	10.98	29.74	19.42	6.08	0.25	16.84	C5-2	2.98	11.95	14.24	5.06	1.00	38.42
1116-1	13.45	25.36	15.21	5.66	0.46	21.73	C5-3	4.18	11.15	15.86	8.85	4.57	35.23
1116-2	9.73	27.64	17.18	6.12	0.51	18.44	C5-4	9.25	10.91	16.66	8.48	5.73	24.74
1119-1	4.89	21.87	20.14	7.07	0.84	27.59	C6-1	5.13	20.48	17.27	9.67	5.36	22.73
1119-2	6.97	28.19	19.36	4.85	0.34	22.53	C6-2	6.31	17.09	21.36	3.53	1.10	27.13
1120-1	4.41	24.62	16.08	8.01	0.85	27.70	C6-3	12.64	8.91	22.72	4.26	4.89	24.40
1120-2	8.29	32.17	20.13	5.62	0.42	16.72	C7-1	9.96	19.80	24.24	5.75	0.88	22.84
1121-1	15.07	21.04	21.66	1.60	1.00	17.90	C7-2	1.84	32.86	31.94	4.90	5.76	8.76
1122-1	13.18	27.39	13.92	7.39	0.62	21.18	C7-3	13.01	24.62	21.77	6.38	0.80	17.61
1127-1	13.28	24.63	17.10	5.51	0.76	22.21	C8-1	4.78	30.41	16.95	5.04	0.16	22.26
1127-2	7.22	28.96	15.72	9.49	0.04	20.32	C8-2	15.33	10.70	19.11	7.17	4.34	25.32
1129-1	12.25	23.13	16.71	8.69	0.34	22.35	C8-3	10.01	8.95	23.21	4.65	0.90	35.93
1129-2	13.83	18.66	15.93	7.88	0.48	25.12	C8-4	17.87	7.97	21.15	6.23	0.90	28.65
1130-1	18.35	21.58	21.30	6.54	0.16	16.67	C9-1	8.47	21.17	9.81	9.05	2.99	29.10
1130-2	10.01	23.01	14.21	9.11	0.13	23.44	C9-2	4.31	21.91	17.45	5.68	1.23	33.58
1131-1	27.58	26.69	10.79	6.68	0.33	9.78	C9-3	6.23	20.63	11.03	12.61	2.79	19.35
1132-1	20.71	21.69	18.36	5.14	0.32	16.23	C10-1	5.88	26.28	25.34	6.85	1.10	17.29
1134-1	12.12	33.99	21.54	3.57	0.52	11.35	C10-2	15.78	9.89	13.03	10.29	2.07	29.13
1134-2	15.29	30.93	19.10	3.51	0.20	14.38	C10-3	14.35	9.50	16.26	7.36	4.13	16.68
1136-1	11.98	28.72	19.54	3.18	0.50	15.71	C10-4	14.36	6.70	12.14	5.85	1.39	24.97
1136-2	11.98	28.09	15.74	7.23	0.21	16.48	C11-1	1.49	17.79	14.14	5.10	3.64	35.86
1136-3	8.19	29.35	19.01	8.10	0.65	19.26	C11-2	0.80	15.44	7.87	3.61	4.78	45.26
1139-1	4.98	26.64	22.64	4.65	0.81	25.01	C11-3	8.49	14.90	20.00	2.62	0.26	19.48
2000-1	3.28	26.55	16.97	9.61	0.22	26.11	C11-4	7.37	19.73	14.55	6.59	0.22	17.91
2000-2	2.54	21.59	17.11	8.66	0.06	30.57	C12-1	11.20	15.53	26.46	15.50	1.45	17.67
2001-1	3.77	20.24	18.92	8.61	0.33	29.24	C12-2	20.32	9.63	13.37	11.55	1.85	19.86
2002-1	5.07	29.15	17.49	9.24	0.29	15.74	C12-3	23.36	14.76	16.84	5.82	1.34	15.49
2002-2	4.72	29.41	13.72	10.77	0.39	23.09	C12-4	25.36	8.14	19.82	9.50	3.33	12.12
110-1	3.54	32.48	12.77	8.34	1.46	19.94	C13-1	6.03	15.26	19.26	10.77	7.79	21.77
110-2	7.16	18.77	17.97	9.98	0.46	28.35	C13-2	7.00	11.44	17.04	9.57	1.15	28.93
110-3	1.60	20.25	15.16	9.40	2.78	33.65	C13-3	7.07	12.58	15.32	4.28	0.52	27.47
115-1	1.21	28.03	16.83	6.19	2.74	26.20	C14-1	13.45	9.36	15.85	7.04	1.65	37.40
116-1	0.90	31.50	14.06	7.52	3.28	28.20	C14-2	15.33	6.47	12.70	5.19	0.36	31.01
116-2	0.75	31.64	14.78	6.13	2.50	23.09	C14-3	14.16	9.07	11.25	11.56	4.24	19.86
116-3	1.38	35.92	13.50	10.10	2.70	19.21	C14-4	22.23	3.28	18.36	6.22	0.56	27.10
116-4	0.37	36.39	13.97	6.34	2.37	20.77	C15-1	13.16	12.47	9.99	11.23	3.03	30.55
116-5	0.23	31.24	15.21	7.60	2.04	24.26	C15-2	23.12	7.32	14.71	9.34	6.39	21.93
117-1	0.29	29.86	15.12	5.09	3.17	30.09	C16-1	13.02	13.61	19.59	13.96	8.84	11.52
117-2	0.07	27.72	30.70	4.54	3.13	19.30	C16-2	13.67	3.31	14.30	8.23	6.21	33.05
117-3	0.09	28.32	27.00	5.09	2.68	24.08	C17-1	9.64	15.47	16.53	14.36	3.61	20.59
117-4	0.14	22.80	23.07	6.55	3.76	32.50	C17-2	16.24	8.30	17.37	7.13	P	22.88
C1-1	0.29	29.94	22.57	5.35	3.52	10.75	C17-3	16.05	5.16	13.63	7.13	1.17	30.96
C1-2	0.67	17.44	15.46	5.54	7.72	33.54	C17-4	17.79	6.81	16.05	11.66	1.22	29.02
C1-3	0.65	17.08	20.91	5.94	1.80	30.95	C17-5	22.83	4.03	17.06	6.22	1.19	24.82
C1-4	0.70	15.87	15.13	4.82	1.86	39.82	C18-1	3.89	10.79	11.02	7.69	1.91	39.39
C2-1	4.21	27.13	23.98	4.91	1.27	18.11	C18-2	5.13	8.86	20.23	14.00	4.61	24.61
C2-2	3.71	19.63	21.77	6.09	0.69	20.84	C19-1	13.42	13.38	11.22	7.31	3.07	29.52
C2-3	3.67	20.60	15.93	4.97	3.67	31.30	C19-2	5.72	13.82	14.45	12.86	5.78	28.16
C2-4	1.58	25.01	18.05	6.50	3.86	17.79	C19-3	1.26	17.83	14.77	12.04	6.17	29.31
C3-1	4.72	10.67	19.11	9.62	0.59	20.49	C20-1	2.75	26.49	10.05	4.93	3.62	30.00
C3-2	5.16	20.91	17.98	5.35	0.12	12.76	C20-2	4.12	23.58	13.71	8.09	3.69	18.92

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE	SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
C20-3	6.47	18.61	4.54	15.75	9.43	15.36	C40-3	1.20	25.74	14.87	6.61	1.56	31.43
C20-4	13.17	21.74	4.15	12.78	1.98	18.54	C41-1	8.96	19.92	19.92	13.25	3.47	14.19
C21-1	5.29	22.12	14.20	13.09	3.37	16.54	C41-2	2.70	20.79	11.98	10.89	3.82	16.53
C22-1	2.81	25.96	9.17	7.55	2.82	28.80	C41-3	2.53	25.50	14.00	4.10	2.21	32.40
C22-2	3.23	24.30	12.64	5.13	1.66	31.32	C42-1	1.62	34.40	11.50	10.21	3.59	18.08
C22-3	9.41	20.86	14.05	8.19	3.78	22.63	C42-2	3.07	31.44	13.40	7.75	1.85	21.65
C22-4	5.55	24.99	11.50	4.46	4.20	29.44	C42-3	3.33	31.18	20.43	9.26	4.88	10.48
C23-2	5.02	21.24	15.83	8.50	2.22	29.93	C42-4	1.90	49.40	5.45	7.45	2.66	13.35
C23-3	1.91	24.34	14.14	5.74	2.54	33.14	C43-1	10.23	5.11	21.39	24.35	8.86	11.63
C23-4	0.49	24.03	11.68	4.58	2.91	27.96	C43-2	1.51	28.84	14.77	7.69	2.49	21.97
C24-1	1.70	28.92	13.41	7.11	2.17	25.15	C43-3	4.44	18.49	18.21	3.40	2.22	33.12
C24-2	4.68	24.97	12.04	8.41	6.90	19.96	C44-1	9.05	14.45	14.17	7.09	2.93	32.46
C25-1	0.43	35.22	7.85	9.90	3.30	19.44	C44-2	0.40	27.87	17.28	10.48	4.74	20.12
C25-2	0.84	35.87	8.30	8.09	2.84	16.51	C44-3	3.07	24.32	11.47	6.16	7.00	23.30
C25-3	0.53	27.61	13.34	8.57	2.84	18.55	C45-1	4.00	13.30	19.27	11.75	6.53	24.63
C26-1	4.37	33.39	6.59	12.52	2.60	18.97	C45-2	1.20	16.99	13.92	12.37	5.72	26.76
C26-2	6.95	19.76	10.47	7.67	2.11	24.98	C45-3	0.84	22.21	13.95	5.28	2.90	22.70
C26-3	17.17	8.47	13.41	6.82	2.75	25.90	C46-1	3.69	19.62	17.64	10.04	3.71	22.37
C27-1	5.07	18.69	8.71	10.83	1.76	31.11	C46-2	1.14	22.84	14.30	8.07	4.44	27.48
C27-3	0.69	44.43	10.58	5.97	2.02	13.76	C46-3	2.81	17.80	12.99	5.76	4.84	26.92
C28-1	0.35	34.13	10.80	9.48	3.87	20.96	C46-4	1.11	29.17	14.15	8.14	3.23	21.86
C28-2	5.82	26.08	9.51	7.06	3.10	25.47	C47-1	6.49	18.15	14.37	8.80	2.67	27.94
C28-3	5.26	18.20	16.89	7.98	1.93	21.39	C47-2	0.43	33.49	10.83	8.53	5.08	18.71
C28-4	4.12	28.67	6.53	9.12	1.98	21.76	C48-1	0.49	29.11	14.09	14.36	6.38	15.22
C29-1	2.65	39.62	10.20	6.68	2.75	16.99	C48-2	0.77	16.89	15.21	10.54	4.60	22.29
C29-2	1.43	31.61	7.00	8.92	1.56	26.50	C48-3	1.07	27.71	13.83	8.50	5.70	17.69
C30-1	2.26	24.22	11.24	8.59	4.75	22.09	C48-4	0.85	29.65	16.92	5.73	5.91	18.64
C31-1	0.51	34.59	9.53	6.88	3.28	26.81	C49-1	0.69	28.89	10.56	10.32	6.48	17.97
C31-2	1.20	36.77	4.77	10.96	3.36	19.05	C49-2	0.50	30.27	9.58	12.44	8.55	16.16
C31-3	5.53	30.61	14.27	7.66	4.15	13.96	C49-3	0.83	25.11	9.53	7.99	3.47	33.40
C31-4	9.62	13.02	12.23	12.92	5.14	22.57	C49-4	0.62	21.71	14.72	11.86	4.63	23.87
C32-1	4.79	27.79	8.15	7.34	0.42	29.83	C50-1	2.03	20.40	4.28	4.46	2.94	6.43
C32-2	7.66	16.24	13.54	8.92	3.98	24.26	WB-						
C32-3	9.98	24.02	10.40	10.35	1.30	20.08	063-1	0.24	39.20	4.74	17.24	3.73	18.50
C33-1	7.52	13.39	10.45	9.23	2.65	27.56	063-2	0.67	40.78	4.70	10.52	2.61	16.21
C33-2	7.92	13.07	12.36	8.88	1.06	26.97	063-3	2.01	35.64	2.64	15.71	2.26	15.29
C33-3	9.04	13.20	12.26	10.87	2.24	21.20	AVG	6.03	24.01	14.42	8.10	2.28	22.79
C33-4	5.24	24.95	10.96	7.91	1.62	20.18	STD	5.37	10.71	4.95	3.14	1.95	6.96
C34-1	0.42	32.91	10.70	5.88	1.96	31.74	MAX	27.58	60.33	31.94	24.35	9.43	45.26
C34-2	3.14	32.86	12.34	7.40	3.54	19.73	MIN	0.07	3.28	2.01	1.60	0.00	6.43
C34-3	6.44	17.64	10.05	9.08	1.43	31.16							
C35-1	3.02	20.55	10.40	6.32	1.00	22.95							
C35-4	1.95	29.82	8.66	9.02	3.34	18.33							
C36-1	0.90	41.83	18.96	6.44	5.01	11.08							
C36-2	0.48	34.89	11.83	5.39	5.05	22.53							
C36-3	1.10	40.04	10.63	6.73	2.40	19.16							
C36-4	2.03	26.01	11.89	5.89	4.79	23.76							
C37-1	11.57	13.50	18.23	8.99	2.93	21.83							
C37-2	0.69	26.93	16.73	8.68	2.79	22.79							
C37-3	1.88	30.55	11.43	3.80	3.87	25.74							
C38-1	6.98	14.17	12.68	6.71	2.53	35.29							
C38-2	0.92	19.75	16.99	9.74	3.31	15.77							
C39-1	9.77	18.74	16.53	4.00	0.81	31.43							
C39-2	1.37	21.36	15.72	8.91	0.13	37.79							
C39-3	1.30	29.26	18.63	4.06	2.18	29.39							
C40-1	10.55	19.23	16.07	10.10	4.66	19.00							
C40-2	3.84	22.96	11.15	4.80	1.84	34.39							

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA
B01-1	0.97	0.85	0.57	0.57	0.78	P
B01-2	0.59	1.01	1.75	0.25	0.58	0.12
B02-1	1.04	1.66	1.54	0.19	0.25	0.46
B02-2	0.64	0.55	0.57	0.28	1.86	0.15
B03-1	0.56	0.73	0.59	1.09	0.86	0.05
B03-2	0.70	1.20	0.40	0.72	0.70	0.04
B03-3	1.68	1.06	0.72	1.29	1.70	P
B04-1	0.94	0.50	0.00	0.33	0.74	P
B05-1	0.65	3.31	0.92	0.18	0.54	0.51
B05-2	1.81	3.01	1.85	0.40	0.70	0.99

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA	SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA
H01-1	0.75	3.12	1.14	0.27	1.80	1.15	1094-2	1.56	1.48	0.27	0.56	1.71	0.01
H01-2	1.25	0.24	0.14	1.16	0.43	0.06	1095-1	0.68	0.46	0.39	0.61	1.02	P
H01-3	2.66	2.83	1.44	0.12	0.30	1.44	1095-2	1.95	1.40	0.48	0.55	1.47	P
H02-1	0.86	1.68	0.26	0.19	1.52	0.14	1096-1	0.36	0.98	0.26	0.66	0.86	0.05
H02-2	P	1.75	0.63	0.23	0.12	0.45	1096-2	1.63	1.27	0.16	0.18	1.35	0.03
H02-3	1.05	3.93	0.46	1.16	0.85	P	1097-1	0.67	0.99	0.22	0.34	1.08	P
H03-1	0.78	1.31	1.08	0.67	1.98	0.33	1097-2	1.23	1.36	0.44	0.99	2.13	0.09
H04-1	1.50	0.67	0.29	1.48	0.81	P	1097-3	2.12	0.82	0.28	0.45	1.95	P
H04-2	0.70	3.91	0.70	0.05	0.05	P	1098-1	1.34	2.25	0.45	0.05	2.20	0.13
H04-3	0.97	0.57	0.45	0.95	1.53	P	1098-2	1.51	2.22	0.36	0.02	2.01	0.16
H05-1	1.27	1.15	0.61	0.10	1.23	0.12	1099-1	1.52	0.63	0.30	0.67	2.10	0.01
H06-1	0.53	0.59	0.44	0.26	0.23	P	1099-2	1.66	2.08	0.32	0.47	1.31	0.25
H06-2	1.77	3.69	1.17	0.18	0.57	0.15	1100-1	0.66	0.93	0.65	0.33	1.00	P
H06-3	0.60	0.81	0.00	1.35	0.50	P	1100-2	1.25	1.85	0.10	0.09	0.83	0.01
H06-4	0.96	0.90	0.38	0.56	1.55	P	1103-1	0.64	0.61	0.27	0.30	1.23	0.01
H07-1	0.71	0.57	0.50	0.66	1.15	0.06	1103-2	1.36	1.18	0.24	0.44	3.12	P
H07-2	1.11	1.57	0.56	1.32	0.23	P	1103-3	1.21	0.85	0.04	0.55	1.31	0.11
H07-3	0.97	0.32	0.03	0.58	0.37	0.03	1106-1	0.81	0.68	0.28	0.32	0.77	0.09
H08-1	0.58	0.18	0.32	0.21	0.71	0.14	1106-2	0.85	0.36	0.24	0.20	0.43	P
H08-2	0.88	0.70	0.15	0.83	0.29	0.02	1107-1	0.66	0.77	0.47	0.55	0.79	0.12
H09-1	0.20	1.57	0.47	1.83	0.45	0.05	1107-2	1.43	0.75	0.49	0.35	1.17	0.19
H10-1	0.26	1.50	0.47	0.79	0.68	0.01	1109-1	0.47	0.22	0.37	0.74	0.96	P
H10-2	0.61	0.53	0.46	0.79	0.99	0.06	1111-1	1.19	0.46	0.23	0.23	0.82	0.03
H11-1	1.08	0.14	0.14	0.50	0.58	P	1111-2	0.91	0.00	0.32	0.97	0.71	0.03
H12-1	0.42	0.49	0.72	0.05	0.68	0.09	1116-1	0.96	0.50	0.62	0.11	0.75	0.10
H12-2	0.20	0.86	0.60	0.50	0.55	P	1116-2	2.10	0.39	0.13	0.48	0.36	0.11
H13-1	0.84	3.24	0.98	1.38	1.80	0.37	1119-1	1.35	0.20	0.27	0.91	0.93	0.22
H14-1	0.98	1.15	1.03	1.96	0.93	0.59	1119-2	1.35	0.40	0.28	0.90	0.35	0.05
H14-2	1.71	5.19	2.04	0.41	0.33	1.09	1120-1	1.09	0.98	0.13	1.27	0.55	0.23
V1-1	1.58	0.59	0.05	0.51	0.71	0.05	1120-2	1.05	0.23	0.17	0.06	1.07	0.03
V1-2	1.93	2.20	0.32	0.73	1.90	0.36	1121-1	0.94	0.36	0.13	P	0.80	0.04
V1-3	1.37	3.02	0.17	0.06	2.17	0.33	1122-1	0.90	0.55	0.34	0.71	0.84	0.09
V1-4	1.69	0.76	0.05	0.98	3.31	0.29	1127-1	0.89	0.25	0.27	P	0.90	P
V2-1	0.69	1.58	0.41	0.52	1.18	0.15	1127-2	0.55	0.67	0.17	0.54	1.23	0.07
V2-2	2.25	0.75	0.18	0.28	1.77	0.04	1129-1	0.86	0.64	0.79	0.22	1.01	0.08
V2-3	1.25	3.81	0.21	0.34	1.80	0.29	1129-2	0.79	0.68	0.86	0.32	0.79	P
V2-4	1.62	0.84	0.59	0.16	1.42	0.05	1130-1	0.59	0.51	0.49	0.29	0.58	0.08
V4-1	0.50	0.80	0.39	0.62	1.70	0.08	1130-2	0.45	0.47	0.28	0.35	0.91	0.03
V4-2	2.09	1.43	0.77	0.10	1.86	0.04	1131-1	1.06	0.48	0.34	0.30	0.70	0.37
V4-3	1.59	1.89	0.22	0.85	2.61	0.11	1132-1	0.68	0.52	0.63	0.44	0.84	0.01
V4-4	2.08	1.43	0.25	0.35	3.02	0.09	1134-1	1.79	0.20	0.39	0.24	0.30	0.17
V3-1	1.37	1.85	0.18	0.46	5.39	0.10	1134-2	0.95	0.55	0.36	0.06	0.57	P
V3-2	1.89	3.83	0.28	P	1.06	0.04	1136-1	1.13	0.43	0.27	0.59	0.99	P
V5-1	0.91	0.62	0.56	1.31	1.73	0.03	1136-2	0.61	0.21	0.55	0.31	0.73	0.30
V5-3	1.61	2.93	0.43	0.36	2.24	0.30	1136-3	1.09	0.28	0.21	0.51	0.48	0.03
V5-4	1.99	1.17	0.29	1.12	1.40	0.03	1139-1	1.23	0.91	0.63	0.48	1.62	0.26
V5-5	1.37	1.50	0.13	0.88	3.50	0.16	2000-1	1.34	0.96	0.48	0.29	1.88	0.07
V6-1	1.38	0.14	0.17	0.44	0.39	0.04	2000-2	1.45	1.03	0.25	0.39	1.42	P
V6-2	1.59	0.06	0.03	1.79	0.45	0.03	2001-1	1.23	0.59	1.00	0.30	1.75	0.05
1090-1	0.94	0.31	0.23	0.32	0.44	P	2002-1	0.49	0.44	0.21	0.45	0.21	P
1090-2	1.23	1.04	0.52	0.57	1.33	0.07	2002-2	0.31	0.44	0.47	0.80	0.89	0.01
1091-1	0.56	0.81	0.88	0.73	1.43	2.47	110-1	1.58	0.72	0.05	0.49	0.52	P
1091-2	1.63	1.02	0.32	0.09	1.98	0.15	110-2	1.21	0.81	0.09	0.46	1.10	P
1091-3	2.31	0.92	0.21	0.79	1.16	P	110-3	1.15	1.45	0.93	0.47	1.21	0.10
1092-1	1.71	1.61	0.00	0.16	1.37	0.13	115-1	1.52	1.19	0.91	1.00	1.03	0.11
1092-2	1.93	1.32	0.11	0.79	3.15	0.05	116-1	1.69	2.37	0.56	0.08	2.16	0.15
1094-1	1.26	0.60	0.44	0.65	1.33	0.01	116-2	2.05	1.78	0.35	0.54	2.66	0.10

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA	SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA
116-3	1.44	2.05	0.53	0.54	1.98	P	C14-4	1.75	2.91	0.30	0.59	1.41	P
116-4	1.95	1.65	1.45	0.17	1.55	0.14	C15-1	1.20	2.47	0.13	1.55	1.17	0.00
116-5	3.15	1.95	0.62	0.31	2.52	0.23	C15-2	1.34	2.23	0.10	0.19	1.40	0.00
117-1	1.38	1.25	0.56	0.61	1.76	0.06	C16-1	1.19	2.09	0.10	0.17	0.28	0.00
117-2	1.70	1.65	0.88	1.34	1.08	0.10	C16-2	1.69	2.21	0.25	0.22	0.31	P
117-3	1.06	1.46	1.06	P	0.92	0.16	C17-1	1.45	2.80	0.17	1.34	2.19	P
117-4	1.26	1.57	0.69	P	1.35	0.06	C17-2	1.38	3.26	0.20	1.04	0.64	P
C1-1	0.68	3.15	0.02	4.57	3.98	0.02	C17-3	2.18	3.63	0.20	1.89	0.51	P
C1-2	1.48	3.37	0.19	4.00	1.45	P	C17-4	2.09	1.68	0.42	1.07	0.96	0.00
C1-3	0.00	2.82	0.23	0.62	2.91	0.08	C17-5	2.09	2.02	0.12	1.07	0.46	0.00
C1-4	1.60	2.75	0.53	1.20	2.69	P	C18-1	0.74	4.58	0.43	1.28	1.66	P
C2-1	1.32	0.89	0.40	2.05	1.07	0.03	C18-2	1.23	2.80	0.17	3.56	1.49	P
C2-2	1.16	2.12	0.56	2.65	2.00	P	C19-1	1.98	1.77	0.73	0.60	1.05	P
C2-3	1.03	2.42	0.49	1.15	3.39	P	C19-2	1.55	3.51	0.20	0.83	0.71	P
C2-4	1.34	1.46	0.30	2.65	4.02	0.10	C19-3	0.84	2.80	0.29	1.55	2.06	0.04
C3-1	1.73	2.75	0.03	1.17	0.91	P	C20-1	1.83	2.14	0.83	0.55	4.09	P
C3-2	1.08	4.18	0.02	1.33	0.52	P	C20-2	1.22	3.01	0.00	1.75	6.93	P
C3-3	1.77	3.86	0.08	3.32	1.21	P	C20-3	1.87	2.48	0.19	1.17	2.24	P
C3-4	1.86	2.26	0.12	1.57	1.02	P	C20-4	1.59	2.52	0.61	1.08	3.51	0.00
C4-1	1.55	1.42	0.18	1.55	1.09	0.03	C21-1	1.57	1.72	0.10	1.32	5.82	P
C4-2	1.55	3.04	0.47	0.77	1.13	P	C22-1	1.73	3.16	0.13	0.67	7.87	P
C4-3	0.87	2.56	P	4.45	1.34	P	C22-2	2.04	2.93	0.28	0.59	5.59	P
C5-1	1.25	3.28	0.33	3.00	2.11	0.05	C22-3	1.24	2.91	0.17	1.74	4.04	P
C5-2	1.89	5.10	0.42	0.51	1.93	P	C22-4	1.37	4.24	0.36	0.84	3.06	0.05
C5-3	1.57	3.49	0.21	2.80	0.71	P	C23-2	0.71	1.63	P	0.63	2.61	P
C5-4	1.39	4.62	0.26	1.31	1.62	P	C23-3	1.36	1.83	0.10	1.04	1.81	0.06
C6-1	1.52	2.37	0.32	1.35	1.27	0.03	C23-4	1.06	1.79	0.98	1.09	3.23	P
C6-2	1.37	1.65	0.05	0.41	1.15	P	C24-1	2.30	3.43	0.05	0.79	4.04	0.05
C6-3	2.14	3.52	0.40	0.12	1.16	P	C24-2	2.03	4.10	0.41	2.18	4.08	P
C7-1	0.79	0.88	0.29	0.61	0.00	P	C25-1	2.67	3.73	0.52	1.81	3.84	P
C7-2	0.70	1.03	0.14	1.58	2.21	0.32	C25-2	1.72	2.47	P	0.64	3.41	P
C7-3	0.26	1.75	0.44	0.56	1.17	P	C25-3	1.13	3.18	0.61	0.38	2.12	P
C8-1	1.16	2.50	0.40	0.59	0.50	0.06	C26-1	1.83	2.25	0.15	2.37	3.59	0.03
C8-2	1.23	2.67	0.20	1.94	0.99	P	C26-2	2.55	3.58	0.00	1.32	2.03	P
C8-3	1.89	2.40	0.64	0.66	0.49	0.00	C26-3	2.68	2.76	0.37	1.76	1.36	P
C8-4	1.41	1.33	0.34	1.97	0.51	P	C27-1	0.94	2.70	0.07	0.26	1.44	P
C9-1	1.73	2.45	0.12	2.80	1.99	P	C27-3	2.05	2.63	0.52	0.89	3.03	P
C9-2	1.33	2.53	0.15	1.87	1.15	0.00	C28-1	1.93	3.06	0.74	1.27	4.28	0.13
C9-3	1.96	2.44	0.09	2.57	1.16	0.03	C28-2	1.86	2.13	0.00	1.20	2.55	0.02
C10-1	1.92	2.05	0.38	1.91	0.89	0.04	C28-3	1.72	2.13	0.47	3.92	2.15	P
C10-2	1.43	3.27	0.27	2.27	0.71	P	C28-4	1.57	3.27	0.13	3.31	3.37	0.04
C10-3	1.53	4.52	0.39	1.30	1.34	0.00	C29-1	1.47	3.13	0.03	1.78	2.04	0.07
C10-4	1.87	3.64	0.42	0.70	1.86	0.00	C29-2	1.81	2.35	0.34	0.87	2.09	0.09
C11-1	1.07	3.08	0.26	1.02	2.81	0.07	C30-1	2.16	3.46	0.24	1.34	2.42	P
C11-2	2.01	5.83	0.81	0.53	3.14	P	C31-1	2.07	3.53	1.61	0.39	3.15	0.05
C11-3	0.70	2.91	0.00	2.13	0.60	P	C31-2	2.25	4.25	0.86	2.01	4.86	0.05
C11-4	1.34	5.56	P	1.15	0.62	0.02	C31-3	2.30	3.12	0.21	1.33	2.09	0.03
C12-1	0.45	1.44	0.10	2.05	1.25	P	C31-4	1.60	2.47	0.82	0.30	3.00	P
C12-2	1.53	2.89	0.08	0.36	0.68	P	C32-1	2.55	3.03	0.35	1.27	3.00	P
C12-3	1.17	3.72	0.20	0.74	1.17	0.00	C32-2	1.38	2.65	0.04	1.61	3.18	0.02
C12-4	1.36	3.15	0.08	0.63	0.51	0.00	C32-3	1.75	3.06	P	1.48	2.60	P
C13-1	1.95	1.63	0.31	1.42	2.13	P	C33-1	3.03	5.59	0.22	0.86	1.92	P
C13-2	1.63	3.09	2.52	2.15	3.01	P	C33-2	1.91	2.63	0.13	1.68	1.40	P
C13-3	2.15	3.79	0.21	1.11	0.96	P	C33-3	1.69	1.81	0.69	2.21	2.34	P
C14-1	1.41	0.81	0.12	0.78	0.78	P	C33-4	1.49	3.42	0.15	0.50	2.63	0.06
C14-2	1.68	3.47	0.67	1.63	0.31	0.00	C34-1	2.04	3.31	0.64	0.87	1.84	0.10
C14-3	2.10	4.58	0.06	2.05	2.70	P	C34-2	1.14	3.16	0.04	1.95	2.52	P

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA	SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM
C34-3	1.55	3.68	0.31	0.87	1.90	P	B01-1	1.46	18.86	18.36	2.95	3.91
C35-1	1.46	2.80	0.65	2.20	3.88	P	B01-2	2.36	13.32	19.35	2.17	2.88
C35-4	2.01	2.17	0.91	1.03	4.57	P	B02-1	3.93	11.52	27.30	2.31	2.42
C36-1	1.73	4.08	P	0.77	2.37	0.37	B02-2	1.58	14.41	24.88	3.73	3.88
C36-2	1.48	4.69	1.48	0.45	2.03	0.05	B03-1	1.56	15.55	20.46	2.85	3.20
C36-3	1.79	3.20	0.97	0.71	1.56	0.12	B03-2	3.66	13.41	19.99	2.59	3.33
C36-4	1.57	4.47	0.00	4.13	3.20	P	B03-3	3.31	26.08	22.98	2.52	3.26
C37-1	1.18	3.23	0.05	0.69	2.54	P	B04-1	1.63	23.81	16.41	1.87	2.53
C37-2	1.80	2.50	0.16	1.88	1.28	P	B05-1	3.96	10.88	30.00	1.48	1.86
C37-3	2.46	2.36	1.40	0.32	2.64	0.04	B05-2	4.77	12.43	36.82	1.12	1.82
C38-1	1.44	2.27	0.64	0.72	1.23	0.05	H01-1	3.10	11.04	39.81	3.57	3.86
C38-2	1.40	4.20	0.25	1.67	1.59	P	H01-2	2.73	19.09	21.91	4.22	5.10
C39-1	1.75	1.66	P	0.72	1.23	P	H01-3	7.60	29.91	32.23	5.13	5.48
C39-2	1.33	2.24	0.31	0.99	0.54	P	H02-1	2.46	27.88	22.51	1.53	2.32
C39-3	2.05	2.89	0.82	0.34	1.03	0.04	H02-2	2.32	20.61	25.08	0.23	1.09
C40-1	1.27	2.57	0.11	1.80	1.56	P	H02-3	7.61	26.96	26.84	0.68	1.34
C40-2	2.12	3.08	0.60	0.56	3.25	0.02	H03-1	3.13	18.78	24.68	1.85	2.14
C40-3	1.52	2.41	0.41	1.64	2.81	P	H04-1	3.03	17.50	21.34	2.46	3.06
C41-1	1.60	3.85	0.11	1.09	1.17	0.00	H04-2	4.19	12.38	22.09	0.63	1.37
C41-2	2.05	6.15	0.16	1.55	2.87	P	H04-3	2.27	21.40	20.18	1.15	1.57
C41-3	2.02	2.32	1.06	1.21	2.53	P	H05-1	3.33	18.07	22.98	3.28	3.67
C42-1	1.64	2.06	0.07	2.86	2.88	P	H06-1	1.67	17.43	17.37	2.68	3.13
C42-2	1.83	2.49	P	0.71	2.11	0.03	H06-2	4.47	14.35	30.88	1.46	1.70
C42-3	2.50	2.59	0.00	0.46	0.93	0.06	H06-3	3.52	26.66	20.74	1.23	1.49
C42-4	1.95	2.09	0.17	0.37	2.00	0.15	H06-4	3.81	28.65	17.24	0.59	0.74
C43-1	1.72	1.97	0.18	1.23	2.48	P	H07-1	2.07	14.66	23.77	3.08	3.75
C43-2	1.44	3.05	0.12	4.68	1.34	0.04	H07-2	3.53	16.55	19.63	1.46	1.87
C43-3	1.28	2.31	0.06	0.98	0.77	P	H07-3	2.46	21.25	14.06	1.32	1.54
C44-1	1.41	2.48	0.07	0.33	1.55	0.00	H08-1	2.25	16.91	24.58	5.21	5.52
C44-2	1.25	2.89	0.22	3.21	0.60	P	H08-2	3.15	17.22	19.56	2.25	2.85
C44-3	1.10	2.31	0.12	3.87	2.45	P	H09-1	6.59	23.50	16.53	2.44	3.62
C45-1	1.35	2.09	0.06	0.78	2.70	0.00	H10-1	1.79	24.03	13.61	1.71	2.74
C45-2	1.03	4.50	0.23	3.28	2.27	P	H10-2	3.48	25.40	14.42	1.45	3.21
C45-3	2.15	4.03	0.18	2.18	2.68	P	H11-1	1.02	14.37	18.30	3.11	4.00
C46-1	1.37	2.63	0.07	1.38	1.43	P	H12-1	2.17	22.14	24.55	5.51	6.88
C46-2	0.85	2.94	0.13	4.47	1.30	P	H12-2	1.50	37.73	15.81	4.23	5.34
C46-3	1.09	3.35	P	3.72	1.93	P	H13-1	0.78	28.80	27.27	1.22	2.23
C46-4	1.99	3.34	0.16	3.08	1.16	0.04	H14-1	3.93	15.92	22.18	0.31	0.52
C47-1	1.73	2.67	P	0.25	2.63	P	H14-2	3.42	27.36	20.99	0.41	1.49
C47-2	1.23	4.90	P	0.88	3.06	0.04	V1-1	3.13	11.50	25.50	0.39	1.17
C48-1	2.13	3.79	P	1.63	3.41	P	V1-2	2.82	4.32	59.92	0.59	0.82
C48-2	1.68	3.72	0.06	2.49	3.85	P	V1-3	2.74	6.41	55.34	0.34	0.61
C48-3	2.28	5.64	0.38	2.59	2.31	P	V1-4	3.80	7.81	66.08	0.43	0.83
C48-4	1.74	3.16	0.12	2.11	3.03	P	V2-1	2.21	13.31	29.64	0.93	2.72
C49-1	1.62	4.04	2.38	0.20	3.61	0.05	V2-2	6.16	10.22	56.19	0.36	1.67
C49-2	1.44	4.62	0.25	2.02	4.20	P	V2-3	2.97	6.38	47.27	0.47	3.90
C49-3	1.62	3.93	0.71	0.58	1.04	P	V2-4	3.66	15.10	57.68	0.79	2.12
C49-4	1.33	3.05	0.03	2.36	1.38	P	V4-1	3.06	12.36	29.98	0.71	1.77
C50-1	0.87	4.02	0.39	0.75	1.63	P	V4-2	2.01	8.04	45.73	0.73	1.06
WB-							V4-3	2.40	8.25	40.98	0.57	1.39
063-1	1.81	3.67	0.12	P	1.34	P	V4-4	3.09	7.71	54.87	0.72	1.35
063-2	0.59	2.75	0.29	1.55	4.15	P	V3-1	3.63	10.43	44.86	0.59	1.42
063-3	1.10	2.65	1.13	1.80	5.71	0.04	V3-2	3.11	9.20	46.15	0.27	0.50
							V5-1	4.26	18.60	25.71	0.88	1.95
AVG	1.40	2.17	0.39	1.05	1.73	0.08	V5-3	3.60	4.87	53.42	0.85	1.26
STD	0.55	1.32	0.39	0.93	1.21	0.21	V5-4	5.04	7.09	53.91	1.01	1.20
MAX	3.15	6.15	2.52	4.68	7.87	2.47	V5-5	4.30	6.99	56.61	0.84	1.44
MIN	0.00	0.00	0.00	0.00	0.00	0.00						

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM	SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM
V6-1	4.51	16.55	30.56	1.06	2.48	2000-2	3.37	11.54	28.86	0.14	2.39
V6-2	6.62	13.67	33.73	0.75	1.71	2001-1	2.18	11.79	26.04	0.42	2.02
1090-1	3.05	12.85	30.89	0.74	2.46	2002-1	3.15	18.08	33.44	0.56	3.75
1090-2	3.69	11.68	33.20	0.61	1.91	2002-2	2.45	12.53	33.51	0.60	3.01
1091-1	9.22	7.19	38.61	0.60	2.36	110-1	5.49	12.62	40.79	1.09	2.60
1091-2	4.05	17.15	39.24	0.64	1.71	110-2	2.19	11.46	24.07	1.19	2.21
1091-3	4.64	12.70	46.89	0.43	1.61	110-3	1.35	10.49	25.51	1.07	1.41
1092-1	3.19	8.28	53.29	0.60	1.70	115-1	2.10	10.94	33.97	0.25	0.74
1092-2	4.90	8.50	58.18	0.56	1.03	116-1	4.01	3.52	41.87	0.45	0.58
1094-1	2.93	11.98	42.23	0.32	1.15	116-2	2.73	10.89	40.97	0.19	0.54
1094-2	4.19	9.96	56.62	0.55	1.01	116-3	3.46	7.20	44.85	1.55	2.17
1095-1	3.62	13.90	28.92	0.64	2.51	116-4	4.02	8.86	45.70	0.71	0.92
1095-2	3.26	9.67	54.46	0.80	2.30	116-5	3.31	7.31	42.41	1.36	1.66
1096-1	2.04	12.59	30.03	0.72	1.84	117-1	2.50	8.26	36.81	1.15	1.26
1096-2	2.84	8.62	46.15	0.74	2.23	117-2	2.04	5.75	34.29	1.37	3.87
1097-1	4.42	10.68	37.40	0.60	2.60	117-3	1.86	6.22	33.77	2.62	3.95
1097-2	3.82	6.99	55.30	0.34	1.39	117-4	1.76	4.48	28.81	1.91	2.84
1097-3	3.17	8.65	61.31	0.47	1.26	C1-1	4.24	10.92	42.01	1.72	2.19
1098-1	1.36	5.85	57.16	0.54	1.78	C1-2	2.89	6.25	26.62	2.42	3.21
1098-2	3.08	6.14	69.30	0.22	0.58	C1-3	0.41	15.58	23.31	1.43	2.14
1099-1	4.21	10.08	42.66	0.32	1.18	C1-4	3.85	9.17	26.77	0.68	1.97
1099-2	3.00	8.38	59.32	0.52	1.78	C2-1	5.34	9.26	35.80	1.63	4.17
1100-1	3.20	11.60	30.51	0.65	2.64	C2-2	4.85	13.92	29.76	0.39	1.81
1100-2	3.99	8.31	52.97	0.73	2.51	C2-3	4.84	6.54	32.28	1.14	2.67
1103-1	1.90	8.87	43.02	1.22	1.80	C2-4	2.75	14.60	34.68	0.71	1.43
1103-2	2.74	11.35	48.90	0.31	1.62	C3-1	3.67	24.53	19.73	0.64	4.07
1103-3	4.44	9.34	29.41	0.38	1.74	C3-2	5.79	24.79	32.48	0.92	4.35
1106-1	2.32	6.48	42.37	1.41	3.59	C3-3	7.03	18.70	33.46	0.61	3.59
1106-2	1.70	9.14	32.69	0.86	2.63	C3-4	4.03	21.18	39.06	0.68	3.44
1107-1	2.59	9.99	35.70	0.68	4.35	C4-1	4.78	6.81	26.21	0.87	2.67
1107-2	2.01	9.74	25.22	0.60	1.83	C4-2	3.46	9.04	23.93	0.91	2.41
1109-1	1.27	13.07	25.62	0.97	3.08	C4-3	3.84	16.52	27.04	1.24	2.72
1111-1	3.88	9.42	30.81	0.58	2.76	C5-1	3.09	5.07	39.26	1.62	2.04
1111-2	2.72	11.03	34.11	0.60	3.20	C5-2	4.51	11.99	25.38	1.53	2.98
1116-1	2.69	12.40	30.36	1.19	4.39	C5-3	3.30	8.09	20.21	1.56	3.55
1116-2	3.93	12.89	34.52	1.11	4.00	C5-4	7.02	8.00	25.56	1.23	3.36
1119-1	2.17	11.53	26.75	1.23	2.43	C6-1	5.54	6.96	31.21	2.02	4.45
1119-2	3.71	10.73	34.04	1.12	2.39	C6-2	7.33	11.52	28.59	0.26	2.56
1120-1	2.08	11.99	29.55	0.96	1.95	C6-3	3.85	10.99	19.57	0.49	5.79
1120-2	2.69	11.36	37.24	1.18	3.05	C7-1	2.93	11.05	24.39	0.61	3.17
1121-1	4.23	15.23	27.41	1.01	3.44	C7-2	1.93	6.04	39.05	1.07	1.48
1122-1	2.23	10.66	32.00	1.31	5.67	C7-3	1.44	10.18	29.24	1.41	2.41
1127-1	3.03	11.17	29.70	1.04	5.51	C8-1	5.13	10.06	39.76	1.85	3.52
1127-2	3.15	11.86	34.64	0.72	2.70	C8-2	4.06	6.92	19.65	2.54	6.81
1129-1	2.21	10.73	27.92	2.88	7.65	C8-3	3.48	6.79	17.21	0.83	3.66
1129-2	2.20	12.46	23.11	0.78	6.11	C8-4	3.67	8.00	14.89	0.67	3.58
1130-1	2.94	9.93	26.28	2.62	7.17	C9-1	3.74	6.58	31.07	2.02	4.67
1130-2	0.99	16.60	25.87	0.24	1.96	C9-2	2.93	5.89	29.84	1.50	3.87
1131-1	2.82	12.08	32.12	1.02	5.92	C9-3	5.17	13.95	31.38	1.56	3.27
1132-1	5.57	8.85	29.32	1.21	6.32	C10-1	4.80	5.28	35.98	0.76	3.23
1134-1	4.64	9.17	41.09	1.50	8.79	C10-2	4.10	7.78	19.40	1.07	4.10
1134-2	3.60	10.51	36.60	1.38	6.82	C10-3	6.47	16.20	23.35	1.14	5.07
1136-1	3.46	13.51	34.72	1.96	9.01	C10-4	7.85	18.26	21.91	0.75	4.61
1136-2	3.68	13.87	33.63	1.74	6.42	C11-1	4.61	9.06	29.42	1.51	1.92
1136-3	3.56	9.27	34.79	0.83	3.34	C11-2	2.45	7.46	28.88	1.64	1.82
1139-1	2.79	7.35	33.45	1.08	2.44	C11-3	6.64	21.27	25.74	0.73	3.63
2000-1	2.52	9.73	33.32	0.30	2.00	C11-4	8.55	16.40	35.82	0.87	3.16

SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM	SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM
C12-1	2.05	4.84	20.72	3.05	5.68	C31-4	5.36	10.96	25.46	0.84	4.03
C12-2	4.21	13.69	18.93	1.75	5.43	C32-1	4.86	6.62	41.24	1.59	2.75
C12-3	7.33	8.08	28.15	3.28	9.21	C32-2	5.01	11.49	28.49	0.79	2.75
C12-4	5.61	10.39	18.77	2.59	7.54	C32-3	7.54	7.45	38.96	0.90	3.41
C13-1	3.39	8.28	24.36	1.64	3.25	C33-1	5.68	11.91	29.61	0.80	1.98
C13-2	3.82	8.65	22.98	1.62	2.69	C33-2	6.63	15.36	25.64	0.65	2.53
C13-3	6.93	17.61	26.41	0.95	1.83	C33-3	6.03	16.41	25.07	0.15	2.42
C14-1	2.28	9.07	14.64	2.11	4.57	C33-4	5.82	15.05	38.38	0.16	1.24
C14-2	5.49	15.69	17.42	0.72	2.04	C34-1	3.04	4.57	43.23	0.96	1.09
C14-3	4.46	13.90	22.92	1.26	6.02	C34-2	4.56	7.62	44.24	2.42	3.83
C14-4	4.52	10.78	13.87	0.64	5.63	C34-3	3.99	11.91	28.76	0.87	2.17
C15-1	3.60	9.44	20.91	1.94	5.76	C35-1	6.40	18.38	35.09	0.13	1.78
C15-2	3.38	8.53	15.68	1.14	6.61	C35-4	5.83	12.37	44.40	0.46	1.33
C16-1	2.77	12.85	19.95	2.53	7.00	C36-1	4.75	1.70	55.13	0.48	0.62
C16-2	4.49	12.05	12.02	1.82	5.43	C36-2	4.64	5.01	47.78	0.59	0.73
C17-1	4.31	7.53	26.23	2.20	3.85	C36-3	7.07	4.52	53.78	0.73	0.86
C17-2	6.41	15.15	19.99	1.24	4.37	C36-4	4.72	7.54	39.97	0.72	0.81
C17-3	3.88	13.62	15.36	0.98	4.08	C37-1	5.62	9.66	26.06	0.91	4.43
C17-4	2.98	8.24	14.53	1.42	5.31	C37-2	3.54	10.23	36.05	1.52	2.25
C17-5	4.07	14.02	12.66	0.89	5.76	C37-3	3.78	9.72	41.83	1.34	2.19
C18-1	2.43	14.18	20.20	2.07	3.00	C38-1	4.87	10.42	24.03	0.46	2.00
C18-2	3.41	9.90	17.79	2.43	3.58	C38-2	3.16	21.26	30.09	0.29	2.33
C19-1	4.62	11.34	22.79	1.20	4.10	C39-1	5.36	7.99	28.75	0.90	4.42
C19-2	3.68	8.74	23.26	0.94	2.08	C39-2	3.46	5.87	28.92	1.09	4.15
C19-3	1.42	9.63	24.98	1.73	2.15	C39-3	3.12	4.90	38.38	1.09	2.62
C20-1	2.94	9.76	37.50	0.56	1.30	C40-1	4.32	8.74	28.95	0.79	4.58
C20-2	2.58	12.39	37.32	1.29	1.78	C40-2	4.43	6.97	35.85	1.19	4.20
C20-3	4.05	17.86	29.24	0.20	0.97	C40-3	4.48	5.33	36.96	1.42	2.77
C20-4	5.51	12.83	34.86	0.33	1.94	C41-1	4.70	7.76	31.24	0.95	3.80
C21-1	7.14	7.72	38.37	0.38	1.11	C41-2	4.51	16.01	36.37	0.63	1.89
C22-1	3.93	5.38	42.66	1.36	1.55	C41-3	4.66	5.46	37.04	1.27	2.68
C22-2	4.10	6.20	38.95	1.50	1.78	C42-1	3.86	7.23	44.84	1.13	3.61
C22-3	3.51	7.46	32.56	1.85	2.42	C42-2	5.07	8.59	42.98	0.86	4.37
C22-4	2.61	7.33	36.32	0.87	1.23	C42-3	4.33	9.59	41.58	0.60	*
C23-2	4.09	7.59	30.28	0.89	1.45	C42-4	6.65	6.44	62.22	0.85	3.19
C23-3	3.82	8.17	33.22	1.47	1.63	C43-1	2.72	8.13	14.00	1.17	6.40
C23-4	3.42	16.77	33.54	0.84	0.96	C43-2	3.63	8.45	38.33	1.46	3.58
C24-1	3.08	7.83	41.80	0.83	1.07	C43-3	3.96	10.77	26.81	1.09	6.76
C24-2	2.86	7.37	38.05	1.16	1.51	C44-1	4.53	9.47	24.42	0.90	6.51
C25-1	7.42	3.86	52.88	0.23	0.42	C44-2	3.55	7.38	36.17	1.59	3.53
C25-2	4.01	15.30	47.48	0.38	1.40	C44-3	3.81	11.03	33.99	0.68	1.76
C25-3	2.39	18.75	36.43	0.57	1.79	C45-1	4.49	9.05	23.92	0.31	3.02
C26-1	4.29	7.03	45.39	1.87	3.58	C45-2	2.71	9.02	27.49	1.76	2.65
C26-2	6.35	12.22	34.27	0.95	2.64	C45-3	5.74	15.18	36.80	1.57	2.93
C26-3	5.65	10.91	20.92	0.49	5.13	C46-1	3.16	12.88	28.21	1.08	3.39
C27-1	4.44	13.97	28.21	0.40	2.29	C46-2	2.24	9.81	30.17	0.86	2.22
C27-3	3.94	9.49	56.08	0.34	2.67	C46-3	2.78	16.01	26.95	0.70	2.22
C28-1	3.89	5.10	47.42	1.39	1.91	C46-4	4.74	7.83	40.45	2.28	3.10
C28-2	7.17	8.04	39.80	1.42	3.31	C47-1	3.02	11.29	28.19	0.66	4.49
C28-3	5.18	12.78	29.39	1.32	3.13	C47-2	4.27	8.55	46.99	1.33	1.65
C28-4	5.14	10.99	42.06	0.98	2.43	C48-1	3.54	5.85	41.99	0.55	0.90
C29-1	5.93	6.67	52.25	4.32	4.58	C48-2	1.67	16.24	27.81	0.63	0.96
C29-2	4.87	10.57	42.80	0.38	1.30	C48-3	3.78	8.55	41.71	0.50	0.75
C30-1	4.92	12.31	37.18	0.67	2.98	C48-4	3.09	9.04	40.67	1.27	1.83
C31-1	3.53	4.08	46.91	0.59	0.73	C49-1	2.95	10.25	41.16	0.78	1.02
C31-2	6.00	3.61	54.17	1.36	1.52	C49-2	3.73	6.26	44.25	0.61	0.82
C31-3	5.10	9.65	43.24	1.48	3.18	C49-3	2.70	9.10	34.39	0.86	1.67

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM	SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
C49-4	3.38	11.06	30.85	0.81	4.16	45	7.85	19.48	19.30	6.55	0.75	29.97
C50-1	3.70	48.10	30.63	0.32	2.67	46	4.95	24.83	16.17	3.29	2.58	23.99
WB-						47	6.38	27.94	18.07	4.80	1.05	20.53
063-1	4.22	5.19	50.25	1.49	2.10	48	7.09	30.79	15.13	1.35	1.67	16.93
063-2	5.30	9.88	53.56	1.18	2.19	49	6.78	23.31	13.88	1.20	1.17	29.56
063-3	5.11	8.90	50.25	2.58	2.53	50	3.64	18.98	19.46	7.24	0.94	31.94
						51	10.66	21.39	17.07	3.82	0.93	26.44
AVG	3.84	11.72	33.22	1.19	2.87	52	11.65	25.39	18.99	3.49	0.09	20.04
STD	1.50	5.78	11.38	0.87	1.66	53	12.08	19.39	17.17	4.74	1.82	25.22
MAX	9.22	48.10	69.30	5.51	9.12	54	11.08	28.98	20.44	3.05	0.05	19.45
MIN	0.41	1.70	12.02	0.13	0.41	55	12.97	13.08	21.56	5.07	0.02	28.26

290 core samples

GRAB SAMPLES

SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE	SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
1	10.20	16.71	21.25	5.73	0.53	30.33	56	10.59	22.44	13.15	4.20	2.59	29.69
2	6.42	31.94	19.89	6.49	1.43	12.05	57	16.18	24.98	17.69	3.36	0.46	17.27
3	17.05	19.04	29.79	3.43	2.90	12.95	58	11.05	22.60	20.13	1.57	1.57	23.52
4	9.42	21.44	16.29	2.11	1.81	21.35	59	4.48	34.94	19.55	3.93	P	19.66
5	1.13	24.10	21.92	8.28	0.17	25.81	60	6.55	24.63	19.89	3.11	1.34	20.78
6	0.19	22.81	37.36	2.70	9.04	15.34	61	6.85	23.86	16.81	0.72	0.40	25.03
7	4.65	18.90	16.35	6.97	1.30	34.04	62	8.81	23.09	16.97	4.38	0.85	24.32
8	0.23	34.42	22.65	1.59	7.49	21.27	63	12.94	13.58	16.86	3.98	1.87	27.93
9	0.51	25.56	20.05	2.00	5.24	29.72	64	13.56	10.17	20.68	7.98	0.02	30.08
10	0.50	25.10	26.23	7.31	P	31.44	65	0.87	27.44	10.54	13.90	2.91	24.19
11	0.08	31.43	34.83	0.47	2.98	16.48	66	10.13	22.23	15.69	5.61	0.04	20.71
12	3.00	25.02	21.19	6.51	0.91	19.58	67	3.40	50.28	12.42	2.13	5.68	6.16
13	2.60	20.21	22.31	5.13	0.49	26.47	68	1.08	35.93	11.78	9.41	2.73	15.42
14	0.74	28.72	20.74	2.84	3.19	27.11	69	0.28	20.47	8.56	14.31	2.96	32.24
15	5.74	35.07	15.00	4.59	0.72	13.15	70	0.42	34.69	10.78	10.73	5.95	16.03
22	1.31	23.73	16.21	5.43	1.57	31.65	71	3.19	28.81	15.16	8.96	0.91	26.45
23	3.72	21.75	17.99	4.06	2.96	30.32	72	0.34	41.63	16.84	8.20	2.96	9.12
24	0.53	19.35	13.76	5.25	2.35	37.66	73	5.91	21.11	16.93	3.98	1.15	19.40
25	2.95	17.71	19.40	3.38	2.28	34.76	74	2.63	21.08	21.89	5.08	0.06	28.44
27	0.12	17.65	13.53	2.27	3.26	45.74	75	0.52	29.78	19.75	5.51	3.77	19.77
28	2.36	30.73	18.80	8.33	0.30	22.52	76	0.33	31.24	9.29	12.76	5.07	19.75
29	4.28	14.80	20.18	5.98	1.26	28.62	77	2.25	31.18	9.58	9.91	0.44	26.99
30	2.97	30.01	17.44	5.61	1.45	23.86	78	0.44	37.19	14.50	4.70	3.06	19.22
31	3.48	19.49	22.37	8.27	0.21	30.70	79	0.26	22.13	8.67	8.17	11.78	10.37
32	2.75	27.99	25.94	1.57	4.02	22.89	80	1.47	38.22	8.14	4.19	0.80	19.73
33	6.35	58.85	8.75	2.24	0.49	3.84	81	6.17	24.58	17.49	9.06	0.40	22.32
34	6.67	18.18	17.81	4.49	0.85	32.98	82	0.31	47.30	13.36	4.85	1.67	12.74
35	8.39	35.58	15.13	4.92	3.31	9.74	83	0.36	44.71	15.00	7.52	5.31	10.64
36	10.90	24.41	17.44	4.35	2.99	19.82	84	0.26	37.74	13.52	7.73	1.96	17.46
39	7.61	34.58	16.82	3.79	0.88	14.12	85	3.48	54.88	8.40	3.96	1.24	8.43
40	6.83	44.26	6.14	3.40	1.15	12.92	86	1.32	33.13	12.26	9.94	1.82	22.55
41	10.34	24.88	5.75	3.79	2.52	24.18	87	1.65	42.77	11.69	7.77	0.55	6.70
42	7.83	21.44	20.02	2.09	0.26	18.60	88	0.34	32.51	10.81	9.46	5.44	22.87
43	4.56	16.65	19.40	6.26	0.17	33.41	89	7.18	19.35	18.72	4.08	0.78	23.72
44	5.93	19.86	27.48	3.99	0.51	20.47	89A	1.24	47.00	13.81	5.70	1.35	16.57
							90	0.43	41.73	20.64	8.09	6.35	4.60
							91	0.85	49.52	9.56	7.00	1.10	13.68
							93	0.59	30.42	18.24	10.33	3.44	20.84
							94	0.49	36.00	11.52	9.56	5.71	20.08
							95	0.52	18.87	14.11	14.01	4.65	31.14
							96	0.35	43.05	12.75	10.15	7.44	10.28
							97	0.89	39.35	11.84	5.81	2.43	13.46
							98	0.27	41.34	11.82	8.88	2.19	13.34
							100	2.17	42.04	12.75	9.37	0.80	11.87
							101	5.87	23.50	15.44	7.95	0.25	27.20

SAMPLE NAME	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
STA-						
054	1.51	32.88	15.39	7.07	4.27	16.24
055	1.12	23.90	17.64	8.38	6.84	16.07
056	0.35	30.97	16.62	10.16	5.74	12.61
093	6.00	23.71	15.33	10.72	3.89	16.72
094	3.57	22.86	17.39	7.22	2.64	24.15
51-1	2.80	21.72	13.21	9.04	4.42	17.69
51-2	2.27	27.76	8.94	7.53	4.06	18.20
51-3	0.65	24.53	15.43	9.21	2.85	17.12
51-4	0.37	42.81	16.88	7.76	3.20	9.94
AVG	4.35	28.51	16.66	5.99	2.34	21.30
STD	4.18	9.74	5.35	3.06	2.21	7.79
MAX	17.05	58.85	37.36	14.31	11.78	45.74
MIN	0.08	10.17	5.75	0.47	0.00	3.84

B. GRAB SAMPLES

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA
1	0.27	0.32	0.20	0.01	0.43	0.07
2	0.77	1.14	0.38	0.80	1.03	0.42
3	0.77	0.37	0.34	0.04	0.94	0.05
4	1.41	1.40	1.16	0.65	2.99	0.22
5	0.92	0.10	0.26	0.22	1.73	0.13
6	0.55	0.76	0.72	P	1.15	0.57
7	0.52	0.39	0.40	0.48	0.79	0.04
8	0.82	0.86	1.03	P	1.53	0.41
9	0.59	0.94	0.52	1.09	0.97	0.28
10	0.36	0.18	0.15	0.17	0.89	0.11
11	1.62	0.39	0.31	0.26	1.96	1.70
12	0.88	0.19	0.47	0.91	1.61	0.04
13	0.79	0.28	0.92	0.55	0.97	0.19
14	0.94	1.91	1.12	P	2.89	0.82
15	1.43	1.39	1.08	0.02	1.34	0.11
22	0.44	0.85	0.53	0.72	3.08	0.58
23	1.51	0.60	0.77	1.02	0.89	0.14
24	0.82	1.17	0.45	0.09	2.18	0.29
25	1.13	0.46	0.42	1.48	1.70	0.27
27	1.16	3.36	1.51	0.47	1.56	0.56
28	0.38	0.84	0.67	0.60	1.06	0.20
29	1.22	0.92	0.33	0.21	0.71	P
30	0.86	0.86	0.99	1.15	0.88	0.39
31	1.13	0.23	0.26	0.19	1.02	0.46
32	0.91	1.00	0.59	0.09	0.90	0.41
33	0.83	1.22	0.47	0.10	0.65	0.14
34	1.01	0.46	0.50	1.24	1.95	0.44
35	0.80	2.51	0.19	P	0.19	0.99
36	0.14	0.74	0.20	0.21	1.38	0.81
39	0.75	1.07	0.80	0.91	1.84	0.02
40	0.00	0.77	0.63	0.40	0.00	0.74
41	0.12	0.33	0.21	0.66	2.97	0.17
42	0.64	0.05	0.05	0.17	0.57	0.36
43	0.73	0.37	0.27	0.41	1.17	0.17

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA
44	1.03	1.17	0.79	0.07	0.73	0.15
45	0.82	0.42	0.21	0.05	0.62	0.10
46	0.55	0.79	0.64	0.21	1.79	0.16
47	0.83	0.72	0.57	1.33	0.52	0.15
48	0.81	0.36	0.61	1.35	2.17	P
49	0.75	0.55	0.30	0.67	1.01	0.12
50	1.09	1.41	1.04	0.63	1.17	0.67
51	1.30	0.34	0.16	1.01	1.32	0.23
52	0.66	0.18	0.25	1.49	1.32	0.28
53	0.76	1.12	0.89	0.55	0.80	0.11
54	1.07	0.36	0.28	0.01	0.19	0.37
55	1.04	0.96	0.34	0.64	1.08	0.05
56	1.39	0.36	0.36	1.73	0.91	0.39
57	0.75	0.22	0.25	1.09	1.33	0.05
58	1.01	0.18	0.08	0.38	0.44	0.08
59	1.53	0.87	0.05	0.14	0.63	0.08
60	0.54	0.81	1.26	1.00	1.14	0.01
61	1.32	0.13	0.42	0.81	0.99	P
62	1.09	0.54	0.21	0.85	1.25	P
63	1.26	0.56	0.16	0.37	1.71	0.05
64	0.90	0.64	0.27	0.17	0.83	P
65	1.12	1.20	0.46	1.64	1.46	0.15
66	1.41	0.21	0.14	0.54	0.80	P
67	1.01	1.93	0.10	0.41	3.03	0.57
68	0.57	2.20	0.38	0.63	2.79	0.51
69	1.50	1.85	0.28	1.73	4.41	0.33
70	2.13	2.20	0.35	0.79	4.25	0.5
71	0.97	0.88	0.59	0.54	1.70	0.02
72	1.40	1.87	0.45	1.18	4.05	0.44
73	0.69	0.54	0.48	0.37	0.59	0.08
74	1.07	0.12	0.24	0.72	1.10	P
75	1.60	1.14	0.00	1.59	2.39	0.43
76	2.20	1.69	0.00	1.40	1.99	0.59
77	1.06	1.10	0.09	0.82	2.72	0.12
78	1.50	1.43	0.20	0.60	2.65	0.44
79	2.55	4.80	1.26	3.94	4.80	1.17
80	0.93	0.26	0.16	0.17	1.80	0.31
81	1.65	0.79	0.40	0.52	1.47	P
82	2.77	1.40	0.53	0.59	3.26	0.49
83	2.33	1.30	0.57	0.79	1.54	0.67
84	1.02	2.03	0.14	2.73	3.18	0.29
85	2.44	0.15	0.38	0.24	1.77	0.08
86	2.07	0.64	0.37	0.35	3.04	0.19
87	2.33	0.72	0.39	0.31	2.52	0.26
88	2.04	2.20	0.11	0.68	3.59	0.91
89	1.41	0.26	0.30	0.85	2.17	0.13
89A	1.73	0.88	0.26	0.10	1.89	0.15
90	1.30	2.39	0.18	0.44	3.27	0.62
91	0.93	1.15	0.12	0.39	2.60	0.22
93	1.50	1.19	0.00	0.52	2.93	0.73
94	1.88	2.32	0.00	1.08	1.87	0.56
95	0.87	3.51	0.04	1.41	2.14	0.67
96	1.59	2.07	0.26	0.55	1.65	1.80
97	1.57	0.83	0.04	0.31	1.35	0.10
98	1.69	1.65	0.00	0.09	1.95	0.67
100	2.02	0.71	0.04	0.07	0.99	0.04
101	0.88	0.55	0.18	0.61	1.24	0.03

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA	SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT % RHM	WT % THM
STA054	2.48	3.47	0.24	1.54	2.68	P	46	3.69	16.35	31.81	4.64	6.80
STA055	2.14	6.13	0.42	2.95	2.46	P	47	1.46	15.63	31.62	4.27	6.18
STA056	1.98	4.47	0.31	3.01	1.23	P	48	3.67	18.07	37.80	4.65	9.39
STA093	1.24	4.26	0.04	1.34	1.92	P	49	2.73	17.97	28.47	3.72	6.32
STA094	1.58	4.05	0.09	2.77	1.33	0.02	50	1.79	9.99	25.12	4.97	6.30
51-1	1.80	6.15	0.70	3.83	5.64	P	51	3.49	11.85	28.06	2.65	6.49
51-2	1.20	8.01	0.13	2.65	8.20	0.09	52	3.86	12.31	31.68	1.92	5.90
51-3	1.18	7.67	0.00	2.97	5.98	P	53	1.15	14.20	23.32	4.30	7.79
51-4	2.32	4.22	0.00	1.05	3.02	0.10	54	4.92	9.74	35.89	7.02	14.66
							55	3.09	11.84	19.31	4.14	7.87
AVG	1.19	1.40	0.39	0.82	1.85	0.30	56	3.83	8.36	29.33	4.04	7.95
STD	0.58	1.56	0.33	0.83	1.31	0.34	57	3.34	13.04	30.67	3.48	7.79
MAX	2.77	8.01	1.51	3.94	8.20	1.80	58	2.01	15.38	26.33	2.18	5.44
MIN	0.00	0.05	0.00	0.00	0.00	0.00	59	4.30	9.83	42.36	6.74	11.02
							60	1.87	17.07	29.00	1.12	4.51
							61	3.48	19.16	29.79	0.87	6.08
							62	1.35	16.28	27.33	1.34	2.93
							63	3.33	15.40	20.49	1.78	3.65
							64	3.44	11.25	15.98	2.84	5.32
							65	2.15	11.95	33.52	1.22	1.53
							66	3.56	18.93	28.21	4.67	6.79
							67	2.10	10.81	58.92	1.58	2.55
							68	3.42	13.15	45.42	0.66	1.14
							69	1.29	9.81	29.83	0.72	0.83
							70	2.09	9.06	45.90	0.58	0.65
							71	2.43	9.39	34.81	0.58	1.19
							72	2.66	8.87	52.04	1.62	1.94
							73	1.19	27.59	24.20	1.60	4.92
							74	2.39	15.19	25.75	2.91	4.40
							75	2.79	10.97	38.12	0.47	0.55
							76	3.68	10.02	41.39	0.32	0.48
							77	2.58	11.16	38.75	0.46	1.51
							78	2.91	11.17	46.12	0.89	1.04
							79	2.72	17.38	38.18	0.12	0.14
							80	3.82	20.00	45.35	3.10	4.74
							81	3.42	11.73	31.92	0.76	4.39
							82	3.15	7.57	58.37	0.92	1.31
							83	2.05	7.20	52.61	0.58	0.70
							84	2.62	9.32	46.88	0.37	0.51
							85	3.82	10.73	63.14	9.63	10.75
							86	3.24	9.08	42.31	0.76	1.31
							87	3.31	9.03	51.90	2.96	4.16
							88	2.23	6.83	43.47	0.38	0.44
							89	2.79	18.25	26.11	1.76	5.22
							89A	2.54	6.77	54.20	3.76	4.38
							90	3.36	6.58	52.68	0.76	0.80
							91	3.39	9.49	57.82	3.93	4.52
							93	2.90	6.38	39.66	0.81	0.97
							94	1.63	7.29	44.25	0.68	0.82
							95	1.58	6.47	27.64	0.38	0.42
							96	3.95	4.13	54.11	0.46	0.79
							97	3.07	18.95	46.26	0.37	1.12
							98	3.51	12.60	50.82	0.51	6.25
							100	3.68	13.46	49.47	2.23	4.48
							101	2.04	14.24	28.24	0.20	3.47
							STA054	4.80	7.43	46.31	4.41	5.21
							STA055	1.85	10.08	36.49	0.39	0.51

SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT % RHM	WT % THM
1	1.56	12.39	19.36	6.86	7.28
2	2.62	14.62	37.92	4.25	6.08
3	1.30	11.03	22.47	4.21	5.29
4	3.31	16.44	30.76	5.18	9.30
5	4.24	11.00	31.21	5.53	7.62
6	1.29	7.52	27.13	1.72	2.29
7	3.00	12.18	23.64	0.41	2.10
8	2.12	5.58	40.16	1.02	1.67
9	1.49	11.04	29.83	1.66	1.74
10	0.62	6.94	27.26	6.53	7.68
11	2.45	5.04	39.55	1.31	1.53
12	3.16	16.52	30.91	4.35	8.13
13	1.91	17.18	24.35	1.31	3.01
14	1.62	7.36	36.90	4.17	5.51
15	5.37	15.00	44.70	0.34	5.94
22	1.87	12.04	30.55	3.03	4.53
23	2.54	11.73	27.43	0.65	1.99
24	2.06	14.04	25.86	3.05	3.78
25	1.76	12.30	23.04	4.14	5.64
27	2.30	6.49	26.60	0.62	0.73
28	1.90	11.29	35.12	1.06	2.69
29	2.44	19.05	20.10	3.24	4.33
30	2.88	10.63	35.88	4.83	7.00
31	2.07	10.12	24.41	2.43	3.03
32	1.63	9.30	32.84	5.33	8.06
33	4.10	11.96	65.80	3.13	5.12
34	1.97	11.43	24.02	3.57	7.70
35	1.64	16.61	41.71	3.44	7.12
36	2.06	14.56	29.54	4.22	9.07
39	1.46	15.35	39.71	4.64	8.35
40	4.29	18.46	50.06	2.48	5.25
41	3.00	21.09	31.47	3.42	8.62
42	5.07	22.85	28.13	5.61	11.06
43	3.28	13.15	22.37	2.08	2.94
44	3.21	14.60	26.16	2.94	4.12
45	1.80	12.08	23.24	1.42	2.35

APPENDIX IV

SUMMARY COMPOSITION STATISTICS
(WITH RESPECT TO HEAVY MINERAL CONCENTRATE) FOR ALL SAMPLES

SAMPLE NAME	WT % ZIRCON	WT % OTHER	WT % ECON	WT% RHM	WT% THM
STA056	2.98	9.58	41.63	0.58	0.84
STA093	4.07	10.76	35.20	3.23	5.74
STA094	3.26	9.06	33.11	5.23	7.57
51-1	2.89	10.10	38.20	0.68	0.80
51-2	3.17	7.79	48.43	0.07	0.09
51-3	3.99	8.42	43.35	0.05	0.08
51-4	4.05	4.27	56.53	7.06	10.01
AVG	2.77	12.12	36.02	2.56	4.43
STD	0.98	4.33	11.07	2.04	3.14
MAX	5.37	27.59	65.80	9.63	14.66
MIN	0.62	4.13	15.98	0.05	0.08

100 grab samples

	WT % MAG	WT % IL	WT % GAR	WT % EP	WT % STAUR	WT % PYROBOLE
AVG	5.60	25.17	14.99	7.56	2.29	22.41
STD	5.14	10.64	5.15	3.25	2.02	7.21
MAX	27.58	60.33	37.36	24.35	11.78	45.74
MIN	0.07	3.28	2.01	0.47	0.00	3.84

GARNAR'S VALUES

NONE GIVEN	45.00	15.00	15.00	20.00	NONE GIVEN
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	WT % RUTILE	WT % SIL/KY	WT % SPHENE	WT % TOURM	WT % LEUC	WT % MONA
AVG	1.34	1.97	0.39	0.99	1.76	0.13
STD	0.56	1.42	0.37	0.91	1.24	0.27
MAX	3.15	8.01	2.52	4.68	8.20	2.47
MIN	0.00	0.00	0.00	0.00	0.00	0.00

GARNAR'S VALUES

2.00	7.00	NONE GIVEN	NONE GIVEN	5.00	1.00
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	WT % ZIRCON	WT % OTHER	WT % ECON	CORR WT% RHM	CORR WT% THM
AVG	3.57	11.82	33.94	1.55	3.27
STD	1.46	5.44	11.35	1.40	2.24
MAX	9.22	48.10	69.30	9.63	14.66
MIN	0.41	1.70	12.02	0.05	0.08

GARNAR'S VALUES

5.00	NONE GIVEN	NONE GIVEN	NONE GIVEN	5.00
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390 samples (100 grab, 290 core)

APPENDIX V

SELECTED MINERAL COMPOSITION WITH
RESPECT TO THE ENTIRE SAMPLE

Underlined samples have concentrations of one or more ECON minerals equal to or greater than Garnar's values (using THM = 5%). See text for explanation.

SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON
B01-1	3.91	0.56	0.04	0.03	<0.01	0.06
B01-2	2.88	0.42	0.02	0.02	<0.01	0.07
B02-1	2.42	0.48	0.03	0.01	0.01	0.10
B02-2	3.88	0.78	0.03	0.07	0.01	0.06
B03-1	3.20	0.53	0.02	0.03	<0.01	0.05
B03-2	3.33	0.46	0.02	0.02	<0.01	0.12
B03-3	3.26	0.50	0.05	0.06	<0.01	0.11
B04-1	2.53	0.32	0.02	0.02	<0.01	0.04
B05-1	1.86	0.39	0.01	0.01	0.01	0.07
B05-2	1.82	0.46	0.03	0.01	0.02	0.09
H01-1	3.86	1.15	0.03	0.07	0.04	0.12
H01-2	5.10	0.88	0.06	0.02	<0.01	0.14
<u>H01-3</u>	5.48	0.95	<u>0.15</u>	0.02	<u>0.08</u>	<u>0.42</u>
H02-1	2.32	0.37	0.02	0.04	<0.01	0.06
H02-2	1.09	0.22	<0.01	<0.01	<0.01	0.03
H02-3	1.34	0.18	0.01	0.01	<0.01	0.10
H03-1	2.14	0.37	0.02	0.04	0.01	0.07
H04-1	3.06	0.47	0.05	0.02	<0.01	0.09
H04-2	1.37	0.18	0.01	<0.01	<0.01	0.06
H04-3	1.57	0.23	0.02	0.02	<0.01	0.04
H05-1	3.67	0.58	0.05	0.05	<0.01	0.12
H06-1	3.13	0.45	0.02	0.01	<0.01	0.05
H06-2	1.70	0.34	0.03	0.01	<0.01	0.08
H06-3	1.49	0.23	0.01	0.01	<0.01	0.05
H06-4	0.74	0.07	0.01	0.01	<0.01	0.03
H07-1	3.75	0.72	0.03	0.04	<0.01	0.08
H07-2	1.87	0.25	0.02	<0.01	<0.01	0.07
H07-3	1.54	0.15	0.01	0.01	<0.01	0.04
H08-1	5.52	1.14	0.03	0.04	0.01	0.12
H08-2	2.85	0.41	0.03	0.01	<0.01	0.09
H09-1	3.62	0.28	0.01	0.02	<0.01	0.24
H10-1	2.74	0.26	0.01	0.02	<0.01	0.05
H10-2	3.21	0.28	0.02	0.03	<0.01	0.11
H11-1	4.00	0.62	0.04	0.02	<0.01	0.04
H12-1	6.88	1.43	0.03	0.05	0.01	0.15
H12-2	5.34	0.68	0.01	0.03	<0.01	0.08
H13-1	2.23	0.45	0.02	0.04	0.01	0.02
H14-1	0.52	0.08	0.01	<0.01	<0.01	0.02
H14-2	1.49	0.14	0.03	<0.01	0.02	0.05
V1-1	1.17	0.23	0.02	0.01	<0.01	0.04
V1-2	0.82	0.42	0.02	0.02	<0.01	0.02
V1-3	0.61	0.28	0.01	0.01	<0.01	0.02
V1-4	0.83	0.46	0.01	0.03	<0.01	0.03
V2-1	2.72	0.65	0.02	0.03	<0.01	0.06
V2-2	1.67	0.76	0.04	0.03	<0.01	0.10
V2-3	3.90	1.45	0.05	0.07	0.01	0.12
V2-4	2.12	1.06	0.03	0.03	<0.01	0.08
V4-1	1.77	0.42	0.01	0.03	<0.01	0.05

SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON
V4-2	1.06	0.41	0.02	0.02	<0.01	0.02
V4-3	1.39	0.45	0.02	0.04	<0.01	0.03
V4-4	1.35	0.61	0.03	0.04	<0.01	0.04
V3-1	1.42	0.46	0.02	0.08	<0.01	0.05
V3-2	0.50	0.18	0.01	0.01	<0.01	0.02
V5-1	1.95	0.35	0.02	0.03	<0.01	0.08
V5-3	1.26	0.54	0.02	0.03	<0.01	0.05
V5-4	1.20	0.53	0.02	0.02	<0.01	0.06
V5-5	1.44	0.66	0.02	0.05	<0.01	0.06
V6-1	2.48	0.60	0.03	0.01	<0.01	0.11
V6-2	1.71	0.43	0.03	0.01	<0.01	0.11
1	7.28	1.22	0.02	0.03	<0.01	0.11
2	6.08	1.94	0.05	0.06	0.03	0.16
3	5.29	1.01	0.04	0.05	<0.01	0.07
4	9.30	1.99	<u>0.13</u>	<u>0.28</u>	0.02	<u>0.31</u>
5	7.62	1.84	0.07	0.13	0.01	<u>0.32</u>
6	2.29	0.52	0.01	0.03	0.01	0.03
7	2.10	0.40	0.01	0.02	<0.01	0.06
8	1.67	0.58	0.01	0.03	0.01	0.04
9	1.74	0.44	0.01	0.02	<0.01	0.03
10	7.68	1.93	0.03	0.07	0.01	0.05
11	1.53	0.48	0.02	0.03	0.03	0.04
12	8.13	2.03	0.07	0.13	<0.01	<u>0.26</u>
13	3.01	0.61	0.02	0.03	0.01	0.06
14	5.51	1.58	0.05	0.16	<u>0.05</u>	0.09
15	5.94	2.08	0.08	0.08	0.01	<u>0.32</u>
22	4.53	1.08	0.02	0.14	0.03	0.08
23	1.99	0.43	0.03	0.02	<0.01	0.05
24	3.78	0.73	0.03	0.08	0.01	0.08
25	5.64	1.00	0.06	0.10	0.02	0.10
27	0.73	0.13	0.01	0.01	<0.01	0.02
28	2.69	0.83	0.01	0.03	0.01	0.05
29	4.33	0.64	0.05	0.03	<0.01	0.11
30	7.00	2.10	0.06	0.06	0.03	0.20
31	3.03	0.59	0.03	0.03	0.01	0.06
32	8.06	<u>2.26</u>	0.07	0.07	0.03	0.13
33	5.12	<u>3.01</u>	0.04	0.03	0.01	0.21
34	7.70	1.40	0.08	0.15	0.03	0.15
35	7.12	<u>2.53</u>	0.06	0.01	<u>0.07</u>	0.12
36	9.07	2.21	0.01	0.12	<u>0.07</u>	0.19
39	8.35	<u>2.89</u>	0.06	0.15	<0.01	0.12
40	5.25	<u>2.33</u>	0.00	0.00	0.04	0.23
41	8.62	2.14	0.01	<u>0.26</u>	0.01	<u>0.26</u>
42	11.06	<u>2.37</u>	0.07	0.06	0.04	<u>0.56</u>
43	2.94	0.49	0.02	0.03	0.01	0.10
44	4.12	0.82	0.04	0.03	0.01	0.13
45	2.35	0.46	0.02	0.01	<0.00	0.04
46	6.80	1.69	0.04	0.12	0.01	<u>0.25</u>
47	6.18	1.73	0.05	0.03	0.01	0.09
48	9.39	<u>2.89</u>	0.08	0.20	<0.01	<u>0.34</u>
49	6.32	1.47	0.05	0.06	0.01	0.17
50	6.30	1.20	0.07	0.07	0.04	0.11
51	6.49	1.39	0.08	0.09	0.01	0.23
52	5.90	1.50	0.04	0.08	0.02	0.23
53	7.79	1.51	0.06	0.06	0.01	0.09
54	14.66	<u>4.25</u>	<u>0.16</u>	0.03	<u>0.05</u>	<u>0.72</u>
55	7.87	1.03	0.08	0.09	<0.01	0.24

SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON	SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON
<u>56</u>	7.95	1.78	<u>0.11</u>	0.07	0.03	<u>0.30</u>	1096-2	2.23	0.87	0.04	0.03	<0.01	0.06
<u>57</u>	7.79	1.95	0.06	0.10	<0.01	<u>0.26</u>	1097-1	2.60	0.79	0.02	0.03	<0.01	0.11
58	5.44	1.23	0.05	0.02	<0.01	0.11	1097-2	1.39	0.65	0.02	0.03	<0.01	0.05
<u>59</u>	11.02	<u>3.85</u>	<u>0.17</u>	0.07	0.01	<u>0.47</u>	1097-3	1.26	0.67	0.03	0.02	<0.01	0.04
60	4.51	1.11	0.02	0.05	0.00	0.08	1098-1	1.78	0.89	0.02	0.04	<0.01	0.02
61	6.08	1.45	0.08	0.06	<0.01	0.21	1098-2	0.58	0.35	0.01	0.01	<0.01	0.02
62	2.93	0.68	0.03	0.04	<0.01	0.04	1099-1	1.18	0.40	0.02	0.02	<0.01	0.05
63	3.65	0.50	0.05	0.06	<0.01	0.12	1099-2	1.78	0.91	0.03	0.02	<0.01	0.05
64	5.32	0.54	0.05	0.04	<0.01	0.18	1100-1	2.64	0.65	0.02	0.03	<0.01	0.08
65	1.53	0.42	0.02	0.02	<0.01	0.03	1100-2	2.51	1.13	0.03	0.02	<0.01	0.10
<u>66</u>	6.79	1.51	<u>0.10</u>	0.05	<0.01	0.24	1103-1	1.80	0.70	0.01	0.02	<0.01	0.03
67	2.55	1.28	0.03	0.08	0.01	0.05	1103-2	1.62	0.65	0.02	0.05	<0.01	0.04
68	1.14	0.41	0.01	0.03	0.01	0.04	1103-3	1.74	0.37	0.02	0.02	<0.01	0.08
69	0.83	0.17	0.01	0.04	<0.01	0.01	1106-1	3.59	1.35	0.03	0.03	<0.01	0.08
70	0.65	0.23	0.01	0.03	<0.01	0.01	1106-2	2.63	0.77	0.02	0.01	<0.01	0.04
71	1.19	0.34	0.01	0.02	<0.01	0.03	1107-1	4.35	1.34	0.03	0.03	0.01	0.11
72	1.94	0.81	0.03	0.08	0.01	0.05	1107-2	1.83	0.36	0.03	0.02	<0.01	0.04
73	4.92	1.04	0.03	0.03	<0.01	0.06	1109-1	3.08	0.70	0.01	0.03	<0.01	0.04
74	4.40	0.93	0.05	0.05	<0.01	0.11	1111-1	2.76	0.67	0.03	0.02	<0.01	0.11
75	0.55	0.16	0.01	0.01	<0.01	0.02	1111-2	3.20	0.95	0.03	0.02	<0.01	0.09
76	0.48	0.15	0.01	0.01	<0.00	0.02	1116-1	4.39	1.11	0.04	0.03	<0.01	0.12
77	1.51	0.47	0.02	0.04	<0.01	0.04	1116-2	4.00	1.11	0.08	0.01	<0.01	0.16
78	1.04	0.39	0.02	0.03	<0.01	0.03	1119-1	2.43	0.53	0.03	0.02	0.01	0.05
79	0.14	0.03	<0.01	0.01	<0.01	<0.01	1119-2	2.39	0.67	0.03	0.01	<0.01	0.09
80	4.74	1.81	0.04	0.09	0.01	0.18	1120-1	1.95	0.48	0.02	0.01	<0.01	0.04
81	4.39	1.08	0.07	0.06	<0.01	0.15	1120-2	3.05	0.98	0.03	0.03	<0.01	0.08
82	1.31	0.62	0.04	0.04	0.01	0.04	1121-1	3.44	0.72	0.03	0.03	<0.01	0.15
83	0.70	0.31	0.02	0.01	<0.01	0.01	1122-1	5.67	1.55	0.05	0.05	<0.01	0.13
84	0.51	0.19	0.01	0.02	<0.01	0.01	1127-1	5.51	1.36	0.05	0.05	<0.01	0.17
<u>85</u>	10.75	<u>5.90</u>	<u>0.26</u>	0.19	0.01	<u>0.41</u>	1127-2	2.70	0.78	0.01	0.03	<0.01	0.09
86	1.31	0.43	0.03	0.04	<0.01	0.04	1129-1	7.65	1.77	0.07	0.08	0.01	0.17
<u>87</u>	4.16	1.78	<u>0.10</u>	0.10	0.01	0.14	1129-2	6.11	1.14	0.05	0.05	<0.01	0.13
88	0.44	0.14	0.01	0.02	<0.01	0.01	1130-1	7.17	1.55	0.04	0.04	0.01	0.21
89	5.22	1.01	0.07	0.11	0.01	0.15	1130-2	1.96	0.45	0.01	0.02	<0.01	0.02
89A	4.38	2.06	0.08	0.08	0.01	0.11	1131-1	5.92	1.58	0.06	0.04	0.02	0.17
90	0.80	0.34	0.01	0.03	0.01	0.03	<u>1132-1</u>	6.32	1.37	0.04	0.05	<0.01	<u>0.35</u>
91	4.52	2.24	0.04	0.12	0.01	0.15	<u>1134-1</u>	8.79	<u>2.99</u>	<u>0.16</u>	0.03	0.01	<u>0.41</u>
93	0.97	0.29	0.01	0.03	0.01	0.03	<u>1134-2</u>	6.82	2.11	0.06	0.04	<0.01	<u>0.25</u>
94	0.82	0.29	0.02	0.02	<0.01	0.01	<u>1136-1</u>	9.01	<u>2.59</u>	<u>0.10</u>	0.09	<0.01	<u>0.31</u>
95	0.42	0.08	<0.01	0.01	<0.01	0.01	1136-2	6.42	1.80	0.04	0.05	0.02	0.24
96	0.79	0.34	0.01	0.01	0.01	0.03	1136-3	3.34	0.98	0.04	0.02	<0.01	0.12
97	1.12	0.44	0.02	0.02	<0.01	0.03	1139-1	2.44	0.65	0.03	0.04	0.01	0.07
<u>98</u>	6.25	<u>2.59</u>	<u>0.11</u>	0.12	0.04	0.22	2000-1	2.00	0.53	0.03	0.04	<0.01	0.05
100	4.48	1.88	0.09	0.04	<0.01	0.16	2000-2	2.39	0.52	0.03	0.03	<0.01	0.08
101	3.47	0.82	0.03	0.04	<0.01	0.07	2001-1	2.02	0.41	0.02	0.04	<0.01	0.04
1090-1	2.46	0.64	0.02	0.01	<0.01	0.08	2002-1	3.75	1.09	0.02	0.01	<0.01	0.12
1090-2	1.91	0.49	0.02	0.03	<0.01	0.07	2002-2	3.01	0.89	0.01	0.03	<0.01	0.07
<u>1091-1</u>	2.36	0.57	0.01	0.03	<u>0.06</u>	0.22	110-1	2.60	0.84	0.04	0.01	<0.01	0.14
1091-2	1.71	0.52	0.03	0.03	<0.01	0.07	110-2	2.21	0.41	0.03	0.02	<0.01	0.05
1091-3	1.61	0.61	0.04	0.02	<0.01	0.07	110-3	1.41	0.29	0.02	0.02	<0.01	0.02
1092-1	1.70	0.77	0.03	0.02	<0.01	0.05	115-1	0.74	0.21	0.01	0.01	<0.01	0.02
1092-2	1.03	0.48	0.02	0.03	<0.01	0.05	116-1	0.58	0.18	0.01	0.01	<0.01	0.02
1094-1	1.15	0.42	0.01	0.02	<0.01	0.03	116-2	0.54	0.17	0.01	0.01	<0.01	0.01
1094-2	1.01	0.48	0.02	0.02	<0.01	0.04	116-3	2.17	0.78	0.03	0.04	<0.01	0.08
1095-1	2.51	0.58	0.02	0.03	<0.01	0.09	116-4	0.92	0.33	0.02	0.01	<0.01	0.04
1095-2	2.30	1.07	0.04	0.03	<0.01	0.07	116-5	1.66	0.52	0.05	0.04	<0.01	0.05
1096-1	1.84	0.47	0.01	0.02	<0.01	0.04	117-1	1.26	0.38	0.02	0.02	<0.01	0.03

VIRGINIA DIVISION OF MINERAL RESOURCES

SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON	SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON
117-2	3.87	1.07	0.07	0.04	<0.01	0.08	C16-2	5.36	0.18	0.09	0.02	<0.01	0.24
117-3	3.95	1.12	0.04	0.04	0.01	0.07	C17-1	3.80	0.59	0.06	0.08	<0.01	0.16
117-4	2.84	0.65	0.04	0.04	<0.01	0.05	<u>C17-2</u>	4.26	0.35	0.06	0.03	<0.01	<u>0.27</u>
C1-1	2.18	0.65	0.01	0.09	<0.01	0.09	C17-3	4.03	0.21	0.09	0.02	<0.01	0.16
C1-2	3.18	0.55	0.05	0.05	<0.01	0.09	<u>C17-4</u>	5.27	0.36	<u>0.11</u>	0.05	0.00	0.16
C1-3	2.09	0.36	<0.01	0.06	<0.01	0.01	<u>C17-5</u>	5.72	0.23	<u>0.12</u>	0.03	0.00	0.23
C1-4	1.95	0.31	0.03	0.05	<0.01	0.08	C18-1	2.92	0.31	0.02	0.05	<0.01	0.07
C2-1	4.12	1.12	0.05	0.04	<0.01	0.22	C18-2	3.50	0.31	0.04	0.05	<0.01	0.12
C2-2	1.80	0.35	0.02	0.04	<0.01	0.09	C19-1	4.06	0.54	0.08	0.04	<0.01	0.19
C2-3	2.65	0.55	0.03	0.09	<0.01	0.13	C19-2	2.05	0.28	0.03	0.01	<0.01	0.08
C2-4	1.41	0.35	0.02	0.06	<0.01	0.04	C19-3	2.08	0.37	0.02	0.04	<0.01	0.03
C3-1	3.99	0.43	0.07	0.04	<0.01	0.15	C20-1	1.29	0.34	0.02	0.05	<0.01	0.04
C3-2	4.21	0.88	0.05	0.02	<0.01	0.24	C20-2	1.75	0.41	0.02	0.12	<0.01	0.05
<u>C3-3</u>	3.54	0.69	0.06	0.04	<0.01	<u>0.25</u>	C20-3	0.97	0.18	0.02	0.02	<0.01	0.04
C3-4	3.36	1.01	0.06	0.03	<0.01	0.14	C20-4	1.93	0.42	0.03	0.07	0.00	0.11
C4-1	2.65	0.46	0.04	0.03	<0.01	0.13	C21-1	1.11	0.25	0.02	0.06	<0.01	0.08
C4-2	2.40	0.35	0.04	0.03	<0.01	0.08	C22-1	1.54	0.40	0.03	0.12	<0.01	0.06
C4-3	2.66	0.49	0.02	0.04	<0.01	0.10	C22-2	1.76	0.43	0.04	0.10	<0.01	0.07
C5-1	2.03	0.60	0.03	0.04	<0.01	0.06	C22-3	2.38	0.50	0.03	0.10	<0.01	0.08
C5-2	2.91	0.35	0.05	0.06	<0.01	0.13	C22-4	1.22	0.31	0.02	0.04	<0.01	0.03
C5-3	3.51	0.39	0.06	0.02	<0.01	0.12	C23-2	1.43	0.30	0.01	0.04	<0.01	0.06
C5-4	3.31	0.36	0.05	0.05	<0.01	0.23	C23-3	1.59	0.39	0.02	0.03	<0.01	0.06
C6-1	4.38	0.90	0.07	0.06	<0.01	0.24	C23-4	0.95	0.23	0.01	0.03	<0.01	0.03
C6-2	2.55	0.44	0.04	0.03	<0.01	0.19	C24-1	1.05	0.30	0.02	0.04	<0.01	0.03
<u>C6-3</u>	5.78	0.51	<u>0.12</u>	0.07	<0.01	0.22	C24-2	1.49	0.37	0.03	0.06	<0.01	0.04
C7-1	3.14	0.62	0.02	0.00	<0.01	0.09	C25-1	0.41	0.15	0.01	0.02	<0.01	0.03
C7-2	1.45	0.48	0.01	0.03	<0.01	0.03	C25-2	1.39	0.50	0.02	0.05	<0.01	0.06
C7-3	2.35	0.58	0.01	0.03	<0.01	0.03	C25-3	1.77	0.49	0.02	0.04	<0.01	0.04
C8-1	3.45	1.05	0.04	0.02	<0.01	0.18	C26-1	3.53	1.18	0.06	0.13	<0.01	0.15
<u>C8-2</u>	6.75	0.72	0.08	0.07	<0.01	<u>0.27</u>	C26-2	2.60	0.51	0.07	0.05	<0.01	0.17
C8-3	3.65	0.33	0.07	0.02	0.00	0.13	<u>C26-3</u>	5.11	0.43	<u>0.14</u>	0.07	<0.01	<u>0.29</u>
C8-4	3.56	0.28	0.05	0.02	<0.01	0.13	C27-1	2.28	0.43	0.02	0.03	<0.01	0.10
C9-1	4.63	0.98	0.08	0.09	<0.01	0.17	C27-3	2.66	1.18	0.05	0.08	<0.01	0.10
C9-2	3.84	0.84	0.05	0.04	0.00	0.11	C28-1	1.88	0.64	0.04	0.08	<0.01	0.07
C9-3	3.16	0.65	0.06	0.04	<0.01	0.16	C28-2	3.27	0.85	0.06	0.08	<0.01	0.23
C10-1	3.22	0.85	0.06	0.03	<0.01	0.15	C28-3	3.08	0.56	0.05	0.07	<0.01	0.16
C10-2	4.07	0.40	0.06	0.03	<0.01	0.17	C28-4	2.40	0.69	0.04	0.08	<0.01	0.12
<u>C10-3</u>	4.98	0.47	0.08	0.07	0.00	<u>0.32</u>	<u>C29-1</u>	4.53	1.79	0.07	0.09	<0.01	<u>0.27</u>
<u>C10-4</u>	4.53	0.30	0.08	0.08	0.00	<u>0.36</u>	C29-2	1.29	0.41	0.02	0.03	<0.01	0.06
C11-1	1.88	0.33	0.02	0.05	<0.01	0.09	C30-1	2.96	0.72	0.06	0.07	<0.01	0.15
C11-2	1.81	0.28	0.04	0.06	<0.01	0.04	C31-1	0.72	0.25	0.01	0.02	<0.01	0.03
C11-3	3.53	0.53	0.02	0.02	<0.01	0.23	C31-2	1.52	0.56	0.03	0.07	<0.01	0.09
<u>C11-4</u>	3.08	0.61	0.04	0.02	<0.01	<u>0.26</u>	C31-3	3.14	0.96	0.07	0.07	<0.01	0.16
C12-1	5.62	0.87	0.03	0.07	<0.01	0.12	C31-4	3.99	0.52	0.06	0.12	<0.01	0.21
C12-2	5.32	0.51	0.08	0.04	<0.01	0.22	C32-1	2.71	0.75	0.07	0.08	<0.01	0.13
<u>C12-3</u>	9.12	1.35	<u>0.11</u>	0.11	0.00	<u>0.67</u>	C32-2	2.73	0.44	0.04	0.09	<0.01	0.14
<u>C12-4</u>	7.40	0.60	<u>0.10</u>	0.04	0.00	<u>0.42</u>	<u>C32-3</u>	3.39	0.81	0.06	0.09	<0.01	<u>0.26</u>
C13-1	3.21	0.49	0.06	0.07	<0.01	0.11	C33-1	1.95	0.26	0.06	0.04	<0.01	0.11
C13-2	2.64	0.30	0.04	0.08	<0.01	0.10	C33-2	2.50	0.33	0.05	0.04	<0.01	0.17
C13-3	1.73	0.22	0.04	0.02	<0.01	0.12	C33-3	2.42	0.32	0.04	0.06	<0.01	0.15
C14-1	4.47	0.42	0.06	0.03	<0.01	0.10	C33-4	1.24	0.31	0.02	0.03	<0.01	0.07
C14-2	1.99	0.13	0.03	0.01	0.00	0.11	C34-1	1.08	0.35	0.02	0.02	<0.01	0.03
<u>C14-3</u>	5.95	0.54	<u>0.13</u>	0.16	<0.01	<u>0.27</u>	C34-2	3.77	1.24	0.04	0.10	<0.01	0.17
<u>C14-4</u>	5.61	0.18	<u>0.10</u>	0.08	<0.01	<u>0.25</u>	C34-3	2.14	0.38	0.03	0.04	<0.01	0.09
C15-1	5.70	0.71	0.07	0.07	0.00	0.21	C35-1	1.78	0.37	0.03	0.07	<0.01	0.11
C15-2	6.57	0.48	0.09	0.09	0.00	0.22	C35-4	1.31	0.39	0.03	0.06	<0.01	0.08
C16-1	6.91	0.94	0.08	0.02	0.00	0.19	C36-1	0.62	0.26	0.01	0.01	<0.01	0.03

SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON
C36-2	0.73	0.25	0.01	0.01	<0.01	0.03
C36-3	0.86	0.34	0.02	0.01	<0.01	0.06
C36-4	0.80	0.21	0.01	0.03	<0.01	0.04
<u>C37-1</u>	4.40	0.59	0.05	0.11	<0.01	<u>0.25</u>
C37-2	2.22	0.60	0.04	0.03	<0.01	0.08
C37-3	2.16	0.66	0.05	0.06	<0.01	0.08
C38-1	1.99	0.28	0.03	0.02	<0.01	0.10
C38-2	2.32	0.46	0.03	0.04	<0.01	0.07
C39-1	4.40	0.83	0.08	0.05	<0.01	0.24
C39-2	4.13	0.88	0.05	0.02	<0.01	0.14
C39-3	2.60	0.76	0.05	0.03	<0.01	0.08
C40-1	4.56	0.88	0.06	0.07	<0.01	0.20
C40-2	4.18	0.96	0.09	0.14	<0.01	0.19
C40-3	2.75	0.71	0.04	0.08	<0.01	0.12
C41-1	3.86	0.77	0.06	0.04	0.00	0.18
C41-2	1.83	0.38	0.04	0.05	<0.01	0.08
C41-3	2.65	0.68	0.05	0.07	<0.01	0.12
C42-1	3.56	1.23	0.06	0.10	<0.01	0.14
C42-2	4.35	1.37	0.08	0.09	<0.01	0.22
C42-3	*	*	*	*	*	*
C42-4	3.17	1.56	0.06	0.06	<0.01	0.21
<u>C43-1</u>	6.38	0.33	<u>0.11</u>	0.16	<0.01	0.17
C43-2	3.55	1.02	0.05	0.05	<0.01	0.13
<u>C43-3</u>	6.72	1.24	0.09	0.05	<0.01	<u>0.27</u>
<u>C44-1</u>	6.49	0.94	0.09	0.10	0.00	<u>0.29</u>
C44-2	3.50	0.97	0.04	0.02	<0.01	0.12
C44-3	1.74	0.42	0.02	0.04	<0.01	0.07
C45-1	3.01	0.40	0.04	0.08	0.00	0.14
C45-2	2.63	0.45	0.03	0.06	<0.01	0.07
C45-3	2.85	0.63	0.06	0.08	<0.01	0.16
C46-1	3.36	0.66	0.05	0.05	<0.01	0.11
C46-2	2.20	0.50	0.02	0.03	<0.01	0.05
C46-3	2.19	0.39	0.02	0.04	<0.01	0.06
C46-4	3.04	0.89	0.06	0.04	<0.01	0.14
C47-1	4.47	0.81	0.08	0.12	<0.01	0.13
C47-2	1.62	0.54	0.02	0.05	<0.01	0.07
C48-1	0.89	0.26	0.02	0.03	<0.01	0.03
C48-2	0.91	0.15	0.02	0.04	<0.01	0.02
C48-3	0.74	0.21	0.02	0.02	<0.01	0.03
C48-4	1.79	0.53	0.03	0.05	<0.01	0.06
C49-1	1.00	0.29	0.02	0.04	<0.01	0.03
C49-2	0.82	0.25	0.01	0.03	<0.01	0.03
C49-3	1.66	0.42	0.03	0.02	<0.01	0.04
C49-4	4.14	0.90	0.06	0.06	<0.01	0.14
C50-1	2.66	0.54	0.02	0.04	<0.01	0.10
WB063-1	2.07	0.81	0.04	0.03	<0.01	0.09
WB063-2	2.13	0.87	0.01	0.09	<0.01	0.11
WB063-3	2.53	0.90	0.03	0.14	<0.01	0.13
<u>STA054</u>	5.12	1.69	<u>0.13</u>	0.14	<0.01	<u>0.25</u>
STA055	0.50	0.12	0.01	0.01	<0.01	0.01
STA056	0.83	0.26	0.02	0.01	<0.01	0.02
STA093	5.64	1.34	0.07	0.11	<0.01	0.23
<u>STA094</u>	7.45	1.70	<u>0.12</u>	0.10	<0.01	0.24
51-1	0.79	0.17	0.01	0.04	<0.01	0.02
51-2	0.09	0.03	<0.01	0.01	<0.01	<0.01
51-3	0.08	0.02	<0.01	<0.01	<0.01	<0.01
<u>51-4</u>	9.99	<u>4.28</u>	<u>0.23</u>	<u>0.30</u>	0.01	<u>0.40</u>

SAMPLE NAME	WT% THM	WT% IL	WT% RUTILE	WT% LEUC	WT% MONA	WT% ZIRCON
AVG	3.27	0.78	0.04	0.05	0.00	0.12
STD	2.24	0.68	0.03	0.04	0.01	0.10
MAX	14.66	5.90	0.26	0.30	0.08	0.72
MIN	0.08	0.02	0.00	0.00	0.00	0.00

GARNAR'S
VALUES 5.0 2.25 0.10 0.25 0.05 0.25

Grab samples 51-1, 51-2, 51-3, and 51-4 were taken from North Carolina barrier island beaches.

APPENDIX VI

SAMPLES SORTED BY DECREASING ABUNDANCE OF SELECTED MINERALS

Samples are sorted by decreasing abundance (with respect to the total sample) of selected minerals. Only those samples with values equal to or greater than Garnar's values (ilmenite, 2.25%; leucoxene, 0.25%; rutile, 0.1%; monazite, 0.05%; zircon, 0.25%; based on THM = 5%) are listed.

sample	% ILMENITE	sample	% RUTILE
85	5.90	85	0.26
51-4	4.28	51-4	0.23
54	4.25	59	0.17
59	3.85	1134-1	0.16
33	3.01	54	0.16
1134-1	2.99	H01-3	0.15
48	2.89	C26-3	0.14
39	2.89	4	0.13
1136-1	2.59	STA054	0.13
98	2.59	C14-3	0.13
35	2.53	6-3	0.12
42	2.37	C17-5	0.12
40	2.33	STA094	0.12
32	2.26	56	0.11
		C17-4	0.11
		C43-1	0.11
sample	% LEUCOXENE	12-3	0.11
		98	0.11
51-4	0.30	1136-1	0.10
4	0.28	C12-4	0.10
41	0.26	C14-4	0.10
		87	0.10
		66	0.10

sample % MONAZITE

H01-3	0.08
36	0.07
35	0.07
1091-1	0.06
54	0.05
14	0.05

sample % ZIRCON

54	0.72
C12-3	0.67
42	0.56
59	0.47
H01-3	0.42
C12-4	0.42
85	0.41
1134-1	0.41
51-4	0.40
C10-4	0.36
1132-1	0.35
48	0.34
5	0.32
C10-3	0.32
15	0.32
1136-1	0.31
4	0.31
56	0.30
C44-1	0.29
C26-3	0.29
C8-2	0.27
C17-2	0.27
C29-1	0.27
C43-3	0.27
C14-3	0.27
C11-4	0.26
57	0.26
41	0.26
12	0.26
C32-3	0.26
C14-4	0.25
46	0.25
C3-3	0.25
C37-1	0.25
STA054	0.25
1134-2	0.25

APPENDIX VII

CORE DESCRIPTIONS

The following 39 cores were provided by A.E. Grosz of the U.S. Geological Survey. They were taken by the U.S. Army Corps of Engineers Coastal Engineering Research Center (CERC) and used by Meisburger, 1972. They are arranged by the CERC numbers, so a cross-reference to the USGS-assigned number is provided. Colors are from the Munsell Soil Color charts.

USGS NO.	CERC NO.	USGS NO.	CERC NO.
110	70	1111	12
115	59	1116	9
116	58	1119	54
117	D73	1120	39
1090	5	1121	40
1091	43	1122	20
1092	33	1127	29
1093	4	1129	25
1094	46	1130	26
1095	47	1131	19
1096	48	1132	28
1097	49	1134	56
1098	34	1136	41
1099	35	1139	16
1100	30	2000	2
1103	36A	2001	3
1106	53	2002	31
1107	52	2003	58
1109	11B	2004	60
2005	61		

Thickness (meters)

USGS NUMBER 2000 (CERC #2)

Silt, gray (5Y 6/1), clayey; some sand, very-fine-grained; oyster shell at top of core6.30

USGS NUMBER 2001 (CERC #3)

NOTE: Empty plastic liner labeled 3A.....2.00

Silt, light olive gray (5Y 6/2); sandy, very-fine-grained; massively bedded; scattered shell fragments at top and bottom of core; sand, fine-to medium-grained, laminae throughout core (1-3cm thick);labeled 3B.....1.34

USGS NUMBER 1093 (CERC #4)

Silt, light-olive-gray (5Y 6/2); clayey; sandy, fine-grained; massively bedded.....3.01

	Thickness (meters)		Thickness (meters)
USGS NUMBER 1090 (CERC #5)		Sand, pale-yellow (2.5Y 7/4), fine-grained; massively bedded; in this interval at 0.27m Callianassa? tubes (up to 5cm)	
Sand, grayish-brown (2.5Y 5/2), fine-grained; silty; massively bedded; shell fragments common; many shell fragment at approximately 0.95m	2.45		0.84
USGS NUMBER 1122 (CERC #20)		USGS NUMBER 1122 (CERC #20)	
Sand, grayish-brown (2.5Y 5/2), fine- to medium-grained; massively bedded; grading into sand, medium- to coarse-grained; some gravel; massively bedded.....	1.09	Sand, light-brownish-gray (2.5Y 6/2) fine-grained; massively bedded; abundant shell fragments; shell layer-(.5-.65m) shells up to 6cm.....	
USGS NUMBER 1116 (CERC #9)			
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; silty; massively bedded; <i>Ensis</i> fragments common.....	2.50	Sand, light-olive-gray (5Y 6/2), fine-grained; massively bedded; shell fragments common.....	
Sand, coarse-grained; and gravel; and shell fragments; including coral (4cm long)	0.25		
Sand, light -brownish-gray (2.5Y 6/2), fine-grained; silty; massively bedded; <i>Ensis</i> fragments common.....	1.35	USGS NUMBER 1129 (CERC #25)	
USGS NUMBER 1109 (CERC #11B)		Sand, light-brownish-gray (2.5Y 6/2), fine grained; massively bedded; sparse shell fragments	
NOTE: Top of section B, not the top of the core		Sand, coarse-grained; with shell fragments.....	
Sand, light-olive-gray (5Y 6/2), fine-grained, micaceous; massively bedded; shell fragments common.....	2.38	Sand, grayish-brown (2.5Y 5/2), fine-grained; massively bedded.....	
USGS NUMBER 1111 (CERC #12)		Clay and silt, light-yellow-brown (2.5Y 6/4).....	
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; massively bedded; scattered shell fragments common ...	2.00	Sand, grayish-brown (2.5Y 5/2) fine-grained; massively bedded.....	
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; massively bedded; shell fragments common; a small sandy mud pod; from 0.8 to 1.10m in this interval is a higher concentration of shell fragments	1.34	USGS NUMBER 1130 (CERC #26)	
USGS NUMBER 1139 (CERC #16)		Sand, light-olive-gray (5Y 6/2), micaceous, fine-grained; massively bedded; with shell fragments.....	
Sand, light-gray (2.5Y 7/2), fine- to medium-grained; massively bedded; with small shell fragments (a few mm.).....	0.45	Silt, light-brownish-gray (2.5Y 6/2), slightly clayey; lenses of sand, fine-grained.....	
Sand, light-brownish-gray (2.5Y 6/2), very-fine- to fine-grained; massively bedded	1.39	USGS NUMBER 1132 (CERC #28)	
USGS 1131 (CERC #19)		Sand, light-olive-gray (5Y 6/2), fine- to medium-grained; with shell fragments; <i>Ensis</i> clam at top; oyster shell at 0.45m	
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; massively bedded; abundant shell fragments in this interval at 0.3 to 0.65 m.....	0.98	USGS 1127 (CERC #29)(Cape Charles)	
		Sand, light-olive-gray (5Y 6/2), micaceous, fine-grained	
		USGS NUMBER 1100 (CERC #30)	
		Sand, light-olive-gray (5Y 6/2), micaceous, coarse- to fine-grained.....	

	Thickness (meters)		Thickness (meters)
Sand, coarse-grained; and gravel; iron stained	0.07	USGS NUMBER 1098 (CERC #34)	
Sand, micaceous, fine- to medium-grained; shell fragments	0.10	Sand, light-yellowish-brown (2.5Y 6/4), coarse-grained; and gravel; massively bedded; high concentration of pebbles at .45-.60m	0.70
Sand and silt and clay, olive gray (5Y 5/2), massively bedded	0.83	Sand, yellowish-brown (10YR 5/8), coarse-grained; and gravel; massively bedded; high concentration of gravel in this interval at .10-.25m and again at .65-.95m	1.21
Silt, light-olive-gray (5Y 6/2) sandy, fine-grained; massively bedded	0.70	Sand, yellowish-brown (10YR 5/8), coarse-grained; and gravel; and pebbles; iron staining; micaceous; grades into below	0.68
Sand, light-olive-gray (5Y 6/2), medium- to coarse-grained; and gravel	0.27	Sand, light-olive-gray (5Y 6/2), medium-grained; grades into below	0.16
USGS NUMBER 2002 (CERC #31)		Silt, light-yellowish-brown (10YR 6/4); sandy, fine-grained; clayey; micaceous	1.06
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; massively bedded; shell layer at 0.26-0.30m, shells up to 3cm diameter	0.30	Silt, light-yellowish-brown (10YR 6/4); clayey; sandy, fine grained; shell fragments; micaceous	1.89
Sand, gray (5Y 6/1), fine- to very-fine-grained; shell fragments common; <i>Ensis</i> fragment in this interval at 0.63m	1.47	USGS NUMBER 1099 (CERC #35)	
Silt and sand, gray (5Y 6/1), very-fine-grained; massively bedded shell fragments rare	1.62	Sand, light-brownish-gray (2.5Y 6/2), fine- to medium-grained; shell fragments; massively bedded; grades into below	0.50
USGS NUMBER 1092 (CERC #33)(#33a,33b Cape Henry 8/21/68)		Sand, fine-grained; muddy; micaceous; grades into below	1.55
Sand, light-yellowish-brown (2.5Y 6/4), coarse-grained; and gravel; massively bedded; local concentrations of clay	0.75	Sand, fine- to medium-grained; muddy; scattered gravel at bottom of interval	0.52
Sand and gravel, olive-yellow (2.5Y 6/6), coarse-grained; (increased amounts of gravel).....	1.05	Sand, fine- to medium-grained; muddy; scattered shell fragments.....	0.38
Sand, light-yellowish-brown (2.5Y 6/4), medium- to fine-grained; some coarse-grained sand; massively bedded	0.56	Sand, pale yellow (5Y 7/3), coarse- to medium-grained; gravelly; micaceous	0.25
Sand, pale-yellow (2.5Y 7/4), medium- to coarse-grained; and gravel massively bedded	1.49	Sand, light-yellowish-brown (2.5Y 6/4), coarse- to medium-grained gravelly; micaceous	0.25
Sand, light-gray (2.5Y 7/2), fine-grained; and gravel; plant roots in this interval at 0-0.15m	0.45	Sand, light-brownish-gray (2.5Y 6/2), coarse- to medium-grained; gravelly; micaceous.....	0.70
Sand, pale-yellow (2.5Y 7/4), medium- to coarse-grained; and gravel massively bedded	0.48	Sand, light-yellowish-brown (2.5Y 6/4), coarse-grained; pebbly; gravelly; iron stained	0.41
NOTE: Bottom of last core liner is threaded		USGS NUMBER 1103 (CERC #36A)	
		Shell fragments; silt; and clay; light-olive-gray (5Y 6/2); core highly disturbed.....	0.25

	Thickness (meters)
Sand, olive-gray (5Y 5/2), fine-grained; silt; and clay; shell fragments; core highly disturbed	0.95
Sand, olive-gray (5Y 5/2), coarse-grained; silt; and gravel; few shell fragments; core highly disturbed	0.60
Sand, gray (5Y 5/1), fine- to medium-grained; gravel; small amount of silt and clay; scattered shell fragments	1.05
Sand, gray (5Y 5/1), fine- to very-fine-grained; sparse shell fragments	1.80
Sand, gray (5Y 5/1), fine- and medium-grained; gravel	0.35
 USGS NUMBER 1120 (CERC #39)	
Sand, light-gray (2.5Y 7/2), medium- to coarse-grained; abundant shell fragments (up to 2cm) including <i>Ensis</i> , various other bivalves, and a sand dollar fragment; massively bedded	0.62
Sand, light-olive-gray (5Y 6/2), medium- to fine-grained; massively bedded	0.70
Sand, light-gray (2.5Y 7/2), medium- to coarse-grained; abundant shell fragments, some large (up to 6cm); massively bedded	0.18
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; massively bedded	0.10
Sand, light-brownish-gray (2.5Y 6/2), fine- to very -fine-grained, massively bedded	1.75
 USGS NUMBER 1121 (CERC #40)	
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; micaceous; massively bedded; widely scattered shells	2.36
 USGS NUMBER 1136 (CERC #41)	
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; micaceous; massively bedded; widely scattered shells	1.50
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; micaceous; massively bedded; shelly layer in this interval at 1.02-1.08m	3.15
Clay, silty	0.20
 NOTE: Iron stain at bottom of core due to rusted core-catcher	

	Thickness (meters)
 USGS NUMBER 1091 (CERC #43)	
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; silty; micaceous; massively bedded	4.70
 USGS NUMBER 1094 (CERC #46) CAPE HENRY	
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; micaceous massively bedded; shell fragments rare; well-formed worm tubes at 0.25m.; some unidentified fragments, coal?	1.58
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; micaceous; massively bedded; rare shell fragments	0.91
Clay, light-olive-gray (5Y 6/2); silty; massively bedded; iron staining in the surface along the core.....	0.88
 USGS NUMBER 1095 (CERC #47) CAPE HENRY	
Sand, light-olive-gray (5Y 6/2); silty; massively bedded; shell fragments rare; big piece of coal this interval at 0.25m	1.61
Sand, light-yellowish-brown (2.5Y 6/4), fine- to very-fine-grained; silty; massively bedded; iron stained; coarse quartz grains rare.....	0.44
Sand, light-gray (5Y 7/2), (gray color), fine-grained; silty; clay; massively bedded	0.15
Sand, pale-yellow (2.5Y 7/3), mixture of fine-, medium- and coarse-grained; (poor sorting).....	1.08
 USGS NUMBER 1096 (CERC #48)	
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; silty; micaceous; massively bedded; worm tubes in the surface (10cm); some coal fragments in the first 20 cm; layer of shell fragments this interval at 1.50-1.55m ...	1.80
Clay, light-gray (5Y 7/1); silty; with some laminations	0.55
Sand, light-olive-gray (5Y 6/2), fine-, medium-, and coarse-grained; poorly sorted.....	0.55
Cobbles (6x3 cm); gravel; coarse sand; poorly sorted ...	0.17
Silt, olive-yellow (2.5Y 6/6); sand; with clay; iron-colored	1.68

	Thickness (meters)	Thickness (meters)	
USGS NUMBER 1097 (CERC #49)			
Sand, light-olive-gray (5Y 6/2), fine-grained; micaceous; massively bedded; few scattered shell fragments; grading to sand, medium-grained; micaceous; massively bedded; grading to sand, medium- with some coarse-grained; micaceous; massively bedded; grading to sand, pale yellow (2.5Y 7/4), medium- to coarse-grained; micaceous massively bedded	2.78	Sand, medium-grained; micaceous; scattered shell fragments; massively bedded; grading into below	0.50
Sand, coarse-grained; and gravel up to 2cm	0.07	Sand, medium- to fine-grained; micaceous; scattered shell fragments; massively bedded	0.28
Silt, brownish-yellow (10YR 6/6), fine-grained sand, and silty, fine- grained sand; iron stained; clam shells common up to 6 or more cm partially dissolved, casts and molds; micaceous; massively bedded; grades to below	1.65	USGS NUMBER 1134 (CERC #56)	
Sand, yellowish-brown (10YR 5/4), fine-grained; silty; shells and shell fragments (0.5 cm to several cm); massively bedded	0.76	Sand, light-olive-gray (5Y 6/2), fine-grained; micaceous; widely scattered shell fragments; massively bedded; medium- to fine- grained sand this interval at 0.25-0.35m	3.50
USGS NUMBER 1107 (CERC #52)			
Sand, pale-yellow (5Y 7/3), medium-grained; micaceous; shell fragments; massively bedded	0.15	USGS NUMBER 2003 (CERC #58)	
Sand, light-olive-gray (5Y 6/2), fine-grained; micaceous; massively bedded shell fragments; grading into below	0.85	Sand, light-olive-gray (5Y 6/2), fine-grained; micaceous; scattered shell fragments; massively bedded	0.25
Sand, pale-yellow (5Y 7/3), medium-grained; micaceous; scattered shell fragments; massively bedded; grading into below	0.40	Sand, light-gray (2.5Y 7/2), coarse-grained; shelly; and gravel; (shells to 6 cm) including sand dollar; massively bedded	0.25
Sand, light-olive-gray (5Y 6/2), fine- with some medium-grained; scattered shell fragments; massively bedded; micaceous	1.91	Sand, light-gray (2.5Y 7/2), medium- to coarse-grained; abundant shell fragments (somewhat smaller); massively bedded; grading into below	0.80
USGS NUMBER 1106 (CERC #53)			
Sand, light-olive-gray (5Y 6/2), fine-grained; micaceous; scattered shell fragments including <i>Ensis</i> ; massively bedded	2.96	Sand, light-gray (2.5Y 7/2), coarse-grained; with gravel; abundant shell fragments (to 6cm); gravel is iron stained; massively bedded	0.50
USGS NUMBER 1119 (CERC #54)			
Sand, light-olive-gray (5Y 6/2), medium-grained; micaceous; scattered shell fragments; massively bedded; grading into below	0.70	Silt, light-olive-gray (5Y 6/2); sandy, fine-grained; possibly Pliocene (Yorktown?) in age; massively bedded	0.21
Sand, light-olive-gray (5Y 6/2), fine-grained; micaceous; scattered shell fragments; concentrated shell fragments up to 1.5cm and some gravel in this interval at 0.72-0.82m; massively bedded; grades to below	2.70	Silt, light-brownish-gray (2.5Y 6/2); slightly clayey; some sand, fine-grained; small amount of gravel; massively bedded	0.39
		Sand, light-brownish-gray (2.5Y 6/2), fine-grained; silty; massively bedded; grading into below	0.85
		Sand, fine-grained; micaceous; massively bedded; grading into below	0.13
		Sand, light-brownish-gray (2.5Y 6/2), medium-grained; massively bedded	0.33
		USGS NUMBER 2004 (CERC #60)	
		Silt, pale-brown (10YR 6/3); clayey; massively bedded; grading into below	0.60
		Sand, light-brownish-gray (2.5Y 6/2), fine-grained; silty; massively bedded; grading into below	0.25

	Thickness (meters)
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; micaceous; massively bedded; grading into below	0.80
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; silty; massively bedded; grading into below	0.65
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; massively bedded	0.17
 USGS NUMBER 2005 (CERC #61)	
Sand, light-gray (5Y 7/2), medium-grained; rare shell fragments; massively bedded	1.40
Sand, light-gray (5Y 7/2), fine- to medium-grained; abundant shell fragments; massively bedded; increased amount of shell fragments in this interval at 0.8-0.93m	0.93
 USGS NUMBER 116 (CERC #58 and #D58) Delmarva sand	
Sand, pale-yellow (5Y 7/3), fine- to medium-grained; micaceous; shell fragments	0.55
Sand, pale-yellow (2.5Y 7/4), coarse -grained; and gravel; shelly	0.30
Clay, gray (5Y 5/1); silty; massively bedded; scattered shell fragments (well-preserved, mostly bivalves, some gastropods and sand dollars up to 1-2cm)	2.76
Sand, light-olive-gray (5Y 6/2), fine- to very-fine-grained; micaceous; massively bedded; scattered shell fragments (clam and oyster shells to 2cm); numerous shell fragments in this interval at 1.16-1.32m; plant roots at bottom of core - possibly modern contamination	1.90
 (CERC #D58B) Note: No markings to show top or bottom of core.	
Sand, light-gray (5Y 7/2), fine- to medium-sand; massively bedded; shell fragments	0.80
Sand, light-olive-gray (5Y 6/2), fine-grained matrix with medium- to coarse-grains; numerous shell fragments (to 2cm)	0.20
Sand, light-gray (5Y 7/2), fine- to medium-grained, coarsening toward bottom; shell fragments rare; massively bedded	0.76

USGS NUMBER 116-5 D58 A 2/2

NOTE: Core was broken. Most of the material was absent.

Sand, fine-grained; micaceous; same sand as the other two sections	0.94
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USGS NUMBER 117 (CERC #D73)

Sand, pale-olive (5Y 6/3), medium- to coarse-grained; gravel; shells	0.30
Sand, light-olive-gray (5Y 6/2), medium-grained; micaceous; scattered shell fragments; massively bedded; grading into below	0.30
Sand, fine-grained; micaceous; massively bedded	0.60
Mud, and sand, fine- to coarse-grained; and gravel, gray (5Y 5/1); abundant shell fragments	0.95
Sand, light-olive-gray (5Y 6/2); fine- to medium-grained; scattered shell fragments	0.75
Sand, light-olive-gray (5Y 6/2); medium-grained; micaceous; abundant shell fragments; massively bedded	0.65
Sand, fine-grained; micaceous; abundant shell fragments; massively bedded.....	0.15
Sand, medium-grained; micaceous; abundant shell fragments; massively bedded.....	0.25
Sand, coarse-grained; and gravel; poorly sorted shells	0.10
Sand, pale-yellow (5Y 7/3), fine- to medium-grained; silty; micaceous; massively bedded; shell fragments, well-preserved gastropods	0.75
Sand, gray (5Y 6/1), medium grained; abundant shell fragments; scattered quartz gravel; massively bedded ...	1.05
 USGS NUMBER 110 (CERC #70)	
Silt, pale-yellow (5Y 7/3); clayey; massively bedded	0.70
Sand, pale-yellow (5Y 6/3), very-fine-grained; micaceous; massively bedded.....	1.65
Sand, gray (5Y 6/1), very-fine-grained; silty; micaceous; massively bedded.....	0.95
Silt, grayish-brown (2.5Y 5/2); sandy, very-fine-grained; shelly	0.55
Silt, clayey	0.15

	Thickness (meters)		Thickness (meters)
Sand, very-fine-grained; silty; micaceous	0.20	CORE H03	
Silt, clayey.....	0.20	Sand, fine- to very-fine-grained; massive; shell fragments up to 1-2mm grading into below	0.22
Silt, light-brownish-gray (2.5Y 6/2); sandy, fine-grained; shelly; clayey silt layers in this interval at 0.30-0.35m and 0.48-0.51m	0.60	Sand, coarse- to fine-grained; massive; shell fragments up to 2cm; well-preserved clams, <i>Ensis</i> ; grading into below	0.18
Silt; clayey; shelly.....	0.32	Sand, fine- to very-fine-grained; massive; grading into below	0.13
USGS NUMBER 115 (CERC #59)		Sand, coarse-grained; massive; shell fragments up to 1.5cm; grading into below	0.09
NOTE: possible missing core section listed below		Sand, medium- grained; massive; shell fragments several mm; grading into below	0.08
Silt, coarse-grained	0.05	Sand, fine- to coarse-grained; shell fragments several mm; grading into below.....	0.08
Silt, light-olive-gray (5Y 6/2); clayey; shell fragments rare (a few mm); massively bedded	3.30	Sand, fine- to very-fine-grained; massive; micaceous	0.51
Silt, gray (5Y 6/1); clayey; shell fragments rare (up to 2cm); massively bedded.....	1.80		
The following 25 cores were acquired during the summer of 1986.		CORE H04	
CORE H01		Sand, olive-gray (5Y 4/2), fine- to very-fine-grained; massive	1.09
Sand, light-brownish-gray (2.5Y 6/2), fine- to medium-grained; massive; shell fragments up to 1.5cm; oyster shell fragment 2cm; <i>Spisula?</i> 1.5cm	1.80	Clay, plastic; massive; very wet.....	0.09
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; slightly silty; massive; shell fragments; in this interval shell fragments up to 1.5cm beginning at 1.20m; well preserved shell <i>Spisula?</i> 3cm at 1.65m; gastropods 1cm long below 1.70m	1.96	Sand, very-fine-grained; silty; massive	0.15
CORE H02		Clay, plastic; massive.....	0.24
Sand, coarse- to medium-grained; with clay balls; shells-oysters, clam, <i>Ensis</i> - up to 5.5cm	0.17	Sand, olive-gray (5Y 4/2), fine- to very-fine-grained; silty; massive; in this interval: shell fragments up to .8cm some well-preserved at 1.12-1.16m; abundant shell fragments up to 1.5cm at 1.37-1.57m	2.08
Sand, fine- to very-fine-grained; massive; grading into below	0.11	Shelly layer shell up to 1cm.....	0.05
Sand, coarse-grained; massive; shell fragments up to 1cm	0.14	Clay, dark-gray (5Y 4/1), silty; with stringers of silty fine- to very-fine-grained sand.....	0.41
Sand, fine- to very-fine-grained; massive	0.44	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; silty; micaceous	0.30
Silt, (5Y 2/1), clayey; small amount of very-fine-sand; massive; interspersed with clayey, silty, very-fine-grained sand this interval at 0.89m	2.96	CORE H05	
		Sand, olive-gray (5Y 4/2), fine- to very-fine-grained; massive; micaceous; locally slightly silty, fine- to very-fine-grained sand; in this interval: shell fragments in upper 0.75m (up to 6cm long); and layer of medium- to fine-grained sand, abundant shell fragments up to .5cm (clams, <i>Ensis</i> , oyster shell 6cm long; color changes several time throughout core as follows: very-dark-gray (5Y 3/1) at	

	Thickness (meters)
0.16m; olive-gray (5Y 5/2) at 0.39m, dark-gray (5Y 4/1) at 0.72m	1.85
CORE H06	
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; massive; scattered shell fragments up to 3cm	0.72
Oyster shell and clam shell fragments up to 7cm long.....	0.10
Silt, clayey; slightly sandy; massive; slightly plastic; 3cm long bone? fragment this interval at 0.67m	0.84
Sand, very-dark-gray (5Y 3/1), fine-grained; silty; clayey; micaceous; massive; grading into slightly muddy fine-grained sand	1.46
Sand, very-dark-gray (5Y 3/1), fine-grained; muddy; micaceous; massive; with clay pods interspersed	1.52
Silt, very-dark-gray (5Y 3/1), clayey; sandy; micaceous; massive; slightly plastic; grading to clayey, silty, fine-grained sand; with sparse clay pods 1cm	1.40
CORE H07	
Sand, very-dark-gray (5Y 3/1), fine-grained; massive; scattered shell fragments of several mm	0.48
Sand, fine- to coarse-grained; poorly sorted; abundant shell fragments of several mm; some well-preserved oyster, scallop, and clam shells up to 5cm (which continue into mud layer, abundant to 0.12m depth); nonhomogenous color this interval at 0.00-0.05m	0.12
Clay, dark-olive-gray (5Y 3/2), silty; plastic; with pods of muddy fine-grained sand; micaceous; color changes to very-dark-gray (5Y 3/1)	1.17
Mud, fine-grained sand; plastic; abundant shell fragments 3-4cm; well-preserved oyster shell 7cm	0.05
Clay, silty; fine-grained sand; plastic; scattered shell fragments	0.28
Shell layer; plastic fine-grained sand, silty clay; well-preserved oyster shell (7cm); abundant oyster shells; grading into below	0.10
Clay, silty; micaceous; plastic; some sandy pods, scattered shell fragments; grading into below	0.02
Sand, dark-gray (5Y 4/1) to olive-gray (5Y 4/2), fine- to very-fine-grained; massive; micaceous; intercalations of silty	

	Thickness (meters)
clay this interval at 0.63-0.76m	1.22
Clay, silty; with firm clay balls	0.10
CORE H08	
Sand, grayish-brown (2.5Y 5/2), fine-grained; micaceous; massive; shell fragments	0.17
Sand, medium- to fine-grained; shell fragments up to 0.5cm	0.08
Sand, dark-gray (2.5Y 4/0), fine-grained; micaceous; massive; shell fragments up to 4cm; in this interval: oyster shell fragment 4cm at 0.75m; coarse-grained sand with shell fragments up to 2cm at 0.93-0.97m; 2.5 cm scallop shell; grading into below	1.09
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; silty; micaceous; massive; several interspersed discontinuous clay pods 0.5cm	1.11
Shell hash.....	0.05
Sand, fine- to very-fine-grained; silty.....	0.07
Silt, olive (5Y 5/4), fine-grained sand; with clay pods	0.21
CORE H09	
Sand, fine- to very-fine-grained; micaceous	0.28
Sand, dark-reddish-gray (10YR 4/1), fine-grained; sparse shell fragments up to 4cm	1.03
CORE H10	
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; massive; scattered shell fragments up to 1mm; possible plant stems this interval at 0.55m	0.95
Sand, coarse-grained; shell fragments up to 6cm	0.08
Sand, dark-gray (5Y 4/1), fine-grained	0.04
Sand, fine-grained; with silty clay pods (highly indurated); grading into below	0.16
Sand, olive (5Y 4/3), fine- to very-fine-grained; micaceous; massive; somewhat silty?; color changes to olive-gray (5Y 5/2) and olive (5Y 5/3); grading into below	1.61
Silt, clayey; grading into below.....	0.18
Clay, silty; grading into below.....	0.15

	Thickness (meters)		Thickness (meters)
Silt, fine-grained sand; slightly micaceous	0.22	Clay, silty; plastic; intercalated with layers of fine-grained, micaceous sand (up to 9cm thick); piece of wood removed for dating this interval at 0.11m	0.31
CORE H11			
Sand, fine- to very- fine-grained; micaceous; massive; scattered <i>Ensis</i> fragments at top, other shell fragments throughout; in this interval: 4cm oyster shell fragment at 0.41m; poorly sorted coarse-grained sand, abundant shell fragments well-preserved clams, etc. up to 3cm at 0.33-0.36m, and 0.40-0.45m	1.89	Clay, very-dark-gray (5Y 3/1), silty; plastic; intercalated with fine-grained micaceous fine sand; well-preserved oyster shell 7.5cm this interval at 0.35m	0.75
		Sand, very-dark-gray (5Y 3/1), fine-grained; micaceous; abundant shell fragments; in this interval: <i>Ensis</i> at 0.05m; well-preserved <i>Ensis</i> , oyster shells, clam shells at 0.28m; fewer shell fragments at bottom of core	0.67
CORE H12			
Sand, medium- to coarse-grained; abundant shell fragments	0.19	CORE H15 — One-foot length of core, not processed.	
Sand, dark-gray (5Y 4/1) to very-dark-gray (5Y 3/1), medium-grained; abundant shell fragments up to 1cm; grading into below	0.81	CORE B01	
Sand, very-fine- to fine-grained; micaceous; shell fragments	0.23	Sand, olive-gray (5Y 5/2), fine- to very-fine-grained; massive; locally very micaceous; vertical stringer of very-dark-gray (2.5Y 3/0) sand at 0.46-0.85m; color changes to gray (5Y 5/1) and then to very-dark-gray (2.5Y 3/0); well-preserved clam shell 1cm at 2.33m; few shell fragments about 1mm from 2.33m and down	
Sand, fine-grained; rare shell fragments up to 2cm; shell layer, well-preserved 2cm clam this interval; at 0.52m color changes dark-gray (5Y 4/1) to very-dark-gray (5Y 3/1)	1.05	CORE B02	
CORE H13			
Sand, coarse-grained; poorly sorted; abundant shell fragments up to 3.5cm, <i>Ensis</i> , oyster and clam fragments; grading into below	0.27	Sand, olive-gray (5Y 5/2), fine- to very-fine-grained; micaceous; massive; scattered shell fragments about 1mm; color changes throughout as follows: very-dark-gray (5Y 3/1) at 0.51m; olive-gray (5Y 5/2) at 1.37m; dark-gray (5Y 4/1) at 1.62m	
Sand, light-brownish-gray (2.5Y 6/2), fine-grained; abundant shell fragments up to 5cm (oyster shell)	0.28	CORE B03	
Sand, dark-gray (10YR 4/1), fine-grained; micaceous; sparse shell fragments	1.49	Sand, olive-gray (5Y 5/2), fine- to very-fine-grained; micaceous; massive; scattered shell fragments, well-preserved articulated <i>Ensis</i> 2cm; color changes throughout as follows: very-dark-gray (5Y 3/1) at 0.55m; olive-gray (5Y 5/2) then very-dark-gray (5Y 3/1); 1.5cm long piece of wood at 1.83m; gastropod 0.7cm long at 2.20m...2.44	
CORE H14			
Sand, coarse- to medium-grained; poorly sorted; with oyster shells, well-preserved gastropod (5cm)	0.30	Sand, very-dark-gray (2.5Y 3/0), fine- to very-fine-grained; micaceous; massive; scattered shell fragments	
Clay, very-dark-gray (5Y 3/1), silty; plastic; intercalated with layers of fine-grained, micaceous sand; sand 1-2cm thick	0.28	CORE B04	
Sand, dark-gray (5Y 4/1), fine-grained; massive; micaceous	0.59	Sand, olive-gray (5Y 5/2), fine- to very-fine-grained; micaceous; massive; scattered shell fragments up to 2cm long, <i>Ensis</i> , clam; clayey silt pod at 0.88-0.94m; color changes to dark gray (5Y 4/1) at 1.00m	

	Thickness (meters)		Thickness (meters)
CORE B05			
Sand, very-dark-gray (2.5Y 3/0), fine- to very-fine-grained; micaceous; massive; sparse shell fragments of 1- 2mm	2.00	Sand, dark-olive-gray (5Y 3/2), fine-grained; silty; massive; some mud balls near bottom; rare gravel; grading into below	0.91
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; massive; sparse shell fragments of 1-2mm	1.07	Sand, dark-olive-gray (5Y 3/2), medium- to coarse-grained; rare shell fragments (oyster shells to 5cm); some mud near bottom	0.60
CORE V1			
Sand, fine-grained; with clay pods.....	0.49	Clay, greenish-gray (5GY 5/1), plastic; interrupted by layers of coarse sand 2cm thick this interval at 0.32-0.70m; some iron staining	0.90
Sand, medium-grained; with clay pods	0.83	Sand, greenish-gray (5GY 5/1), coarse-grained; and mud	0.24
Sand, coarse-grained.....	0.17	Sand, olive-gray (5Y 5/2), coarse-grained	0.20
Sand, coarse-grained; coarsening toward bottom	1.51	Clay, greenish-gray (5GY 5/1), plastic	0.13
Sand, coarse-grained; and gravel; iron oxide stain	1.52	Sand, light-olive-brown (2.6Y 5/6), coarse-grained; and gravel massive; iron stained (in part).....	0.85
Sand, medium- and fine-grained	0.48	Clay, olive-gray (5Y 4/2), plastic.....	0.13
Sand, coarse-grained; and gravel.....	0.40	CORE V4	
Sand, medium-grained; heavy iron-oxide staining this interval at 0.06-0.14m	0.60	Sand, fine- to medium-grained; rare shell fragment; whole skate or ray egg case	0.40
CORE V2			
Sand, fine-grained; small amount of mud	1.18	Sand, fine-grained; interbedded with medium- to coarse-grained sand and large clay pods; 2.5cm clam shell and other shell fragments	0.50
Sand, medium-grained; shell fragment 3-4cm this interval at 0.21m	0.25	Sand, fine-grained; bottom 10cm includes some coarse-grained sand	0.35
Sand, fine- to medium-grained; laminations of silt and clay	1.11	Sand, medium- to fine-grained; small clay pods; grading into below	0.09
Mud layer.....	0.03	Sand, coarse-grained	0.29
Sand, fine-grained.....	0.17	Sand, medium- to coarse-grained; and gravel	0.22
Mud, compact; with rock fragments (5cm)	0.16	Sand, medium-grained.....	0.09
Mud, compact; with scattered shells	0.31	Sand, medium-grained; occasional pebbles up to 2cm; becoming coarser and more pebbly	0.53
Shell layer with mud.....	0.06	Sand, medium-grained.....	0.18
Sand, mixed; plastic mud.....	0.58	Sand, medium-grained; grading to coarse-grained sand, and gravel; clay pods	0.39
CORE V3			
Sand, olive-gray (5y 4/2), coarse- to medium-grained; rare shell fragments up to 1.5cm	0.39	Sand, coarse grained	0.12

	Thickness (meters)		Thickness (meters)
CORE C1			
Sand, fine- to medium-grained; with clast of pebbles and medium-grained sand; grading into medium- to coarse-grained sand with pebbles up to 1cm	0.59	Sand, olive-gray (5Y 5/2), medium- to coarse-grained; shell fragments (up to 3cm, bivalves); coarse-grained sand abundant in this interval at 0.40-0.75m; color grading downwards	0.85
Sand, fine-grained	0.09	Sand, medium- to coarse-grained; scattered shell fragments (a few mm)	0.35
Mud layer; pebbly fine sand below	0.06	Sand, very-dark-gray (5Y 3/1), fine-grained; micaceous; scattered shell fragments (a few mm)	0.34
Sand, fine-grained	0.43	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; shell fragments (up to 2cm); 6cm clam fragment this interval at 0.26m	0.31
Mud, plastic	0.03	Silt, sandy, very-fine-grained; scattered shell fragments	0.05
Sand, medium-grained.....	0.22	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; scattered shell fragments; silty laminae; micaceous	0.30
Sand, medium- to coarse-grained	0.53	Sand, olive-gray (5Y 5/2), fine-grained; micaceous; shell fragments rare(a few mm); scattered silty lamina	0.84
Sand, fine-grained; silt; wood fragment.....	0.07	Sand, gray (5Y 6/1) dry; fine-grained; micaceous; very few shell fragment	0.91
Sand, fine-grained.....	0.52	Sand, dark-gray (5Y 4/1), medium- to fine-grained; scattered shell fragments (up to 1cm); scattered mud pods; grading into below	0.50
Sand, fine-grained; mixed with gravel up to 4cm thick	0.07	Sand, gray (5Y 5/1), fine-grained; micaceous; scattered shell fragments; grading into sand, medium to fine grained	0.25
Gravel, well-rounded; in sand-silt matrix; gravel up to 2cm thick.....	0.24	Sand, dark-greenish-gray (5GY 4/1) fine- to very-fine-grained; silty; micaceous; abundant pods of clayey silt; scattered shell fragments (a few mm)	1.45
CORE V5			
Sand, gray (5Y 5/1), fine-grained; silty; massive; rare shell fragments; dry	1.08	CORE C2	
Sand, olive-gray (5Y 4/2), medium- to coarse-grained; rare shell fragments; some clay balls 1cm; grading into below	0.73	Sand, very-dark-gray (2.5Y 3/0), fine-grained; micaceous; H ₂ S smell; abundant mud pods; shell fragments at top up to 5cm; shell fragments at the bottom	0.37
Sand, olive-gray ((5Y 4/2) medium-grained; massive; rare shell fragments and clay balls; grading into below	1.55	Sand, dark-gray (5Y 4/1), coarse-grained; quartzose; shelly	0.10
Sand, olive-gray (5Y 4/2), fine-grained; massive; grading into below	1.10	Sand, dark-gray (5Y 4/1), fine grained; micaceous; mud pods; shell fragments	0.78
Sand, light-olive-brown (2.5Y 5/4), medium- to coarse-grained; rare gravel	1.28	Silt, dark-gray (5Y 4/1), clayey; with sand pods, fine-grained; few shell fragments	0.20
<p>The following 50 cores were acquired during the summer of 1988. For this project, deep penetration was attempted at 16 sites. When vibracoring refused to penetrate the offshore sediments, the core was removed and labeled "RUN-1". The vibracorer was placed again on the sea floor and water was pumped through the empty core liner, thus "jetting" down to about the same depth where refusal was previously encountered. Vibracoring began again at this new depth below the sea floor; this core section was labeled "RUN-2". This procedure was repeated to attain a total penetration of up to 20 feet.</p>			
		Silt, dark-gray (5Y 4/1), clayey; with sand pods, fine-grained	0.30

Thickness (meters)	Thickness (meters)
Silt, dark-gray (5Y 4/1), clayey; with scattered pods; gastro-pod in this interval at 0.75m1.22	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous scattered shell fragments; interlayered with silty clay; 1cm shell layer in this interval at 0.92m0.95
Sand, very-dark-gray (5Y 3/1), fine-grained; and clayey silt; interlayered - layers about 1cm; micaceous0.93	Silt, clayey0.15
Sand, very-dark-gray (5Y 3/1), medium-grained; shelly; mud pods of silty clay and clayey silt 1cm thick0.50	Sand, fine-grained; micaceous; scattered shell fragments0.10
Sand, very-dark-gray (5Y 3/1), medium-grained; shelly .0.05	Sand, fine-grained; clayey silt; interlayered; micaceous; scattered shell fragments.....0.23
Sand, dark-gray (5Y 4/1), medium-grained; shelly; pods of silty clay0.45	Shell fragments, 10cm long0.04
Sand and clayey silt, shelly, interlayered.....0.10	Sand, dark-gray (5Y 4/1), fine-grained; micaceous; very few mud pods; shell hash0.48
Sand, medium-grained; shelly.....0.20	Sand, fine- to very-fine-grained; micaceous; interlayered with silty clay and clayey silt; slightly mottled1.14
Sand, shelly, and clayey silt; interlayered0.30	
Sand, medium-grained; very shelly0.10	
 CORE C3 RUN-1, RUN-2	
Run-1	
Silt, black (2.5Y 2/0); clayey; fluid mud; strong sulfur smell0.10	CORE C4
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous0.45	Sand, very-dark-gray (5Y 3/1), medium- to fine-grained; micaceous; shelly; shell fragments0.60
Sand, fine- to very-fine-grained; and silty clay; interlayered, (1-4cm); micaceous; slightly shelly this interval at 0.55m0.68	Sand, medium- to fine-grained; shelly; interlayered with silty clay; pieces of wood this interval at 0.28m0.35
Clay, silty0.12	Clay, silty; with sand laminations (shelly and medium-grained sand, 1cm thick)0.61
Sand, fine- to very-fine-grained; micaceous; some shell hash; gastropod this interval at 0.09m0.19	Clay, silty0.32
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; some mud; scattered shell fragments0.36	Sand, fine- to medium-grained; micaceous; few shell fragments; grading to medium-grained sand0.32
Sand, fine- to very-fine-grained; clay and silt; interlayered0.12	Sand, medium-grained; micaceous; piece of wood 6cm long this interval at 0.77m1.14
Sand, dark-gray (5Y 4/1), fine-grained; micaceous; shell fragments0.81	Sand, fine-grained; micaceous; few shell fragments0.28
Run-2 penetration-6.03m, recovery-3.05m	CORE C5
Silt, black (2.5Y 2/0); clayey; (fluid mud)0.10	Shells and shell hash, quartzose sand, fine-grained; (bivalves)0.42
Sand, fine-grained; micaceous; scattered shell fragments0.25	Sand, fine-grained; micaceous; with laminations of shell hash and clayey silt (less than 1cm thickness); scattered shell hash0.78
	Sand, very-dark-gray (5Y 3/1), very-fine-grained; muddy; grading into very-fine-grained sandy mud0.31

Thickness (meters)	Thickness (meters)
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; muddy; micaceous; with pods of very-fine-grained sandy clayey silt1.55	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; scattered shell fragments (a few mm)0.51
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; muddy; micaceous; with pods of very-fine-grained sandy, clayey silt; some scattered shell hash; shelly layer this interval at 0.34-0.39m1.55	Shell layer, bivalves (1cm) and fragments up to 3cm0.04
Sand, fine- to very-fine-grained; muddy; shelly0.39	Sand, dark gray (5Y 4/1), fine- to very-fine-grained; scattered shell fragments; increase in mud content at bottom (slightly muddy sand)0.65
Sand, fine- to very-fine-grained; muddy; micaceous; with pods of fine-grained sandy clayey silt0.95	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; shell fragments (bivalve, to 4cm)0.26
Sand, fine- to very-fine-grained; micaceous; small amount of silt0.15	Sand, medium- to coarse-grained; quartzose; abundant shell fragments (up to 10cm clam shell, also gastropods)...0.25
CORE C6	Sand, olive-gray (5Y 5/2), medium- to coarse-grained; shell fragments rare (a few mm)0.26
Sand, fine-grained; micaceous; scattered shell fragments0.10	Clay, dark-gray (5Y 4/1), silty; plastic.....0.11
Sand, fine-grained; muddy; shelly.....0.10	Mud, medium-grained, sandy; shell fragments rare0.20
Sand, fine-grained; micaceous; scattered shell fragments0.10	Sand, gray (5Y 5/1), medium- to coarse-grained; shell hash; and fragments up to 3cm0.43
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; pods of silty clay up to 15cm thick; scattered shell fragments, 1cm thick shell layer in this interval at 0.03m1.25	Clay, very-dark-gray (5Y 3/1), silty; with shelly medium sand pods or lenses (up to 3cm thick); plastic mud0.68
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; alternating layers with scattered shell fragments and silty clay; lamination thickness ranges from less than 1cm to 10cm; micaceous1.54	CORE C8 RUN-1, RUN-2, RUN-3
Clay, very-dark-gray (2.5Y 3/0); silty; some very-fine-grained sand; massive0.47	Run-1
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; shell fragments (including gastropod, <i>Ensis</i> , up to 2cm almost a shell hash; silt and clay layer this interval at 0.14-0.20m0.28	Sand, olive-gray (5Y 4/2), fine- to medium-grained; abundant shell fragments (1cm bivalves and smaller fragments); grades into below0.26
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; massive1.01	Sand, very-dark-gray (5Y 3/1), fine-grained; micaceous; scattered shell fragments0.36
CORE C7	Shell hash, (1cm bivalve and fragments to 4cm); with sand, coarse-grained0.10
Sand, black (2.5Y 2/0), fine- to very-fine-grained; massive; small mud pods; abundant small shell fragments (a few mm); sandy shell layer (<i>Ensis</i> , oyster shell, to 4cm) this interval at 0.25-0.34m0.34	Sand, olive (5Y 4/4), fine-grained; some fine parallel laminations; scattered shell fragments; micaceous0.32
	Run-2 jetted-2.07m, penetration-3.08m; recovery-1.46m Sample 8-2 continues into core 8 Run-2
	Sand, olive (5Y 4/4), fine-grained; some parallel laminations; micaceous; scattered shell fragments, (1cm bivalves and smaller fragments)1.45
	Run-3 jetted-3.05m; penetration-6.04m; recovery-2.90m Clay, olive-gray (5Y 4/2), plastic; with lenses of fine-grained sand; up to 2cm thick0.42
	Sand, dark-gray (5Y 4/1), fine-grained; abundant shell in top half of layer (1cm bivalves and smaller fragments); micaceous0.25

Thickness (meters)	Thickness (meters)
Mud, dark-gray (5Y 4/1), plastic; sandy; shell fragments0.13	Clay, silty; shell hash; 7cm oyster shell0.06
Sand, olive-gray (5Y 4/2), fine-grained; micaceous; scattered shell fragments; and mud lenses this interval at 0.00- 0.03m and 0.05-0.07m0.73	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; with pods of silty clay (scattered, less than or equal to 1cm thickness) and scattered concentrations of shell fragments (a few mm) shelly layer this interval at 1.45-1.47m (<1cm whole bivalves)1.59
Sand, olive-gray (5Y 4/2), fine-grained; micaceous; scattered shell fragments.....0.65	Run-2 jetted-2.68m, penetration-4.97m, recovery-1.46m Sand, fine-grained; micaceous; few pods of silty clay (<1cm thick) scattered shell fragments (1mm) concentration of shell this interval at 0.54m (1cm bivalves)1.39
Mud and fine-grained sand pods; gradual color change...0.15	Run-3 jetted-3.72m, penetration-6.04m, recovery-1.52m Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; scattered shell fragment (1cm bivalve); pods of silty clay (1-3cm)1.16
Sand, very-dark-gray (5Y 3/1), fine-grained; with mud lenses to 2cm thick; micaceous; scattered shell fragments0.44	Shell hash (<1cm fragments and whole bivalves)0.05
Shell hash, mostly bivalves of <1cm0.07	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; scattered shell fragment (1cm bivalve); pods of silty clay (1-3cm)0.22
CORE C9	
Sand, very-dark-gray (5Y 3/1), fine-grained; micaceous; shell fragments; (mostly 1mm, also one <i>Ensis</i> 6cm long, gas- tropod of 2cm); layer of silty clay and shell (10cm thick) this interval at 0.52-0.62m; a few lenses of muddy sand (1cm thick)1.55	CORE C11 RUN-1, RUN-2
Sand, very-dark-gray (5Y 3/1), fine-grained; micaceous; widely scattered shell fragments (1mm)0.72	Run-1 Sand, dark-gray (5Y 4/1), medium- to coarse-grained; shelly, (fragments to 5cm).....0.75
Sand, very-dark-gray (5Y 3/1), fine-grained; silty; micaceous; pods of clayey silt and very-fine-grained sandy silt; few scattered shell fragments (1mm)0.80	Shell hash, dark-gray (5Y 4/1); sandy, medium- to coarse- grained (fragments up to 5cm)0.20
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; muddy; micaceous; abundant shell fragments (1 to sev- eral mm); pods of clayey silt and very-fine-grained sandy silt; in this interval shell fragment 3cm at 0.88m; piece of wood (saved for dating) at 1.05m1.73	Sand, dark-gray (5Y 4/1), medium-grained; scattered shell fragments0.23
CORE C10 RUN-1, RUN-2, RUN-3	
Run-1 Sand, very-dark-gray (5Y 3/1), fine-grained; shelly; mi- caceous; (shells to 1cm, bivalve)0.09	Sand, olive-gray (5Y 5/2), medium-grained; scattered shell fragments (<1cm); shell layer this interval at 0.54-0.57m; layer of shelly muddy sand, very-dark-gray (5Y 3/1) this interval at 0.93-0.97m1.14
Sand, fine-grained, micaceous; interlayered with plastic silty clay and micaceous shelly fine-grained sand; layers of <1 to 10cm thick; concentration of shells (a few mm) this interval at 0.34-0.46m0.62	Run-2 jetted-3.51m, penetration-6.04m, recovery-3.20m Clay, very-dark-gray (5Y 3/1); silty; top 1-2cm (whole and fragments of oyster shell up to 4cm long)0.92
Clay, very-dark-gray (5Y 3/1); silty; plastic0.46	Sand, very-dark-gray (5Y 3/1), very-fine-grained; silty; clayey; few scattered shell fragments.....0.67
Sand, fine- to very-fine-grained; muddy; micaceous0.04	Sand, very-dark-gray (5Y 3/1), very-fine-grained; clayey; silty; few pods of silty clay (2cm thick); mud content increases toward bottom1.57
Shell hash, very-dark-gray (5Y 3/1), fragments up to 6cm oyster shell and many 1cm whole bivalves0.19	

	Thickness (meters)		Thickness (meters)
CORE C12 RUN-1, RUN-2			
Run-1		Sand, dark-gray (5Y 4/1), fine-grained; micaceous; silty clay layer this interval at 0.33-0.36m	1.00
Sand, very-dark-gray (2.5Y 3/0), fine- to very-fine-grained; micaceous; few scattered shell fragments; concentration of shell and shell fragments this interval at 0.30-0.35m (1cm long)	1.55	Run-2 jetted-2.29m, penetration-5.00m, recovery 1.98m	
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; scattered shell fragments; layer of fine, sandy shell hash fragments up to 5cm; whole gastropods this interval at 0.45-0.47m	0.47	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; fine, silty clay laminations this interval at 1.16-1.19m	1.92
Sand, very-fine-grained; clayey; silty	0.08	Run-3 jetted-4.21m; penetration-6.04m; 1.74m	
Clay, very-dark-gray (5Y 3/1); silty; highly plastic; with 2cm thick fine-grained sand lamination	0.15	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous	1.71
Sand, very-dark-gray (5Y 3/1), very-fine; micaceous....	0.72	CORE C14 RUN-1, RUN-2, RUN-3	
Run-2 jetted-2.62m, penetration-4.82m, recovery-2.44m NOTE: Top of core totally disrupted		Run-1	
Sand, dark-gray (5Y4/1), fine-grained; micaceous	0.10	Sand, fine-grained; micaceous; shell fragments (to 1cm)..	0.13
Clay, dark-gray (5Y 4/1); silty; plastic.....	0.15	Sand, coarse-grained; shell fragments (gastropods to 2cm, etc.)	0.03
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous	0.53	Sand, dark-gray (5Y 4/1), fine-grained; micaceous; shell fragments rare; color change to olive-gray (5Y 4/2) this interval at 0.79m	0.91
Clay, silty (layer)	0.03	Sand, fine-grained; micaceous; abundant shell fragments	0.06
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous	0.45	Shell hash with matrix of micaceous, fine-grained sand, (bivalves 1-2cm)	0.04
Sand, dark-gray (5Y 4/1), fine-grained; micaceous; shell fragments up to 5cm.....	0.34	Sand, fine-grained; micaceous; shell fragments rare; shell fragments becoming more abundant toward bottom	0.24
Sand, shelly; with bivalves and gastropods	0.09	Clay, olive-gray (5Y 4/2); silty.....	0.02
Sand, dark-gray (5Y 4/1), fine-grained; micaceous; fine-grained sand with shell fragments this interval at 0.49-0.54m	0.80	Clay, olive-gray (5Y 4/2); silty; layers of fine-grained sand (1-2cm thick); sand layer this interval at 0.07-0.10m	0.32
CORE C13 RUN-1, RUN-2, RUN-3			
Run-1		Sand, dark-grayish-brown (2.5Y 4/2), fine-grained; micaceous	0.19
Sand, dark-gray (5Y 4/1), medium- to fine-grained; scattered shell fragments up to 5cm	0.60	Clay, silty; sand laminations (up to 1cm thick)	0.09
Shell layer with medium-grained sand; shell fragments up to 5cm long	0.27	Sand, olive (5Y 4/3), fine- to very-fine-grained; micaceous; no shell fragments	0.48
Sand, fine-grained; micaceous; shell fragments up to 5cm long	0.15	Clay, silty; with fine-grained sand laminations (up to 1cm)	0.17
Sand, fine-grained; shelly; shell fragments up to 2cm mostly bivalves and gastropods	0.21	Sand, fine- to very-fine-grained; micaceous	0.06
		Run-2 jetted-2.41m, penetration-4.18m, recovery-2.20m	
		Sand, dark-gray (5Y 4/1), fine-grained; micaceous	0.15
		Shell layer (fragments of up to a few mm)	0.01

	Thickness (meters)
Clay, silty	0.04
Sand, fine-grained; micaceous	0.05
Clay, silty; pockets of micaceous fine-grained sand	0.25
Sand, dark-grayish-brown (2.5Y 4/2), fine-grained; micaceous; silty clay laminations this interval at 0.20-0.25m; shell fragments (1mm or less) and silty clay laminations at 1.10-1.2; mud ball at 1.41-1.44m	1.70
Run-3 jetted-4.42m, penetration-6.04m, recovery-1.83m Sand, fine-grained; micaceous; shell fragments rare; sediments disturbed by water in core liner	0.33
Clay, gray (5Y 5/1), silty; sand laminations (up to 1cm thick)	0.21
Sand, olive-gray (5Y 4/2), fine-grained; shell fragments rare this interval at 0.96-1.01m.....	1.31
 Core C15 RUN-1, RUN-2	
Run-1	
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; top 12cm has scattered shell fragments (up to 1cm)	0.80
Clay, silty; with fine-grained sand laminations (0.5 cm thick)	0.20
Sand, dark- gray (5Y 4/1), fine- to very-fine-grained; micaceous; color changes to olive gray (5Y 4/2) this interval at 0.30m	0.88
Run-2 jetted-1.83m, penetration-6.04m, recovery-2.14m Sand, olive-gray (5Y 4/2), fine-grained; micaceous; (no shell); silty clay laminations this interval at 1.01-1.03m and 1.33-1.36m; color changes to olive brown (2.5Y 4/4) this interval at 1.00m	2.10
 CORE C16 RUN-1, RUN-2	
Run-1	
Sand, very-dark-gray (2.5Y 3/0), fine-grained; micaceous; rare shell fragments (abundant only from 0.15-0.20m); color changes to dark gray (5Y 4/1) this interval at 0.94m EXCEPT for silty clay lamination this interval at 1.21-1.22m with color of very dark gray (2.5Y 3/0)	1.69
Run-2 jetted-1.98m, penetration-3.36m, recovery-0.92m Sand, dark-gray (2.5Y 4/0), fine- to very-fine-grained; micaceous; few scattered shell fragments (1mm); silty clay laminations this interval at 0.22-0.23m and 0.30-0.33m; color changes to dark-grayish-brown (2.5Y 4/2) this interval at 0.30m	0.96

	Thickness (meters)
 CORE C17 RUN-1, RUN-2, RUN-3, RUN-4	
Run-1	
Sand, dark-gray (2.5Y 4/0), fine- to very-fine-grained; micaceous; shell fragments (1mm) rare; silty clay lamination this interval at 1.28m	1.64
Dark gray (2.5Y 4/0); silty clay and micaceous fine-grained sand, alternating layers; (layers up to 7cm thick); scattered shell fragments in sand; color changes to dark-gray (5Y 4/1) this interval at 0.19m	0.36
Sand, dark-gray (5Y 4/1), fine-grained; micaceous; scattered shell fragments 1mm (mostly below .35); silty clay laminations with shell fragments (a few mm) this interval at 0.72-0.73m and 0.75-0.76m	0.85
Run-2 jetted-2.29m, penetration-3.66m, recovery-0.76m	
Clay, dark-gray (2.5Y 4/0), silty; laminations of micaceous, silty, fine-grained sand; (up to 3cm thick); widely scattered shell fragments a few mm; color changes to very-dark-gray (5Y 3/1) in this interval at 0.10m	0.36
Sand, fine-grained; micaceous; (no shells); layer of abundant shell fragments (bivalves, a few mm) this interval at 0.34-0.39m	0.53
Run-3 jetted-3.29m, penetration-4.06m, recovery-1.07m	
Clay, dark-gray (5Y 4/1), silty; laminations of silty fine-grained sand (to 1 cm thick)	0.21
Sand, very-dark-gray (5Y 3/1), fine-grained; micaceous	0.23
Clay, silty; fine-grained sand lamination this interval at 0.04-0.05m	0.20
Sand, dark-gray (5Y 4/1), fine-grained; micaceous; few scattered shell fragments (about a mm)	0.36
Run-4 jetted-4.03m, penetration-6.04m, recovery-1.52m	
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; scattered shell fragments (to 1cm); in this interval: silty clay layer at 0.45-0.50m; widely scattered shells between 0.42-0.90m (1mm); silty clay layer with shell fragments at 0.91-0.96m; abundant shell fragments (bivalves, a few mm) silty sand at 1.04-1.06m; abundant shell fragments silty clay with sand at 1.28-1.32m	1.50
 CORE C18 RUN-1, RUN-2	
Run-1	
Sand, dark- gray (5Y 4/1), fine- to very-fine-grained; micaceous; abundant to widely scattered shell fragments (<1mm-1.5cm); shell fragments up to 4cm this interval at 2.00-2.09m	2.09

Thickness (meters)	Thickness (meters)
Run-2 jetted-1.98m, penetration-2.59m, recovery-0.55m Sand, dark-gray (5Y 4/1), fine-grained; micaceous; scattered shell fragments (mostly 1-2mm, also a bivalve of 2cm)	Clay, dark-gray (5Y 4/1), slightly silty; lenses of medium- to fine-grained sand; micaceous; lenses <1cm; thin parting of clayey silt <1mm, black this interval at 0.43m and 0.72m
CORE C19 RUN-1, RUN-2, RUN-3	Sand, fine-grained; micaceous; with silty clay layers up to .5cm thick
Run-1 Sand, dark-gray (2.5Y 4/0), fine- to very-fine-grained; lightly scattered shell fragments, 1-2mm; grades into silty fine-grained sand	Run-2 penetration-6.04m; recovery-5.09m Sand, dark-grayish-brown (2.5Y 4/2), coarse- to medium-grained; shell fragments (up to 6cm) and rounded gravel (up to 2cm) increasing in abundance downward
Sand, fine- to coarse- grained; silty; and gravel; micaceous; shell fragments up to 3cm	Cobble, showing alternating layers of sandstone and siltstone; pebbles and shells common
Run-2 jetted-1.83m, penetration-4.88m, recovery-1.62m Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; scattered shell fragments up to 6cm; shell fragments up to 1cm common this interval at 0.98-1.09m	Sand, dark-gray (5Y 4/1), fine-grained; abundant shell fragments (up to 2mm) and some rounded gravel (<1cm); shelly layer this layer at 0.83-0.84m
Sand, light-gray (5Y 6/1), medium- with some fine-grained; shell fragments up to 6cm (bivalve); this interval at 0.00-0.06m; pod of fine- to medium-grained sand, slightly silty this interval at 0.39-0.43m	Shell hash, sandy; fragments up to 3cm, some gravel; silty clay pods
Run-3 jetted-3.38m, penetration-5.89m, recovery-2.10m Sand, medium- with fine-grained; widely scattered gravel and shell fragments; gravel up to 5cm; shell fragments up to 4cm; scattered pods of mud (1cm size); cobble this interval at 1.85m	Sand, fine-grained; some silt.....
Sand, fine-grained; pod of silty fine sand this interval at 0.03-0.07m	Clay, dark-gray (5Y 4/1), silty; micaceous; fine-grained sand laminations (up to 1mm); crossbed of silty fine-grained sand and gravel <3cm thick this interval at 0.26m
CORE C20 RUN-1, RUN-2	Clay, dark-gray (5Y 4/1), micaceous and silty, alternating with beds of micaceous silty fine-grained sand; layering ranges from <1mm to 1cm for sandy layers and <1mm to 5cm for clayey layers; sporadic pods of silty medium- and fine-grained sand; sandy layers begin to range in thickness from <1mm to 8cm; this interval at 2.1 to 2.55m
Run-1 Sand, dark-olive-gray (5Y 3/2), coarse- with some fine-grained; scattered shell fragments up to 3cm	CORE C21 Sand, olive-gray (5Y 5/2), coarse-grained; few scattered shell fragments
Cobble; sandy siltstone, in fine- to medium-grained sand; rounded gravel; shell fragments	Sand, olive-gray (5Y 5/2), coarse-grained; and gravel; abundant biotritus, bivalves up to 10cm (quartz shelly sand)
Sand, dark-gray (5Y 4/1), fine-grained; shelly; pods of silty sand and gravelly shell hash, shell up to 1-2mm.....	Clay, gray (5Y 4/1), silty; plastic; with coarse-sand pockets this interval between 0.04-0.09m
Shell fragments in silty clay matrix with fine- to medium-grained sand and gravel; shell fragments up to 3cm	CORE C22 Sand, olive-gray (5Y 4/2), coarse-grained; lot of shell fragments up to 6cm long)
Clay, silty; lenses of fine- to medium-grained sand; also gravel; lenses less than 1cm thick; some mica.....	

Thickness (meters)	Thickness (meters)
Sand, olive-gray (5Y 4/2), coarse- to medium-grained; scattered shell fragments0.45	Sand, dark-gray (2.5Y 4/0), silty; laminations of coarse- to medium-grained sand up to 2cm thick; very micaceous; no shell fragments0.78
Sand, olive-gray (5Y 4/2), medium-grained; shell fragments0.65	Sand, very-fine-grained; micaceous0.36
Sand, medium-grained.....0.15	Sand, dark-gray (5Y 4/1), very-fine-grained; micaceous0.70
Sand, olive-gray (5Y 4/2), coarse-grained; shell fragments up to 4cm long0.06	Sand, coarse-grained0.05
Sand, medium-grained0.09	Sand, very-fine-grained; micaceous; silty clay this interval at 0.00-0.02m0.10
Sand, coarse-grained; shell fragments up to 4cm long0.03	Sand, gray (5Y 5/1), coarse-grained; grading into below0.55
Sand, medium-grained0.07	Sand, medium-grained.....0.16
Sand, medium-grained; abundant shell fragments0.15	Sand, dark-gray (5Y 4/1), medium- to coarse-grained0.59
Sand, gray (5Y 4/1), medium-grained0.40	Sand, coarse-grained; gravel and pebbles up to 2cm0.20
Sand, medium-grained; abundant shell fragments0.05	Sand, medium- to coarse- grained0.55
Sand, medium-grained; big oyster shell this interval at 0.30m0.40	Sand, fine- to very-fine-grained; micaceous; shelly layer with fine-grained sand shell (biodebris) to 5cm long, this interval at 0.07-0.15m0.21
Sand, medium- to fine-grained; scattered shell fragments0.15	
Sand, very-dark-gray (5Y 3/1), fine-grained; scattered shell fragments; small silty clay pod this interval at 0.87m1.09	CORE C24
Sand, coarse-grained0.04	Sand, dark-gray (5Y 4/1), coarse- to medium-grained0.91
Sand, very-dark-gray (5Y 3/1), fine- to medium-grained; small amounts of silt; scattered shell fragments0.08	Sand, dark-gray (5Y 4/1), coarse-grained; and gravel; scattered shell fragments up to 8cm0.30
Sand, olive-gray (5Y 4/2), medium- to coarse-grained; gravel (quartz) up to 2cm0.10	Sand, dark-gray (5Y 4/1), medium- to fine-grained; higher concentration of finer grained material at bottom; some well-preserved bivalves 3-4cm long this interval at 0.35m0.40
Sand, olive-gray (5Y 4/2), medium- to coarse-grained ...0.69	Sand, coarse- to medium-grained; scattered shell fragments0.13
Sand, olive-gray (5Y 4/2), medium- to fine-grained; scattered shell fragments; scattered gravel (quartz and rock) up to 2cm0.40	Sand, dark-gray (2.5Y 4/1), medium- to fine-grained; scattered shell fragments1.16
	Clay, silty; interlaminated with medium- to fine-grained sand up to 1cm thick0.06
CORE C23	Sand, fine-grained; shell fragments up to 7cm long0.20
Clay, very-dark-gray (2.5Y 3/0), silty; smelly; small silty sand pocket this interval at 0.17-0.19m; shelly layer this interval at 0.96m1.55	
Sand, silty; possibly washed in0.06	CORE C25
Clay, black (5Y 2.5/1), silty.....0.31	Clay, dark-gray (5Y 4/1), silty; very silty, medium-grained

Thickness (meters)	Thickness (meters)
sand pods in this interval at: 0.03-0.12m (with scattered shell fragments), and 0.16-0.22m, and 0.50-0.52m (with shell fragments up to 2cm), and 0.70-1.03m, and 1.19-1.21m (with scattered shell fragments), and 1.31-1.33m (with medium- to fine-grained sand)1.35	laminations vary between 1cm and 10cm thick; concentration of bivalve shells up to 1cm long fine sand matrix this interval at 0.04-0.13m; shell fragments up to 4cm long at 0.54-0.56m; crossbedded (?) clay layer at 0.56-0.62m; concentration of bivalve and gastropod shells up to 1.5cm, in fine sand matrix at 0.62-0.69m1.02
Sand, gray (5Y 5/1), coarse-grained; shell fragments; becomes silty towards bottom; silty clay pod this interval at 0.20m0.50	CORE C27
Sand, dark-gray (5Y 4/1), fine-grained; silty0.10	Sand, dark-gray (5Y 4/1), coarse- to very-coarse-grained; scattered shell fragments0.12
Sand, gray (5Y 5/1), medium-grained; grading into below0.15	Sand, dark-gray (5Y 4/1), fine-grained; micaceous; silty clay lamination this interval at 0.11m0.13
Sand, coarse-grained0.45	Sand, coarse- to medium-grained; sandy shell hash (shell fragments up to 3cm long) this interval at 0.07-0.13m0.20
Clay, silty0.04	Sand, very-fine-grained; micaceous; scattered shell fragments0.08
Sand, coarse-grained; cobble (5cm)0.06	Clay, dark-gray (2.5Y 4/1), silty; shelly medium- to coarse-grained sand this interval at 0.08-0.11m; silty sand pods at 0.12-0.17m and 0.043-0.45m1.20
Clay, dark-gray (5Y 4/1), silty; and fine- to very-fine-grained sand laminations up to 3cm thick0.65	Clay, dark-gray (2.5Y 4/1), silty; small well compacted sand pod this interval at 0.03-0.05m2.95
Sand, dark-gray (5Y 4/1), very-coarse-grained; and gravel; large shell fragments up to 8cm; silty clay lens this interval at 0.44-0.45m0.45	Silt, sandy; various amounts of fine sand0.32
Sand, gray (5Y 5/1), coarse- to medium-grained0.53	Cobbles to coarse-grained sand; (quartz); small mud pod this interval at 0.10-0.15m0.30
CORE C26	CORE C28
Sand, olive-gray (5Y 5/2), fine- to very-fine-grained; micaceous; fine-grained sand with shell hash; fragments up to 1cm this interval at 1.10-1.14m and at 1.26-1.28m; silty, fine-grained sand laminations 1cm thick at 1.20-1.25m; silty clay layer at 1.60-1.64m; color changes to dark-gray (5Y 4/1) at 1.24m1.71	Sand, medium- to fine-grained; colors as follows: light-olive-gray (5Y 6/2) up to 0.28m, dark-gray (5Y 4/1) up to 1.30m, light-olive-gray (5Y 6/2) up to 1.59; shell fragment 2cm long this interval at 0.44m; exhibits planer bedding at 0.50-0.60m; silty clay layer thins from 3cm to <0.05cm at 1.99-2.02m2.12
Sand, fine- to very-fine-grained; micaceous; some scattered shell fragments; shell fragments up to 8cm long this interval at 0.20-0.25m concentration of shell fragments at 0.33-0.36m0.69	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; scattered shell fragments <0.05cm; concentration of shell fragments some medium-grained sand this interval at 1.62-1.72m; grading into below2.08
Sand, medium-grained; shell fragments up to 2cm and clay balls 2cm dia0.13	Sand, medium- to coarse- grained0.15
Sand, fine-grained; silty; silty clay pod this interval at 0.16-0.32m; silty clay layers at 0.72-0.75m and 0.84-0.87m0.90	Sand, dark-gray (5Y 4/1), fine- to medium-grained with inter-laminations silty clay; silty clay 3mm-1cm thick; sand 1-3cm thick0.67
Clay, very-dark-gray (5Y 3/1), silty; laminations of silty fine-grained sand; sand laminations up to 1cm thick; color changes to dark gray (5Y 4/1) this interval at 0.16m0.63	Sand, dark-gray (5Y 4/1), medium-grained; scattered shell fragments up to 1cm0.26
Sand, fine-grained; silty; with silty clay laminations; clay	

Thickness (meters)	Thickness (meters)
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; silty; widely scattered shell fragments; becomes slightly coarser this interval at 5.75m1.00	Run-2 penetration-3.11m, recovery-2.99m Sand, dark-gray (5Y 4/1), fine-grained; some silt; shell fragments up to 2mm; plastic plug this interval at 0.35-0.45m0.45
CORE C29	Sand, dark-gray (5Y 4/1), fine-grained; silty; scattered shell fragments <1mm; very moist to wet (high water content)1.51
Sand, olive-gray (5Y 5/2), medium- to fine-grained; some silt; scattered shell fragments up to 2mm; concentration of fragments this interval at 0.98-1.02m; and at 0.95-1.45m (these up to 3cm); color changes to dark gray (5Y 4/1) at 1.50m2.33	Silt; sandy, fine-grained; scattered shell fragments <1mm0.27
Clay, dark-gray (5Y 4/1), silty; well-compacted; less compacted mud pods this interval at 0.18m and 0.32m and 0.57m; fine-grained sand pod at 2.27m (2mm thick)2.89	Sand, coarse-grained; silty; shell fragments <2mm; upper contact at 45 degree angle0.16
CORE C30	Silt; sandy, fine-grained; shell fragments <1mm0.06
Clay, dark-gray (5Y 4/1), silty; scattered shell fragments <1mm; fine-grained sandy silt layer 3cm thick at a 45 degree angle this interval at 0.20m0.34	Sand, coarse-grained; silty; upper contact at 45 degree angle0.09
Sand, fine-grained; silty; shell fragments up to 3cm; peice of wood 2cm long this interval at 0.08m0.44	Sand, dark-gray (5Y 4/1), fine-grained; silty; scattered shell fragments up to 4cm.....0.26
Clay, dark-gray (5Y 4/1), silty with interlayers and silty fine-grained sand; with scattered shell fragments up to 1mm; clay layers 4-5cm; sand layers 15-20cm0.56	CORE C32
Clay, dark-gray (5Y 4/1), silty0.14	Sand, dark-gray (5Y 4/1), fine-grained; silty; scattered shell fragments up to 2mm; large shell fragment (3cm long) this interval at 0.70m; becomes coarser at 0.85-1.05m1.17
Sand, fine-grained; silty; scattered shell fragments to 1mm0.29	Silt; fine-grained, sandy; scattered shell fragments <1mm0.11
Clay, dark-gray (5Y 4/1), silty; widely scattered shell fragments <1mm well compacted; shell fragment 2cm long this interval at 0.74m1.69	Sand, dark-gray (5Y 4/1), coarse-grained; silty; grading into fine-grained sand this interval at 0.04m; scattered shell fragments up to 3mm.....0.28
Clay, dark-gray (5Y 4/1), silty; shell fragments absent; air pockets in center of core this interval at 0.13-0.17m and 0.46-0.64m1.64	Sand, fine-grained; scattered shell fragments0.49
CORE C31 RUN-1, RUN-2	Clay, silty0.05
Run-1	Sand, fine-grained; scattered shell fragments0.14
Sand, pale-yellow (5Y 7/4), medium-grained; scattered shell fragments up to 1mm; clam shell 3cm this interval at 0.31m; color changes to very-dark-gray (5Y 3/1) at 0.15-1.20m (bioturbation), pale-yellow (5Y 7/4) at 1.20-1.40m, dark-gray (5Y 4/1) at 1.45-2.00m (bioturbation); medium- to coarse- grained sand with higher concentration of shell fragments at 2.40-2.54m, and at 2.87-2.92m3.05	Clay, dark-gray (5Y 4/1); several <1mm, silty -and laminations; silty, fine-grained sand layer this interval at 0.17-0.18m; concentration of shell at bottom contact0.25
	Sand, dark-grayish-brown (2.5Y 4/2), fine-grained; micaceous; silty; silty-clay lamination (1mm thick) this interval at 0.14m; horizontal bedding visible; color changes to light-olive-brown (2.5Y 5/4) at 0.11m0.16
	Clay, light-olive-brown (2.5Y 5/4), silty; becomes coarser from 0.30m and down; color changes several times in this interval to gray (5Y 5/1) at 0.04m; and dark-gray (5Y 4/1) at 0.05m; and dark-grayish-brown (2.5Y 4/2) at 0.30m0.45

Thickness (meters)	Thickness (meters)
Sand, dark-gray (5Y 4/1), very-fine-grained; silty; micaceous; color changes several times in the interval from 0.13m to bottom alternating colors of olive gray (5Y 4/2) and yellowish-brown (10YR 5/8) with fine material related to darker color and coarser material related to lighter colors0.40	Sand, dark-olive-gray (5Y 3/2), coarse-grained; and gravel; abundant shell fragments up to 5cm long; pod of mud this interval at 0.06m0.31
Sand, laminations of silty, fine-grained and medium-grained; laminations range from 1mm to 0.5cm thick0.15	Sand, dark-gray (2.5Y 4/0), fine-grained; very silty; mud pods; scattered shell fragments0.53
Sand, medium- to coarse-grained; and gravel; (rounded)0.06	Silt, clayey; interlayered with silty clay, layers range 1-2cm; shell absent0.13
Sand, fine-grained; micaceous; mud lens <1mm this interval at 0.04m0.04	Clay, very-dark-gray (2.5Y 3/0), silty; grading into below0.15
Sand, medium- to coarse-grained; and gravel0.03	Sand, dark-gray (5Y 4/1), fine-grained; silty; becomes less silty with depth; pod of mud this interval at 0.91m1.34
Sand, medium-grained0.08	Sand, dark-gray (5Y 4/1), fine-grained; gravelly0.17
Sand, medium-grained; and gravel0.04	Gravel, black (2.5Y 2/0); with silty fine-sand; scattered shell fragments0.32
Clay, fine-grained sand lenses.....0.08	Silt, clayey; more clayey at top; some gravel at bottom0.16
Sand, olive-gray (5Y 4/2), fine-grained; some silt; micaceous0.54	Gravel, with silty fine-grained sand; scattered shell fragments; gravelly silt layer this interval at 0.14-0.15m; higher concentration of shell fragments with some medium-grained sand toward bottom0.26
Sand, dark-gray (2.5Y 4/0), fine-grained; some silt; micaceous; begin to have shell fragments with increasing concentration with depth0.20	Silt, black (2.5Y 2/0), clayey0.06
Shell hash; some fine-grained sand; mostly bivalves up to 1cm with trace gravel0.26	Gravel and shell fragments, with silty fine-grained sand and some medium-grained sand0.25
Sand, dark-gray (2.5Y 4/0), very-fine-grained; silty; micaceous; widely scattered shell fragments; shelly layer this interval at 0.10-0.12m0.57	Clay, silty; interlayered with clayey silt; with gravel; shows horizontal bedding0.07
CORE C33	Gravel and scattered shell fragments; with medium- to coarse-grained sand and silt0.17
Sand, black (2.5Y 6/0), fine-grained; silty; widely scattered shell fragments; interlayers of silty clay ranging from 0.5-6.0cm thick this interval from 0.0-0.95m; silty-clay layers at 0.32-0.38m, and 0.45-0.48m (with .5cm layer of coarse-grained sand below), and 0.64-0.67m; silty, fine- to medium-grained sand layer at 0.50-0.57m; medium-grained sand with shell fragments up to 4cm some silt at 0.68-0.73m; color changes to dark-gray (2.5Y 4/0) at 0.48m1.54	Sand, gray (5Y 5/1), interbedding of silty, fine- and medium-grained; clay ball this interval at 0.09m0.10
Sand, fine-grained; silty0.34	Sand, gray (5Y 5/1), medium- to fine-grained; and gravel; trace clay; abundant shell fragments0.17
Clay, silty0.03	CORE C34
Sand, fine-grained; silty0.04	Sand, olive-gray (5Y 5/2), medium-grained; trace of coarse- and fine-grained sand; widely scattered shell fragments2.20
Clay, silty; with several fine-grained sand lenses0.05	Sand, fine- to medium-grained; widely scattered shell fragments; mud lamination up to 2mm thick this interval at 0.15m; higher percent of medium sand at 0.20-0.27m0.27

Thickness (meters)	Thickness (meters)
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; widely scattered shell fragments; layer of abundant shell fragments 2cm thick this interval at 0.43m1.05	Run-2 jetted-1.13m, penetration-2.41m, recovery-1.37m Sand, pale-olive (5Y 6/3), medium-grained; scattered shell fragments; plastic plug this interval at 0.22-0.32m; color changes to olive-gray (5Y 5/2) this interval at 0.15m; silty-clay pod with color of dark-gray (5Y 4/1) this interval at 1.02m; grades into below1.15
Sand, medium-grained; shell fragments0.02	Sand, fine- to medium-grained; scattered shell fragments0.23
Sand, dark-gray (5Y 4/1), very-fine-grained; silty; with layers of medium-grained sand and shell fragments this interval at 0.13-0.14m, and 0.23-0.26m; pod of coarse-grained sand at 0.33-0.38m; 0.5cm thick layer of silty clay at 0.39m0.39	Run-3 jetted-2.35m, penetration-3.08, recovery-1.07m NOTE: top 0.4m of tube empty; measurements not exact; core disturbed
Sand, olive-gray (5Y 5/2), coarse-grained; shell fragments; several mud pods0.17	Sand, olive (5Y 5/3), medium-grained; abundant shell fragments; color changes to gray (5Y 5/1) this interval at 0.55m1.03
Sand, fine-grained; and shell fragments0.06	Sand, dark-gray (5Y 4/1), fine-grained; abundant shell fragments0.33
Sand, olive-gray (5Y 5/2), coarse-grained; abundant shell fragments0.11	Run-4 jetted-2.99m, penetration-3.96m, recovery-1.01 Sand, gray (5Y 5/1), fine- to medium-grained; abundant shell fragments; darker colored parting this interval at 0.33m; plastic plug this interval at 0.77-0.87m1.00
Sand, dark-gray (5Y 4/1) very-fine-grained; silty0.52	
CORE C35	
Sand, medium-grained; in mud matrix; shell fragments up to 4cm0.08	CORE C37
Clay, very-dark-gray (5Y 3/1); pods and discontinuous laminations of fine-grained sand common; pods toward surface contain medium-grained sand and mud; scattered fragments of wood this interval at: 1.15-1.20m, and 1.35-1.56m, and 1.80-1.95m; color changes to dark-gray (5Y 4/1) at 0.80m; abundant fine-grained sand laminations at 4.15-4.60m; sand laminations increase in thickness and interlayers of clay become more silty and thinner at 5.25-5.42m5.42	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; scattered shell fragments; concentration of shell fragments mostly <i>Ensis</i> this interval at 0.12-0.14m; laminations of silty clay up to 2cm thick at 0.53-0.65m and 1.29-1.30m grading into below2.00
Sand, gray (5Y 5/1), medium- to fine-grained; grading to very-fine-grained sand at bottom; interlayered mud and fine-grained sand this interval at 0.35-0.38m, and 0.42-0.46m; trace of gravel at bottom contact this interval at 0.48m0.48	Sand, dark-gray (5Y 4/1), medium- to fine-grained; shelly layer in sand matrix, fragments up to 3cm this interval at 0.45-0.53m; shell layer in sand matrix, gastropods and bivalves up to 8cm at 0.75-0.80m0.82
Clay, silt matrix; pods of green, compacted clay; scattered shell fragments; colors: clay, dark-greenish-gray (5GY4/1); silt, dark-gray (5Y 4/1)0.12	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; silty sand layer this interval at 0.31-0.33m; silty clay layers at 0.46 and 0.56 (1cm)2.14
CORE C36 RUN-1, RUN-2, RUN-3, RUN-4	CORE C38
Run-1	Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous; <i>Ensis</i> shell fragment 4cm long this interval at 0.81-0.84m1.03
Sand, olive (5Y 5/3), medium- to coarse-grained; abundant shell fragments up to 5cm; abundant fine- to medium-grained sand, coarse-grained sand common this interval at 0.72m1.25	Sand, dark-olive-gray (5Y 3/2), coarse-grained; some gravel0.08
	Sand, medium-grained; silty0.03
	Sand, medium- to coarse-grained; shell fragments up to 4cm0.06

Thickness (meters)	Thickness (meters)
Sand, very-dark-gray (5Y 3/1), medium- to fine-grained; silty clay this interval at 0.00-0.01m0.22	CORE C41
Sand, very-dark-gray (5Y 3/1), medium-grained0.11	Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; silty; micaceous; widely scattered shell fragments; in this interval: 1cm wide layer abundant shell fragments <1cm oriented at 45 degree angle at 0.30-0.35m, horizontal layer of abundant shell fragments 1cm at 0.42-0.44m, abundance of <i>Ensis</i> at 0.20m1.31
Sand, very-dark-gray (5Y 3/1), fine- to very-fine-grained; micaceous0.30	Sand, dark-greenish-gray (5GY 4/1), fine- to very-fine-grained; micaceous; silty; widely scattered shell fragments up to 1cm; in this interval: decrease in sand and increase in clay content at 0.37m; silty clay with scattered occurrences of very-fine-grained sand at 0.55m; scattered coarse grains of sand below 0.54m0.74
Clay, silty; some fine-grained sand; micaceous0.15	Clay; some silt0.17
Sand, coarse-grained; silty; and gravel; shell fragments up to 7cm0.21	Sand, gray (5Y 5/1), medium- to coarse-grained; and gravel, scattered shell fragments <1cm0.36
Clay, dark-gray (5Y 4/1), slightly silty; high degree of compaction; small pods of coarse-grained sand this interval at 1.64-1.74m; 0.5cm thick layer of shell fragments this interval at 3.20m 3.96	Sand, medium- to coarse- grained0.03
CORE C39	Sand, gray (5Y 5/1), fine- to very-fine-grained; widely scattered shell fragments up to 1cm; gathering of shell fragments including 3cm <i>Ensis</i> this interval at 1.14m1.36
Sand, dark-gray (5Y 4/1), very-fine-grained; massive; scattered shell fragments up to 4cm <i>Ensis</i> ; dark band this interval at 0.10-0.12m1.54	CORE C42
Sand, medium-grained; and gravel; shell fragments0.05	Sand, very-dark-gray (2.5Y 3/1), very-fine- grained; micaceous0.13
Sand, fine- to very-fine-grained; some medium-grained sand; micaceous0.22	Sand, coarse-grained; and gravel; shell fragments up to 1cm0.02
Sand, coarse- to medium-grained; trace of gravel0.03	Sand, medium- to fine-grained0.05
Sand, dark- gray (5Y 4/1), fine- to very-fine-grained; micaceous; scattered shell fragments; trace of subrounded gravel; concentration of gravel and shell fragments up to 4cm this interval at 0.46-0.56m; piece of wood 4cm long at 1.28m; concentration of bivalve shells at 2.05-2.08m; layer of silty, fine-grained sand at 2.79-2.84m; layer of silty clay at 2.89-2.95m; shell hash with fragments up to 3cm with coarse-grained sand at 3.29-3.34m; laminations of silty clay and silty, fine-grained sand up to 1cm thick at 3.42-3.46m3.59	Clay, dark-gray (2.5Y 4/1); laminations of medium- to fine-grained sand and silty-clay up to 2cm thick0.28
CORE C40	Sand, coarse-grained; shelly; shell fragments up to 2cm0.09
Sand, dark-gray (5Y 4/1), very-fine-grained; micaceous; massive; widely scattered shell fragments1.45	Sand, dark-gray (2.5Y 4/1), fine-grained; micaceous; scattered shell fragments; silty sand layer this interval at 0.15m1.00
Sand, dark-gray (5Y 4/1), very-fine-grained; micaceous; massive; scattered shell fragments up to 1cm; several pods of silty, fine-grained sand this interval at 0.55-0.70m; 1cm wide shell layer (clams 1cm at an angle) at 0.80m1.53	Sand, medium- to fine-grained; micaceous0.48
Sand, dark-gray (5Y 4/1), very-fine-grained; micaceous; massive; widely scattered shell fragments; 1cm thick lenses of silty fine-grained sand common1.49	Sand, dark-gray (5Y 4/1), medium- to fine-grained; micaceous; shell fragments up to 2cm0.25
	Sand, dark-gray (5Y 4/1), very-fine -grained; micaceous; variable amounts of silt and clay along core; in this interval: silty sand at 0.00-0.40m, clayey sand at 0.40-0.70m; silty sand at 0.70-0.81m0.81

	Thickness (meters)
Sand, very-fine-grained; silty; clayey; variable amounts of silty clay along the core, no lamination pattern, looks like disrupted lenses of sand, silt and clay; in this layer: silty clay layer at 0.05-0.07m; gastropod at 0.27m	1.52
Clay, dark-gray (5Y 4/1), silty; pods and stringers of silty fine-grained sand; scattered shell fragments 1mm along clay/sand boundary; in this interval: 3cm pebble at 0.92m; becoming more sandy at 1.17m	1.38
Sand, gray (5Y5/1), medium- to fine-grained; micaceous	0.11

CORE C43

Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; mud pod this interval at 0.78-0.80m; layer of coarse shelly sand, shell fragments up to 6cm at 1.24-1.30m	1.77
Sand, fine-grained; widely scattered shell fragments; shell fragments up to 3cm this interval at 1.48m	1.48
Sand, fine-grained; interlaminated with silty clay; laminations up to 2cm thick	0.25
Sand, dark-gray (2.5Y 4/1), very-fine-grained; micaceous; with silty sand and clay laminations up to 3cm long	1.67

CORE C44

Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; shelly layer 2cm thick this interval at 0.23m	1.56
Sand, coarse-grained; shelly; fragments up to 8cm	0.09
Sand, dark-gray (5Y 4/1), medium- to fine-grained; micaceous; abundant shell fragments; shell fragments up to 5cm throughout; shelly sand layers this interval at 0.13-0.17m, 1.48-1.52m, and 1.73-1.79m; abundance of bivalve shells this interval at 1.87-2.05m	2.35
Sand, coarse-grained; interlaminated with silty clay; laminations up to 10cm thick; coarse-grained sand - color gray (5Y 6/1); silty sand - color gray (2.5Y 5/1); piece of wood (sample taken) 6cm long this interval at 0.80m	1.15
Sand, dark-gray (5Y 4/1), medium- to fine-grained; widely scattered shell fragments	0.09

CORE C45

Sand, fine- to very-fine-grained; micaceous	0.02
Sand, coarse- to medium-grained; scattered shell fragments up to 1mm	0.08
Sand, fine- to very-fine-grained; micaceous; scattered shell fragments	0.05
Sand, very-dark-gray (2.5Y 7/0), muddy; some shell fragments	0.10
Clay, dark-gray (5Y 4/1), silty; with laminations of shell hash and silty sand up to 2cm thick	1.20
Clay, silty; laminations of muddy sand up to 3cm	0.15
Sand, dark-gray (5Y 4/1), medium-grained; scattered shell fragments	0.61
Sand, coarse-grained; shell fragments up to 7cm, gastropod and bivalve	0.15
Sand, dark-gray (5Y 4/1), medium- to fine-grained; scattered shell fragments; silty clay lense up to 2mm this interval at 0.59m	1.14
Sand, coarse-grained; abundant shell fragments up to 5cm, bivalves	0.22
Sand, gray (5Y 5/1), medium-grained; silty fine-grained sand layer showing more compaction this interval at 0.30-0.38m	0.49

CORE C46

Sand, dark-gray (5Y 4/1), fine-grained; micaceous; scattered shell fragments; in this interval: concentration of shell fragments at 0.30-0.40m, silty clay with very fine-grained sand at 0.40-0.44m	0.76
Sand, coarse-grained; shelly; silty clay; shell fragments up to 4cm	0.19
Clay, silty; scattered shell fragments	0.10
Sand, silty; scattered shell fragments	0.10
Sand, silty; with laminations of silty clay up to 2cm	0.16
Sand, dark-gray (5Y 4/1), medium-grained; scattered shell fragments	0.24
Sand, gray (5Y 5/1), medium-grained; small amount of silt and clay; scattered shell fragments; shell hash this interval at 0.05-0.11m	0.34

Thickness (meters)	Thickness (meters)
Sand, gray (5Y 5/1), fine-grained; laminated with silty clay; laminations range from 2-10cm; shell hash with fine-grained sand this interval at 0.32-0.36m1.21	plastic plug at 0.47-0.57m; large shell fragment 5cm at 1.42m; layer of dark gray coarse to medium-grained sand, olive gray (5Y 4/2) at 1.50-1.66m; and 1.70-2.02m2.02
Clay, gray (5Y 5/1), silty; laminations of fine-grained sand; laminations range from 1-5cm; in this interval: coarse-grained sand layer at 0.36-0.42m; pod of coarse-grained shelly sand at 1.38-1.42m; shell fragment 5cm at 1.60m1.68	Sand, dark-gray (5Y 4/1), coarse- to medium-grained; scattered shell fragments; pods of light brownish gray (2.5Y 6/2)1.00
Sand, coarse-grained; shelly; fragments up to 4cm0.06	Sand, fine- to medium-grained0.13
Sand, dark-gray (5Y 4/1), medium-grained; scattered shell fragments <1mm0.48	Sand, dark-gray (5Y 4/1), coarse- to medium-grained; pods of light-brownish-gray (2.5Y 6/2); layer of medium- to fine-grained sand this interval at 0.25-0.27m; fine sandy silt at 0.71-0.74m0.80
Sand, medium- to fine-grained; with silty clay laminations up to 2cm0.16	Run-3 jetted-4.24m, penetration-6.04m, recovery-1.22m
Sand, coarse-grained; abundant shell fragments; silty clay layer this interval at 0.03-0.05m0.28	Sand, olive-gray (5Y 4/2), medium- to fine-grained; widely scattered shell fragments in this interval, becoming coarse- to medium-grained at 1.40m; becomes very shelly, fragments up to 1.5cm grayish brown (2.5Y 5/2) at 1.60m1.91
Sand, medium- to fine-grained; scattered shell fragments about 1mm0.36	Sand, dark-gray (5Y 4/1), medium- to fine-grained; plastic plug this interval at 0.11-0.19m0.27
CORE C47	
Sand, dark-gray (5Y 4/1), fine- to very-fine-grained; micaceous; silty-clay lamination this interval at 0.40-0.43m0.56	CORE C49
Clay, dark-gray (5Y 4/1), slightly silty; with laminations of coarse- and fine-grained sand; laminations range from 1-5cm; several large shell fragments up to 8cm this interval at 0.99m1.84	Sand, light-olive-gray (5Y 6/2), medium- to coarse-grained; widely scattered shell fragments0.50
Sand, coarse-grained; shelly; scattered shell fragments up to 5cm; silty-clay layer this interval at 0.20-0.30m0.45	Sand, olive-gray (5Y 5/2), medium- to coarse-grained; widely scattered shell fragments in this interval; color mottle of light-olive-gray (5Y 6/2) at 0.20-0.25m; larger percentage of coarse-grained sand near bottom1.11
Sand, gray (5Y 5/1), medium- to coarse-grained; widely scattered shell fragments up to 1mm; trace of subangular gravel0.70	Sand, dark-gray (5Y 4/1), coarse- to medium-grained; scattered shell fragments up to 1cm1.52
CORE C48 RUN-1, RUN-2, RUN-3	
Run-1	Silt, very clayey0.02
Sand, light-olive-brown (2.5Y 4/4), medium- to coarse-grained; scattered shell fragments up to 2cm0.82	Sand, olive-gray (5Y 5/2), fine- to medium-grained; scattered shell fragments; becomes finer toward bottom; shell fragments to 2.5cm0.86
Sand, olive-gray (5Y 4/2), fine- to coarse-grained; fewer scattered shell fragments than above1.06	Sand layers, dark-gray (5Y 4/1), fine-grained and silty, fine-grained0.13
Run-2 jetted-1.92m, penetration-4.39m, recovery-3.99m	Clay, silty; pods of medium- to coarse-grained shelly sand; shell fragments up to 3cm0.21
Sand, light-olive-gray (5Y 6/2), coarse- to medium-grained; with pods of darker colored coarse- to medium-grained sand; trace of shell fragments up to 2mm; in this interval:	Clay, gray (5Y 5/1), silty; pods of silty fine shelly sand0.22
	Clay, silty; and shelly medium- to fine-grained sand in patches; gravel in medium- to fine-grained sand ; shells up to 3cm0.56

	Thickness (meters)
Sand, fine- to very-fine-grained; micaceous; widely scattered shell fragments up to 0.5cm	0.61
 CORE C50	
Silt, dark-gray (5Y 4/1); micaceous; with very-fine-grained sand and clay; pod of fine-grained sand this interval at 0.42m; grading into below	0.54
Clay, silty; micaceous	0.30
Sand, very-dark-gray (5Y 3/1), mottles of fine-grained sand and clay; more sandy and less silty toward bottom	0.29
Clay, gray (5Y 5/1)	0.41
Clay, dark-gray (2.5Y 4/1), silty; well compacted	0.46
Clay	1.07
Clay, dark-gray (2.5Y 4/1), silty; well compacted; scattered shell fragments this interval at 0.18m and 0.53m	1.53
Clay, silty; compacted; shell concentrations this interval at 0.54m and 0.70m	1.11
Clay, very-dark-gray (5Y 3/1), silty; fine-grained sandy	0.06
Shell hash, dark-gray (5Y 4/1), in clay matrix	0.39