

Appendix D:

Geotechnical

Overview

MEMORANDUM

(P-001-2018) Consultant

TO: John Moore, PE
Director
Division of Planning

FROM: Bart Asher, PE, PLS
Director
Division of Structural Design

BY: Erik Scott, PE 
Geotechnical Branch

DATE: January 8, 2018

Subject: Kenton County
Turkeyfoot Road (KY 1303) Corridor Study
Barnwood Drive to Northern I-275 Ramp
MP 5.085 to 5.797
Preliminary Geotechnical Overview

The preliminary geotechnical overview report for the subject project has been completed by American Engineers, Inc. This report was prepared as part of the Planning Study for the Turkeyfoot Road Corridor under Statewide Planning Contract. The report will be made available on ProjectWise and the KYTC Geotechnical Database.

cc: Division of Planning
Division of Highway Design
TEBM for Project Development (District)
American Engineers, Inc.
Palmer Engineering, Inc.



GEOTECHNICAL OVERVIEW REPORT P-001-2018

Turkeyfoot Road (KY 1303) Corridor Study
From Barnwood Drive to North End of Bridge over I-275

Kenton County, KY

January 2018



January 5, 2018

Gary W. Sharpe, PE
Project Manager
Palmer Engineering
Engineering Planning
301 East Main Street
Suite 900
Lexington, KY 40507

Re: Geotechnical Overview Report
Turkeyfoot Road (KY 1303)
P-001-2018
From Barnwood Drive to North End of Bridge over I-275
Kenton County, Kentucky
AEI Project No. 217-222

Dear Mr. Sharpe:

American Engineers, Inc. Field Services Center is pleased to submit this geotechnical overview that details the results of our site and mapping reconnaissance at the above referenced site.

The attached report describes the site conditions and near-surface geology and also details potential design recommendations for the proposed project. The Appendices to the report contains a water well location map for the study area as well as a geologic map of the study area.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully,
AMERICAN ENGINEERS, INC.

A handwritten signature in blue ink that reads "Jackson Daugherty".

Jackson Daugherty, EIT
Geotechnical Engineer

A handwritten signature in blue ink that reads "Dennis Mitchell".

Dennis Mitchell, PE
Geotechnical Project Manager

**Geotechnical Overview Report
KY 1303 (Turkeyfoot Road) Study
From Barnwood Drive to North End of Bridge over I-275
Kenton County, KY**

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**Geotechnical Overview Report
KY 1303 (Turkeyfoot Road) Study
From Barnwood Drive to North End of Bridge over I-275
Kenton County, KY**

1. PROJECT DESCRIPTION

The study area includes a section of KY 1303 (Turkeyfoot Road) beginning at the intersection with Barnwood Drive and continuing north to the north end of the bridge over I-275 covering a length of about 4,000 feet, as well as Town Center Boulevard and Thomas More Parkway. The study area ranges from about 700 feet in width from east to west near the southern and northern ends of the project, and as much as about 2,000 feet in width to include portions of Town Center Boulevard and Thomas More Parkway. The extent of the study area encompasses the existing roadways, several approach roads, Crestview Hills Mall, Thomas More College, a hospital, an office park and residential areas. The study area is an existing roadway near several high traffic areas. Six or more approach roads intersect the current alignment in the extent of the study area, including Interstate 275 near the end of the project limits.

Thomas More College lies east of the current alignment. There is a greenspace area adjacent to the Thomas More baseball field. Thomas More College is actively seeking a development in this area. Per the Scoping Meeting conducted on June 16th, 2017, District 6 is considering granting partial access to the property in the form of a right-in/right-out. Crestview Hills Mall lies west of the current alignment. Crestview Hills Mall has requested a right turn lane at the intersection of Northbound Turkeyfoot road and Thomas More Parkway. Current left turning lanes do not provide enough storage and may be lengthened. There is currently a pond north of the intersection of Thomas More Parkway and Turkeyfoot Road.

The current roadway is paved with asphaltic pavement. A few areas along the existing roadway show signs of fatigue and exhibit cracking, particularly along pavement joints and near the



existing concrete curb based on review of satellite imaging. Approximate coordinates for the southern extent of the study area near Barnwood Drive are 39.018368, -84.574732; and 39.027996, -84.567846 for the northern extent of the study area near the north end of the bridge over I-275.

The geotechnical overview was conducted in relative accordance with Section 801 of the Kentucky Transportation Cabinet Geotechnical Manual. The purpose of this overview is to identify potential geotechnical concerns and provide anticipated typical parameters for design throughout the defined study area as a precursor to a more thorough geotechnical field investigation.

The study was conducted during November and December 2017 and included geologic research of available geologic and topographic quadrangle maps, Soil Survey of Kenton County, Kentucky, as well as multiple resources available from the Kentucky Geological Survey and the United States Geological Survey. Past reports from geotechnical investigations for roadways and structures in and near the area of the Overview were also reviewed.

2. SITE GEOLOGY

Available geologic mapping (*Geologic map of the Covington quadrangle, northern Kentucky, USGS, 1971* and the Kentucky Geological Survey Geologic Map Information Service online) indicates bedrock which underlies the study area is comprised primarily of the Upper Ordovician-aged Bull Fork Formation. The Bull Fork Formation is predominantly comprised of interbedded limestone and shale. The limestone, which is typically fossiliferous, occurs as more than 50 percent of the formation and is described as being medium to light-gray in color where freshly exposed. The shale is medium-gray to dark-greenish-gray in color when freshly exposed and is typically non-durable and requires slaking prior to being placed as an engineered fill. Regional dip in the study area was reviewed based on subsurface structure contours drawn at the base of the



Bellevue Tongue of the Grant Lake Limestone and indicates a dip of about 13 feet per mile, or about ¼ percent from west to east.

Highway fill containing appreciable quantities of shale and argillaceous limestone from Upper Ordovician formations is subject to failure by sliding.

Mapping did not indicate any potential for karst development and no known coal zones or oil or gas fields exist in the project area. Two monitoring wells were noted from the KY Geologic Map Information Service north and south of the intersection of Dudley Road and Turkeyfoot Road.

3. TOPOGRAPHY AND DRAINAGE

The study area lies within the Outer Bluegrass Physiographic Region in Kenton County. Topography of the study area is characterized by broad, gently sloping ridgetops, moderately sloping side slopes and moderately wide to narrow flood plains. Topographic relief throughout the study area ranges from a low of about 860 feet at the north end of the bridge over I-275 to a high of about 895 feet near Dudley road.

Surface drainage within the study area trends toward several small localized creeks and ditches and ultimately drains to the Ohio River. Along the existing roadway surface drainage appears to drain into a curb and gutter along the west side of the roadway.

4. GEOTECHNICAL CONSIDERATIONS

- Subgrade soils which lie within the study area are anticipated to have a design CBR value near 2. It is anticipated that subgrade stabilization will likely be required for any new construction. Chemical treatment, such as lime or cement stabilization may be desired to effectively stabilize road subgrades, however may not be practical due to traffic flow and existing structures, utilities, etc. Stabilization utilizing processed crushed stone and geotextile fabric may prove to be a more viable alternative for this project.

- Soils which underlie the study area are anticipated to largely consist of clayey silts with excessive moisture contents, which are highly sensitive to moisture content. Closer tolerances to the optimum moisture content are often required when utilizing soils containing high percentages of silt and sand-sized particles.
- Wet areas could require stabilization for embankment construction. Likewise, subgrade soils under existing pavements could be very wet and might require stabilization if pavements are removed. It should be anticipated that shale may have been utilized for pavement subgrade stabilization during prior roadway construction in the area.
- Any new bridges, culverts or culvert extensions will likely be designed for a non-yielding foundation.
- Adequate drainage will be of primary concern with any new design or new construction since the soils in the area are anticipated to be silty in nature. Positive drainage should be promoted at all times during construction. Mitigation of surface runoff should be performed by silt checks, silt traps, sediment basins and lined ditches where appropriate and directed toward permanent drainage structures as soon as possible.
- Any new roadway embankments or cut slopes for new construction will likely be minimal. Any embankments constructed at 2H:1V or flatter will likely provide an acceptable factor of safety for embankments less than 20 feet in height. Soil cuts in the residual soils and plastic shales of the Bull Fork Formation can be problematic due to softening of the clays upon exposure in the cuts. Soil cut slopes should not be steeper than 2H:1V. While not anticipated, previous reports in the area indicate that embankments and cut slopes greater than 20 feet in height may require flatter configurations. Review of previous roadway reports indicate that embankments greater than approximately 25 feet in height



should be constructed at 2.5H:1V and embankments greater than approximately 35 feet in heights should be constructed at 3H:1V. Previous roadway reports also indicate that cuts over 25 feet in depth should be constructed at 2.5H:1V. Further investigation and analyses will dictate the slope design however, these slope ratios should be considered until such work has been performed.

- No oil or gas wells were identified through review of online mapping or during field review of the study area. Any oil or gas wells identified prior to or during construction should be closed in accordance with Section 708 of the current edition of the Standard Specifications for Road and Bridge Construction.
- **Several monitoring wells or other water wells were indicated to lie within the study area upon review of online mapping near the intersection with Dudley Road.** Any water wells, cisterns, manholes or catch basins not incorporated into any new design and identified prior to or during construction should be closed in accordance with Section 708 of the current edition of the Standard Specifications for Road and Bridge Construction.
- A working platform for subgrade stabilization may be required for select areas where soft, saturated soils are encountered. The working platform will typically consist of quarry material such as KYTC No. 2 stone or similar. Previous Geotechnical reports in the area have listed select areas where working platforms were required beneath the roadway template. The crushed stone will likely be wrapped in Geotextile Fabric, Type I. Based on previous projects in areas containing similar materials, the thickness of the working platform may exceed one foot. Alternatively, in lieu of a working platform the use of geogrid and/ or high-strength fabric may be an option to improve subgrade performance when used in conjunction with an additional six to eight inches of processed stone such as DGA or crushed stone base. The actual thickness, type of stabilization and locations



will be determined by the engineer during construction and may depend on seasonal fluctuations of the water table.

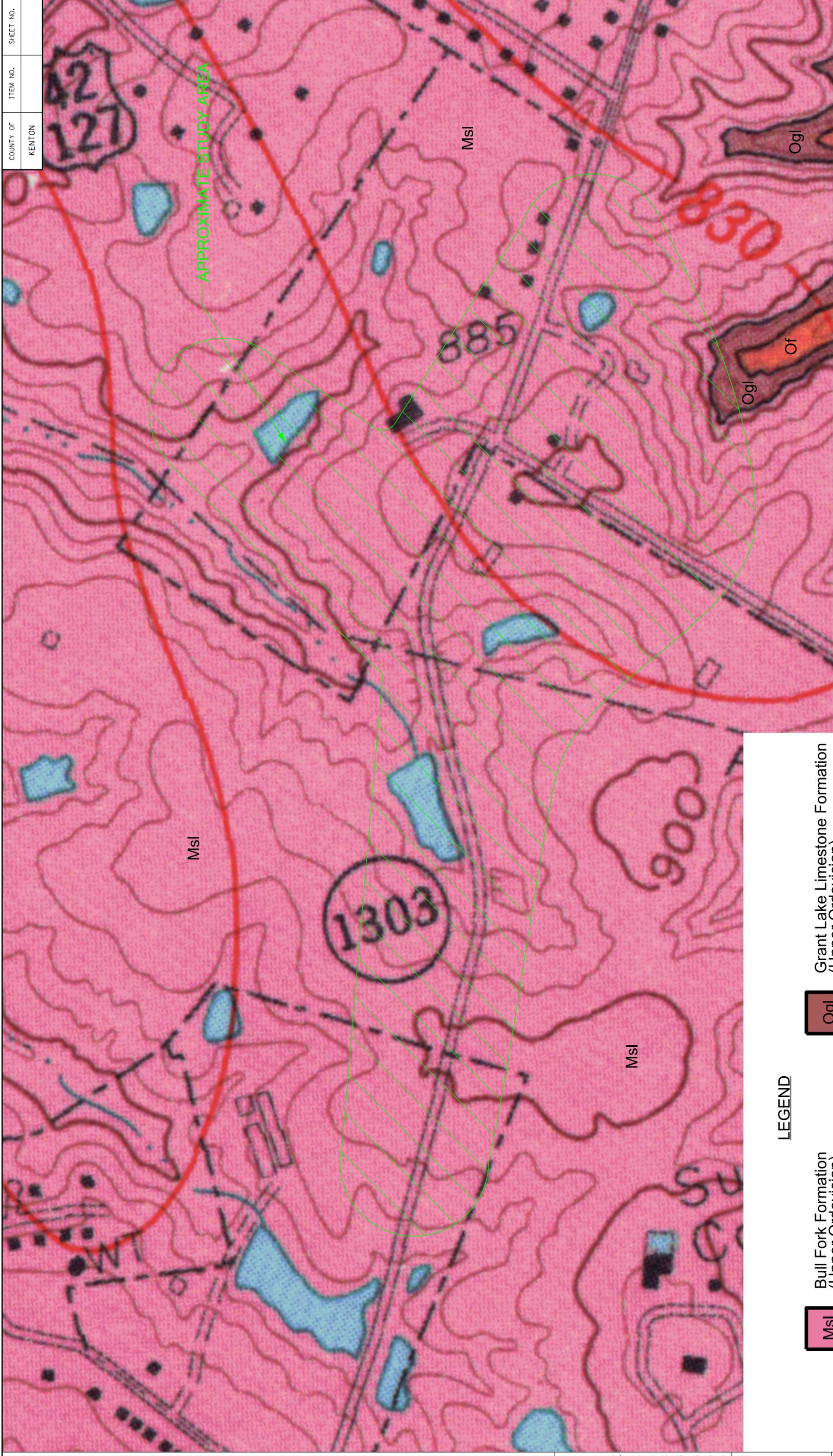
- A list of previously completed Geotechnical Investigations proximate to the study area is included below. These reports can be accessed through the KYTC Geotechnical Branch Database.

List of Projects & Reports

Project ID	Project Type	Project Description
R-047-1998	Roadway	Turkeyfoot Road Section 1 (KY 1303)
R-048-1998	Roadway	Turkeyfoot Road Section 2 (KY 1303)
R-057-1999	Roadway	Turkeyfoot Road Section 3 (KY 1303)
S-201-1998	Culvert	Turkeyfoot Road Arch Culvert @ Station 5+050.65
S-205-1998	Culvert	Turkeyfoot Road Arch Culvert @ Station 14+820

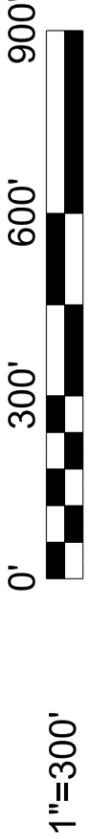
5. SUMMARY

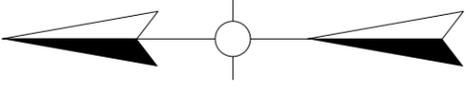
Much of the entire study area is developed with residential and commercial properties, a bridge and intersections with high traffic counts. Numerous utilities, including both overhead and underground, were observed along the existing roadway and much of the existing alignment is bound by Thomas More College on the east side of the existing roadway. It is likely that any new construction will be constrained by these existing features. A means of soil stabilization will likely be required to provide a suitable platform for any additional fill placement and to support any new construction, whether by utilization of granular embankment or chemical stabilization. However, chemical stabilization may not be practical due to traffic flow and existing structures, utilities, etc. Manipulation and drying of subgrade soils will likely be required during construction to provide adequate compaction.



LEGEND

- Bull Fork Formation (Upper Ordovician)
- Grant Lake Limestone Formation (Upper Ordovician)
- Ogl
- Structural Contours
- Of
- Fairview Formation (Upper Ordovician)





LEGEND

- Other
- Domestic
- Industrial
- Agriculture
- Monitoring Well
- Public
- Mining
- Geothermal
- Spring



TURKEYFOOT ROAD
WATER WELLS AND SPRINGS