STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

June 3, 2004

STATE PROJECT: 33356.1.1
TIP NO: B-3922
COUNTY: Watauga

DESCRIPTION: Bridge No. 316 on SR 1149 over Cove Creek

SUBJECT: Geotechnical Report – Foundation Investigation

Site Description

Bridge number 316 is located in western Watauga County, approximately 7 miles west of Boone and 2.5 miles west of the junction of US 321 and US 421. The bridge is on SR 1149 at its intersection with US 321.

The existing bridge is to be replaced with a new structure on alignment -L- approximately 370 feet downstream. The new crossing is on a bend in the stream. A small tributary enters Cove Creek on the west bank about 100 feet upstream of -L-, flowing from the mouth of a 3-barrel concrete culvert beneath US 321.

Plans call for a new bridge constructed of pre-stressed girders in three spans of 50 feet, 65 feet and 40 feet, respectively, with a skew of 90 degrees.

Cove Creek is a major tributary of the Watauga River, with its headwaters on the flank of Rich Mountain, a 5000 foot ridge running north from the town of Boone to the Tennessee State Line. It is a turbulent, mountain stream 30 to 40 feet wide flowing on a bed of coarse sand, gravel and boulders, within banks 3 to 5 feet high. The flood plain at that point is 150 feet wide between the embankments of SR 1149 on one side and US 321 on the other side. An additional 100 feet of flood plain has been cut off by the US 321 roadway embankment. The floodplain is covered in grass and hay meadow, with a few scattered trees.

Cove Creek and the surrounding region experienced a moderate flood in the Fall of 2003, leaving evidence of its effects on the site of this project. The west bank of the creek on the proposed alignment was undercut and freshly eroded, as was the base of the

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-250-4088
FAX: 919-250-4237
WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
BUILDING B
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

embankment on US 321 about 150 to 200 feet upstream of the proposed new crossing. The surface of the floodplain was eroded at new Bent Two and fresh deposits of gravel and small boulders were left. The edge of the channel migrated over the Right Side of Bent Two.

The Geotechnical Engineering Unit conducted a Foundation Investigation in April, 2004. Borings were made with a CME 550 all-terrain power drilling machine equipped with a rotary casing advancer and NXWL diamond coring tools. Two borings were made at each bent, including one core boring at each interior bent. Standard Penetration Tests (SPT's) were made at 2.5 or 5 foot intervals in soil and weathered rock, and quality samples were taken from soil strata. Six rock core samples were submitted for compression tests and 2 samples for splitting tensile tests. All tests were conducted by a DOT laboratory.

Soil and Rock Materials

Borings at the site found embankment soils, alluvium, saprolite, weathered rock and hard rock. Alluvial soils on the floodplain directly overlie weathered rock and hard rock. Saprolite was found underlying weathered rock and hard rock in one boring.

Alluvial soils are 7 to 9 feet thick and are typically composed of a few feet of dark brown, very soft silt (A-4) or clay (A-7) overlying loose sand and gravel with cobbles and boulders (A-1-b). Alluvium on the west bank around Bent Two is all loose sand and gravel (A-1-b) or silty sand (A-2-4) with suspended gravel.

Embankment soil is found only at End Bent One, where an old roadway embankment gives access to the floodplain from SR 1149. The soil is very soft, yellow-brown sandy silt (A-4) with suspended rock fragments and a few boulders.

The rock at this site comprises a variety of hard, crystalline lithologies, the most abundant of which are layered biotite gneiss and massive biotite gneiss. The layered biotite gneiss is composed of dark gray, biotite-rich layers alternating with light gray feldspar-rich layers .05 to .80 feet thick. Those biotite gneisses display moderately well-developed foliation that dips 25 degrees, parallel with the layering where present. Four additional lithologies are part of the stratified sequence found at Bent Two. They are light gray feldspathic gneiss; very coarse, white crystalline pegmatite; a feldspathic transition between the pegmatite and biotite gneiss with a well-developed shear foliation; and metagabbro composed chiefly of hornblende partially altered to chlorite and moderately well foliated. The foliation in those lithilogies dips 10 to 20 degrees. Rock quality among all those lithologies varies from very poor to very good.

Bent Descriptions

End Bent One (EB1): This bent lies across an embankment beside the shoulder of SR 1149. The embankment is part of an old soil road from SR 1149 to the floodplain surface. The Left Side of the bent is on the surface of the floodplain and the Right Side is on the embankment.