North Carolina Department of Environmental Quality
Division of Energy, Mineral and Land Resources

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North Carolina Geological Survey
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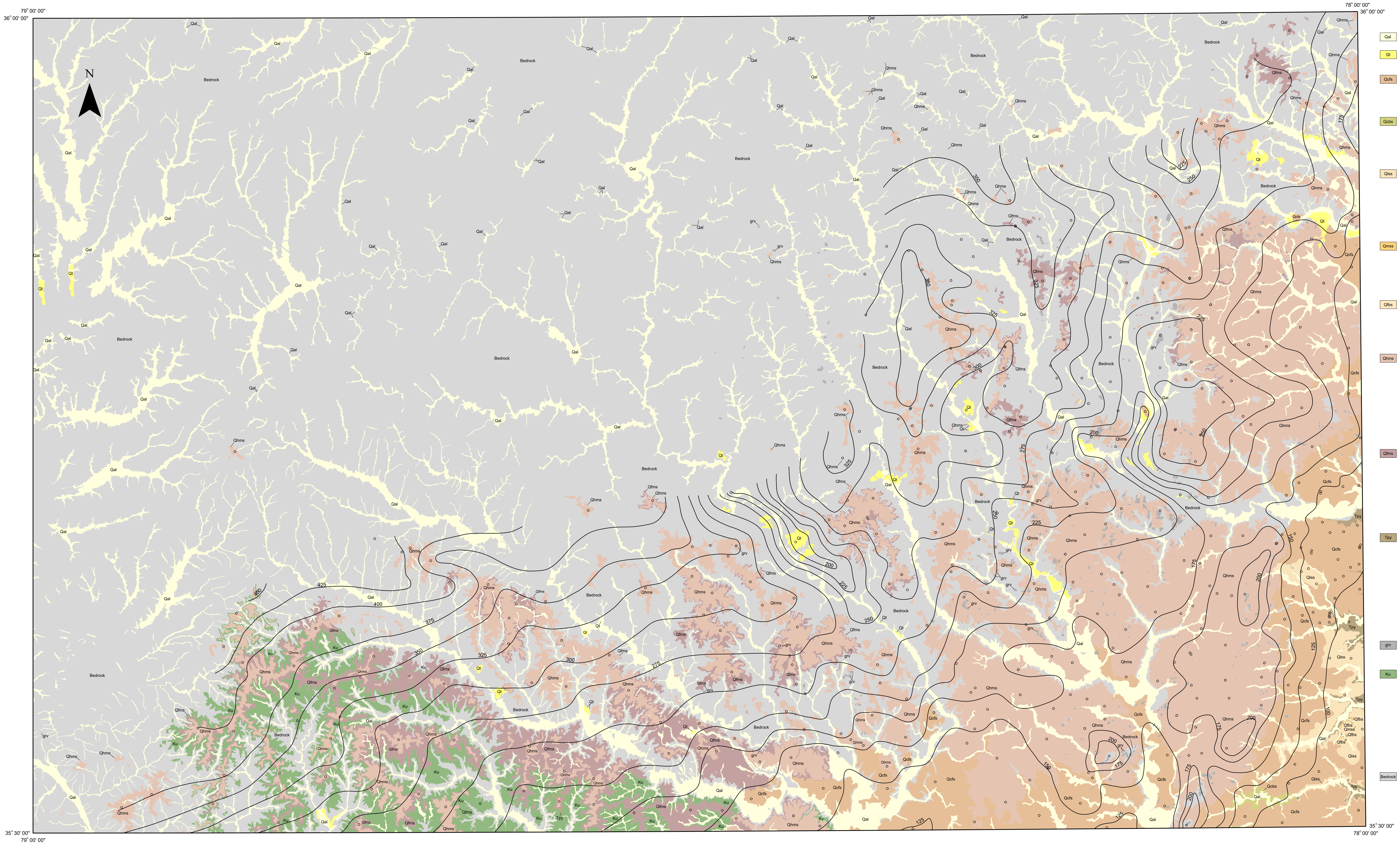


DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qal **Quaternary alluvium -** Sand, gravel, clay and silt; white, gray and black; unconsolidated; associated with present stream channels and floodplains.

Qt **Quaternary terraces -** Terrace alluvium: unconsolidated, tan to light gray, stream deposits of sand and gravel, with occasional clay and silt; poorly- to well sorted, poorly stratified. Mapped areas include multiple, undifferentiated terrace levels.

Qcfs **coarse feldspathic sand -** Silty and clayey; typically moderate reddish brown, pale yellowish orange, light gray; predominantly coarse-grained sand; poorly to moderately sorted; trace to common white feldspar; trace mica; trace to common rose quartz; heavy minerals are rare to absent. Contains beds of slightly sandy clay, sandy silt and black organic rich find sand. Occurs below 170 feet mean sea level. Unconformably overlies all other facies present in the area. The coarse feldspathic sand here was deposited in fluvial environments during an overall regression.

Qcbs **cross-bedded sand -** Sand, slightly silty; pale pink to moderate pink, pale yellowish orange to yellowish gray; fine- to coarse-grained sand and sandy gravel; poor to very well sorted, subangular to subrounded; trace of heavy mineral in discrete laminations, trace to minor white feldspar, trace of mica. Low angle cross-bedding is common. Contains thin beds of massive sandy silt. Qcbs generally unconformably overlies Qlss, rarely overlies Qfbs, and is in turn unconformably overlain by Qcfs. Occuring below 150' in this area, Qcbs is found parallel to a prominent drainage in the far SE of the compilation area. The cross-bedded sand was deposited in a subtidal, shoreface environment to a fluvo-estuarine environment during an overall regression.

Qlss **laminated silt and sand -** Silty, slightly sandy clay; sands are generally pale yellowish orange, light red, and mod orange fine-grained to very fine grained, and well to very well sorted; silt and silty clay are predominantly light gray and moderate orange pink. Facies consists of predominantly continuous parallel laminations of alternating fine sand and silty clay; minor wavy and lenticular bedding; trace of small horizontal burrows, but lack of vertical bioturbation; trace to minor mica, rare disseminated heavy minerals. Contains distinct beds of fine-grained silty sand; moderately to well sorted. Occurs at elevations mostly below 140' mean sea level, with one outlier area reaching 170' maximum. In this area, Qlss generally overlies Tpy unconformably. The laminated clay is interpreted as a tidal flat complex. The clayey tidal flats were crossed by tidal channels where sand was deposited. East of the major flat was a subtidal front where mixed clay and sand accumulated.

Qmss **massive sand -** Sand, slightly clayey; moderate yellowish orange, pale yellowish orange, and moderate orange pink; medium- to coarse-grained (predominately coarse); quartz grains subangular to subrounded, locally faintly cross bedded; moderately well to well sorted; locally fines upward. Contains rare to trace very fine grained heavy minerals, trace to moderate white kaolin clasts, trace of white feldspar near the base of the unit. Qmss occurs at elevations below ~130' in a small local area to the SE (similar coverage area and topographic constraints as Qfbs, which it unconformably overlies when present). The massive sand unit is almost always structureless and was always recovered in a very wet, soupy condition. This unit maybe the result of heaving sand encountered during coring.

Qfbs **flaser-bedded sand -** Predominantly pale yellowish orange sands and light gray, silty clayey flasers; fine- to medium-grained; well-sorted; quartz grains are subangular to subrounded. Flasers are continuous to discontinuous parallel. Trace of very fine grained heavy minerals. Common to abundant mica. Chaotic bedding present in the cores is either primary or more likely a drilling artifact. Occurs at elevations below ~125' in this area. Qfbs occurs only in a small area near the SE corner of the compilation area along hillsides exposed along a swampy drainage. Qmss and Qal overlie this unit in this local area. The orange micaeous flaser bedded sand conformably overlies the Yorktown formation here and may be an oxidized portion of that unit.

Qhms **heavy mineral bearing sand -** Slightly clayey and silty sand; moderate reddish brown, dark yellowish orange, pale yellowish orange, yellowish gray and very pale orange; fine- to medium-grained; poor to moderately sorted at base, well-sorted in upper portions; quartz grains are subangular to subrounded; trace to minor amounts of heavy minerals, chiefly ilmenite, rutile, dravite, leucoxene, and staurolite, with lesser amounts of zircon, kyanite and sillimanite; rare to trace mica. Fines upward overall. Sedimentary structures include parallel laminations defined by clay or heavy minerals, subvertical clay-lined Ophiomorpha-like burrows, and low angle planar cross bedding. A basal quartz pebble lag is common. Occurs at elevations above 170-feet., reference mean sea level. The heavy mineral sand is interpreted as a blanket deposit covering the topographically high regions within the mapped area. It most likely was a barrier complex of shoreface and dune environments that were subsequently drowned as a rising sea level covered the Kenly Ridge. The barrier complex collapsed covering the Kenly Ridge and filling the Little River and other embayments. The heavy minerals that were concentrated in the shore and dune complex were mixed with the fine to medium sands during the barrier collapse, thus appearing as disseminated grains in this unit.

Qfms **fine, micaceous sand -** Fine micaceous sand. Sand, clayey and silty, yellow, light gray and pink to reddish pink . Contains two distinct lithofacies. 1) The upper lithofacies is typically fine-grained sand, but contains coarse silt as well; moderately well to well-sorted; grains are subangular to subrounded. Contains rare to trace heavy minerals often in distinct laminations, trace to minor mica, and rare to trace white feldspar. Sedimentary structures include laminations, flaser bedding, and burrows. 2) The lower lithofacies consists of coarse- to very coarse-grained quartz sand with distinct beds of coarse-grained silt; poorly to moderately sorted; grains are angular to subangular. Contains rare to trace heavy minerals, trace to minor coarse mica, rare to trace white feldspar, and rare rose quartz. Massively bedded, silt beds are laminated and contain lenticular beds. Contact between the upper and lower lithofacies is gradational. Qfms rests on Ku where Cretaceous strata remains in the southern area. To the North and East of that area, Qfms directly overlies bedrock. Most often, Qhms overlies this unit. Like Ku, Qfms is exposed either as interfluves, or more often along erosional hillsides when capped by younger sedimentary cover.

Tpy **Yorktown Formation -** Sand and clay, medium bluish gray to dark bluish gray when freshly exposed, oxidizes quickly to greenish gray to dark greenish gray. Extreme upper portion also further oxidized to dark yellowish orange. Two lithofacies are present. (1) upper silty clay; sandy; thinly laminated; stiff, contains very fine grained well-sorted quartz sand. (2) lower sand; fine- to medium-grained, silty; poorly to moderately well sorted; subangular to subrounded; locally laminated; also locally heavily bioturbated. A thin basal gravel of rounded quartz and rounded phosphate pebbles is locally present. Both lithofacies are locally fossiliferous; the bivalve Mulinia congesta is common in the eastern portion of the mapped area. Also present is the phosphatic brachiopod Discinisca cf. D. lugubris. Both lithofacies contain glauconite, lithic phosphate, chlorite/biotite, muscovite, trace of pyrite and lignite. Molluscan biostratigraphic information indicates an upper Pliocene age (personal communication, Buck Ward, 1996; Gay, 1980). Unconformably overlies crystalline basement rock over most of the mapped area and rarely overlies Upper Cretaceous sandstone. Occurs predominately at elevations below 170 feet mean sea level, but also occurs as rare outliers above 170 feet. The lower sand lithofacies is interpreted as an open marine sand (possibly equivalent to the Rushmere Member of the Yorktown Formation). The upper clay is interpreted as restricted bay fill sediment (possibly equivalent to the Mogarts Beach Member of the Yorktown Formation).

grv **gravel patches -** Gravel, rounded to subrounded, white vein quartz, and iron-stained quartzite, granule to boulder gravel. Gravels are predominantly moderate red. Occurs in distinct patches at the surface. Unit occurs primarily in the eastern and southern parts of the mapped area. Typically indicates crystalline basement rocks in shallow subsurface (ie, basal coastal plain sediments).

Ku **Cretaceous sediments, undifferentiated -** Individual facies are detailed here; however, this section has been lumped into a Cretaceous undifferentiated unit as shown on the map. The recognized facies consist of, from the uppermost unit downward: 1) an upper, widespread, gray, silty, and sandy clay unit with a thin ferricrete zone at the uppermost contact; 2) a grayish, clayey, coarse sand; 3) a fine to very fine grained, light grayish, silty, well-sorted sand with common whitish flasers and locally common to abundant, fine to medium grained siderite and trace amounts of amber; 4) a lower grayish, clayey sand, commonly cross-bedded with traces of organic material (lignite); 5) fine-grained, slightly silty, well-sorted sands with minor amounts of carbonaceous material; and 6) a basal, coarse to very coarse grained sand unit with abundant gravel. A gravel lag is common at the contact with crystalline basement rocks. Top elevations of this unit range from approximately 480 feet in the west to less than 180 feet in the east. Where present, Ku rests on bedrock and is primarily overlain by Qfms and Qhms. The sand and rip up clast gravel of this lithofacies are interpreted to have been deposited in a fluvial to marine transition zone.

CRYSTALLINE ROCKS (UNDIFFERENTIATED)

Bedrock **crystalline rocks of igneous and metamorphic origin, undifferentiated -** Discrete bedrock units (undifferentiated in this compilation) across the Raleigh 100K area are oriented generally NNE-SSW across the mapped area. Bedrock exposed at the surface includes Mesozoic-age, rift basin sedimentary rocks of the Durham sub-basin of the Deep River Basin in the far west. Moving eastward, intrusive rocks as metamorphosed granites of the Eastern Carolina Terrane are exposed, followed by metamorphics as a predominantly felsic mica gneiss of the Crabtree terrane. Further east and encompassing a small area to the NW (within two 24k quads) are the metamorphosed ultramafics of the Falls Lake Terrane. Metamorphics in the form of mica schist in the Raleigh Terrane partially surround the large Rolesville granitic batholith, which is exposed broadly through the center of the compilation area. Final bedrock exposures at the surface to the far east include metamorphics as biotite gneisses and schists of the Spring Hope Terrane. The surface of the bedrock below the existing coastal plain sedimentary cover dips generally to the southeast at approximately 8.5 feet per mile. The irregular, erosional bedrock surface is a major nonconformity in the rock record.

Surficial Geologic Map with Top of Bedrock Structural Contours in the Raleigh 30 x 60 Minute Quadrangle, North Carolina

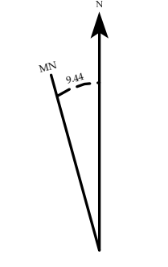
Map units compiled by
Dwain M. Veach
Original mapping by: John G. Nickerson, Norman K. Gay, Kathleen M. Farrell, Philip J. Bradley, and David A. Grimley

Structural contours mapped by
Dwain M. Veach

Map preparation, digital cartography, and editing by Dwain M. Veach, Sierra J. Isard, Yates McConnell, and Michael A. Medina
2022 & 2023

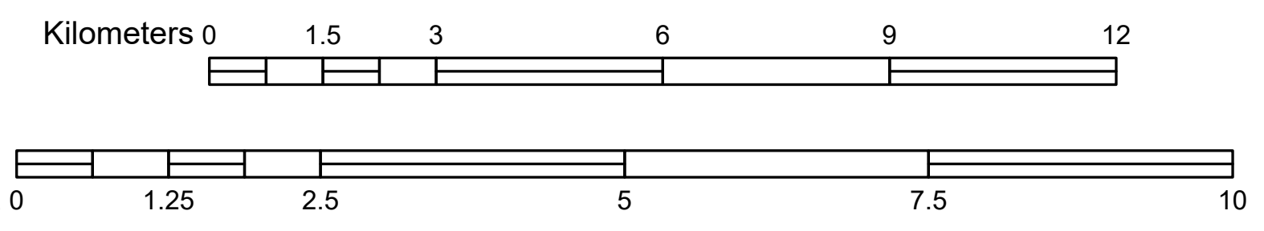
INDEX TO 7.5-MINUTE QUADRANGLES

SW DURHAM	SE DURHAM	BAYLEAF	WAKE FORESET	ROLESVILLE	BUNN WEST	BUNN EAST	SPRING HOPE
GREEN LEVEL	CARY	RALEIGH WEST	RALEIGH EAST	KNIGHTDALE	ZEBULON	MIDDLESEX	BAILEY
NEW HILL	APEX	LAKE WHEELER	GARNER	CLAYTON	FLOWERS	STANCILS CHAPEL	LUCAMA
COKESBURY	FURQUAY-VARINA	ANGIER	EDMONDSON	POWHATAN	SELMA	KENLY WEST	KENLY EAST



9.44 degrees west
declination
at center of sheet

SCALE 1:100,000



CONTOUR INTERVAL: 25 feet

Projection: Lambert Conformal Conic
Projected coordinate system: NAD 1983 State Plane North Carolina FIPS 3200 (Meters)

Legend

○ borehole

— isovalue contour line