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

Kenneth B. Taylor, State Geologist

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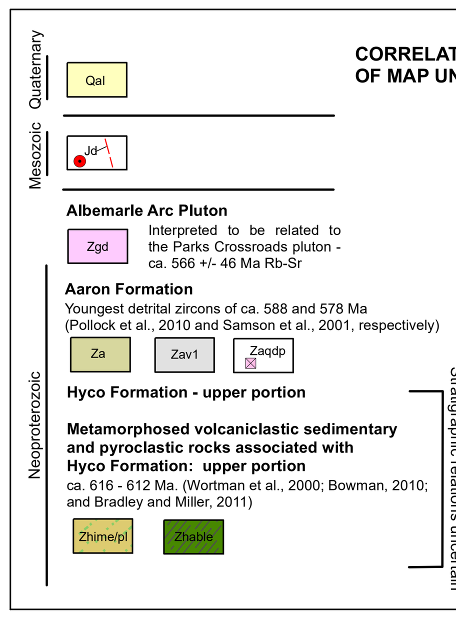
North Carolina Geological Survey
Open File Report 2018-03



INTRODUCTION

The Coleridge 7.5-minute Quadrangle lies in the east central portion of the North Carolina Piedmont. The Randolph – Chatham County line crosses the quadrant from north to south. The Siler City Municipal Airport is located on the eastern side of the quadrangle. The unincorporated community of Coleridge which includes the Coleridge Historic District (part of the National Register of Historic Places) is present in Randolph County on the southwest corner of the quadrangle. The northern portion of the quadrangle is crossed by US Hwy 64, a major east-west corridor for the central Piedmont. State Hwy 22 and 42 are present in the southwest corner of the quadrangle.

The majority of the quadrangle drains to the Deep River along drainages that include Reed Creek, Brush Creek, Little Brush Creek, Blood Run, Millstone Creek, Broad Mouth Branch and Back Branch. A small portion of the northeast corner of the quadrangle drains to the Rocky River. Natural exposures of crystalline rocks occur mainly along these and numerous unnamed creeks. Rock exposure at road cuts, ridges, resistant finned-shaped outcrops and pavement outcrops occur locally outside of drainages. The elevations in the map area range from about 700 feet above sea level at the end of Knoll Ridge Road near the east-central edge of the quadrangle (on the ridge that marks a major geologic contact between the Hyco and Aaron Formations in the area), to less than 370 feet along the Deep River near the southwest corner of the quadrangle.

GEOLOGIC BACKGROUND AND PAST WORK

Pre-Mesozoic crystalline rocks in the Coleridge Quadrangle are part of the Neoproterozoic to Cambrian Carolina terrane (Hibbard et al., 2002; and Hibbard et al., 2006). In the region of the map area, the Carolina terrane can be separated into two lithotectonic units: 1) the Hyco Arc and 2) the Aaron Formation of the redefined Virgilina sequence (Hibbard et al., 2013). The Hyco Arc consists of the Hyco Formation which include ca. 633 to 612 Ma (Wortman et al., 2000; Bowman, 2010; Bradley and Miller, 2011) metamorphosed layered volcaniclastic rocks and plutonic rocks. Available age dates (Wortman et al., 2000; Bradley and Miller, 2011) indicate the Hyco Formation may be divided into lower (ca. 630 Ma) and upper (ca. 615 Ma) portions (informal) with an apparent intervening hiatus of magmatism. In northeastern Chatham County, Hyco Formation units are intruded by the ca. 579 Ma (Tadlock and Loewy, 2006) East Farrington pluton and associated West Farrington pluton. The Aaron Formation consists of metamorphosed layered volcaniclastic rocks with youngest detrital zircons of ca. 588 and 578 Ma (Pollock et al., 2010 and Samson et al., 2001, respectively).

FOLDS

The Hyco Arc and Aaron Formation lithologies were folded and subjected to low grade metamorphism during the ca. 578 to 554 Ma (Pollock, 2007; Pollock et al., 2010) Virgilina deformation (Glover and Sinha, 1973; Harris and Glover, 1985; Harris and Glover, 1988; and Hibbard and Samson, 1995). In the map area, original layering of Hyco and Aaron Formation lithologies are interpreted to range from shallowly to steeply dipping due to open to tight folds that are locally overturned to the southeast.

Four hundred and seven (407) primary bedding, layering and compaction/welding foliation measurements from this and adjacent quadrangles in the immediate area of the map were used in stereogram analyses to determine the range of fold interlimb angles. Calculated interlimb angles ranged from greater than 120 degrees to less than 30 degrees indicating the presence of gentle to tight folds. Preliminary domainal analyses of measurements in Hyco Formation units only, indicate the folds range from tight to open with the majority of the folds likely within the tight to close range. Preliminary domainal analyses of measurements in Aaron Formation units only, indicate the folds range from tight to gentle with the majority of the folds within the open range.

MINERAL RESOURCES

There are no active mining activities currently in the quadrangle. Two abandoned quarries utilized for crushed stone are present within the Parks Crossroads Granodiorite (Tingle, 1982). Both abandoned quarries are located in the vicinity of the crossroads of Parks Crossroads.

DESCRIPTION OF MAP UNITS

All pre-Mesozoic rocks in the map area have been metamorphosed to at least the chlorite zone of the greenschist metamorphic facies. Many of the rocks display a weak or strong metamorphic foliation. Although subjected to metamorphism, the rocks retain relict igneous, pyroclastic, and sedimentary textures and structures that allow for the identification of protolith rocks. As such, the prefix "meta" is not included in the nomenclature of the pre-Mesozoic rocks described in the quadrangle.

Map units of metavolcanic and metavolcaniclastic rocks include various lithologies that when grouped together are interpreted to indicate general environments of deposition. The dacitic lavas and tuffs unit is interpreted to represent dacitic domes and proximal pyroclastics. The andesitic to basaltic lavas (with tuffs or conglomerates) units are interpreted to represent eruption of intermediate to mafic lava flows and associated pyroclastic and/or epiclastic deposits. The epiclastic/pyroclastic units are interpreted to represent deposition from the erosion of dormant and active volcanic highlands. Some of the metavolcaniclastic units within the map area display lithologic relationships similar to dated units present in northern Orange and Durham Counties. Due to these similarities, the metavolcanic and metavolcaniclastic units have been tentatively separated into upper and lower portions of the Hyco Formation; geochronologic data in the map area is needed to confirm this interpretation. A review of the regional lithologies is summarized in Bradley (2013).

Abundant evidence of brittle faulting at the outcrop scale and large-scale lineaments (as interpreted from hillshade LiDAR data) are present in the map area and adjacent quadrangles. The brittle faulting and lineaments are interpreted to be associated with Mesozoic extension. The Colon cross-structure (Reinemund, 1955), located to the southeast of the study area, is a constriction zone in the Deep River Mesozoic basin and is characterized by crystalline rocks overprinted by complex brittle faulting. Dikes of Jurassic aged diabase intrude the crystalline rocks of the area. Quaternary aged alluvium is present in most major drainages.

A preliminary review of the area geology is provided in Bradley (2013). Unit descriptions common to Bradley et al. (2017a, b) and Bradley et al. (2018) from the Crutchfield Crossroads, Siler City, and Liberty geologic maps, respectively, were used for conformity with on strike units in neighboring quadrangles. Unit descriptions and stratigraphic correlations were maintained from adjacent mapping in Orange County (Bradley et al., 2016). The nomenclature of the International Union of Geological Sciences subcommission on igneous and volcanic rocks (IUGS) after Le Maitre (2002) is used in classification and naming of the units. The classification and naming of the rocks is based on relict igneous textures, modal mineral assemblages, or normalized mineral assemblages when whole-rock geochemical data is available. Pyroclastic rock terminology follows that of Fisher and Schminke (1984).

Sedimentary Units

Qal

Qal – Alluvium: Unconsolidated poorly sorted and stratified deposits of angular to subrounded clay, silt, sand and gravel- to boulder-sized clasts, in stream drainages. May include point bars, terraces and natural levees along larger stream floodplains. Structural measurements depicted on the map within Qal represent outcrops of crystalline rock inliers surrounded by alluvium.

Intrusive and Metaintrusive Units

Jd

Jd – Diabase: Black to greenish-black, fine- to medium-grained, dense, consists primarily of plagioclase, augite and may contain olivine. Occurs as dikes up to 100 ft wide. Diabase typically occurs as spheriodally weathered boulders with a grayish-brown weathering rind. Red station location indicates outcrop or boulders of diabase.

Zgd

Zgd –Granodiorite: (CI=5) Leucocratic, fine- to medium- grained, equigranular metamorphosed, granodiorite. Mineral assemblage includes quartz, plagioclase, and green hornblende +/- chlorite, +/- epidote. Likely correlative to the Parks Crossroads pluton - ca. 566 +/- 46 ma. Rb-Sr whole rock age (Tingle, 1982).

Zaqdp

Zaqdp - Quartz dacite porphyry: Porphyritic with aphanitic groundmass and sub- to euhedral phenocrysts (2-6 mm) of white to salmon plagioclase and gray to dark gray (beta-) quartz; phenocrysts typically constitute 20 to 25% of the rock. May locally have fine-grained intrusive texture. Interpreted as either lava flows or shallow intrusives. Similar to quartz dacite porphyry unit within the Bynum Quadrangle (Bradley et al., 2013). Present as isolated outcrops or boulders as designated by pink-colored station locations.

Metavolcanic and Metavolcaniclastic Units

Aaron Formation

Zav1

Zav1 – Aaron Formation (Virgilina member) volcanics: Mixed epiclastic-pyroclastic rocks with interlayered felsic to mafic lavas: Grayish-green to green; metamorphosed: non-tuffaceous to tuffaceous conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone. Pyroclastic rocks are grayish-green to greenish-gray and silvery-gray; massive to foliated fine- to coarse tuffs. Tuffs are differentiated from other volcaniclastic rocks by the presence of zones of cryptocrystalline texture that exhibit conchoidal-like fractures in between foliation domains. Gray to greenish-gray, siliceous, cryptocrystalline dacite and porphyritic dacite with plagioclase phenocrysts. Gray-green, gray, to green; typically unfoliated, amygdaloidal, plagioclase porphyritic, amphibole/pyroxene porphyritic and aphanitic; metamorphosed: andesitic to basaltic lavas and shallow intrusions. Diorite locally intrudes.

Za

Za – Aaron Formation: Distinctive metasedimentary package that ranges from fine-grained siltstones to coarse-grained sandstones, pebbly sandstones and conglomerates. Siltstones are similar in appearance to Hyco Formation lithologies. The sandstones, pebbly sandstones and conglomerates [classified as litharenite, feldspathic litharenite and lithic feldsarenite by Harris (1984)] are distinctive and commonly contain rounded to subrounded clasts of quartz ranging from sand- to gravel-sized. In the sandstones, feldspar is the most prominent mineral grain; quartz varies from sparse to abundant in hand sample. Lithic clasts are typically prominent and range from sand- to gravel-size. Harris (1984), performed a detailed sedimentary study of the Aaron Formation to the immediate west of the map area. Harris (1984) interpreted the Aaron Formation to have been deposited by turbidity currents in a retrogradational submarine fan setting. Pollock et al., (2010) interprets an approximate 37 million year unconformity between the Aaron and underlying Hyco Formation. This interpretation is based in part on detrital zircon age date data from an Aaron conglomerate sample collected in the adjacent Liberty Quadrangle.

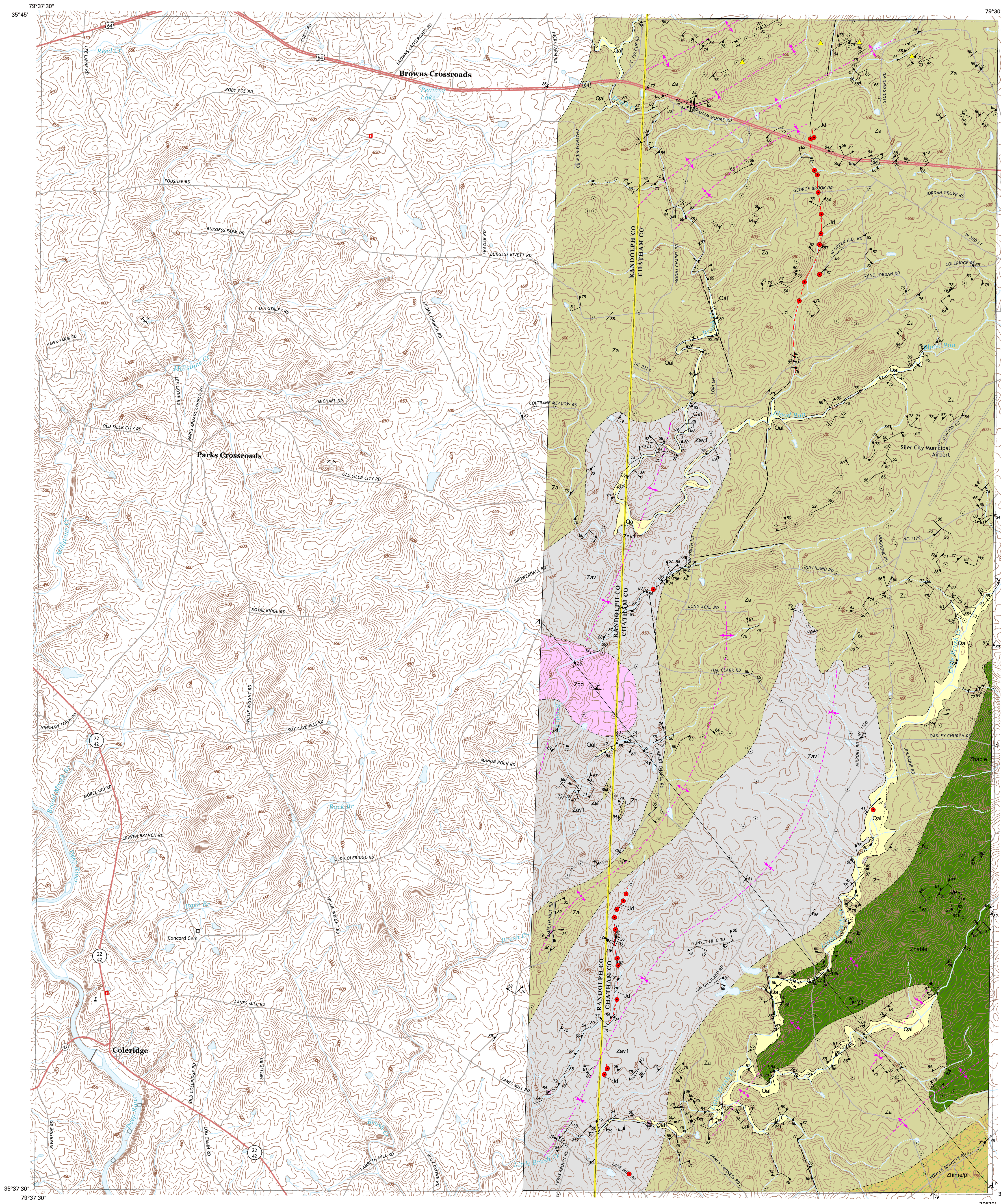
Hyco Formation – Upper Portion

Zhime/pl

Zhime/pl - Mixed intermediate to mafic epiclastic-pyroclastic rocks with interlayered intermediate to mafic lavas: Grayish-green to green, locally with distinctive reddish-gray or maroon to lavender coloration; metamorphosed: conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone. Lithologies are locally bedded; locally tuffaceous with a cryptocrystalline-like groundmass. Siltstones are locally phyllitic. Locally contain interbedded intermediate to mafic lavas identical to Zhabl, Zhable, and Zhablc units. Contains lesser amounts of fine- to coarse tuff and lapilli tuff with a cryptocrystalline-like groundmass. Pyroclastics, lavas, and epiclastics are mainly intermediate to mafic in composition. Minor dacitic lavas and tuffs present. Silicified and/or sericitized altered rock are locally present. Conglomerates and conglomeratic sandstones typically contain subrounded to angular clasts of andesite and basalt in a clastic matrix. Generally interpreted to have been deposited proximal to active intermediate to mafic composition volcanic centers and/or record the erosion of proximal intermediate to mafic composition volcanic centers after cessation of active volcanism.

Zhable

Zhable – Andesitic to basaltic lavas with interlayered epiclastic rocks: Light green, gray-green, gray, and dark gray; typically unfoliated, amygdaloidal, plagioclase porphyritic, amphibole/pyroxene porphyritic and aphanitic; metamorphosed: andesitic to basaltic lavas and shallow intrusions. Hyaloclastic texture is common and imparts a fragmental texture on some outcrops and float boulders. Contains lesser amounts of grayish-green, light green, and light gray to white; metamorphosed conglomerate, conglomeratic sandstone, sandstone, siltstone and mudstone.



Topographic base produced by the United States Geological Survey.
Altered by the North Carolina Geological Survey for use with map.

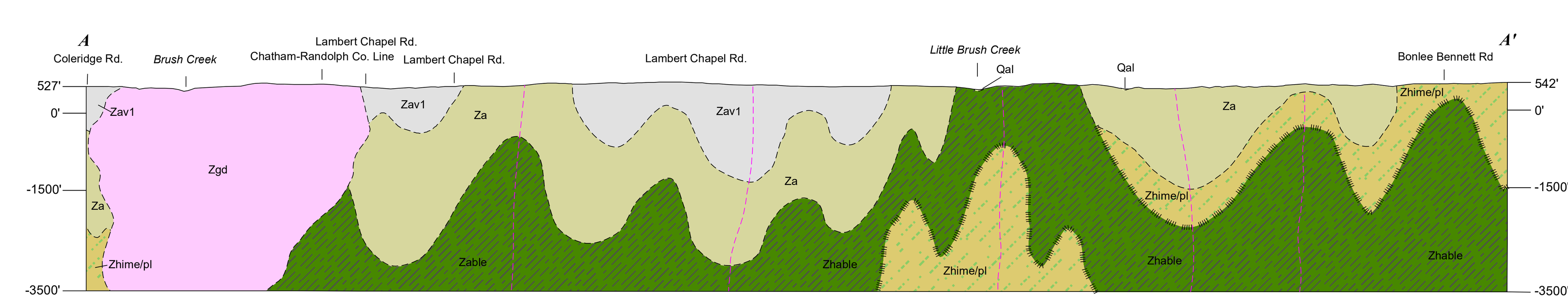
SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.11

Base map is from USGS 2013 GeoPDF of the Coleridge 7.5-minute quadrangle. Air photo, map collar and select features removed. Bounds of GeoPDF based on 7.5-minute grid projection in UTM 17S; North American Datum of 1983 (NAD83). Geologic polygons tied to 7.5-minute grid projection in State Plane coordinates for edge-matching with legacy GIS data, as such some overlap and underlap of map unit polygons occur around edge of map.

COLERIDGE, NC



cross section scale - 1:24 000 no vertical exaggeration

EXPLANATION OF MAP SYMBOLS

CONTACTS

Inferred contact
Concealed contact
Quaternary alluvium contact
Linear geomorphic feature interpreted from hillshade LiDAR - origin uncertain
In cross section, gradational contact
Inferred brittle fault. ? indicates identity or existence questionable; inferred from LiDAR lineament.
Diabase dike - inferred
Interpreted fold hinge anticline, dotted where concealed
Interpreted fold hinge of syncline, dotted where concealed
In cross section, inferred fold axis
Cross section line

PLANAR AND OTHER FEATURES

Strike and dip of primary bedding and/or layering
Strike and dip of primary bedding and/or layering (multiple observations at one location)
Strike and dip of inclined regional foliation
Strike of vertical regional foliation
Strike and dip of inclined regional foliation (multiple observations at one location)
Strike and dip of cleavage
Strike and dip of cleavage (multiple observations at one location)
Strike and dip of inclined joint surface
Strike and dip of inclined joint surface (multiple observations at one location)
Strike of vertical joint surface
Strike of vertical joint surface (multiple observations at one location)
Observation station location
Indicates location of vuggy quartz or sliceous breccia float
Diabase station location
Quarry (crushed stone) - abandoned
Indicates location of quartz dacite porphyry boulders or outcrop

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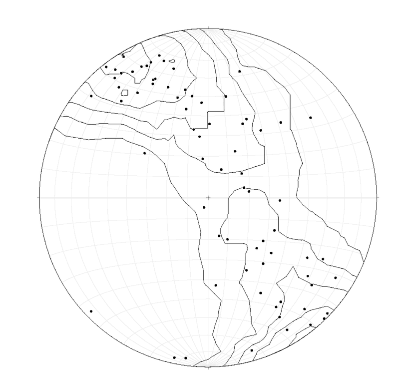
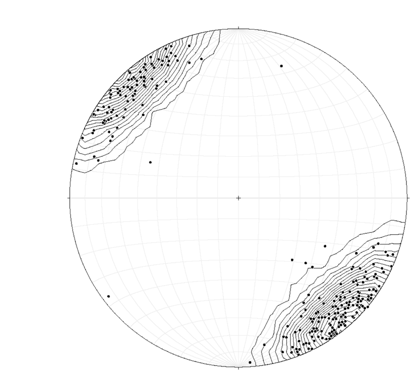
Equal-Area Schmidt Net Projections and Rose Diagram

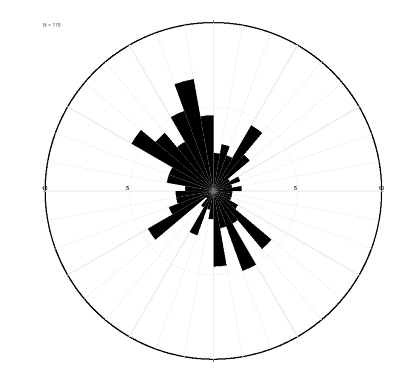
Plots and calculations created using Stereonet v. 8.6.0 based on Allmendinger et al. (2013) and Cardozo and Allmendinger (2013).



Equal Area Schmidt Net Projection of Contoured Poles to Primary Bedding and Layering
Contour Interval =2 sigma; N=73



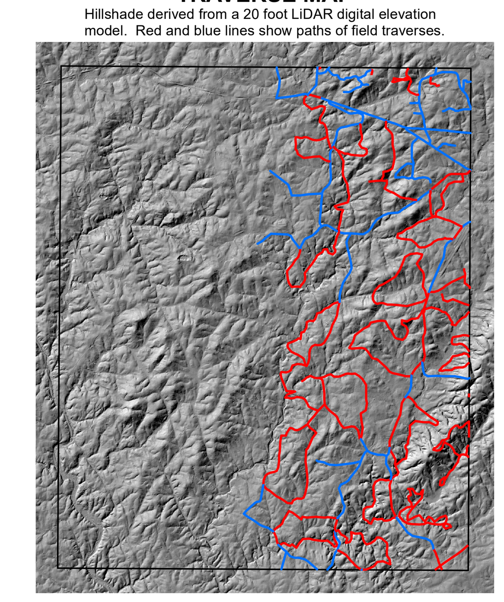
Equal Area Schmidt Net Projection of Contoured Poles to Foliation and Cleavage
Contour Interval = 2 sigma; N=256



Unidirectional Rose Diagram of Joints N = 178
Outer Circle = 10%
Mean vector = 337.1 degrees ± 14.9 degrees;
Max value = 10.11236% between 151 degrees and 160 degrees

TRAVERSE MAP

Hillshade derived from a 20 foot LiDAR digital elevation model. Red and blue lines show paths of field traverses.



Geologic Map of the Chatham County portion of the Coleridge 7.5-Minute Quadrangle, Chatham and Randolph Counties, North Carolina.

By
Philip J. Bradley, Brandon T. Peach, and Heather D. Hanna

Geologic data collected in July 2015 through May 2016 and June 2017 through May 2018.

Map preparation, digital cartography and editing by
Michael A. Medina, Brandon T. Peach, Heather D. Hanna and Philip J. Bradley.

2018

Supersedes Open-file Report 2016-11

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This is an Open File Map. It has been reviewed internally for conformity with North Carolina Geological Survey mapping standards and with the North American Stratigraphic Code. Further revisions or corrections to this Open File map may occur.

Geologic data collected in July 2015 through May 2016 and June 2017 through May 2018.

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Environmental Quality

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