DIVISION OF LAND RESOURCES
DEPARTMENT OF ENVIRONMENT,
HEALTH, AND NATURAL RESOURCES

SUBSURFACE STRATIGRAPHIC FRAMEWORK FOR CENOZOIC STRATA IN BRUNSWICK AND NEW HANOVER COUNTIES, NORTH CAROLINA

BY

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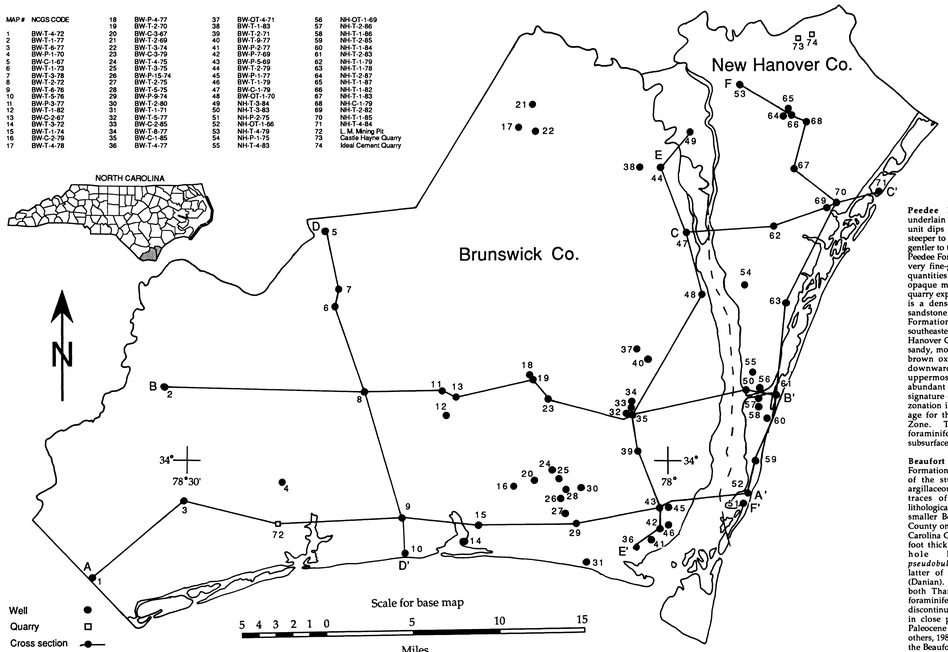
MAP #	NCGS CODE							
1	BW-T-4-72	18	BW-P-4-77	37	BW-OT-4-71	56	NH-OT-1-69	
2	BW-T-1-77	19	BW-T-2-70	38	BW-T-1-83	57	NH-T-2-86	
3	BW-T-6-77	20	BW-C-3-67	39	BW-T-2-71	58	NH-T-1-86	
4	BW-P-1-70	21	BW-T-2-69	40	BW-T-9-77	59	NH-T-2-85	
5	BW-C-1-67	22	BW-T-3-74	41	BW-P-2-77	60	NH-T-1-84	
6	BW-T-1-73	23	BW-C-3-79	42	BW-P-7-69	61	NH-T-2-83	
7	BW-T-3-78	24	BW-T-4-75	43	BW-P-5-69	62	NH-T-1-79	
8	BW-T-2-72	25	BW-T-3-75	44	BW-T-2-79	63	NH-T-1-78	
9	BW-T-6-76	26	BW-P-1-5-74	45	BW-P-1-77	64	NH-T-2-87	
10	BW-T-5-76	27	BW-T-2-75	46	BW-T-1-79	65	NH-T-1-87	
11	BW-P-3-77	28	BW-T-5-75	47	BW-C-1-79	66	NH-T-1-82	
12	BW-T-1-82	29	BW-P-9-74	48	BW-OT-1-70	67	NH-T-1-83	
13	BW-C-2-67	30	BW-T-2-80	49	NH-T-3-84	68	NH-C-1-79	
14	BW-T-3-72	31	BW-T-1-71	50	NH-T-3-83	69	NH-T-2-82	
15	BW-T-1-74	32	BW-T-5-77	51	NH-P-2-75	70	NH-T-1-85	
16	BW-C-2-79	33	BW-C-2-85	52	NH-OT-1-66	71	NH-T-4-84	
17	BW-T-4-78	34	BW-T-8-77	53	NH-T-4-79	72	L. M. Mining Pit	
		35	BW-C-1-85	54	NH-P-1-75	73	Castle Hayne Quarry	
		36	BW-T-4-77	55	NH-T-4-83	74	Ideal Cement Quarry	



INTRODUCTION

The purpose of this reconnaissance study is to identify and delineate Cenozoic formations and informal stratigraphic units in Brunswick and New Hanover Counties, North Carolina. Interpretations of the shallow subsurface stratigraphic framework are based on study of well samples, cores, and geophysical well logs from the North Carolina Geological Survey's sample repository and from limited field work. Age control is based on foraminiferal biostratigraphy. Data from this study are on file at the Coastal Plain Office of the North Carolina Geological Survey.

Many of the wells in the study area penetrate the Upper Cretaceous Peedee Formation, but only the uppermost part of this formation is described in this report. Cross sections and selected structure contour and isopach maps display the extent of locally occurring stratigraphic units.

DESCRIPTION OF GEOLOGIC UNITS

Peedee Formation - The entire study area is underlain by the Peedee Formation. The top of this unit dips to the east-southeast; this dip is noticeably steeper to the east of the minus 20-foot contour, and is gentler to the west. Throughout much of the region the Peedee Formation is a gray or light-brown, silty, fine- to very fine-grained subangular quartz sand with trace quantities of glauconite, phosphorite, oyster shells, opaque mineral grains, and pyrite. In outcrop and quarry exposures in southwestern Brunswick County it is a dense, gray, carbonate-cemented, fine-grained sandstone. The Rocky Point Member of the Peedee Formation is the uppermost Cretaceous unit in southeastern Brunswick County and north central New Hanover County. The Rocky Point Member is a gray, sandy, moldic limestone, locally with orange or light-brown oxidation stains in upper part, that grades downward to a very calcareous sandstone. The uppermost part of this unit commonly contains abundant phosphorite which produces a distinctive signature on gamma ray logs. Planktic foraminiferal zonation indicates a late but not latest Maastrichtian age for the Peedee, within the *Gansserina gansseri* Zone. This age is consistent with other local foraminiferal zonations for the shallow and deep subsurface (Owens and Gohn, 1985; Zarra, 1989).

Beaufort Formation - An outlier of the Beaufort Formation (Paleocene) occurs in the southeast corner of the study area. In cores this unit is a gray, argillaceous siltstone to fine-grained sandstone with traces of glauconite, mica, or pyrite. This is lithologically similar to the fine-grained silty sands of a smaller Beaufort outlier shown in southern Pender County on the geologic map of North Carolina (North Carolina Geological Survey, 1985). A sample from a 20-foot thick section of the Beaufort Formation in core hole BW-P-5-69 contains *Morozovella pseudobulloides* and *Globoconusa daubjergensis*, the latter of which occurs only in planktic Zone P1 (Danian). Strata of the Pender County outlier contain both Thanetian (Zone P4) and Danian (Zone P1) foraminiferal assemblages. The Beaufort Formation is discontinuous throughout the study area; several cores in close proximity to BW-P-5-69 contain either no Paleocene strata, or a thin (8-inch) section (Harris and others, 1986) which is probably Beaufort. Correlation of the Beaufort Formation is facilitated by its stratigraphic position, sandwiched between a zone of phosphorite mineralization at the top of the Peedee Formation and a zone of phosphorite pebble conglomerate at the base of the Castle Hayne Formation, both of which produce a distinctive signature on gamma ray logs.

Castle Hayne Formation - The Castle Hayne Formation (Eocene) occurs in the eastern third of the study area where it is characterized by a variable thickness, as shown on the isopach map (highs and lows defined by single control points are not shown on this map). The proximal margin of this unit thins abruptly over much of the study area, coincident and on trend with the inflection at the minus 20-foot contour of the top of the underlying Peedee Formation. Sinkholes in the Castle Hayne occur to the north in Duplin County, to the northeast in Pender County, and in southwestern Brunswick County. A fossil sinkhole in the Castle Hayne is interpreted on cross section C - C'.

Control is generally sparse, and preservation of microfauna is generally poor. The most common benthic foraminifera in this unit are *Melonis planatus* and *Gyroidinoides octocameratus*. Correlations are based primarily on lithologic criteria. In an updip core (BW-C-1-85), the tan to cream bryozoan limestone of the Comfort Member and the phosphate-pebble conglomerate of the New Hanover Member (Ward and others, 1978) are distinct. In cuttings, the Castle Hayne is generally recognized as a light-gray or white moldic limestone or bryozoan-rich limestone. The limestone cuttings from the upper part of the Castle Hayne often contain traces of finely disseminated phosphate or glauconite. In some downdip wells the limestone section grades downward to a very calcareous fine-grained sandstone, and the limestone section is overlain by a thin silty fossiliferous clay. Similar lithologic trends were observed to the north in correlative strata in the deeper subsurface of Pamlico and Albemarle Sounds (Zarra, 1989). The high phosphate content of the New Hanover Member allows reliable correlations of gamma ray logs where the unit is present.

River Bend Formation - Local distribution of the River Bend Formation (Oligocene) is limited to part of southern New Hanover County. This unit was preserved in a shallow embayment into the underlying Castle Hayne Formation. The River Bend Formation is between 10 and 24 feet thick, with an average thickness of 12 feet. In cuttings, the River Bend is a white, sandy and slightly glauconitic moldic limestone, or a fine-grained, slightly shelly sandstone with traces of phosphate and glauconite. The sparse foraminiferal fauna includes the planktic species *Globigerina ciperoensis* and *G. angiporoides*, and the benthic species *Uvigerina tumeyensis* and *Textularia mississippiensis*. Results of this study show that strata mapped as Oligocene in the subsurface of southern Brunswick County by Brown and others (1972) actually encompass the Castle Hayne Formation and the Rocky Point Member of the Peedee Formation.

Earliest Miocene - A 20-foot-thick interval of earliest Miocene strata was observed in NH-OT-1-66. This unit is a fine-grained slightly shelly sand and light-brown slightly glauconitic clay. Planktic foraminifera from this interval include *Globigerinoides primordius*, *Globoratalia acrostoma*, *Chiloguembelina cubensis*, and *Cassigerinella chipolensis*. Age, lithology, and stratigraphic position of this unit indicate probable correlation with Haywood Landing Member of the Belgrade Formation of Ward and others (1978).

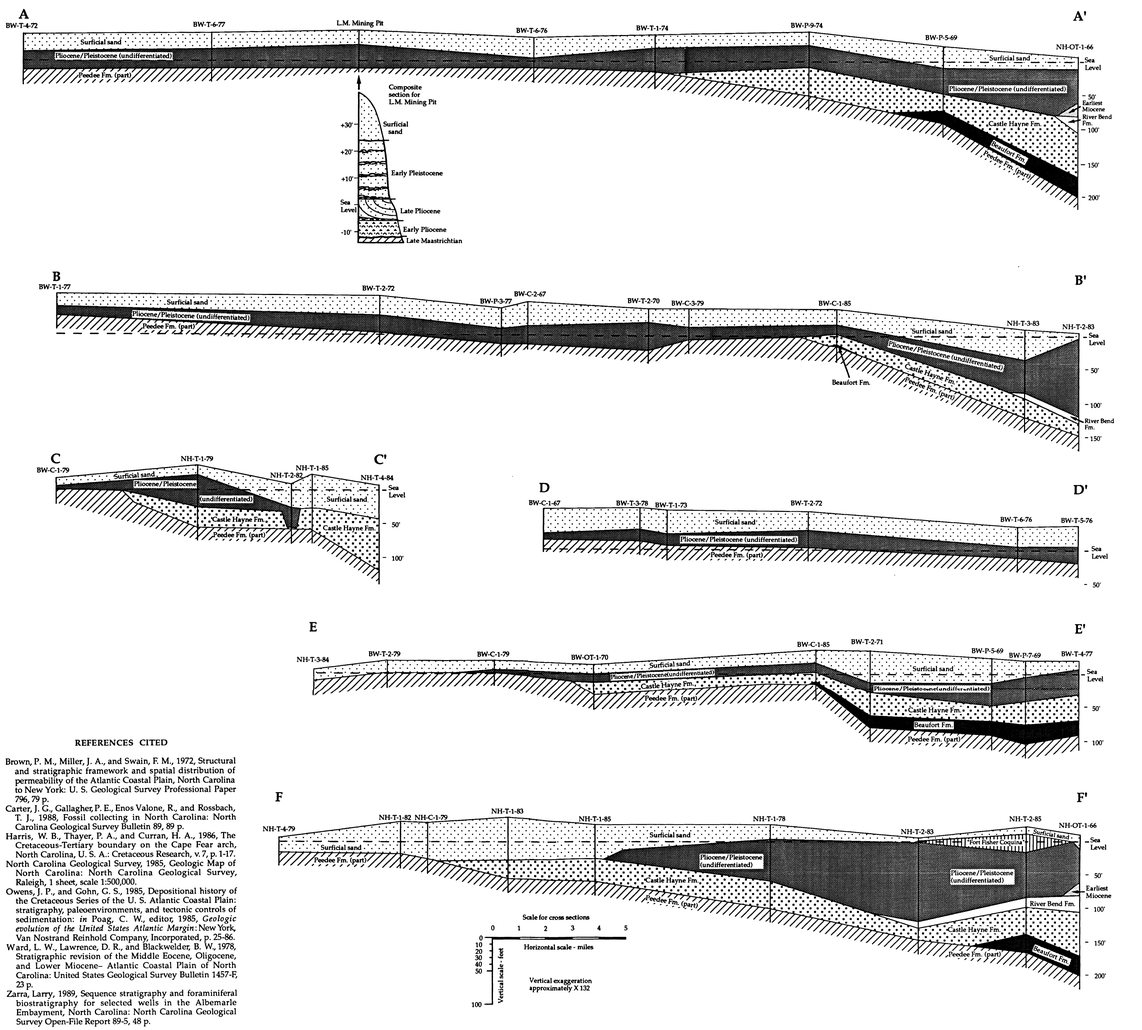
Pliocene/Pleistocene (undifferentiated) - The Pliocene and Pleistocene strata are shown as an undifferentiated unit on the cross sections and maps. Available logs and cuttings samples do not provide sufficient data to separate these strata into component formations. This unit covers most of the study area, but is absent in northern New Hanover County and northeastern Brunswick County. Generally a uniformly thin unit, the Pliocene/Pleistocene strata thicken to the east in southern New Hanover County.

The Pliocene/Pleistocene strata are made up of shelly quartz sands and shelly carbonates. The quartz sands are typically unconsolidated, fine grained, and contain well preserved whole shells to fragmental shell hash. In some localities the shells are stained black. The carbonates vary between loosely consolidated sandy shell hash and sandy marl to indurated sandy moldic limestone. Preservation of shells ranges from well preserved to chalky, abraded, or fragmental. Most shelly lithofacies contain abundant pelecypods, with a few percent gastropods, barnacle plates, and echinoid spines; however, in some wells carbonate lithofacies are dominated by bryozoans. Foraminifera are sparse in cuttings. *Elphidium* sp., *Quinqueloculina* sp., and *Ammonia beccarii* occur throughout the Pliocene/Pleistocene strata, and *Amphistegina* sp. commonly occurs in the carbonate lithofacies.

In the section exposed at the L. M. Mining Pit (see cross section A-A') the Pliocene/Pleistocene strata can be differentiated into three depositional sequences based on lithostratigraphy and foraminiferal biostratigraphy.

"Fort Fisher coquina" - Several wells and outcrops in southern New Hanover County contain this distinct unit which is exposed at Snows Cut and outcrops at Fort Fisher (Carter and others, 1988). The lithology is a coarse- to fine-grained, well rounded, pebbly shelly sandstone/coquina with calcareous cement. This unit is included in the isopach and structure contour maps of Pliocene/Pleistocene (undifferentiated) strata, but is differentiated on cross section F - F'.

"Surficial sands" - All of the wells encountered an unfossiliferous surficial unit which includes the modern surface and shallow subsurface sediments which overlie the older fossiliferous units. The surficial sand unit is generally a light-gray to light-yellow medium- to fine-grained sand with trace quantities of clay, opaque mineral grains, coarse-grained sand, pebbles, and feldspar. Peat is locally abundant.



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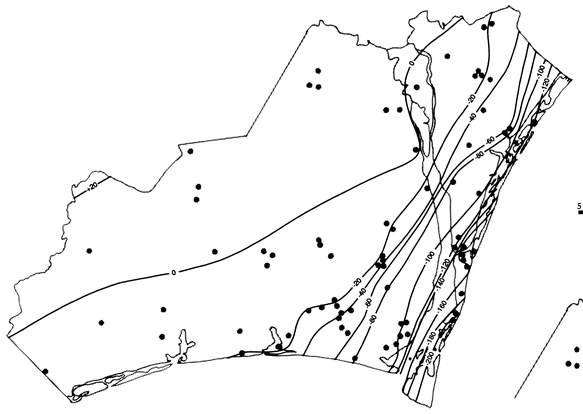

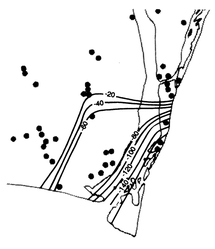

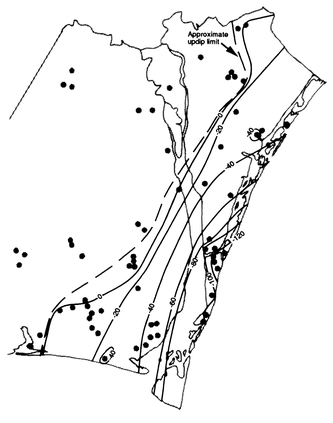

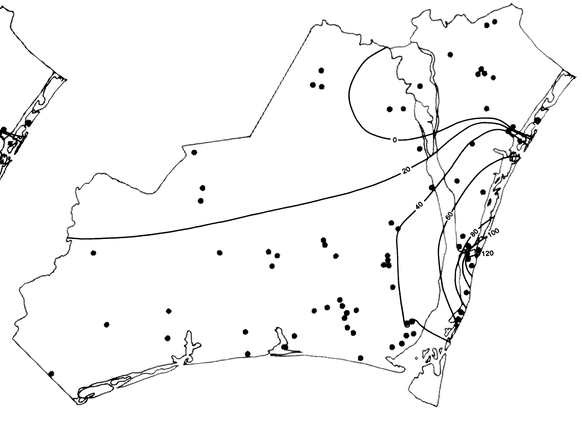

Scale for contour maps
5 4 3 2 1 0 5 10 15
Miles
Contours are in feet relative to sea level
Contour interval is 20 feet