Shallow subsurface geology of the North Charleston 7.5-minute quadrangle, South Carolina

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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Introduction

The area of the North Charleston 7.5-minute quadrangle is underlain almost entirely by middle to upper Pleistocene, marine to marginal marine sediments. Only two outcrops along tidal creeks are known to show any sign of Tertiary (Pliocene) sediments at the surface (NC-2, NC-4), though ephemeral outcrops are occasionally formed by construction projects (for example, NC-3). With the exception of these three localities, and the Pleistocene sections described in NC-1 and NC-46, the sections shown in this report were obtained by shallow augering with a truck-mounted, Mobile Drill B-40 power auger, using 5-foot stem sections. One stem was augered into the ground and then pulled to describe the soil profile. After this, a second run was made in which additional stems were added until either a chattering sound followed by a sudden tightening of the drill string occurred (penetration of the Ashley Formation) or until the vacated 5 feet of the first auger run was filled by rising sediment from the newly penetrated section. In the latter case (usually 4-6 flights, depending on the density of the material being augered), the stems were pulled and described (allowing for 5 feet of total rise during drilling). Usually the base of the Pleistocene section was penetrated by the third run; in exceptionally thick sections, the rest of the section was augered in 20 to 30 foot runs. For most of the sections (except NC-46), no attempt was made to describe sediments in any great detail. Grain sizes and sediment colors were estimated visually without

aid of grain-size or color charts. It is possible, therefore, that units described as "clays" may include clayey silts or clayey sands. Unit names conform to those used in Weems and Lemon (1984a, 1984b), with the addition of the term "Daniel Island beds" for dense, probably lower Pleistocene clays and sands which were encountered sporadically throughout the Cooper River valley.

In addition to the holes described in this text, a number of other data points represent various engineering borings and corings from the river and creek beds. These were included only when the descriptions clearly indicated where the contact between the Pleistocene and the underlying Tertiary units was located. The sources of this information are numerous and have not been designated in a specific manner on the accompanying maps.

It should be noted that in areas where the Tertiary Goose Creek Limestone is thick, the base of the Pleistocene does not correspond closely to the top of the "Cooper Marl" (here the Ashley Formation). In most older reports, the sediment column was considered to include only an overlying, unconsolidated Pleistocene cover and an underlying, well compacted Tertiary "Cooper Marl". In this report, however, a unit of intermediate age, the Pliocene Goose Creek Limestone, is widely recognized throughout this quadrangle. The Goose Creek is highly calcareous like the "Cooper Marl", though coarser grained, but it is only weakly compacted in most places and in this characteristic is rather more like the Pleistocene than the "Cooper marl". Therefore, when planning to erect a structure, the bearing

capacity and other engineering properties of the Goose Creek Limestone should be considered. If the properties of the Goose Creek are inadequate for specific purposes, the thickness of the Goose Creek should be added to the Pleistocene sediment thicknesses in order to arrive at the depth to firm "marl" foundation.

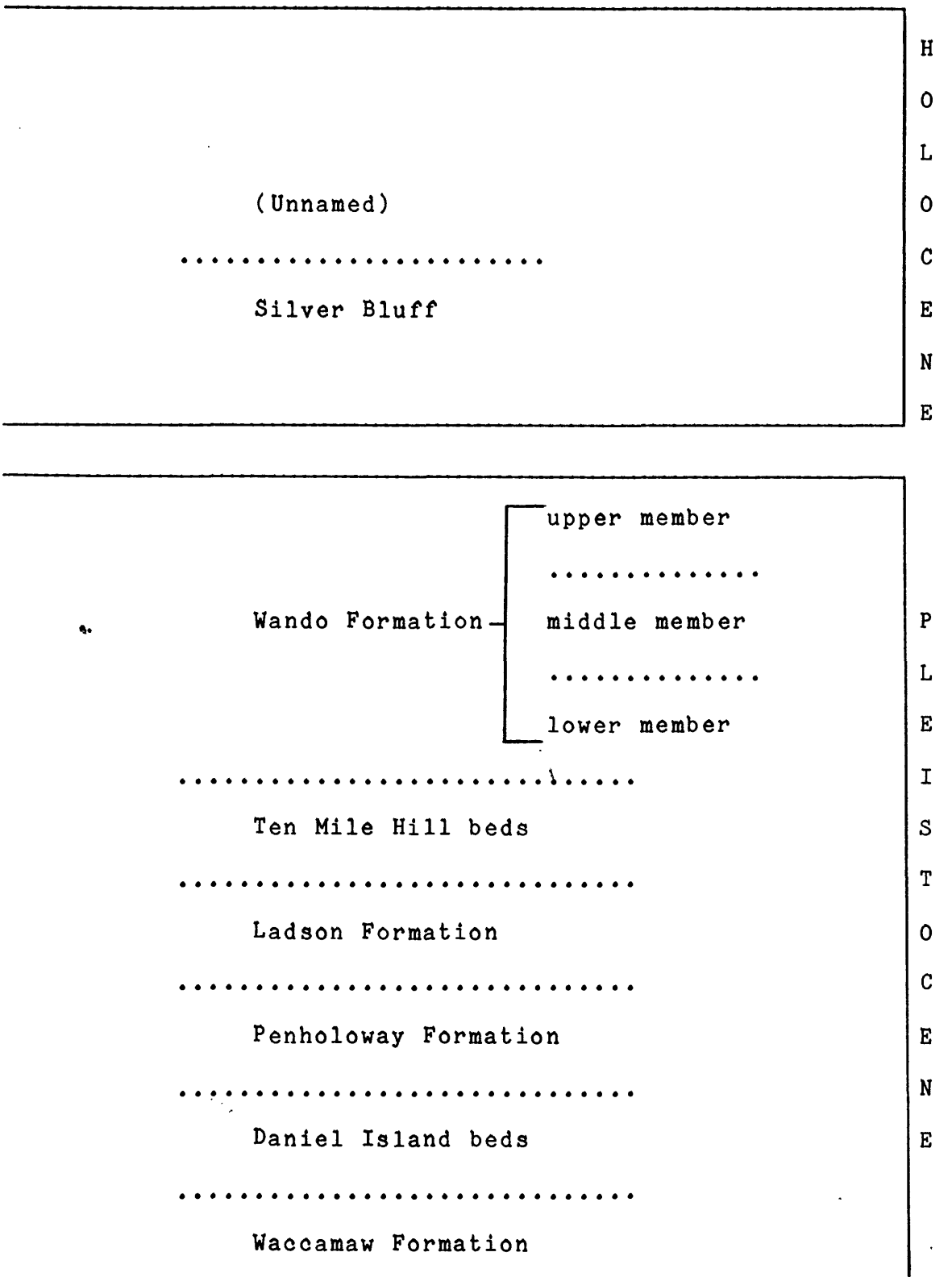
References cited

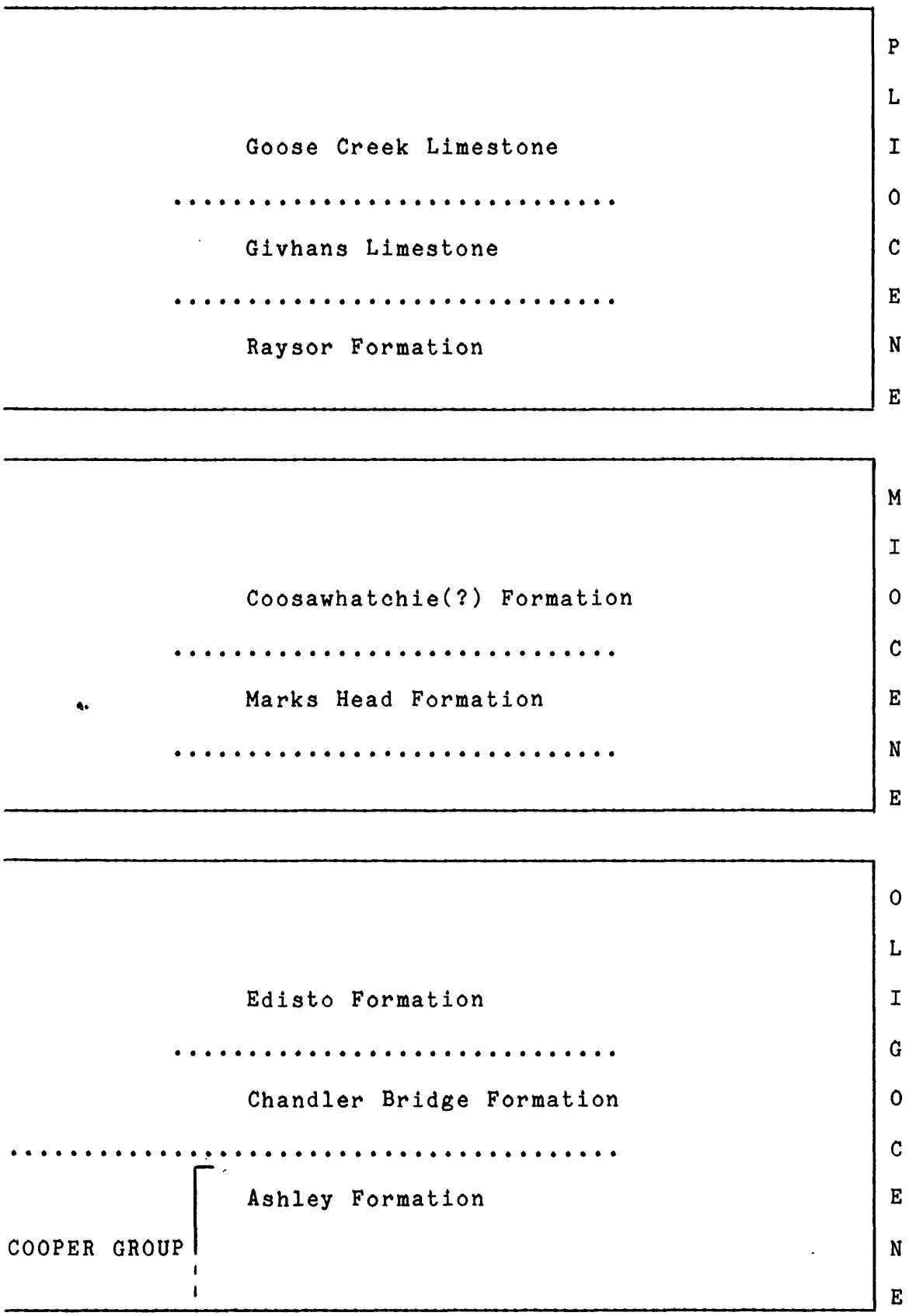
Weems, Robert E., and Lemon, E. M., Jr., 1984a, Geologic map of the Mount Holly quadrangle, Berkeley and Charleston Counties, S. C., with text (1:24,000): U. S. Geological Survey Geologic Quadrangle Map GQ-1579.

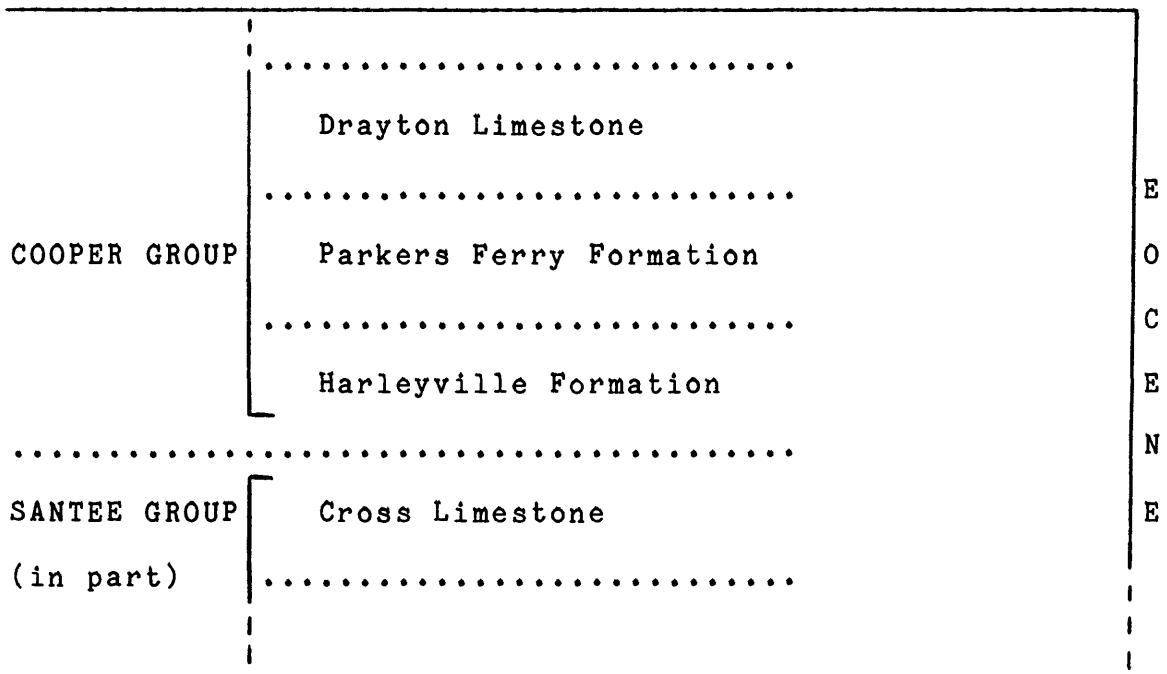
_____, 1984b, Geologic map of the Stallsville quadrangle, Charleston and Dorchester Counties, S. C., with text (1:24,000): U. S. Geological Survey Geologic Quadrangle Map GQ-1581.

Ages and Sequence of Regionally Recognized Geologic Units

(in any given section, many units will be missing due to erosion)




Goose Creek Limestone
Givhans Limestone
Raysor Formation
PLIOCENE
Coosawhatchie(?) Formation
Marks Head Formation
MIOCENE
Edisto Formation
Chandler Bridge Formation
Ashley Formation
COOPER GROUP
OLIGOCENE


Drayton Limestone
COOPER GROUP
Parkers Ferry Formation
Harleyville Formation
SANTEE GROUP
(in part)
Cross Limestone
EOCENE

NC-1: 1.1 mi. W of east quad border, 1.4 mi. S of north quad border. Bluff on south bank of Grove Creek. Top of bluff at about 12 feet elevation.

WANDO FM (UPPER MEM)	0-12	Sand, fine-grained to medium-grained, medium-brown and medium-red (0-8) grading through bright-yellow (8-11) to medium-blue (11-12)

NC-2: 0.8 mi. E of west quad border, 3.5 mi. N of south quad border. Bluff on south bank of Goose Creek (type section of Goose Creek Limestone). Top of exposed bluff about 14 feet above sea level.

TEN MILE HILL BEDS	0-10	Sand, fine- to medium-grained, medium-orangish-yellow, clayey
	10-14	Sand, coarse-grained, pale-white
GOOSE CREEK LS	14-21	Calcarenite, medium-grained, pale-brown to pale-yellowish-brown, shelly, locally indurated

Base of "Ten Mile Hill" beds: ±0 at sea level

Bottomed in Goose Creek Limestone

NC-3: 3.15 mi. W of east quad border, 1.15 mi. S of north quad border. Surface elevation about 12 feet. Pipeline ditch at General Electric plant.

WANDO FM (UPPER MEM)	0-9	Slumped
	9-12	Clay, medium-gray, laminated
	12-13.5	Sand, medium-grained, medium-yellow and medium-red
	13.5-16	Sand, fine-grained, dark-brown

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GOOSE CREEK LS	16-19	Calcarenite, medium-grained, shelly, contained skeleton of a baleen whale (Balaenoptera)

Base of Wando Formation (upper member): -4 feet below sea level

Ditch bottomed in Goose Creek Limestone

NC-4: 3.55 mi. W of east quad border, 0.95 mi. N of south qaud border. Bluff on east bank of Clouter Creek. Top of bluff about 17 feet above sea level

WANDO FM (LOWER MEM)	0-10	Sand, fine-grained, white, massive, contains many fine-grained heavies
	10-13	Sand, fine-grained, medium-orange, clayey, massive
	13-17	Clay, medium-gray grading to medium-orange in basal foot, sandy, phosphate pebbles up to 15 cm in diameter and rare quartz pebbles at basal contact
GOOSE CREEK LS	17-19	Calcarenite, medium-grained, pale-yellowish-brown, shelly (including Amusium mortoni), Carcharodon carcharias tooth present, locally indurated, phosphate pebble bed at base
ASHLEY FM	19-20	Calcarenite, fine-grained, olive-brown, dense

Base of Wando Formation (lower member): ±0 feet at sealevel

Base of Goose Creek Limestone: -2 feet below sea level

Bottomed in Ashley Formation

NC-5: 0.75 mi. W of east quad border, 0.83 mi. N of south quad border.
Surface elevation 7 feet.

SILVER BLUFF		Sand, fine-grained, medium-orange and medium-gray mottled, clayey, stiff
WANDO FM (UPPER MEM)	5-8	Sand, fine-grained, pale-yellowish-brown, loose, well sorted, contains very fine heavies
	8-11	As above but going to medium-gray
	11-23	As above but shelly, shell looks very fresh
TEN MILE HILL BEDS	23-27	Clay, medium-gray, sandy, shelly
	27-39	Sand, fine-grained, medium-gray, silty, shelly, soft
	39-59	As above but getting denser
DANIEL ISLAND BEDS	59-66	Clay, medium-gray, silty, shelly

MARKS HEAD FM	66-69	Sand, fine-grained, olive-brown, dense, very phosphatic
ASHLEY FM	69-75	Calcarenite, fine-grained, pale-brown, dense, contains sand-size quartz and phosphate

Base of Silver Bluff (Holocene):	+2 feet above sea level
Base of Wando Formation (upper member):	-16 feet below sealevel
Base of Ten Mile Hill beds:	-52 feet below sea level
Base of Daniel Island beds:	-59 feet below sea level
Base of Marks Head Formation:	-62 feet below sea level

Bottomed in Ashley Formation

NC-6: 1.55 mi. W of east quad border, 0.65 mi. N of south quad border. Surface elevation 13 feet.

WANDO FM (UPPER MEM)	0-4	Sand, fine-grained, medium-orange and medium-gray mottled, well-sorted, slightly clayey, somewhat stiff
	4-13	Sand, fine-grained, light-gray, loose, well-sorted, contains abundant very- fine-grained heavies
	13-27	Sand, fine-grained, medium-gray, silty, shelly (Anadara ovalis, etc.)
DANIEL ISLAND BEDS	27-42	Clay, medium-gray, micaceous, contains sandy lenses, Mulinia bed at 26 feet, stiff, shelly phosphate pebble bed at base
ASHLEY FM	42-60	Calcarenite, fine-grained, olive-brown

Base of Wando Formation (upper member): -14 feet below sea level

Base of "Daniel Island" beds: -29 feet below sea level

Bottomed in Ashley Formation

NC-7: 3.35 mi. W of east quad border, 1.3 mi. S of north quad border.
Surface elevation 15 feet.

WANDO FM (UPPER MEM)	0-9	Sand, fine-grained, clayey, micaceous, medium-red and medium-orange mottled grading down to medium-yellow and medium-gray mottled
	9-10	Clay, medium-gray grading down to medium-orange, quartz pebbles present at base
GOOSE CREEK LS	10-24	Calcarenite, medium-grained, pale-yellowish-brown, phosphate pebble bed in basal foot
ASHLEY FM	24-25	Calcarenite, fine-grained, olive-brown, contains numerous foram tests

Base of Wando Formation (upper member): +5 feet above sea level
Base of Goose Creek Limestone: -9 feet below sea level
Bottomed in Ashley Formation

NC-8: 0.5 mi. W of east quad border, 0.4 mi. S of north quad border.
Surface elevation 15 feet.

WANDO FM (UPPER MEM)	0-5	Sand, fine-grained, pale-orange grading to bright lepidochrositic orange by base, well-sorted
	at 5	Clay, medium-gray, about 2 cm thick
	5-11	Sand, medium-grained, dark-gray, silty, some coarse-grains present, sparse phosphate pebbles at base
GOOSE CREEK LS	11-17	Calcarenite, medium-grained, pale-yellowish-brown, phosphate pebble bed at base
ASHLEY FM	17-20	Calcarenite, fine-grained, olive-brown, dense

Base of Wando Formation (upper member): +4 feet above sea level
Base of Goose Creek Limestone: -2 feet below sea level
Bottomed in Ashley Formation

NC-9: 0.05 mi. W of east quad border, 0.1 mi. S of north quad border.
Surface elevation 30 feet.

TEN MILE HILL BEDS	0-13	Sand, fine-grained, medium-orange, medium-gray, and medium-brown mottled (0-5) grading down to pale-orange, silty, stiff and clayey in top 5 feet
	13-17	Sand, fine-grained, pale-orange, and clay, medium-gray in beds about 6 inches thick, interbedded
	17-27	Sand, fine-grained, medium-gray, very silty
GOOSE CREEK LS	27-39	Calcarenite, medium-grained, pale-yellowish-brown, phosphate pebble bed at base
ASHLEY FM	39-45	Calcarenite, fine-grained, olive-green, dense

Base of "Ten Mile Hill" beds: +3 feet above sea level

Base of Goose Creek Limestone: -9 feet below sea level

Bottomed in Ashley Formation

NC-10: 0.5 mi. E of west quad border, 0.65 mi. N of south quad border. Surface elevation 26 feet.

WANDO FM (LOWER MEM)	0-20	Sand, fine-grained, dark-brown (0-4) grading through medium-brown (4-15) to medium-gray, well-sorted, micaceous, abundant very fine-grained heavies, silty below 15 feet, basal foot gritty, clayey, and phosphate pebbly
GOOSE CREEK LS	20-36	Calcarenite, medium-grained, pale-grayish-brown, phosphate pebble bed at base
ASHLEY FM	36-40	Calcarenite, fine-grained, olive-brown, sparse sand-size phosphate

Base of Wando Formation (lower member): +6 feet above sea level

Base of Goose Creek Limestone: -10 feet below sea level

Bottomed in Ashley Formation

NC-11: 1.05 mi. E of west quad border, 1.5 mi. N of south quad border.
Surface elevation 10 feet.

WANDO FM (UPPER MEM)	0-4	Sand, fine-grained, pale-brown, well-sorted, clayey
	4-10	Sand, fine-grading down to coarse-grained, medium-brown and light-gray, very clayey, phosphate lumps in basal 2 feet
CHANDLER BRIDGE FM	10-12	Clay, medium-gray, very silty, no basal coarse bed
ASHLEY FM	12-30	Calcarenite, fine-grained, yellowish-brown (12-14) grading down to pale-grayish-green, contains quartz sand

Base of Wando Formation (upper member): ±0 feet at sea level
Base of Chandler Bridge Formation: -2 feet below sea level
Bottomed in Ashley Formation

NC-12: 2.7 mi. E of west quad border 3.2 mi. N of south quad border. Surface elevation 10 feet.

FILL	0-6	Sand, fine-grained, pale-brown and medium-gray mottled (0-5) grading to white (5-6)
SILVER BLUFF	6-10	Sand, fine-grained, medium-brown,well-sorted, clayey, micaceous
WANDO FM (UPPER MEM)	10-23	Sand, fine-grained, dark-bluish-gray, becomes increasingly clayey downward, Mulinia present (some valves articulated) below 15 feet
(MIDDLE MEM)	23-48	Clay, medium-gray, moderately stiff, greasy, sparse Mulinia, sand-filled burrows below 35 feet, sharp basal contact
ASHLEY FM	48-55	Calcarenite, fine-grained, olive-brown, shell fragments, sand-size phosphate, and large forams present

Base of Silver Bluff (Holocene):	±0 feet at sea level
Base of Wando Formation (upper member):	-13 feet below sea level
Base of Wando Formation (middle member):	-38 feet below sea level

Bottomed in Ashley Formation

NC-13: 3.1 mi. E of west quad border, 3.7 mi. S of north quad border. Surface elevation 25 feet.

	0-3	Road fill
TEN MILE HILL BEDS	4-5	Sand, fine-grained, medium-gray, well-sorted
	5-8	Clay, light-gray, sticky
	8-13	Sand, fine- to medium-grained, medium-gray, silty, contains numerous Mulinia, grades rapidly to
	13-24	Clay, medium-gray, silty, shelly at 23-24 feet (Anadara ovalis, Noetia, etc.)
DANIEL ISLAND BEDS	24-29	Clay, medium-gray, caliche nodules present in upper foot, lumpy, contains oyster fragments
	29-31	Sand, fine-grained, medium-gray, silty, fossiliferous, contains clay blebs
	31-37	Clay, medium-gray, lumpy

	37-45	Sand, fine-grained, and clay, medium-gray, interbedded
	45-52	Sand, medium-grained, medium-gray, shelly, contains sand-size phosphate, phosphate nodules present below 47 feet

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ASHLEY FM	52-55	Calcarenite, fine-grained, olive-brown, contains abundant sand-size phosphate and sparse large forams

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Base of Ten Mile Hill beds: +1 foot above sea level

Base of Daniel Island beds: -27 feet below sea level

Bottomed in Ashley Formation

NC-14: 3.15 mi. W of east quad border, 3.9 mi. S of north quad border. Surface elevation 8 feet.

WANDO FM (UPPER MEM)	0-22	Sand, fine-grained, medium-orange, yellowish-brown, and medium-gray mottled (0-5) grading to yellowish-brown, clayey in upper 5 feet, well-sorted, micaceous, contains very fine-grained heavies, silty, grades to
	22-30	Sand, medium-grained, yellowish-brown, occasional coarse quartz grains and clayballs present near base
TEN MILE HILL BEDS	30-34	Sand, fine-grained, dark-blue, silty, micaceous, upper foot weathered to brownish-orange grading down to dark-orange
	34-40	Sand, medium- grading down to coarse-grained, medium-gray, phosphate discoids at base
ASHLEY FM	40-50	Calcarenite, fine-grained, olive-brown, sand-size phosphate and large forams abundant

Base of Wando Formation (upper member): -22 feet below sea level

Base of Ten Mile Hill beds: -32 feet below sea level

Bottomed in Ashley Formation

NC-15: 2.75 mi. E of west quad border, 2.05 mi. S of north quad border.
Surface elevation 7 feet.

WANDO FM (UPPER MEM)	0-10	Sand, fine-grained, pale-orange, medium-brown and pale-gray mottled, well sorted, grading down to medium-grained with some coarse grains, contains a few clay stringers
TEN MILE HILL BEDS	10-25	Clay, greasy, medium-bluish-gray, micaceous, contains oyster fragments, phosphate lumps, and lumps of reworked underlying lithology in basal foot
ASHLEY FM	25-40	Calcarenite, fine-grained, olive-brown, contains phosphate sand and large forams

Base of Wando Formation (upper member): -3 feet below sea level

Base of Ten Mile Hill beds: -18 feet below sea level

Bottomed in Ashley Formation

NC-16: 3.45 mi. E of west quad border, 3.95 mi. N of south quad border. Surface elevation 8 feet.

	0-5	Fill, fulsome
SILVER BLUFF	5-27	Clay, dark-gray with medium-brown mottles, stiff, interbedded with poorly sorted but dominantly fine-grained sand below 13 feet, sparse wood at basal contact
ASHLEY FM	27-45	Calcarenite, fine-grained, olive-brown

Base of Silver Bluff (Holocene): -19 feet below sea level

Bottomed in Ashley Formation

NC-17: 2.9 mi. E of west quad border, 1.15 mi. S of north quad border. Surface elevation 9 feet.

WANDO FM (UPPER MEM)	0-11	Sand, fine-grained, silty and clayey, pale-brown, pale-gray, and medium-orange mottled grading to pale-brown below 5 feet
TEN MILE HILL BEDS	11-30	Clay, medium-blue, greasy, sticky
	30-34	Clay, medium-blue, contains numerous phosphate pebbles
DANIEL ISLAND BEDS	34-47	Clay, dark-bluish-gray, stiff, sparsely shelly, phosphate pebbles at base
ASHLEY FM	47-60	Calcarenite, fine-grained, olive-brown, contains numerous foram tests

Base of Wando Formation (upper member): -2 feet below sea level

Base of Ten Mile Hill beds: -25 feet below sea level

Base of Daniel Island beds: -38 feet below sea level

Bottomed in Ashley Formation

NC-18: 1.55 mi. E of west quad border, 0.05 mi. S of north quad border. Surface elevation 37 feet.

TEN MILE HILL BEDS	0-5	Sand, fine-grained, clayey, medium-orange and pale-gray mottled, grades to
	5-23	Clay, fine-grained sandy, and sand, fine-grained, clayey interbedded, medium-gray to dark-gray
	23-28	Sand, dominantly fine-grained, silty, contains some medium-and coarse-grains, dark-gray; basal bed is a 2-inch dark-gray clay
GOOSE CREEK LS	28-34	Calcarenite, medium-grained, pale-yellowish-brown, contains calcite-cemented lumps, phosphate bed at base
ASHLEY FM	34-40	Calcarenite, fine-grained, olive-brown, burrowed at top with burrows filled with above lithology

Base of Ten Mile Hill beds: +9 feet above sea level

Base of Goose Creek Limestone: +3 feet above sea level

Bottomed in Ashley Formation

NC-19: 1.6 mi. E of west quad border, 2.7 mi. S of north quad border. Surface elevation 36 feet.

TEN MILE HILL BEDS	0-7	Sand, fine-grained, medium-reddish-orange and pale-gray mottled, clayey, slightly micaceous, light-gray clay lenses in basal 2 feet
	7-16	Sand, fine-grained, medium-yellowish-orange, very silty, abundant very fine grained heavies, goes to medium-brown in basal few inches
	16-26	Clay, dark-gray grading down in a few inches to dark-bluish-gray, lenses of fine-grained sand scattered throughout
	26-28	Sand, coarse-grained, dark-bluish-gray, poorly sorted
GOOSE CREEK LS	28-45	Calcarenite, medium-grained, pale-yellowish-brown, phosphate pebble bed at base
ASHLEY FM	45-50	Calcarenite, fine-grained, dark-olive-brown

Base of Ten Mile Hill beds: +8 feet above sea level

Base of Goose Creek Limestone: -9 feet below sea level

Bottomed in Ashley Formation

NC-20: 2.55 mi. E of west quad border, 2.75 mi. S of north qaud border. Surface elevation 27 feet.

TEN MILE HILL BEDS	0-8	Sand, fine-grained, clayey, medium-brown, medium-orange, and light-gray mottled
	8-10	Sand, fine-grained, medium-orange, silty, contains many very fine grained heavies
	10-20	Clay, medium-bluish-gray, greasy, grading to
	20-33	Sand, fine-grained medium-bluish-gray, clayey, contains wood fragments, no basal pebble bed
GOOSE CREEK LS	33-37	Calcarenite, medium-grained, pale-yellowish-brown, phosphate pebble bed at base
ASHLEY FM	37-45	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: -6 feet below sea level

Base of Goose Creek Limestone: -10 feet below sea level

Bottomed in Ashley Formation

NC-21: 3.25 mi. W of east quad border, 0.65 mi. S of north quad border.
Surface elevation 18 feet (soil stripped off).

TEN MILE HILL BEDS	0-2	Sand, fine-grained, medium-orange, well-sorted, with clay lenses
	2-5	Clay, light-gray, very stiff
	5-10	Sand, fine-grained, medium-orange, well-sorted, silty
	10-15	Clay, dark-bluish-gray, no basal coarse bed
GOOSE CREEK LS	15-23	Calcarenite, medium-grained, pale-gray, contains fragments of Amusium mortoni, basal phosphate pebble bed present
ASHLEY FM	23-35	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: +3 feet above sea level
Base of Goose Creek Limestone: -5 feet below sea level
Bottomed in Ashley Formation

NC-22: 0.2 mi. W of east quad border, 1.95 mi. N of south quad border. Surface elevation 7 feet.

SILVER BLUFF	0-6	Clay, medium-orange and light-gray mottled grading down to dark-bluish-gray, wood fragments and caliche nodules in basal foot
WANDO FM (LOWER MEM)	6-15	Sand, fine-grained, light-gray (6-11) grading down to dark-gray, silty, numerous very fine grained heavies, shelly including numerous oyster fragments
ASHLEY FM	15-20	Calcarenite, fine-grained, olive-brown, abundant quartz and phosphate sand

Base of Silver Bluff (Holocene): +1 foot above sea level

Base of Wando Formation (lower member): -8 feet below sea level

Bottomed in Ashley Formation

NC-23: 0.65 mi. W of east quad border, 2.8 mi. N of south quad border. Surface elevation 33 feet.

WANDO FM (LOWER MEM)	0-18	Sand, fine-grained, medium-yellowish-brown (0-2) grading through pale-brown (2-4), dark-brown (4-5) and dark-gray (5-7) then back to dark-brown, humic, well-sorted, numerous very-fine-grained heavies
	18-20	Clay, medium-gray, slick
	20-34	Sand, fine-grained, medium-gray, silty, shell hash and some shells (oyster, Mulinia, Olivella, etc.), phosphate pebbles in basal foot
TEN MILE HILL BEDS	34-35	Clay, medium-gray, stiff
	35-43	Sand, medium-grained, medium-gray, contains sand-size phosphate
ASHLEY FM	43-50	Calcarenite, fine-grained, pale-brown (43-44) grading to olive-brown, abundant sand-size phosphate and large forams

Base of Wando Formation (lower member): -1 foot below sea level

Base of Ten Mile Hill beds: -10 feet below sea level

Bottomed in Ashley Formation

NC-24: 0.2 mi. W of east quad border, 4.2 mi. S of north quad border. Surface elevation 46 feet.

TEN MILE HILL BEDS	0-23	fine-grained, light-gray (0-4) grading down through dark-brown and humic (4-15) to light-gray again, well-sorted, micaceous
	23-28	Clay, medium-gray, micaceous, slick
	28-36	Silt, medium-gray, sandy, grading down to
	36-46	Sand, fine- grading down to medium-grained, medium-gray, phosphate lumps in basal foot
GOOSE CREEK LS	46-52	Calcarenite, medium-grained, pale-yellowish-brown, contains calcite-cemented nodules, phosphate pebble bed at base
ASHLEY FM	52-55	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: ±0 feet at sea level

Base of Goose Creek Limestone: -6 feet below sea level

Bottomed in Ashley Formation

NC-25: 1.8 mi. W of east quad border, 2.15 mi. N of south quad border. Surface elevation 36 feet.

WANDO FM (LOWER MEM)	0-24	Sand, fine-grained, pale-brown (0-3), grading down to dark-brown, humic, well sorted, medium-gray clay layers present below 20 feet
	24-40	Sand, very fine grained, medium-gray, contains sand-size phosphate and shell fragments (Noetia, oyster, etc.)
TEN MILE HILL BEDS	40-78	Clay, medium-gray, moderately stiff, silty, grading to clayey fine-grained sand below 50 feet and to silty fine-grained sand by 60 feet, sparsely shelly below 60 feet
ASHLEY FM	78-80	Calcarenite, fine-grained, olive-brown, burrowed in upper foot

Base of Wando Formation (lower member): -4 feet below sea level

Base of Ten Mile Hill beds: -42 feet below sea level

Bottomed in Ashley Formation

NC-26: 0.80 mi. W of east quad border, 1.65 mi. S of north quad border. Surface elevation about 20 feet.

TEN MILE HILL BEDS	0-5	Sand, fine-grained, pale-orange, well-sorted, contains numerous very fine grained heavies
	5-8	Sand, medium-grained, pale-gray, well-sorted
	8-18	Sand, fine-grained, pale-brown, very silty, basal foot contains abundant pebbles of quartz (up to 0.5 cm in diameter) and phosphate (up to 1 cm diameter)
GOOSE CREEK LS	18-36	Calcarenite, medium-grained, pale-yellowish-brown, contains Amusium mortoni fragments, phosphate pebble bed at base
ASHLEY FM	36-40	Calcarenite, fine-grained, olive-green

Base of Ten Mile Hill beds: +2 feet above sea level

Base of Goose Creek Limestone: -16 feet below sea level

Bottomed in Ashley Formation

NC-27: 2.85 mi. E of west quad border, 0.1 mi. S of north quad border.
Surface elevation 25 feet. (=CNC-1-D)

TEN MILE HILL BEDS	0-7	Sand, fine-grained, medium-red and medium-gray, clayey, massive
	7-24	Sand, fine- to medium-grained, medium-gray, light-brown and medium-yellow (7-15) grading down to medium-gray
GOOSE CREEK LS	24-28	Calcarenite, medium-grained, pale-yellowish-brown, phosphate pebble bed at base
ASHLEY FM	28-30	Calcarenite, fine-grained, light-olive-green

Base of Ten Mile Hill beds: +1 foot above sea level

Base of Goose Creek Limestone: -3 feet below sea level

Bottomed in Ashley Formation

NC-28: 1.6 mi. E of west quad border, 0.65 mi. S of north quad border.
Surface elevation 25 feet (=CNC-2-D).

TEN MILE HILL BEDS	0-2	Clay and sand, fine-grained, interbedded, medium-red medium-yellow, and medium-gray mottled
	2-11	Sand, fine-grained, medium-red and medium-yellow, stringers of medium-yellow to medium-gray clay present between 7 and 9 feet
	11-23	Sand, fine-grained, medium gray (11-18) grading to light-gray, clayey in basal 6 inches
GOOSE CREEK LS	23-33	Calcarenite, medium-grained, pale-yellowish green, phosphate pebbles and quartz discoids present at base
ASHLEY FM	33-35	Calcarenite, fine-grained, dark-olive-green, clayey

Base of Ten Mile Hill beds: ... +2 feet above sea level
Base of Goose Creek Limestone: -8 feet below sea level
Bottomed in Ashley Formation

NC-29: 0.35 mi. E of west quad border, 0.8 mi. S of north quad border.
Surface elevation 23 feet. (=CNC-3-D)

TEN MILE HILL BEDS	0-5	Sand, fine-grained, medium-red, slightly clayey
	5-18	Sand, fine-grained, medium-gray, clayey, very stiff
	18-28	Sand, fine- grading down to medium-grained, light-red grading down to medium-yellow
ASHLEY FM	28-35	Calcarenite, fine-grained, olive-green

Base of Ten Mile Hill beds: -5 feet below sea level

Bottomed in Ashley Formation

NC-30: 2.05 m. E of west quad border, 1.95 mi. S of north quad border.
Surface elevation 34 feet . (=CNC-4-D).

	0-1	Road fill
TEN MILE HILL BEDS	1-15	Sand, fine-grained, medium-yellow (1-3) grading through medium-red (3-5) and then back to medium-yellow, clayey
	15-18	Clay, medium-gray, sandy
	18-33	Sand, fine-grained, medium-gray, clean
	33-38	Clay, medium-red, medium-gray and medium-yellow in upper 6 inches, dark-bluish-gray below that
	38-43	Sand, fine-grading down to medium-grained, medium-gray, shelly
ASHLEY FM	43-45	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: -9 feet below sea level

Bottomed in Ashley Formation

NC-31: 1.5 m. E of west quad border, 1.95 mi. S of north quad border.
Surface elevation 38 feet. (=CNC-5-D).

TEN MILE HILL BEDS	0-8	Sand, fine-grained, and clay, medium-yellow
	8-15	Sand, fine-grained, white, clean
	15-22	Sand, fine-grained, light-yellow, clayey
	22-24	Clay, medium-yellow, medium-gray and very-pale-brown
	24-30	Clay, dark-gray
	30-46	Sand, fine-grading down to coarse-grained, dark-gray, clayey at top but cleaner downward
ASHLEY FM	46-50	Calcarenite, fine-grained, olive-green

Base of Ten Mile Hill beds: -8 feet below sea level

Bottomed in Ashley Formation

NC-32: 2.85 mi. E of west quad border, 3.05 mi. S of north quad border. Surface elevation 32 feet. (=CNC-6-D).

TEN MILE HILL BEDS	0-20	Sand, fine-grained, medium-red, medium-yellow and medium-gray streaked (0-11) grading through medium-yellow (11-15) to medium-gray, clayey except from 11-13
	20-35	Clay, medium-brown, medium-red and medium-yellow (20-21) grading to medium-bluish-gray, sandy from 23-25, shelly at 27, peaty from 32-34
	35-40	Sand, fine-grading down to medium-grained, medium-gray, clayey, phosphate pebbles at base
ASHLEY FM	40-45	Calcarenite, fine-grained, white (40-43) grading down to pale-olive-green, clayey

Base of Ten Mile Hill beds: -8 feet below sea level

Bottomed in Ashley Formation

NC-33: 2.05 mi. E of west quad border, 4.25 mi. N of south quad border.
Surface elevation 25 feet. (=CNC-7-D)

TEN MILE HILL BEDS	0-3	Sand, fine-grained, medium-red, clayey
	3-12	Sand, fine-grained, medium-yellow to white, clean
	12-22	Clay, light-gray, and sand, fine-grained, white
GOOSE CREEK LS	22-26	Calcarenite, medium-grained, pale-yellowish-brown, contains calcite-cemented lumps, phosphate pebbles at base
ASHLEY FM	26-40	Calcarenite, fine-grained, pale-olive-green

Base of Ten Mile Hill beds: +3 feet above sea level

Base of Goose Creek Limestone: -1 foot below sea level

Bottomed in Ashely Formation

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NC-34: 2.45 mi. E of west quad border, 3.55 mi. S of north quad border. Surface elevation 32 feet.

TEN MILE HILL BEDS	0-17	Sand, fine-grained, medium-yellow to medium-red, contains lenses of medium-gray clay
	17-19	Clay, medium-brown to yellowish-brown with light-gray sand stringers
	19-46	Clay, medium-gray, with sand interbedded, shelly at 30 and from 35-44, quartz and phosphate pebbles in basal foot
ASHLEY FM	46-55	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: -14 feet below sea level

Bottomed in Ashley Formation

NC-35: 1.25 mi. E of west quad border, 3.8 mi. S of north quad border. Surface elevation 5 feet. (=CNC-9-D)

SILVER BLUFF	0-3	Sand, fine-grained, medium-yellow, clayey
	3-12	Clay, medium-yellow to medium-gray, wood at 4 feet and oysters at 5 feet
WANDO FM (UPPER MEM)	12-16	Sand, fine-grained grading down to medium-grained, light-red grading down through medium-gray to dark-brown (14-16), phosphate pebbles in basal foot
ASHLEY FM	16-20	Calcarenite, fine-grained, olive-brown

Base of Silver Bluff (Holocene): -7 feet below sea level

Base of Wando Formation (upper member): -11 feet below sea level

Bottomed in Ashley Formation

NC-36: 0.4 mi. E of west quad border, 3.9 mi. S of north quad border.
Surface elevation 32 feet. (=CNC-10-D)

TEN MILE HILL BEDS	0-23	Sand, fine-grained, medium-red and medium-yellow (0-17) grading down to dark-bluish-gray, clayey
	23-28	Clay, medium-gray, with stringers of dark-gray, fine-grained sand
GOOSE CREEK LS	28-32	Calcarenite, medium-grained, pale-yellowish-brown, contains shell fragments, phosphate pebble bed at base
ASHLEY FM	32-35	Calcarenite, fine-grained, pale-olive-green

Base of Ten Mile Hill beds: +4 feet above sea level

Base of Goose Creek Limestone: ±0 feet at sea level

Bottomed in Ashley Formation

NC-37: 0.65 mi. E of west quad border, 2.9 mi. S of north quad border.
Surface elevation 24 feet. (=CNC-11-D)

TEN MILE HILL BEDS	0-2	Clay, medium-red and medium-yellow, sandy
	2-15	Sand, fine-grained, medium-red and medium-yellow (2-3) grading through medium-yellow and medium-gray (3-8) to medium-gray, clayey
	15-38	Clay, medium-bluish-gray, sticky, shelly from 18-24
	38-43	Sand, fine -grading down to medium-grained, medium-gray, fairly clean
ASHLEY FM	43-45	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: -19 feet below sea level
Bottomed in Ashley Formation

NC-38: 2.05 mi. E of west quad border, 2.55 mi. N of south quad border. Surface elevation 10 feet. (=CNC-13-D).

WANDO FM (UPPER MEM)	0-4	Sand, fine-grained, medium-red, medium-yellow and medium-gray, clayey, includes a few clay laminae
	4-15	Clay, medium-red, medium-yellow, medium-brown and medium-gray, sandy in basal foot
	15-19	Sand, medium-grained, pale-yellowish-brown, phosphate pebble bed at base
ASHLEY FM	19-20	Calcarenite, fine-grained, olive-brown

Base of Wando Formation (upper member): -9 feet below sea level

Bottomed in Ashley Formation

NC-39: 1.85 mi. W of east quad border, 3.45 mi. N of south quad border. Surface elevation about 13 feet. (=CNC-14-D).

	0-2	Road fill
WANDO FM (UPPER MEM)	2-21	Sand, fine-grading down to medium-grained, medium-orange and medium-yellow, clayey in upper few feet
GOOSE CREEK LS	21-27	Calcarenite, medium-grained, light-gray, phosphate and quartz pebbles at base
ASHLEY FM	27-35	Calcarenite, fine-grained, olive-green, clayey

Base of Wando Formation (upper member): -8 feet below sea level

Base of Goose Creek Limestone: -14 feet below sea level

Bottomed in Ashley Formation

NC-40: 1.1 mi. W of east quad border, 4.0 mi. N of south quad border.
Surface elevation about 23 feet.(=CNC-15-D).

TEN MILE HILL BEDS	0-30	Sand, fine- grading down to medium-grained, medium-yellow (0-5) grading to medium-gray, clayey in some intervals, shelly below 20 feet (Mulinia, etc.), phosphate pebbles at base
ASHLEY FM	30-35	Calcarenite, fine-grained, dark-brown and clayey grading down to olive-green

Base of Ten Mile Hill beds: -7 feet below sea level

Bottomed in Ashley Formation

NC-41: 0.9 mi. W of east quad border, 4.1 mi. S of north quad border.
Surface elevation about 25 feet (=CNC-16-D).

TEN MILE HILL BEDS	0-5.5	Sand, fine-grained, medium-yellow (0-4.5) grading down to dark-brown, clean
	5.5-8.5	Clay, medium-bluish-gray
	8.5-22	Sand, fine-grading down to medium-grained, medium-gray
GOOSE CREEK LS	22-26	Calcarenite, medium-grained, white
ASHLEY FM	26-35	Calcarenite, fine-grained, olive-green, clayey

Base of Ten Mile Hill beds: +3 feet above sea level
Base of Goose Creek Limestone: -1 foot below sea level
Bottomed in Ashley Formation

NC-42: 0.8 mi. W of east quad border, 2.95 mi. S of north quad border. Surface elevation about 15 feet. (=CNC-17-D).

TEN MILE HILL BEDS	0-11	Sand, fine-grained, medium-red and medium-yellow, clayey, with layers of medium-gray clay
	11-14	Clay, medium-brown grading down to medium-gray
	14-15	Sand, coarse-grained, medium-gray and medium-brown, pebbly
GOOSE CREEK LS	15-25	Calcarenite, medium-grained, pale-yellowish-brown, contains numerous shell fragments
ASHLEY FM	15-30	Calcarenite, fine-grained, olive-green

Base of Ten Mile Hill beds: ±0 feet at sea level

Base of Goose Creek Limestone: -10 feet below sea level

Bottomed in Ashley Formation

NC-43: 1.85 mi. W of east quad border, 2.9 mi. N of south quad border. Surface elevation 40 feet. (=CNC-18-D).

TEN MILE HILL BEDS	0-13	Sand, fine-grained, light-yellowish-brown (0-10) grading down to dark-purplish-brown, clean, grades to
	13-20	Sand, medium- grading down to coarse-grained, light-brown, micaceous near base
	20-21	Sand, fine-grained, and clay interbedded, light-brown
	21-24	Sand, fine-grained, medium-gray grading through medium-yellow to medium-greenish-gray
	24-27	Clay, medium-gray, with fine-grained sand laminae, very micaceous
	27-43	Sand, fine- to medium-grained, clean
	43-52	Clay, medium-bluish-gray, silty, shelly below 48 feet
	52-60	Sand, fine-grained, medium-bluish-green, clayey
	60-67	Clay, medium-bluish-green, sandy, shelly at 66 feet
ASHLEY FM	67-70	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: -27 feet below sea level

Bottomed in Ashley Formation

NC-44: 2.3 mi. W of east quad border, 1.45 mi. N of south quad border. Surface elevation about 15 feet. (=CNC-19-D).

WANDO FM (LOWER MEM)	0-3.5	Sand, fine-grained, medium-yellow grading through light-red to medium-gray
	3.5-7	Clay, medium-blue-gray grading down to medium-gray, sandy
	7-14	Sand, fine-grained, medium-gray, clayey, shelly, pebbly in basal foot and very clayey
TEN MILE HILL BEDS	14-15	Sand, fine-grained, medium-gray, clayey, shelly
GOOSE CREEK LS	15-22	Calcarenite, medium-grained, pale-yellowish-brown
ASHLEY FM	22-25	Calcarenite, fine-grained, olive-brown, shelly horizon present

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Base of Wando Formation (lower member): +1 foot above sea level

Base of Ten Mile Hill beds: ±0 feet at sea level

Base of Goose Creek Limestone: -7 feet below sea level

Bottomed in Ashley Formation

NC-45: 1.05 mi. E of west quad border, 3.7 mi. N of south quad border. Surface elevation 15 feet. (=CNC-20-D). (Supplemental section for Goose Creek Limestone)

TEN MILE HILL BEDS	0-13	Sand, fine-grained, medium-yellowish-orange, clean except 8-10 which is clayey
GOOSE CREEK LS	13-14	Sand, medium-grained, medium-brown, clayey (weathered zone)
	14-23	Calcarenite, medium-grained, pale-yellowish-brown, pecten shell fragments present, phosphate pebble bed at base
ASHLEY FM	23-25	Calcarenite, fine-grained, olive-brown

Base of Ten Mile Hill beds: +2 feet above sea level

Base of Goose Creek Limestone: -8 feet below sea level

Bottomed in Ashley Formation

NC-46: 2.9 mi. W of east quad border, 0.9 mi. S of north quad border.
Bluff on west bank of Cooper River, top of bank at 11 feet elevation

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WANDO FM (UPPER MEM)	0-1	Sand, fine-grained, yellowish-gray (5Y7/2) (SOIL)
	1-3	Sand, fine-grained, silty, grayish-orange (10YR7/4)
	3-4.5	Sand, fine-grained, and clay, well laminated, interlayered, grayish-orange (10YR7/4)
	4.5-5	Sand, fine-grained, massive, grayish-orange (10YR7/4)
	5-5.5	Sand, fine-grained, and clay, well laminated, interlayered, grayish-orange (10YR7/4)
	5.5-6.5	Sand, fine-grained, massive, grayish-orange (10YR7/4)
	6.5-6.8	Clay, light yellowish gray (5Y6/1), well laminated with laminae marked by fine-grained sand-coated surfaces
	6.8-7.2	Sand, coarse to very coarse grained, very poorly sorted granules of quartz present up to 4 mm in diameter (sphericity 0.5, roundness 0.3), moderate-yellowish-brown (10YR5/4)

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TEN MILE HILL BEDS	7.2-12	Sand, clayey, fine- to coarse-grained but dominantly medium-grained, moderate-yellowish-brown (10YR5/4) with thin, often disrupted laminae of clay, yellowish-gray (5Y7/2), burrows in upper 0.5 foot filled with coarse-grained sand from above

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Base of Wandо Formation (upper member): +4 feet above sea level

Base of section in Ten Mile Hill beds