Department of Environment and Natural Resources
Division of Land Resources
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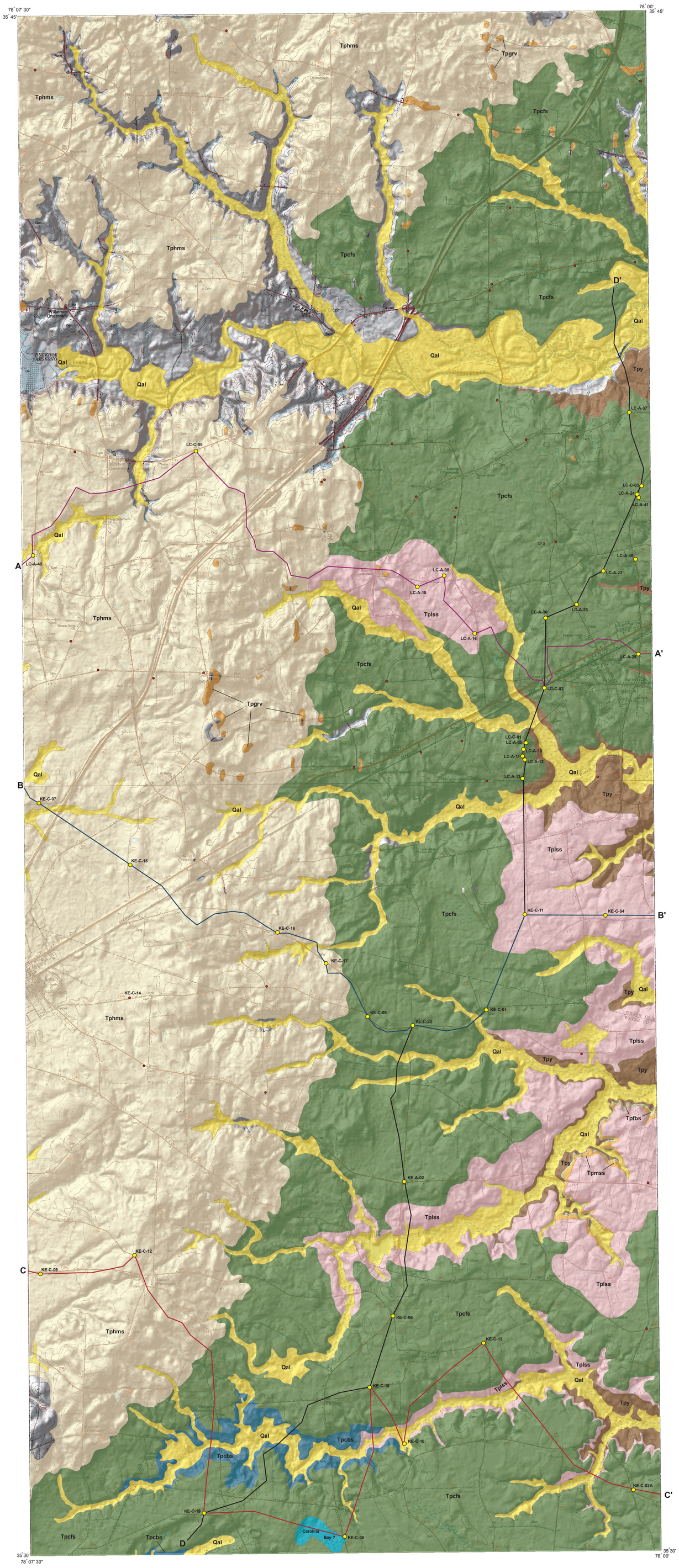

Mapped Sedimentary Facies on the Lucama and Kenly East 7.5-minute Quadrangles, Johnston, Wilson, and Wayne Counties, North Carolina

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INTRODUCTION

The sedimentary cover of the Lucama and Kenly East 1:24,000-scale quadrangles, located in the Raleigh 1:100,000-scale sheet, was mapped as part of the STATEMAP Geologic Mapping Program in 1996-1997. These quadrangles are in the Upper Coastal Plain of eastern North Carolina in parts of Johnston, Wilson, and Wayne Counties. Elevations range from about 90-feet on the eastern side of the quadrangles in the stream drainages to about 300 feet in the northwestern map area on the Sims Pluton. The Kenly Escarpment crosses the area at an elevation of about 170-feet in a northeast southwest orientation and represents a former shoreline location. The database collected for this mapping effort consists of 25 continuous cores, 58 power-auger drill holes, and 289 outcrops and field observations. Drill hole data reveals a relatively thin sedimentary package, ranging up to about 60-feet thick, which rests on an irregular basement surface. This surface restricted the sediment distribution between pre-existing highs. Basement rocks include, but are not limited to, metasedimentary, metavolcanic, and at least two separate granitoid plutons, the Sims Pluton in the northwest map area, and the Contentnea Creek Pluton in the east-central portion of the map area. The metavolcanic Kenly Ridge along the western edge of the Lucama and Kenly East Quadrangles restricted the western limit of some of the earlier marine to marginal marine lithofacies. As sea level continued to rise, eventually this large feature was flooded. The oldest sedimentary unit identified in the mapped area consists of loose coarse-grained sands, and is tentatively correlated with the Upper Cretaceous Black Creek Formation. This unit occurs in the subsurface only in core KE-C-02A. The Upper Pliocene Yorktown Formation in the mapped area is more widespread below about 150-feet, and consists of the Rushmere and the Morgarts Beach Members. The Rushmere Member consists of shelly coarse-grained sands, while the overlying Morgarts Beach Member is a distinctive laminated to massive silty clay. The post-Yorktown units comprise a very complex set of lithofacies that filled pre-existing paleo-drainages as sea level continued to rise. Continued sea level rise flooded drainage interfluves during a maximum sea-level event and sediments were deposited over the entire mapped area. Later as sea level began to fall, some pre-existing lithofacies were eroded out of the old paleo-drainages and new sedimentary packages were deposited in these drainages. Various lithofacies representing tidal flats, tidal channels, overwash deposits, fluvial channels, beach/shoreface complexes, barrier, and back barrier deposits, have been identified in the drill samples and in some outcrops.

DESCRIPTION OF MAP UNITS

Qal - Quaternary Alluvium: - Sand, gravel, clay and silt; White, gray, and black; unconsolidated; associated with present stream channels and floodplains.

CB ? - Possible Carolina Bay sediments: - Coarse-to very coarse-grained sands overlying white to tan plastic bioturbated clay. Unusual lithology compared to other local and regional drilling results, and the drill site resides close to a Carolina Bay depression. KE-C-08 was drilled just east of NC 581 above this feature, however, there may be road fill associated with this area.

Tpgrv - Gravel Patches: Gravel, rounded to subrounded, white vein quartz, and iron-stained quartzite, granule to boulder gravel. Occurs in distinct patches at the surface. Typically indicates crystalline basement rocks in shallow subsurface. Predominantly moderate red 5R (4/6). Unit occurs throughout the mapped area.

Tpcfs - Coarse Feldspathic Sand: Silty and clayey; typically moderate reddish brown 10 R (4/6), pale yellowish orange 10YR (8/6), light gray (N8) ; predominantly coarse-grained; 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. Unconformably overlies all other facies. Occurs at elevations below 170-feet, reference mean sea level.

Facies Interpretation:
The coarse feldspathic sand was deposited in fluvial environments during a general regression.

Tpcbs - Cross-bedded Sand: Sand, slightly silty; pale pink 5RP (8/2) to moderate pink 5R (7/4), pale yellowish orange 10YR (8/6) to yellowish gray 5Y (8/1); 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. Tpcbs generally unconformably overlies Tplss, rarely overlies Tpfbs, and is in turn unconformably overlain by Tpcfs.

Facies Interpretation:

The cross-bedded sand was deposited in a sub tidal, shoreface environment to a fluvo-estuarine environment during a general regression and may correlate with the Upper Pliocene Bacons Castle Formation of Virginia.

Tplss - Laminated Silt and Sand: Silty, slightly sandy clay; sands are generally pale yellowish orange 10YR (8/6), light red 5R (6/6), and mod orange 10YR (7/4) fine-grained to very fine grained, and well to very well sorted; silt and silty clay are predominantly light gray (N6) and moderate orange pink 10R (7/4). 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 below 170-feet, reference mean sea level.

Facies Interpretation:

The laminated silt and sand facies 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 sub tidal front where mixed clay and sand accumulated. The lack of vertical burrows suggests rapid sedimentation. Unit may correlate with the Barhamsville Member of the Upper Pliocene Bacons Castle Formation of Virginia.

Tpmss - Massive Sand: Sand, slightly clayey; moderate yellowish orange 10YR (7/6), pale yellowish orange 10YR (8/6), and moderate orange pink 10R (7/4); 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 are near the base of the unit. Unconformably overlies Tpfbs, when present and unknown contact when overlying Tpy – the nature of the contact is concealed by breaks in the sampling. Occurs at elevations below 170-feet, reference mean sea level.

Facies Interpretation:

The massive sand unit is almost always structureless and was always recovered in a very wet, soupy condition. This unit may be the result of heaving sand encountered during coring and may not accurately reflect the unit's original sedimentary structure(s) or overall sorting.

Tpfbs - Flaser bedded Sand: Predominantly pale yellowish orange 10YR (8/6) sands and light gray (N7) 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 170-feet, reference mean sea level.

Facies Interpretation:

Conformably overlies the Upper Pliocene Yorktown Formation in core KE-C-20, and may represent an oxidized portion of that unit or possibly a regressive phase of the Bacons Castle Formation as mapped by the Virginia Geological Survey. Unit has not been traced from Virginia to this map area.

Tphms - Heavy Mineral bearing Sand: Slightly clayey and silty sand; moderate reddish brown 10R (4/6), dark yellowish orange 10YR (6/6), pale yellowish orange 10YR (8/6), yellowish gray 5Y (8/1) and very pale orange 10YR (8/2); 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.

Facies Interpretation:

The heavy mineral sand is interpreted as a blanket deposit covering the topographically highest areas of 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 embayment to the west and north of the mapped area. 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.

Tpy - Yorktown Formation, Upper Pliocene: Sand and clay, medium bluish gray 5B (5/1) to dark bluish gray 5B (4/1) when freshly exposed, oxidizes quickly to greenish gray 5GY (6/1) to dark greenish gray 5GY (4/1). Extreme upper portion also further oxidized to dark yellowish orange 10YR (6/6). 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 120 feet mean sea level, but also occurs as an outlier above 170-feet (KE-C-14 – 184' interpreted top of Tpy).

Facies Interpretation:

The lower sand lithofacies is interpreted as an open marine sand, equivalent to the Rushmere Member of the Upper Pliocene Yorktown Formation (Ward and Blackwelder, 1980). The upper silty clay is interpreted as restricted bay fill sediment, equivalent to the Morgarts Beach Member of the Yorktown Formation. Age dates obtained for unit in KE-C-10 - macro fossil assemblage, Upper Pliocene Morgarts Beach Member of the Yorktown Formation (personal communication, Buck Ward, 1996) and in core KE-C-11 - palynology results indicate a definite Pliocene age for the upper clay, with a temperate forest assemblage. Environment of deposition most likely nearshore marine (personal communication, Norman Frederiksen, 2001).

Kbc - Black Creek Formation, Upper Cretaceous: Sand and gravel; pale yellowish orange 10YR (8/6) and light gray (N7); sand is fine- to coarse-grained; gravel is granule- to small pebble-size clay rip up clasts; massive and laminated; locally burrowed; trace mica, trace glauconite, trace rose quartz, minor lignite. This unit was encountered in a single bore hole, KE-C-02A.

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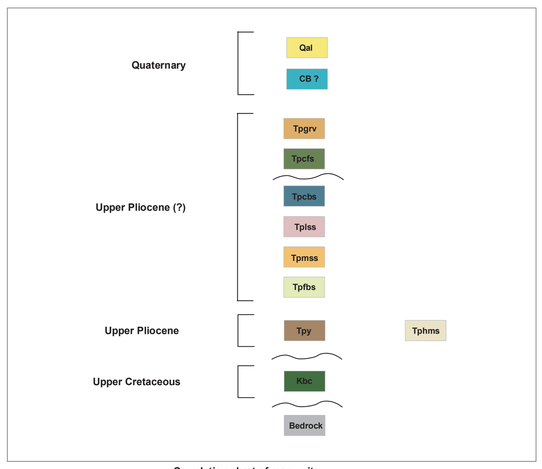
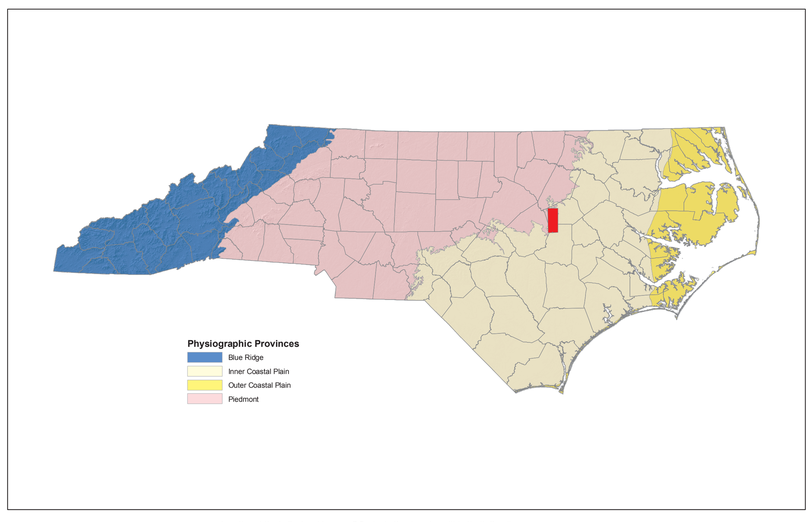


Correlation chart of map units.



Location of Kenly East and Lucama 7.5-minute Quadrangles within North Carolina.

Core Holes and Auger Holes

Drill Holes Along Sections

Additional Drill Holes

Lines of Cross Section

A - A'

B - B'

C - C'

D - D'

This Open-File map is preliminary. It has been internally Reviewed for conformity with the North Carolina Geological Survey editorial standards. Further revisions or corrections to this Open-File map may occur.

SCALE 1:24,007

1 0.5 0 1 Mile

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 0.5 0 1 Kilometer

Original geologic mapping performed under a cooperative agreement through the U.S. Geological Survey's STATEMAP Program.

Hillshade base data source: NC DOT GIS Unit, http://www.ncdot.org/it/gis/DataDistribution/ContourElevationData/default.html

Cultural base map consists of two Digital Raster Graphics for the Lucama and Kenly East Quadrangles, 1:24-000-scale.