

MEMORANDUM

TO: Bart Asher, P.E., P.L.S.
Director, Division of Structural Design

FROM: Michael Carpenter, P.E.
TEBM, Geotechnical Branch

BY: Robert McDonald, P.E. 
Geotechnical Branch Structure Foundation Section

DATE: March 22nd, 2018

SUBJECT: Fleming County
FD52 12F0 035 0032 007-008 01D; BRO5215011
Mars #: 87327 01 D
KY-32
15'x6' RCBC (54') at Sta. 43+29.00, skew 40° Lt.
Item #: 9-1084.00
Geotechnical Engineering Structure Foundation Report

S-113-2017
cc: J. VanZee
D. Eldridge
R. Stull
D. Ritchie
K. Stewart
W. Southworth
R. Matar
S. McIntosh (JMC)

1.0 LOCATION AND DESCRIPTION

The geotechnical investigation for this structure has been completed. The DGN file for the subsurface data sheet has been made available on Projectwise and through email for use in development of structure plans. The drilling for this project was performed by the Central Office Drill Crews.

The proposed 15'x6' culvert will be utilized as part of the proposed bridge replacement project for KY-32 over Mud Lick Creek. The structure is located 0.2 mile west of the intersection with Craintown Rd., at approximate KY-32 M.P. 7.82. The project is located approximately 3.9 miles west of Flemingsburg, KY.

2.0 SITE GEOLOGIC CONDITIONS

This structure is located in the Elizaville Geologic Quadrangle (GQ# 893). The geologic mapping indicates that the bedrock at this site consists primarily of Grant Lake Limestone.

3.0 FIELD INVESTIGATION

A total of five (5) borings were taken at this structure's location. Two (2) of the borings were core holes and three (3) were mechanical rock line soundings. The drill crews delivered rock cores to the KYTC Geotechnical Branch in Frankfort and were logged by a geologist.

4.0 LABORATORY TESTING & SUBSURFACE CONDITIONS

Depths to bedrock varied from 1.6 ft to 8.5 ft. The variations in top of rock/auger refusal elevations ranged from 881.7 ft to 884.3 ft. No soil samples were obtained from the borings at this structure's location.

The rock cores obtained for this location revealed light and dark-gray, fine and coarse grained limestone with fossiliferous, clayey and silty shale partings. Some of the limestone was irregularly bedded. The KY RQD values for the rock core ranged from 0% to 32%. Core recoveries ranged from 87% to 100%.

5.0 ENGINEERING ANALYSIS

Due to shallow foundation soils, embankment stability and settlement analyses were not required. The proposed embankment slopes of 2H:1V appear to be stable. Embankments at the proposed culvert location are to be constructed at slopes of 2:1V or flatter. If any additional embankment is to be constructed at slopes steeper than 2H:1V, please contact the Geotechnical Branch for further analysis. With the recommended embedment depths scour is not a geotechnical concern at this location.

6.0 FOUNDATION RECOMMENDATIONS:

- 6.1 Design this culvert for a **non-yielding** foundation. The culvert should be extended to bedrock.
- 6.2 Spread footings shall be founded on unweathered bedrock. Size the footings at a service limit state using a factored bearing resistance of 16 ksf. The Designer shall provide a note in the plans directing that the footings be extended to rock and prohibiting the use of granular replacement. The note would indicate that the Presumptive Factored Bearing Resistance at the Service Limit State is 16 ksf for spread footings on Competent Unweathered Bedrock. Contact this Branch for a more detailed analysis of nominal bearing resistance if the strength or extreme limit states control the footing design.
- 6.3 This culvert shall be designed to incorporate a paved flowline, the paved flow line shall also include the inlet and outlet apron portions of the culvert's flow line. The footings of the barrel of the culvert will require no embedment and bear directly on competent/unweathered bedrock. The footings of the wingwalls shall be embedded a minimum of 1.0 foot into unweathered bedrock.
- 6.4 All footing excavations in bedrock shall be cut neatly so that no forming or backfilling is necessary in the construction of the portions of the footings located in rock. Concrete should be placed directly against the cut rock faces. Mass concrete should be placed in the excavation from the top of the footing to the bedrock surface where the footing does not extend to the bedrock surface.
- 6.5 The wingwalls should be designed using Soil Type 3 of Exhibit 413 in the Division of Structural Design Guidance Manual. It should be noted that the backfill slope being referred to is that perpendicular to the wingwall.

Plan Notes

(Include the notes below at appropriate locations in the Plans.)

- 6.6 Solid rock excavation will be required to reach required footing elevations.
- 6.7 Temporary sheeting or shoring/cofferdams and/or a dewatering method will be required for installation of the footings.

The designer should feel free to contact the Geotechnical Branch for further recommendations, or for any additional questions that arise pertaining to this project, at (502)564-2374.

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Attachments:

- **Location Map**
- **Subsurface Data Sheet**
- **Culvert Layout Sheet**
- **Coordinate Data Sheet**

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Location Map:



(Replace bridge on KY 32 over Mudlick Creek, 0.2 miles west of the intersection with Craintown Rd (approximate KY-32 M.P. 7.82). Located approximately 3.9 miles west of Flemingsburg, KY.

SUBSURFACE DATA

Plan Scale 1" = 10'



OUTLET ELEV. = 882.68

INLET ELEV. = 883.35

Profile Scale:
Vertical 1" = 10'
Horizontal not to scale

Hole No.
Station
Offset
Elev.
(NAVD 88 datum)

1001
43+26.42
32.50 ft. Lt.
883.80

1002
42+83.67
21.40 ft. Lt.
887.10

1003
43+15.00
891.00

1004
43+68.00
23.00 ft. Rt.
884.90

1005
43+45.13
35.90 ft. Rt.
887.40

R
(881.70)

KYROAD REC Overburden
90 90(15) Limestone: light & dark gray, fine &
22 98 93(13) coarse grained, fossiliferous, clayey
32 100 95(14) & silty shale partings
Limestone: light gray, coarse grained,
irregular bedding w/shale partings
Top of rock elev. = 884.30
Base of weathered rock elev. = 883.30

R
(882.50)

KYROAD REC Overburden
11 87 50(15) Limestone: light & dark gray, fine &
17 100 59(11) coarse grained, fossiliferous, clayey
& silty shale partings
17 100 91(14) Limestone: light gray, coarse grained,
irregular bedding w/shale partings
Top of rock elev. = 883.30
Base of weathered rock elev. = 882.10

R
(881.90)

Datum

The Presumptive Factored Bearing Resistance at the Service Limit State is
16 ksf for Spread Footings on Competent Unweathered Bedrock

S-113-17

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9-1084.00

DATE: 20-MARCH-2018	CHECKED BY:
DESIGNED BY:	
DETAILED BY: E. BAILEY	R. McDONALD
Commonwealth of Kentucky DEPARTMENT OF HIGHWAYS	
COUNTY FLEMING	
ROUTE KY 32	CROSSING Sta. 43+29.00
SUBSURFACE DATA	
PREPARED BY Division of Structural Design	
GEOTECHNICAL BRANCH	
SHEET NO.	00000

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EV0000

Kytc

Version 8.30.004

Query: COORDINATE DATA FILE

Project: n:\geotech\gint\projects\s-113-2017.gpj Library: n:\geotech\gint\libraries\kytc library version

ID	Latitude	Longitude	Hole	Station	Offset	Elevation	Comments
7	38.42141	-83.8052	1002	4283.67	-21.37	887.05	
8	38.42134	-83.805	1003	4315	0	891.029	
6	38.42143	-83.805	1001	4326.42	-32.48	500	
10	38.42127	-83.8049	1005	4345.13	35.89	887.4	
9	38.42131	-83.8048	1004	4368	23	884.913	