



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

May 26, 2010

MEMORANDUM TO: William (Bill) T. Goodwin, PE
Project Development – Bridge Unit – Unit Head
Project Development and Environmental Analysis Branch

FROM: Njoroge W. Wainaina, P.E.
State Geotechnical Engineer
Geotechnical Engineering Unit

TIP NO: B-5177
WBS: 42548.1.1
COUNTY: Watauga
DESCRIPTION: Bridge # 278 over Middle Fork Creek on SR 1540 and realign
intersection of US 321 with SR 1540 & SR 1531 (Middle Fork Rd)

SUBJECT: **Geotechnical Report**

The Geotechnical Engineering Unit has performed a limited assessment of the above referenced project to assist in developing the scope of work necessary to provide early identification of hazardous material and geotechnical issues that could impact the project's planning, design, or construction.

HAZARDOUS MATERIALS EVALUATION

Purpose

This section presents the results of a hazardous material evaluation conducted along the above referenced project. The main purpose of this investigation is to identify properties within the project study area that are or may be contaminated and therefore result in increased project costs and future liability if acquired by the Department. Hazardous material impacts may include, but are not limited to, active and abandoned underground storage tank (UST) sites, hazardous waste sites, regulated landfills and unregulated dumpsites.

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www.ncdot.gov/doh/preconstruct/highway/geotech

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

Techniques/Methodologies

The Geographical Information System (GIS) was consulted to identify known sites of concern in relation to the project corridor. Geotechnical Engineering Unit personnel conducted a field reconnaissance along the project corridor on September 15, 2009. A search of appropriate environmental agencies' databases was performed to assist in evaluating sites identified during this study.

Anticipated Impacts

The Geotechnical Engineering Unit observed no contaminated properties during the field reconnaissance and regulatory agencies' records search. Please note that discovery of additional sites not recorded by regulatory agencies and not reasonably discernable during the project reconnaissance may occur. The Geotechnical Engineering Unit should be notified immediately after discovery of such sites so their potential impact(s) may be assessed. See Appendices A and B for an area map and site photograph.

If there are questions regarding the geoenvironmental issues, please contact Ethan J Caldwell, LG, EI, at 919-250-4088.

GEOTECHNICAL IMPACT EVALUATION

Techniques/Methodologies

The Geotechnical Engineering Unit conducted a preliminary field investigation of this project in April/May of 2010. The investigation consisted of two borings, one at either end of the existing bridge: B-1 in the southwest quadrant and B-2 in the northeast quadrant. The borings were advanced using -NW- casing with an advancer. Standard Penetration Tests were performed at intervals of 5.0 feet. The boring elevations were established relative to a TBM with an assumed elevation of 100.00. The center of the existing bridge deck is at 99.93.

Findings

Geologic Structure

This project is located in the Blue Ridge Physiographic Province. The two borings advanced at this site will be considered separately.

B-1

The surface materials in B-1 comprised almost 9.0 feet of very loose silty sand with gravel embankment. Below this was a layer of dense alluvium, consisting of about 3.5 feet of sand and gravel with cobbles. The alluvium had been emplaced upon saprolite. The saprolite comprised approximately 5.5 feet of medium dense silty sand. The saprolite was in sharp contact with weathered rock at 17.7 feet (elevation 81.1). The interval of weathered rock between 17.7 feet (elevation 81.1) and 19.2 feet (elevation 79.6) contained layers of very dense saprolite. The boring was terminated at 35.6 feet (elevation 63.2) in weathered rock.

B-2

The embankment here was thicker than in B-1. Here, it comprised 15.8 feet of loose to medium dense silty sand with gravel and a trace of boulders. The embankment rested directly upon saprolite: alluvium was not encountered. The saprolite comprised 5.3 feet of medium dense silty sand with a trace of weathered rock seams. Continuous (more or less) weathered rock was in sharp contact with the overlying saprolite at 21.1 feet (elevation 79.5). The interval of weathered rock from 24.2 feet (elevation 82.6) and 31.5 feet (elevation 89.9) contained thin seams of very dense saprolite. Crystalline rock was achieved at 32.7 feet (elevation 67.9). The rock is probably that which is denoted as -Ybrg- on the Geologic Map of North Carolina (1985). It is described as a quartz monzonitic augen gneiss. The boring was terminated at 34.2 feet (elevation 66.4) in crystalline rock. Non-scourable material lay more than 6.0 feet below the creek bed in B-1, and 8.0 feet below the creek bed in B-2.

Geomorphology

The project is located within some of the most mountainous terrain in North Carolina. However, at the proposed bridge site itself, the ground is very nearly flat. This is due to embankment material emplaced for SR-1540 and fill material emplaced for the parking areas of Tweetsie Railroad.

Groundwater and Drainage

Static groundwater was not measured in either boring. Both borings were filled immediately after drilling (FIAD). Water was measured in B-1 (before it was filled, of course) at 11.5 feet. B-2 was caved-in and dry at 9.1 feet. Drainage for the area is provided by Middle Fork Creek. This is a northerly flowing creek approximately 15.0 feet wide. It has a creek bed of sand, gravel and cobbles. At the time of this investigation, the creek was less than a foot deep on average. The creek bed was surveyed in with an elevation of 87.5.

Anticipated Impacts/Recommendations

For approach embankment slopes, use 2:1 (H:V) or flatter.

No significant compaction of the floodplain or embankment soils is expected.

An on-site detour bridge can be located on either side of the existing bridge.

Non-scourable material is too deep for a bottomless culvert to be considered.

If there are any questions regarding the geotechnical issues, please contact Shane Clark, P.E., or Charles Dunnagan, L.G. at (828) 298-3874.

cc:

Art McMillan, PE, State Highway Design Engineer

Jay Bennett, PE, State Roadway Design Engineer

Tom Koch, PE, Assistant State Bridge Design Engineer

D.R. Henderson, PE, State Hydraulics Engineer

Charles W. Brown, PE, PLS, State Location & Surveys Engineer

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Appendix A
Location of USTs, Landfills, & Other Potentially Contaminated Sites



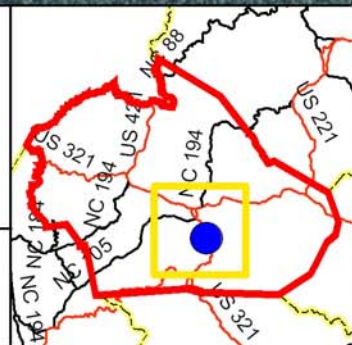
Project 42548.1.1 (TIP # B-5177)
Bridge # 278 over Middle Fork Creek on
SR 1540 and realign intersection of
SR 1540 & SR 1531 (Middle Fork Rd)
Watauga County



0 250 500 1,000 Feet



NC Department of Transportation
Geotechnical Engineering Unit
GeoEnvironmental Section





Bridge # 278. View to the east.



Bridge # 278. View upstream.



Bridge # 278. View downstream.